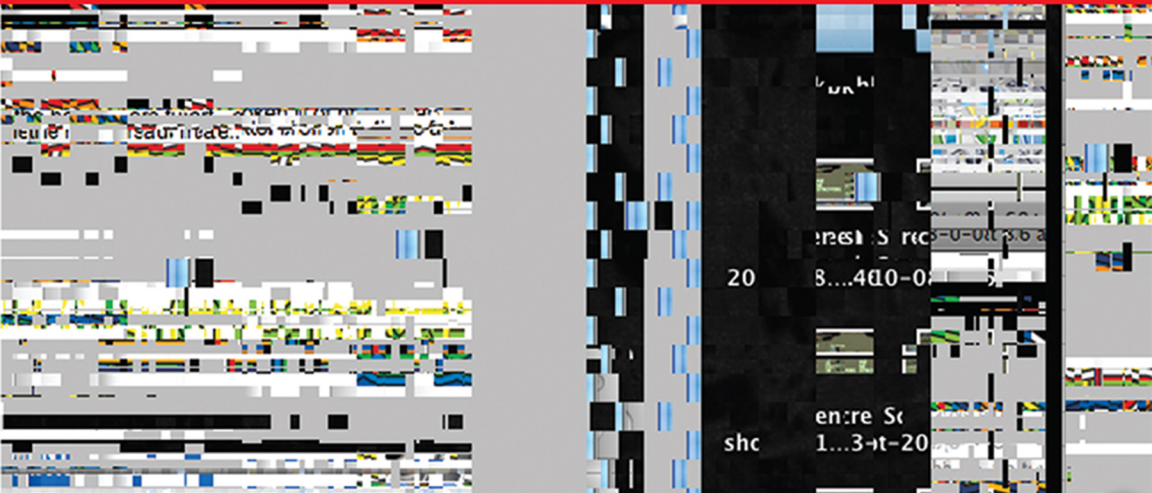# DIGITAL RESEARCH CONFIDENTIAL

THE SECRETS OF STUDYING BEHAVIOR ONLINE

EDITED BY ESZTER HARGITTAI
AND CHRISTIAN SANDVIG

1

How to Think about Digital Research

Christian Sandvig and Eszter Hargittai

"Bench science" has come to connote *routine* scientific labor as opposed to exceptional events. Work done in the natural sciences is sometimes distinguished by the prefix "lab," "bench," "field," or even "wet" when an author wants to emphasize that the scientific labor under discussion has a hands-on relationship with the physical world. This is a way of differentiating "everyday science" from a discipline's finished products and from news coverage that glamorizes new findings. "Bench science" is the process; it is what actually happens among the reagents and enzymes; it is the workaday job of feeding the lab rats, cleaning the fume hood, and keeping the cultures alive. With the exception of the ethnographer's word "fieldwork," social researchers do not have an equivalent phrase. There may be no phrase like "bench social science" because social scientists do not often highlight their own everyday work.[1] But they should. This book argues that social scientific research about digital media and the Internet is a key area of social inquiry where routine research labor is quickly being transformed. Digital media research processes deserve our attention because they are producing new methods, new opportunities, and new challenges for understanding human behavior and society. To appreciate this transformation, we must reconceptualize our everyday research work. This chapter and the essays that follow are reflections by practicing researchers describing "bench" social research with and about the Internet and digital media. They are specific accounts of what actually happened to people doing hands-on work during particular projects. These firsthand accounts should be useful not only to anyone new to the area who wants to learn how to conduct research themselves, but also to those already involved in such work as a way to investigate and consider this transformation in method, with both its opportunities and pitfalls.

Research Methods as a Creative Act

It is difficult to learn about "bench social science" without experiencing it. Detailed, first-person narratives about research methods are hard to find.[2] As scholars, our most common means of written communication is the research article, a kind of writing that originally developed its format from the correspondence between gentleman scientists. All research articles were once written in the first person, as letters (and were required to begin with the salutation "Sir,"; see Swales 1990). The scientific letter was partly a way to update the reader on the process of research, but the research articles that developed later became an end rather than a means. The article is now a final product, and scrutinizing one of them gives the reader few clues as to how the research reported in it came about. Just as the business letter has a formal structure of sender, date, addressee, and body, the genre of the research article evolved to differentiate introduction, method, result, and conclusion.

Yet the research work itself may not divide neatly between compartments like "methods" and "results." And in fact the ideal for many methods sections has become what linguist John Swales has termed the "clipped" style of academic writing (Swales 2004: 220), a kind of writing that intentionally excludes details and omits justifications. The clipped methods section does not explain why a particular process was chosen over alternatives—or even what the other choices were. Due to space constraints, or perhaps the assumption that methodological details are boring, clipped final write-ups of projects do not include enough detail about how studies were actually conducted on the ground to allow for their replication. Yet without knowing certain aspects of a study, such as exactly how the researchers obtained their data, it is impossible to know whether a project is sound enough for its findings to be taken seriously, and readers have no guidance that would help them employ a similar method in their own research. In some traditions of qualitative work, method is never written about at all: indeed, some authors feel that methods should be entirely hidden in the service of narrative and readability (for an overview of this issue, see Iverson and Byler 2012).

To the more jaded eye, there are reasons that explain this state of affairs in writing about method. To the cynical reader, descriptions of methods are not helpful because they are not meant to be so. They are

written down in order to report successes and perhaps to build methodological empires. The methods section in a research article is no recipe, because, rather than hoping to instruct the reader, it aims to defend the author from the reviewers or the dissertation committee. Genre analysis of scholarly research articles describes their dominant literary device as the *defensive hedge* (Swales 1990).

The methodological appendix in books is hardly better. Similar to most writing about research methods, it has evolved to be a series of gestures toward procedures the reader is supposed to know already. It exists more as a rear-guard action against the critics than an educational addendum. The motive of authors who write explanations of their methods can even be sinister. The clipped style of writing might be preferable to them not because everyone in the field agrees about the procedures involved (therefore the author may be brief) but because everyone *disagrees* about the procedures involved (therefore all the better to be brief, hide the embarrassing details, and act as though the choices made were too normal to merit more comment).

Contrary to the norms of open science, researchers have built careers by monopolizing new data sets and new research methods, creating incentives against ever sharing the complete details of what they did and how they did it. Methods sections can differentiate among partisans for or against a particular procedure but they can also act to demarcate the expert from the nonexpert. "In practice," economist Deirdre McCloskey explains, much of the function of methodological writing is of this type. "Methodology serves chiefly to demarcate Us from Them," proving that social scientists are more than a group of opinionated people who like to talk a lot about what other people do (McCloskey 1985: 26). The methods in social science say: "What you have here is more serious than just what I think."

Even a methods textbook, which is usually conceived of as a set of instructions, leaves out much of what actually happens during research. Most textbooks prefer to impart a rigid procedure rather than a genuine discussion of process, and since there is little professional incentive for textbook authorship, the writing is often of poor quality. This led famed anthropologist Clifford Geertz (1989) to recommend that graduate students simply avoid all textbooks: they would be better off, he suggested, if they just read finished research and tried to imitate it. This technique is

how we often excuse the poor state of writing about research methods with vague talk of a doctorate as an "apprenticeship."

