ABSTRACT

MONEA, ALEXANDER PAUL. Numerical Mediation and American Governmentality. (Under the direction of committee Dr. Jeremy Packer.)

This project looks to fill a critical gap in our knowledge of the emergence of new forms of power, knowledge, and subjectivation that emerged during the industrial period in the United States and that continue to operate today. This critical hole is the role of what we will term ‘numerical mediation,’ which is the means by which the chaotic flux of the world can be bounded into discrete things – subjects, objects, associations between them, etc. – that can then be sensed and known by humans. Enumeration will be seen as primary: a necessary prerequisite to recognition and representation, language and nomination, classification and categorization. The project will demonstrate that American governmentality cannot be understood outside of numerical mediation, as governmentality arose within a ‘big data’ problematic that demanded an increasing enumeration of the sociopolitical world. This ‘big data’ problematic inflected sociopolitical problems such that they were understood as problems of data collection, processing, storage, and transmission, and always-already implied the birth of computation as their solutions.

The first part of the project will offer an in-depth examination of Michel Foucault, the foundational theorist of governmentality. The first chapter will situate the inherent ‘big data’ problematic behind governmentality, and argue that this necessitates an investigation of numerical mediation and computation. The second chapter picks up from the first, examining Foucault’s methods of archaeology and genealogy as potential tools for investigating numerical mediation and its technical catalysis by computation.

The second part of the project will provide an analysis of the rise of governmentality in America. The third chapter traces the emergence of the first
electromechanical computer, which was built to solve a data processing problem in the 1890 U.S. Census. It argues that the emergence of biopower is clearly rooted in a ‘big data’ problematic that implied computation as the appropriate solution. This numerical mediation totalized the American population, and thus made it available for human knowledge in unprecedented ways. The fourth chapter examines the social problem of risk and vitality and the history of actuarial calculations and insurance agencies in the United States. These calculations required the ongoing individuation of ‘big’ data to produce increasingly personalized policies. The demands of the insurance industry also lead to many important advances in computational technologies.

The fifth and sixth chapters collectively analyze the manifestation of problems in public opinion and democracy within the ‘big data’ problematic. They trace the rise of public opinion polling and statistical sampling techniques meant to offer an ongoing feedback mechanism that could produce continuous – i.e. ‘real-time’ – feedback for governance. The seventh and final chapter will jump ahead to examine the ways in which Google researchers respond to the social problem of automating data collection and knowledge production to keep pace with the information produced in the physical and social world. This chapter cannot demonstrate the full scope of the ‘big data’ problematic in either the intervening years, or across the contemporary sociopolitical world. It will, however, serve to demonstrate the contemporary critical and analytical efficacy of the concepts of ‘big data’ problematic, numerical mediation, and computation that we have traced throughout the emergence of governmentality in America. Finally, the conclusion will look to tie the themes of the project together into the grounds for contemporary critical and analytical interventions into the sociotechnical systems grounded in the ‘big data’ problematic and governmentality.
Our continued focus on numerical mediation will afford us insight into the affirmative dimensions of power, while our historical analyses will demonstrate how deeply entangled these new technologies of power are with the emergence of the nationalized United States that we know today.
DEDICATION

For the love of my life, Bethany Bradshaw, and the family we’ll build together.
BIOGRAPHY

Alexander Monea was born and raised in Canton, Ohio, where he first began to pursue studies in English and critical theory at Walsh University, where he earned his bachelor’s degree. He moved on to obtain a master’s degree in Literary and Textual Analysis from Bowling Green State University, where he first discovered and developed his interest in media studies. While there, Alex decided to further pursue his studies of critical theory and media, accepting an offer to pursue his doctoral studies in the Communication, Rhetoric, & Digital Media program at North Carolina State University. Under the tutelage of Dr. Jeremy Packer, Alex refined his academic interests and developed a focus on the role of mediation in American governmentality that is represented in this work. While at NC State, Alex met his fiancé, Bethany Bradshaw, and accepted a position as Assistant Professor of Digital Humanities at George Mason University.
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INTRODUCTION

Number is the primary medium by which chaos communes with order. It is only through number that the teeming flow of material elements that make up the world can be integrated into individual entities and objects that are also differentiated from one another. We will refer to this process as enumeration. It is the necessary first step to knowledge, as enumerating individual entities and objects is the prerequisite for counting them, classifying them, observing them over time, determining their frequencies, and producing a navigable world of entities, subjects, objects, means, ends, and associations between them. The capacity to numerically mediate the world, then, must be understood as fundamental to human knowledge, decision-making, and action. It is thus also the bedrock of the government of self and others, a point to which we’ll return shortly.

Figure 1. Random dot autostereogram. Hsu, 2005.

To better understand the operation of numerical mediation, let’s take an example. Think here of autostereograms – like the random dot autostereogram below (Figure 1) –
which use the repetition of basic elements (horizontal patterns, dots, etc.) to produce the 3D effects of stereograms with only a single image and without need of a stereoscope. By utilizing proper viewing techniques, people can with greater or lesser difficulty come to see an integrated entity or object in the foreground that is also differentiated from the background.¹ In the case of Figure 1, proper viewing technique can allow one to see a shark (see Figure 2).

![Figure 2. Depth map for random dot autostereogram. Hsu, 2005.](image)

It is number that allows us to apprehend the shark as *one* thing that is whole and integrated, as well as differentiated from its background, in spite of the fact that the image is composed of nothing but dots. In fact, at the point of apprehension here, the actual arrangement of the dots becomes less important than the outline of Figure 2. In a sense, we no longer see specific dots; we see one shark. There is thus a certain amount of abstraction from and

¹ This is of course dependent upon the viewer having fairly healthy eyesight in both eyes and being free of a number of underlying neurological conditions that affect a subset of the population.
reduction of the constituting elements here, but in exchange, we can now see and know things about the shark.

Numerical mediation is thus essential to arresting and ordering a world in flux so that individual entities and objects might be apprehended as integrated and bounded things, and also so that they might be differentiated from one another. Yet, at the basis of knowledge we find a price for admission, which is a certain abstraction from and reduction of the flux of the world. In exchange for perpetually paying this price, things are granted numerical meaning, in the sense that they can be counted, standardized, measured, integrated with and differentiated from one another, aggregated into species and genera, and put into ‘the long run’ to establish their probabilistic frequencies.

It is important to stress here though that this is not a transcendent faculty or process. Even the case of human vision is concretely historical and probabilistic, as the result of our attempts to determine visual stimuli serves as feedback that modifies our future perceptions as both individuals and a species (Purves & Lotto, 2003, 2010; Purves, Lotto, & Nundy, 2002). Visual stimuli are inherently ambiguous, and thus we have developed visual strategies based on probabilities derived from past experience that we map onto the visual scene (Purves, Lotto, & Nundy, 2002, p. 243).2 What we see is thus not the actual visual scene, but the scene as filtered through our contingent and historical faculty for numerical mediation: once we’ve been trained, we see the outline of the shark and not the dots.

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2 The ambiguity of visual stimuli is also the cause of optical illusions, which demonstrate some of the limits of the human species’ attempts to process ambiguous signals. See Gregory, 2009.
The knowledge of the world that lies behind all of our