We would at least expect the research methodology literature to help readers interested in research methods, but the methodology literature can be far from inviting. Articles there revel in technical detail and jargon, while the common tone of the writing is closer to reprimand than to advice. McCloskey wrote that the definition of a methodologist is someone who fancies himself the judge of the practitioner (indeed, most self-proclaimed methodologists are men), while the genre of the methodological paper "is to scold [researchers] for not allowing it to interfere more" (McCloskey 1985: 22). In areas of methodological controversy and innovation, methodology can take the form of an insular debate among guild members (methodologists), each armed with a variety of secret handshakes.

With this context in mind, in the area of digital media research we hereby call for a friendlier and more accessible approach. This requires a positive conceptualization of method as a creative act. While it is easy to see methods as boring tools or even as a necessary but unpleasant step on the road to results, genuine discussion of the research process is ultimately as much about grand ideas as it is about nitpicking; and as much about design as it is implementation. A discussion of method is a discussion of the labor to which we have dedicated our research lives. Ultimately this is also about knowledge, understanding, and even beauty.[3]

To get there, a first step is to open a space for frank discussions about the research process. Instead of deploying talk of methods as a defensive gambit, much can be gained by revealing and reflecting upon our struggles, dramas, and even disasters. This is particularly true as we stumble through the process of inventing a new area of research: the study of digital media and the Internet. Although it is invigorating to adopt a radical tone, this call for an elaborated method continues a trend that has been building in some quarters for decades. A few examples will make this case. The ethnomethodologists in 1960s sociology asked that an expansive definition of method be diffused throughout all sociological writing, and even subsume theory (Garfinkel 2002). Similar impulses appeared decades later in human-computer interaction (Dourish and Button 1998). In the 1970s and '80s, feminist theorists argued that adding more detail in order to reveal the researcher's own subjectivity ("standpoint theory")

produced stronger quantitative analyses and a new form of objectivity (Harding 1987). Actor-network theorists in science and technology studies recently claimed that abandoning the jargon of social science is the way forward, and that researchers should think of themselves as writing detailed "travel guides" rather than aping the conventions of the natural sciences (Latour 2007: 17).[4] Regardless of your position on these specific ideas, the overall point is that we are now a long way from the gnostically confident social scientific writing of the 1950s. In sociologist Steve Woolgar's phrase, researchers can agree that "the fact that all our analyses are essentially flawed is better celebrated than concealed" (Woolgar 1982: 494). With this volume, following up on Hargittai (2009), we hope to create such a space, where researchers can reveal the messy details of what they are actually doing, aiming toward mutual reflection, creativity, and learning that advances the state of the art.

Two Forms of Transformation in Digital Media Research

The need to improve our writing about what actually happens during the research process is consequential because so many new things are happening in Internet and digital media research. At the moment, this research is not even adequately named as an area, despite the fact that it is not a young field anymore (Dutton and Jefferys 2010: 6). Here we call it "digital media," but the topic can include Internet research, e-research, mobile media, new media, computational social science, cyberinfrastructure, information science, social informatics, and more. It is a "trading zone" between disciplines (Collins, Evans, and Gorman 2007). It includes work being conducted by people with degrees ranging from English to sociology to physics (see Jones 1998, Ess and Consalvo 2002, Urry 2004, and Hendler et al. 2008). There is widespread interest in it, although no one is sure exactly what it is, what it is called or should be called, who should do it, or how exactly it ought to be done. While our approach to the topic is inclusive of this diversity, it is helpful to distinguish two different senses of "digital media," which can help to chart the important transformation in research to which we allude above: digital media as instrumentation and digital media as an object of study.

   In the first sense, digital media is exciting as a new research tool. Important methodological ferment has come from the exciting potential

uses of digital media in the research process. Basic, longstanding questions about humanity that may have been inaccessible to researchers in the past may now be possible to study thanks to the spread of computing and the Internet. In many parts of the world, scores of newly computerized transactions now leave "digital traces that can be compiled into comprehensive pictures of both individual and group behavior, with the potential to transform our understanding of lives, organizations, and societies" (Lazer et al. 2009: 721). At the same time that computing has helped collect these data, it has also provided a wide array of new means to analyze them. We now have advanced visualization tools, new chips for geolocation,[5] new software for natural language processing, and so on—all now possible at a scale that before would have been prohibitively expensive or even impossible. In this first sense, digital media is a new kind of microscope: it represents an unprecedented tool we can use to see ourselves. We call this sense of the topic *digital media as instrumentation*.

In our second sense of the topic, traditional research methods or even new ones are being applied to *digital media as a new object of study*. Digital media themselves produce and are the site of remarkable new situations, combinations, and kinds of human activity. Research innovation in this second sense is not concerned with developing new research methods—instead it encompasses the challenge of taking our existing research methods and questions about human behavior to this new terrain. If the first sense pointed out that old questions can now be answered in new ways, this second sense instead asks what the new questions are, or at least what new contexts have emerged to reinvigorate the central questions of our scholarship. In this vein, researchers consider what social interaction through specific new digital platforms actually entails. Researchers revisit the classical problems of social science like inequality, the allocation of scarce resources, identity, learning, culture, power, and so on—but do so in the context of digital media and the Internet. (Sometimes this second sense is referred to by others as "Internet studies.")

In other words, our second sense of transformation involves the challenges facing humanists and social scientists who practice longstanding research traditions like ethnography, history, or survey research when they ply this craft in an unfamiliar digital media context. It is true that all research is about studying unfamiliar objects—the very term "research"

itself derives originally from hunting, and means "to seek." In this sense digital media are the quarry—the object of the hunt. But when dealing with this second sense of our topic, which we call digital media as an *object of study*, pointing an existing method at a new object often raises difficult intellectual questions related to method. Even if the procedure of a method is relatively unchanged, its meaning might be wholly transformed. Alternately, an existing method's applicability in the first place might be a point that a researcher has to defend, as when a study design employs paper-and-pencil surveys to study Internet use, or an author claims to be performing "an ethnography" without geographically visiting any research sites or speaking to interlocutors in person.[6]

These two forms of potential transformation—as *instrumentation* and as *object*—constitute frames for how to think about research involving the Internet and digital media. They are not exclusive. It is certainly possible that research projects both investigate new phenomena and use new tools and methods to do so. We will now consider the implications that these frames provide when considering the intellectual problems surrounding discussions of method.

The Internet as Instrument

Let us consider digital research as *instrumentation* first. As described by noted physicist and historian of science Derek J. de Solla Price (1986), much of natural science during the era known as the Scientific Revolution can be explained by the fortuitous discovery of a series of new instruments. These were always borrowed from some other endeavor. The first pumps were created for firefighting and mining, but they led to the realization that air is a gas. The cloud chamber was an attempt to create artificial clouds built by a mountaineering buff, but it then became the way to visualize atomic particles. The telescope was first marketed as a novelty, then as a military device, and then Galileo used it to discover that the moon had mountains. De Solla Price calls this era of science the period of "instrumental revelation" (247), writing that:

For the first time in history, [Galileo] had made a discovery not available to other people and by a process that did not involve deeper and clever introspection. Galileo had discovered what was effectively a method of artificial revelation that promised to enlarge what was to be explained by science. (245)

As we noted above, some now believe that the Internet and digital media are instruments that could enable a similar revolution of revelation for the social sciences (Lazer et al. 2009). In this view, online games like World of Warcraft were created by private companies to allow people to pretend to be night elves (or more accurately, for the company to make money from what people spend on subscriptions allowing them to pretend to be night elves). Yet these games might hold the potential to answer basic questions about the networked structure of human interaction. Social network sites like Facebook were developed through private investment with the goal of making money through advertising, but they may allow us to answer basic questions about human behavior.

So far, the most-trumpeted successes of the digital media instrument have been outside of social science. Much of the excitement has surrounded "big data." Consider two of the most well-known examples. First, monitoring Google search queries for the frequency and location of terms like "flu" produced a new way for epidemiologists to monitor influenza outbreaks. Analyses of big data suggested that this could work 1–2 weeks faster than the current method: a weekly survey of doctors conducted by the Centers for Disease Control (Carneiro and Mylonakis 2009; Ortiz et al. 2011). Second, financial engineers found that an automated sentiment analysis of posts on Twitter could predict stock market returns 1–2 days in advance, something not possible with any other method (Bollen, Mao, and Zeng 2011). However, these success stories quickly became controversies. First, Google flu prediction proved to be strongly confounded by media coverage of the flu. Since media coverage of the flu does not accurately reflect the prevalence of the flu, this led to Google flu-prediction errors that could have cost millions of dollars in erroneous vaccine procurement had anyone relied on the Google model and not the traditional CDC surveys of doctors (Butler 2013). Second, systematically watching and tracking Twitter for stock market information quickly made Twitter an unreliable source for that information. A hedge fund managed by Twitter sentiment analysis closed (Leinweber 2013). Stock market prediction using Twitter posts subsequently proved to be susceptible to manipulation, and some of the observed macro-level Twitter trends may in fact be the result of intentional manipulation (Melendez 2013; Messias et al. 2013). In these areas it seems that the

digital research revolution is not here yet, or at least the value of these techniques is still being tested and refined.

Within the social sciences and humanities, the novelty and success of digital media as a research instrument has so far been the most celebrated in the context of large-scale digitization projects like Google Books. In the most prominent example, Michel and colleagues argued that large-scale digitization enables a "new kind of science" called "culturomics … the application of high-throughput data collection and analysis to the study of human culture" (2011: 181) that would subsume traditional methods in the sciences and humanities. Culturomics research has been publicized by promoting a variety of topically disconnected results with claimed relevance for fields like history, English, linguistics, communication, media studies, political science, and law. A sampling of these touted findings reads like a list copied from a manual of cocktail party conversation ideas. The findings include a new estimate of the size of the English lexicon (much larger than was previously thought), a new method to evaluate the scope and impact of government censorship, the fact that the longevity of personal celebrity has been decreasing over time (in other words, the duration of an individual's fame is decreasing), and that for reasons that are not explained, the phrase "ice cream" lost about half of its popularity from 1950 to 1970, and in the years since has almost regained it (Michel et al. 2011).

These claims from the authors selling "culturomics" are relevant here because they demonstrate both the pitfalls and potentials of a possible transformation in instrumentation brought about by digital research, and they do so more clearly than Google flu trends or Twitter stock market prediction. It is tantalizing to imagine that digital research enables the revelation of new facts across such a broad domain from celebrity to ice cream, and bombastic media accounts have even argued that new digital processes of discovery will lead to a new scientific method or "the end of theory" (Anderson 2008). Yet the ability to unearth these facts does not in itself constitute a new science or even perhaps a "finding" in the sense that researchers usually mean the term. Simply participating in fields of endeavor like medicine and finance means that *ipso facto*, the prediction of influenza or the stock market are important, yet the utility of facts unearthed by "culturomics" without a clear research question is not so obvious.

In response to the announcement of the above "culturomics" findings in the journal *Science,* an English professor (Morse-Gagné 2011) apologetically noted that while culturomics provided a new estimate of the size of the English lexicon, this number is not really useful for anything. History professor Tim Hitchcock, commenting on the culturomics findings purporting to be relevant for history, writes that the presentation of these facts "simply misunderstands" history itself:

These large-scale visualisations of language may be the raw material of history, the basis for an argument, the foundation for a narrative, the evidence put in the appendix in support of a subtle point, but they do not serve as a work of history. (Hitchcock 2011)

De Solla Price's earlier description (quoted above) of the telescope providing "instrumental revelation" to Galileo was astute: he wrote that the telescope's revelation was to "enlarge what was to be explained by science" (1986: 245). This was done by adding new facts, such as the existence of unexpected mountains on the moon. Culturomics does present us with new facts to be explained. We could ask ourselves: "What caused the dramatic shift in the popularity of the term 'ice cream'?" But answering that question is sensible only if a fact can be situated in an intellectual frame and context that makes it evidence for a debate of some importance. We could also ask ourselves: "Who cares?"[7]

The telescope also provided Galileo with facts as evidence to support a controversial existing theory—heliocentrism. This led to a paradigm shift in astronomy and physics and to Galileo's eventual conviction by the Catholic Inquisition for heresy. While the scientific revolution in de Solla Price's account was dominated by pivotal developments in instrumentation and apparatus, this does not appear to have been paralleled by any decline in or absence of theory. Indeed, by providing a new source of evidence, instrumentation shaped the codification of the scientific method as we know it today and changed what was meant by "theory." This change could be seen as a much more explicit codification of the role of theory and of the relationship between theory and evidence. We expect the same trajectory for digital research.

In contrast with the high expectations for "big data" projects like the three profiled above (Google Flu Trends, Twitter stock market prediction, and Culturomics), we do not expect that a switch will be flipped and the answers to all research questions will automatically appear, or that with

the appropriate software in place, theory will end (see also Crawford 2013). Popular accounts have focused attention on a few large-scale digital media or Internet projects as a research revolution. All of these involve corporate data sources and a great deal of hype. We instead see that the actual revolution in digital research instrumentation is going on now, all around us, in smaller, "ordinary" research projects. We see it in the use of crowdsourcing to replace traditional pools of research participants (see Shaw, this volume); the use of hyperlink networks as a new source of data to study the relationships between organizations (see Shumate and Weber, this volume); or in the idea that writing your own Web-based application is now a viable data collection strategy (see Gilbert and Karahalios, this volume). Just as in the earliest period of "instrumental revelation" in science, these instruments are providing new sources of evidence. Since the historian de Solla Price diagnosed "instrumental revelation" 400 years after it occurred, so we must wait for the ultimate judgment of future generations as to whether our era is engaged in revolutionary social science. Yet it feels exciting to its "ordinary" practitioners, and it feels exciting to us.

The Relationship Between Instrument and Theory

If the history of science is any guide, the excitement surrounding digital media and the Internet as a new kind of instrumentation is likely to take some time to translate into new bodies of knowledge. We foresee some immediate challenges for those who embrace these new digital research methods. Sociologist and philosopher of science Harry Collins (1985) popularized the concept of *the experimenter's regress* to explain one of the crucial difficulties faced by empirical researchers with new instruments when they are working in an area where the theoretical expectations may not be clear. Paraphrasing Collins, the experimenter's regress functions this way: To answer an empirical research question correctly, we must build a good instrument that measures something. But we do not know if we have built a good instrument until we have tried it and obtained the correct answer to a research question. But we do not know what the correct answer to a research question is until we have built a good instrument … and so on *ad infinitum* (84). The experimenter's regress explains how investigations with new tools can quickly become

stuck, controversial, and intellectually unproductive. In a deeper way the regress, like our earlier discussion of the telescope, is a reflection on the relationship between theory and evidence. As Collins writes, "the experimenter's regress can only be avoided by finding some other means of determining the quality of an experiment" beyond its own results (85). This can be a paradoxical proposition because "a criterion must be found which is independent of the experiment itself" (85).

To illustrate the regress in the context of our topic, if a social scientist used a previously unobtainable source of digital research evidence to obtain a very surprising result, a process related to the experimenter's regress would apply.[8] Imagine that a new method for the large-scale quantitative analysis of Facebook profiles produces an extremely sensational and unexpected fact (say, "92% of married Americans are polyamorous," or "The homeless are the most influential group in matters of public opinion"). The more unexpected the fact, the more the methodological innovation would be called into question ("It must be false! The new method is mistaken!"). If a new method gives us new evidence, we can only make sense of it by comparing it to our existing theories. When a new method produces surprising results, this is as likely to be a problem as it is a success, as it invalidates the method rather than proving its worth. In contrast, in what we might call *the methodologist's lament*, when a new method proves its correctness by delivering a completely obvious result ("poor people are less likely to have high-speed Internet access at home than rich people") the method also damns itself ("If a new method cannot deliver new information to us, of what value is it?" "Why switch to a new method?"). This may explain why methodological changes in day-to-day research practice tend to make their first inroads when methods offer an incremental savings of money or time rather than a bold new way to measure or conceptualize the world.

In a third situation, a new method might deliver evidence about which we have no expectation at all. Imagine that at the dawn of Facebook, a researcher developed a new method to sample and crawl Facebook profile pages. The results suggested that the fewer favorite books a user listed on their profile, the more likely they were to use the Facebook "poke" feature. In this situation the method is also proven worthless, as the result is not interpretable at all. Before asking, "How could those two things be related?" many readers would have been stumped by the things

themselves ("What is the 'poke' feature? " or even "What is Facebook?"). This illustrates the peril of using a new method to deliver facts that are disconnected from a research question or a theoretical frame. In this way the phenomenology of research is always entangled with the epistemology of instrumentation and evidence (see Davis 1971).

It is new ideas, concepts, and models that we ultimately want, not just new facts. Despite the difficulties listed above, the ultimate promise of new instrumentation is in fact to escape the experimenter's regress and also to do more than simply perform the same research process faster, cheaper, or with a different tool. As a way to expand the available evidence and kinds of evidence, digital research instrumentation has the potential for far-reaching consequences reaching beyond method and into theory. This is an important point, because despite extensive, required doctoral-level training in both theory and method, the relationship between the two is often a topic unconsidered by graduate education.

As theory and method are normally presented they seem independent of each other, like two different *á la carte* menus from which the student can select a main course and dessert. Of course this cannot be the case. Sociologist Howard Becker (1986), writing about the research process, takes pains to emphasize the link between the two. He writes that as a research project proceeds, each decision about method forecloses a potential theoretical perspective. That is, he argues that in graduate education it is often thought that theory is something that can be bolted onto a research project after the empirical work has been completed. He points out that the choice of theory has already been made—at least partially—when the methods are chosen due to the observations that were not made, the interview questions unasked, and the sites not visited. Within a broad problem area—inequality, education, well-being, and so on—if an empirical study has already been done, what was studied and how it was examined severely narrow the potential explanations that can be fit to the data later. The idea of digital media and the Internet as instrumentation has profound consequences for theory as well as method.

The use of a method constrains theory. If a study is undertaken without a theory in mind, it may well produce results that are off the theoretical map and cannot be explained at all—they might not fit into any narrative that is comprehensible as research. This applies to every method presented in this book and in every methods book—every procedure

comes with a set of theoretical commitments, whether or not they are stated explicitly. We therefore need to ask ourselves with what hidden theoretical baggage digital media instrumentation is burdened. We might also ask what older theories digital media and the Internet as instrumentation might allow us to escape. Rather than conceiving of theory and method as separate menus from which the researcher can choose, Becker might prefer the simile that combining theory and method in a research design is like combining two chemicals—with the wrong combinations, they explode and are unable to provide the desired results. Some combinations just will not work in a productive way.

Becker's point is certainly true and important, but Becker takes the linkage of method to theory as always a liability. This presupposes a research universe where theory is finished; in Becker's scheme, the scholar's duty is only to select from what explanatory apparatus already exists. Contrary to Becker, we can just as easily state that each empirical step opens possibilities for the creation of new theories as well as foreclosing some that already exist. Each step of procedure, in this view, has the chance to produce new data and new kinds of data that can be explained inductively. This chance for new theory is the goal of many methodological movements. For instance, "grounded theory" in the qualitative sociology of the late 1960s explicitly tried to link new methods to the production of new theory. This impulse was born in an environment where sociologists worried that their research had become too descriptive (and too dependent on a few "great man" theories of society; Glaser and Strauss 1967).

By pointing out that method has hidden links to theory even when the theory is left unstated, then, we are not arguing for atheoretical work, or saying that theory need not be mentioned because it is already implied. In fact, we mean to recognize explicitly what already happens: research is a messy and exploratory process and there is value in focusing on methods and technique as a means of producing new puzzles that can be solved. Like it or not, in "bench" social research, sometimes theory comes later. To be clear, this is not meant as a justification for data mining without any a priori ideas about what one might uncover and without any link to existing relevant literature. Rather, we want to acknowledge that methods can be usefully discussed by themselves and their theoretical frames deferred, as long as theory is not put off forever.

De Solla Price pointed out that "lab," "craft," or "apparatus" work is often delegated to a professional class of laboratory assistants and tool-builders in science who live a parallel but demeaned existence. In opposition to the received wisdom that science advances thanks to the cogitation of the noble scientist, de Solla Price argues forcefully that the cause of most progress in science should be properly attributed to instrumentation and method, and he asks us to reconsider pragmatically the unwarranted prestige of theory. "In social standing, the people with brains in their fingertips are regarded as servants of the … people with theoretical training" (252). Yet "the dominant force of the process we know as the Scientific Revolution was the use of a series of instruments" (246). His prescription for science policy is that the surest way to produce new, important knowledge in a domain is to invest in research tools, technical knowledge, apparatus, instrumentation, and the like without a particular theoretical frame or question in mind, and from this new theories and questions will also be born. This follows chemist Homer Adkins's famous adage, "Basic research is like shooting an arrow into the air and, where it lands, painting a target." Digital research methods are the pump, the cloud chamber, or the telescope of today, and there is promise in where this new instrument could lead us.

The Internet as an Object of Study

In our second major sense of digital research and its potential for transformation, we consider digital media and the Internet as an *object of study*. It is worth spending some effort unpacking what role an "object of study" entails in the grammar of research. In their classic review of "oddball" social scientific research designs, *Unobtrusive Measures* (1966), Webb and colleagues framed the interaction between a research question and the way that question is studied by arguing that researchers should be drawn to new sources of evidence that can be studied in pursuit of some invariant underlying question. "Science," they wrote, "opportunistically exploits the available points of observation" (Webb et al. 1966) to allow multiple chances to get at the truth of a particular issue. They argued that by relying on just one source or on a narrow range of evidence, social scientists had severely and unnecessarily constrained their view of knowledge, of the total possible findings and scope of all research. Most social

scientists, in their view, simply did not really consider creativity in method and were thus constrained in what manifestations of a phenomenon they explored. They instead investigated their substantive question of interest through the method with which they were already familiar, and encouraged their students to do the same. In the logic of the book, the average researcher who claimed to be studying "politics" in 1966 was actually revealed to be studying things people wrote on an exit poll survey, or to be studying voting records kept by the county election department. Politics in some other context was not open to consideration because the political scientist in question habitually only looked at exit polls and voting records.

Webb and colleagues strongly implied that most social science findings of the day were probably wrong for this reason—because researchers visited only one "outcropping" of a phenomenon and employed only one narrow lens at a time to study it. They asked: if a researcher is studying media use and wants to measure the audience for radio stations, why rely solely on the survey questionnaire as the "obvious" research method? Instead, why not go to the auto mechanic and sample the radio presets of cars brought in for repair? While all methods have biases, by triangulating the source of information we scrutinize, Webb argued, we are most likely to gain a complete picture of the phenomenon under study. When one begins to consider digital media and the Internet as an object of study, it complicates this picture further. While the radio station example posits the auto mechanic sampling as a new instrument (just as we discussed in the previous section), at the same time we can go beyond Webb and colleagues to point out that there may be a new way to listen to the radio in cars. The radio in a car may have some important difference from listening to radios in the kitchen or at the beach. It may be that the object of study produces new phenomena that should be studied, or highlights boundaries and limits to the older phenomena, defamiliarizing them.

In the view of *Unobtrusive Measures*, the questions of social science are fixed, but the sources of evidence, the settings for these questions, and the designs, instruments, and methods designed to measure them within those settings may vary. Webb and his colleagues often employed geographic metaphors; they wrote of using "outcroppings" to "triangulate." In the dictionary definition, triangulation uses angles to identify a location, and an outcropping is the visible projection of invisible subterranean

bedrock. In the radio audience example, devices in cars are one particular outcropping of the phenomenon under investigation: media use. In a similar vein, Webb and colleagues might feel that behavior "on the Internet" should then be like a rock outcropping to a geologist. The geologist should visit this new outcrop to get a more complete picture of what lies beneath, unknowable, about the particular social scientific question of interest. There is no sense, in this view, that one outcropping is more or less important to the geologist than another, that is, that studying gender dynamics by observing behavior in a school yard is more insightful than doing so in an online context. Any research context is of value: "If we want to understand nature, if we want to master our physical surroundings, then we must use all ideas, all methods, and not just a small selection of them" (1966). Similarly, if we want to understand social behavior, we should triangulate our sources of evidence and include online manifestations to gain a better sense of the overall picture.

Webb and his colleagues were so confident about their formulation of triangulation and the value of diversity that they closed their book with Cardinal John Henry Newman's epitaph. Cardinal Newman was a prominent Anglican academic in Victorian times who now exemplifies both principled doubt and scholarship—Newman converted to Catholicism after he conducted historical research on Anglican theology and found it untenable. Newman was buried beneath the epitaph "*Ex umbris et imaginibus in veritatem*" (out of shadows and pictures into truth). To Webb and colleagues, then, it seems digital media and the Internet could serve as just one more "place" or setting where truth is accessible. Researchers interested in politics will want to supplement traditional offline studies with studies of politics online because it is a new "outcropping" (in Webb et al.'s term) of political action that can help shed light on existing understandings of political behavior. At the same time, studying the Internet can help us understand what may be changing in light of this specific new online context where people engage in the political process. More than just instrumentation, digital media and the Internet offer a view of a potentially new politics. Digital research is more than a different route to the same destination.

To continue the geographic metaphor, unlike Webb and colleagues, we suspect that the outcrop of the Internet may be part of a wholly different subterranean mountain than the others. We suspect that climbing it

informs all mountaineering. We recognize that some outcroppings might be more valuable than others. We might value methodological diversity, but we also value the particular contribution that studying online phenomena may bring. That is why the chapters covering Internet settings in the rest of this book deserve to be included in a conversation about methodological transformation. These authors should not be seen as researchers who happen to have brought their existing research questions and methods to the Internet. There is more going on than that, as we will explain.

If the Internet and digital media are important in their own right, this begs the question, "What is research about the Internet about?" Other authors have cataloged and classified research about digital media and the Internet from 2001 to 2013 in an attempt to answer this question. A sampling of these review essays shows a surprising amount of agreement about recurring emphases (see particularly DiMaggio et al. 2001; Silver 2000, 2006; Dutton 2013).[9] Reviews identify the six most frequently recurring themes in research about the Internet as identity, community, inequality, politics, organizations, and culture (adapted from DiMaggio et al. 2001), with some reviews arguing that identity and community have received disproportionate attention even within this subset of topics (Silver 2006). This list of major themes may seem broad; however, it excludes a number of topics that loomed much larger for other social scientists and humanists. For example, the concept of "empire" is arguably one of the most important ideas in the humanities in the last few decades (Hardt and Negri 2000), organizing and informing a great deal of scholarly work. Yet compared to the themes of Internet research listed above, empire has simply not had a great deal of conceptual intersection with research about the Internet. Initial Internet research has also excluded topics that loomed larger in the study of earlier communication technologies, such as journalistic practice or the effects of televised violence on children, although as the field matures, an exploration of these topics is moving to the online realm as well.

A key justification for studying digital media and the Internet given by practitioners is that these constitute something beyond "just one more place," communication channel, or platform where researchers gather to investigate central research questions. While of course inequality on the Internet is an example of the broader phenomenon of inequality, the

Internet probably has to be more exceptional in some way, or at least offer us some new information or other benefit, to justify studying it in depth. This assumption is a little controversial. As the use of the Internet and digital media has become more popular and mainstream, scholars have argued that there is a "developing [area] of consensus" that researchers should "move away from any strict duality between ... the real and the virtual" (Dutton 2013: 8) and stop treating the Internet like a distinct place. Yes, the Internet is not "strictly" separable from other parts of life, and should not be continually reified as an exceptional object. At the same time it is likely that Internet scholars (us included) implicitly still believe in some Internet exceptionalism, since it justifies their existence. A number of researchers have explicitly taken up this challenge and argued for the uniqueness and importance of the Internet as an object of study.

The Internet as an Exceptional New Object

Dutton (2009) provides one compelling approach to the Internet, describing it as a distinctive and exceptional domain that produces its own new phenomena and research problems. He argues that the Internet is the "fifth estate." While it is commonly known that the term "the fourth estate" refers to the press or the media, many wrongly think that the term is meant to reference the three constitutional branches of government in the United States. In fact, the term probably references the three "estates of the realm" that were seen as the institutional sources of power in the societies of the Middle Ages and formed the inspiration for the organization of the English government. These three estates in the Middle Ages were the clergy (sometimes analogized today to public intellectuals), the nobility (sometimes analogized to the government), and the burghers or bourgeoisie (sometimes analogized to the business classes).[10] In the 18th century, Edmund Burke (as reported by Thomas Carlyle) identified the press as a new "fourth estate," implying that the printing press and the development of journalism had established a new source of political power beyond that of intellectuals, government, and business (Dutton 2009: 2). Dutton extends this further by naming the Internet the fifth estate. He writes,

Many of those who acknowledge that some aspects of the Internet compose something distinctive also have a limited notion of new digital media as being

essentially a complementary form of news publishing—a[n] … online digital add-on to the mass media. (4)

Or, alternately, Dutton writes, they focus limited emphasis "on techno-logical novelty" that they believe will be a passing fad (4). Instead, Dutton sees the institutional, cultural, and technological complex that we call "the Internet" as a configuration that has been able to produce a new source of power. Drawing from evidence about the Internet's ability to allow new routes and kinds of communication that change the outcome of politically charged debates in a variety of contexts, he argues that the Internet is not a new location to study politics, but rather a new kind of politics.

Many other writers have taken up this thread—Dutton's "fifth estate" is only one well-named example. Benkler, in contrast, argues that the Internet is instead a "networked fourth estate" (2011) in order to empha-size its continuity with other institutions (i.e., the press) and secure for the Internet the protection of laws originally written to apply to the press. But elsewhere, Benkler makes a strong case for Internet exceptionalism of his own in *The Wealth of Networks* (2006). He writes:

It seems passé today to speak of "the Internet revolution." In some academic cir-cles, it is positively naïve. But it should not be. The change brought about by the networked information environment is deep. It is structural. It goes to the very foundations of how liberal markets and liberal democracies have coevolved for almost two centuries. (1)

Benkler identifies the technological and institutional framework of the Internet as a source of radically distributed production processes (such as Wikipedia and open-source software). These processes, Benkler asserts, can lead to innovation, new efficiencies, and most importantly, a new form of radically distributed authority. Benkler portrays the Internet as locked in combat against those with a vested interest in traditional pro-duction. He explains that a critically important focus for researchers in this environment is this struggle between the old and the new.

Justifications for Internet exceptionalism are too extensive to be listed here exhaustively. For instance, Dutton's "fifth estate" and Benkler's "wealth of networks" were heavily influenced by the earlier work of Castells (1996) and others. Castells is part of a longer research tradition theorizing and studying the consequences of new information and com-munication technologies. (For a complete review, see Webster 2006.) Our

point is that there is ample justification for the premise that the Internet is worthy of consideration as an object of study in its own right, and not simply as another example of an existing phenomenon. In closing, we will now turn to the implications of this situation for all research methods—our central topic in this book.

The Internet Transforms Traditional Methods

With both senses of the Internet and digital media (as instrumentation, as object of study) now in hand, we conclude with observations about their interplay and their future implications for method and knowledge. We end this chapter by arguing that one important lesson to be drawn from the new digital methods described in this book is that they help us to reconsider and transform older, nondigital methods. To recap, above we explained that as instrumentation, the Internet and digital media may promise bold new forms of evidence and "instrumental revelation," yet these seem likely to appear at some time distant in the future. Today, the Internet may offer more efficient, cheaper, or otherwise superior itera- tions of our existing research methods. Even though these changes seem minor, they can still subtly ask us to reconsider and revise the theoretical assumptions that are linked to our methods. We argued that theory and method are inextricably linked, even when theories are left unstated. We posited that practitioners of new digital methods may often encounter a variation on the *experimenter's regress* (Collins 1985)—epistemologically unable to make bold new contributions to knowledge because of the non- traditional nature of their instruments, which calls their new findings into question. As an object of study, we explained that the Internet promises us new phenomena to research. It asks us to consider the Internet as a new "outcropping" (Webb et al. 1966) where existing research questions can be examined, but also as a way to interrogate our existing questions in light of new and exceptional facts. While some scholars see the Internet as just another context where social phenomena occur, others have argued that the Internet is an exceptional new "fifth estate" (Dutton 2009) allow- ing people to practice a new form of politics, that networked social pro- duction allows us to redistribute power in topographies that were previously unknown (Benkler 2006) and that are deserving of study in their own right. This tradition of work sees the Internet as a domain of

new and exceptional social action, not as an additional, slightly refined example of what came before.

Elaborating on this last point in conclusion, we assert that even if a researcher takes an ostensibly conservative view and visits the Internet looking for answers to the same old questions about identity, community, inequality, politics, organizations, culture, or other areas that they know from nondigital research, and they try to answer them using the traditional nondigital social research methods they already employ in other work, this experience can leave both their methods and their concepts quite changed. By watching this encounter, it is possible to understand how the practice of "bench social science" evolves and methods come to take new forms and meanings.

Research like Ankerson's study of the recent history of the Flash programming language (this volume) demonstrates that claiming a continuity in method is an interesting intellectual move. Claiming a continuity in method does not, in fact, keep the details of research method fixed for writers like Ankerson, because the Internet as a new object of study reopens concepts for consideration that in traditional settings for research are closed and taken as a given. For instance, even though both pre-Internet history and Ankerson's work on Internet-related topics count as *history*, performing archival research to understand the development of the Flash programming language on the Internet quickly unsettles the fundamental historiographic concepts of "archive," "preservation," "reference," and even the notion of a historical record and how it functions. Reflections by Molnár and Hsiao (this volume) on their searches of online video archives suggest similar experiences. In projects that bring existing methods to the Internet, trying to exercise existing research procedures can unintentionally and unexpectedly produce new research practice and force the researcher to clarify and extend what is meant by their traditional method. In another example of this phenomenon, Bruckman, Luther, and Fiesler (this volume) describe performing a study of an online creative community (Newgrounds) using the research method of the interview. Even though they intended their use of the interview method to be "standard" (their term), the context of the Internet led them to question what they thought they knew about privacy, anonymity, and ultimately "human subjects" and "research." These are terms that they end up putting in quotes, yet they were probably not worrying concepts

that they expected to put in quotes when they began their research project.

This implies that our ideas about the continuity provided by a "stable" method over time or "the same" research method in two different studies might require a great deal of intellectual labor to maintain. In our closing example, the notion of continuity in method as an ongoing challenge can be seen most clearly by contrasting two ethnographies of the Internet that were produced about a decade apart.

In 2001, anthropologist Daniel Miller and sociologist Don Slater coauthored the very influential ethnography *The Internet: An Ethnographic Approach*. It consisted of a long-term multisite ethnography performed to understand modern Trinidad in the context of the Internet and vice versa, and it was one of the first works of ethnography about the Internet. It combined the area studies expertise of one author who had a longstanding interest in Trinidad (Miller) with one author who had previously studied the Internet (Slater). The object and often the instrument of this research were both the Internet, yet the writing often emphasized the value of the Internet as an instrument. Miller and Slater used the Internet to reach diasporic Trinidadians that a traditional ethnography would not have been able to consider. The researchers used screen captures of Trini websites as texts that were diagnostic of Trini culture generally and were not just about the Internet. They proudly published supplemental images on a website, an innovation at the time. The book conveys a sense that the Internet can benefit traditional ethnographic methods and vice versa, and in the book these procedures were framed as methodological innovations.

To both compare and contrast, 10 years later anthropologist Tom Boellstorff published the excellent ethnography *Coming of Age in Second Life: An Anthropologist Explores the Virtually Human* (2010). (The title is a reference to Mead's 1928 book, *Coming of Age in Samoa*.) Boellstorff's book is an ethnography of the commercial virtual world Second Life developed by the company Linden Labs, analogizing this digital media platform to be a place, as do its creators and users. Obviously digital media is the object of study, and while it must necessarily be the instrument as well, this notion is often downplayed by Boellstorff, who denies any innovation in method. Although an ethnography of a virtual world is still an unusual idea to some (for an overview, see Beaulieu 2004; Hine

2005), Boellstorff emphasized in the book that he "engaged in normal anthropological methods" (Boellstorff 2010: 4). In a later coauthored methods handbook developed after that project, Boellstorff and colleagues (2012) stated this even more strongly: "the ethnographic research paradigm does not undergo fundamental transformation or distortion in its journey to virtual arenas" (4). Maybe so, but at the same time the "bench social science" or the practice of ethnographic procedure has been entirely transformed from Boellstorff's first book to this one. Describing in detail what a researcher actually does on a day-to-day basis when conducting an "ethnography" of Indonesians in Jakarta would be quite a different description from that of an "ethnography" in the virtual world of Second Life—so much so that Boellstorff and his colleagues wrote a whole book explaining how to do the latter, for people familiar with the former (2012), all the while arguing that the two conditions are fundamentally equivalent.

The above comparison makes it clear that a claimed continuity in method is often quite the opposite; it is a way to enlarge and refine the definition of traditional research methods while still receiving full credit for rigor and tradition. This is not a bad thing. However, this clever maneuver illustrates the way that research methods evolve as a complicated mixture of the new and the old, all the while maintaining their impressive power to define the everyday experiences of our research work. The following chapters contain more examples of "bench" social researchers attempting to puzzle out new procedures that might transform their research. We have come to see it as a process of small steps with big implications—implications for our procedures, for our working life, for the future of scholarship, and, ultimately, for knowledge itself.

Notes

1. Important exceptions include Becker (1986), Clifford and Marcus (1986), and the reflexive sociologists of science dedicated to understanding the everyday practices of science (e.g., Latour and Woolgar 1986).

2. A precursor volume to this book (Hargittai 2009) was one attempt to include them.

3. "When I am working on a problem, I never think about beauty … but when I have finished, if the solution is not beautiful, I know it is wrong." —R. Buckminster Fuller

4. Latour writes that we should even abandon "the pompous Greek name of 'method,' or even worse, 'methodology'" (2007: 17).

5. Geolocation refers to discovering the geographic location of something. New geolocation capabilities in mobile phones, for instance, have allowed new forms of research about human mobility.

6. This last example of "virtual" or Internet ethnography has been contentious for a number of years. For a review, see Beaulieu (2004) and Hine (2005).

7. The authors of the paper claim this fact is important in the field of "historical gastronomy," (Michel et al. 2011: 181), a claim we are not qualified to judge.

8. This discussion of "surprising" results is extrapolated from Davis (1971) and extended to apply to methodology. On the conservatism of science, compare Kuhn's concept of the "paradigm" (1962). Although Kuhn stated that he did not intend the "paradigm" to apply to social sciences, the word is widely applied there.

9. Reviews of the topic that disagree (Ess and Consalvo 2012) tend to do so because they take a more inclusive view and have a longer list, not because they think the things on our list are not central.

10. The third realm is also called the commons, but this is confusing as it typically does not refer to the peasantry or populace as a whole but to those who rise to influence without nobility or ordination.

References

Anderson, C. 2008. July. The end of theory: The data deluge makes the scientific method obsolete. *Wired*. http://archive.wired.com/science/discoveries/magazine/16-07/pb_theory

Beaulieu, A. 2004. Mediating ethnography: Objectivity and the making of ethnographies of the Internet. *Social Epistemology 18* (2–3): 139–163.

Becker, H. 1986. *Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article*. Chicago: University of Chicago Press.

Benkler, Y. 2006. *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. New Haven: Yale University Press.

Benkler, Y. 2011. A free irresponsible press: Wikileaks and the battle over the soul of the networked fourth estate. *Harvard Civil Rights-Civil Liberties Law Review 46*: 311–397.

Boellstorff, T. 2010. *Coming of Age in Second Life: An Anthropologist Explores the Virtually Human*. Princeton, NJ: Princeton University Press.

Boellstorff, T., B. Nardi, C. Pearce, and T. L. Taylor. 2012. *Ethnography and Virtual Worlds: A Handbook of Method*. Princeton, NJ: Princeton University Press.

Bollen, J., H. Mao, and X. Zeng. 2011. Twitter mood predicts the stock market. *Journal of Computational Science 2* (1): 1–8. doi:.10.1016/j.jocs.2010.12.007

Butler, D. 2013. When Google got flu wrong. *Nature 494* (7436): 155–156. doi:10.1038/494155a.

Carneiro, H., and E. Mylonakis. 2009. Google Trends: A Web-based tool for real-time surveillance of disease outbreaks. *Clinical Infectious Diseases 49* (10): 1557–1564. doi:.10.1086/630200

Castells, M. 1996. *The Rise of the Network Society*. New York: Oxford University Press.

Clifford, J., and G. E. Marcus, ed. 1986. *Writing Culture: The Poetics and Politics of Ethnography*. Berkeley: University of California Press.

Collins, H. 1985. *Changing Order: Replication and Induction in Scientific Practice*. Chicago: University of Chicago Press.

Collins, H., R. Evans, and M. Gorman. 2007. Trading zones and interactional expertise. *Studies in the History and Philosophy of Science Part A 38* (4): 657–666.

Ess, C. and Consalvo, M. 2012. What is "Internet Studies"? In *The Handbook of Internet Studies*, ed. M. Consalvo and C. Ess, 1–8. New York: Wiley-Blackwell.

Crawford, K. 2013. May 9. Think again: Big data. *Foreign Policy*. http://foreign policy.com/2013/05/10/think-again-big-data/

Davis, M. S. 1971. That's interesting! Towards a phenomenology of sociology and a sociology of phenomenology. *Philosophy of the Social Sciences 1* (1): 309–344. doi:.10.1177/004839317100100211

De Solla Price, D. J. 1986. *Little Science, Big Science … and Beyond*. New York: Columbia University Press.

DiMaggio, P., E. Hargittai, W. R. Neuman, and J. P. Robinson. 2001. Social implications of the Internet. *Annual Review of Sociology 27*:307–336.

Dourish, P., and G. Button. 1998. On "technomethodology:" Foundational relationships between ethnomethodology and system design. *Human-Computer Interaction 13* (4): 395–432.

Dutton, W. H. 2009. The fifth estate emerging through the network of networks. *Prometheus 27* (1): 1–15. doi:.10.1080/08109020802657453

Dutton, W. H. 2013. Internet studies: The foundations of a transformative field. In *The Oxford Handbook of Internet Studies*, ed. W. H. Dutton, 1–24. Oxford, UK: Oxford University Press.

Dutton, W. H., and P. W. Jefferys. 2010. World wide research: An introduction. In *World Wide Research: Reshaping the Sciences and Humanities*, ed. W. H. Dutton and P. W. Jefferys, 1–17. Cambridge: MIT Press.

Ess, C. and Consalvo, M. 2012. What is "Internet Studies"? In *The Handbook of Internet Studies*, ed. M. Consalvo and C. Ess, 1–8. New York: Wiley-Blackwell.

Garfinkel, H. 2002. *Ethnomethodology's Program: Working Out Durkheim's Aphorism*. New York: Rowman & Littlefield Publishers.

Geertz, C. 1989. *Works and Lives: The Anthropologist as Author*. Stanford: Stanford University Press.

Glaser, B. G., and A. Strauss. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Sociology Press.

Hargittai, E. ed. 2009. *Research Confidential: Solutions to Problems Most Social Scientists Pretend They Never Have*. Ann Arbor, MI: University of Michigan Press.

Harding, S. 1987. Is there a feminist method? In *Feminism and Methodology*, ed. S. Harding, 1–14. Bloomington: Indiana University Press.

Hardt, M., and A. Negri. 2000. *Empire*. Cambridge, MA: Harvard University Press.

Hendler, J., N. Shadbolt, W. Hall, T. Berners-Lee, and D. Weitzner. 2008. Web science: An interdisciplinary approach to understanding the Web. *Communications of the ACM 51* (7): 60–69.

Hine, C. 2005. Virtual methods and the sociology of cyber-social-scientific knowledge. In *Virtual Methods: Issues in Social Research on the Internet*, ed. C. Hine, 1–16. Oxford: Berg.

Hitchcock, T. 2011. June 19. Culturomics, big data, code breakers and the Casaubon delusion. Historyonics. http://historyonics.blogspot.com/2011/06/culturomics-big-data-code-breakers-and.html.

Iverson, S. D., and D. Byler. (2012). Introductory essay: Literature, writing, and anthropology. *Cultural Anthropology* [virtual special issue]. http://www.culanth.org/?q=node/587

Jones, S., ed. 1998. *Doing Internet Research: Critical Issues and Methods for Examining the Net*. Thousand Oaks, CA: Sage.

Latour, B., and S. Woolgar. 1986. *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press.

Latour, B. 2007. *Reassembling the Social: An Introduction to Actor-Network Theory.* Oxford: Oxford University Press.

Lazer, D., P. Pentland, L. Adamic, S. Aral, A. Barabási, D. Brewer, N. Christakis, 2009. Computational social science. *Science 323*:721.

Leinweber, D. (2013). Mining Twitter Sentiment For Stocks Dies in London, OK at the SEC, Scary in the Market. *Forbes Wall Street*. http://www.forbes.com/sites/davidleinweber/2013/04/24/so-much-for-fund-mining-twitter-sentiment-for-picking-stocks-but-ok-at-the-sec

McCloskey, D. 1985. *The Rhetoric of Economics*. Madison, WI: University of Wisconsin Press.

Mead, M. 1928. *Coming of Age in Samoa: A Psychological Study of Primitive Youth for Western Civilization*. New York: William Morrow.

Melendez, E. D. 2013, February 1. Twitter Stock Market Hoax Draws Attention of Regulators. *The Huffington Post*. http://www.huffingtonpost.com/2013/02/01/twitter-stock-market-hoax_n_2601753.html

Messias, J., L. Schmidt, R. Oliveira, and F. Benevenuto. 2013. You followed my bot! Transforming robots into influential users in Twitter. *First Monday 18* (7). doi:.10.5210/fm.v18i7.4217

Michel, J., Y. K. Shen, A. P. Aiden, A. Veres, M. K. Gray, Google Books Team, J. P. Pickett, . 2011. Quantitative analysis of culture using millions of digitized books. *Science 331*:176–182. doi:.10.1126/science.1199644

Miller, D., and D. Slater. 2001. *The Internet: An Ethnographic Approach*. Oxford: Berg.

Morse-Gagné, E. E. 2011. Culturomics: Statistical traps muddy the data. *Science 332*:35.

Ortiz, J. R., H. Zhou, D. K. Shay, K. M. Neuzil, A. L. Fowlkes, and C. H. Goss. 2011. Monitoring influenza activity in the United States: A comparison of traditional surveillance systems with Google Flu Trends. *PLoS One 6*:4. http://dx.doi.org/10.1371/journal.pone.0018687

Silver, D. 2000. Looking backwards, looking forward: Cyberculture studies 1990–2000. In *Web.studies: Rewiring Media Studies for the Digital Age*, ed. D. Gauntlett, 19–30. London: Arnold.

Silver, D. 2006. Introduction: Where is Internet studies? In *Critical Cyberculture Studies*, ed. D. Silver and A. Massanari, 1–14. New York: New York University Press.

Swales, J. M. 1990. *Genre Analysis: English in Academic and Research Settings*. Cambridge: Cambridge University Press.

Swales, J. M. 2004. *Research Genres: Explorations and Applications*. Cambridge: Cambridge University Press.

Urry, J. 2004. Small worlds and the new "social physics.". *Global Networks 4* (2): 109–130.

Webb, E. J., D. T. Campbell, R. D. Schwartz, and L. Sechrest. 1966. *Unobtrusive Measures: Nonreactive Research in the Social Sciences*. Chicago: Rand McNally.

Webster, F. 2006. *Theories of the Information Society*. 3rd ed. New York: Routledge.

Woolgar, S. 1982. Laboratory studies: A comment on the state of the art. *Social Studies of Science 12* (4): 481–498.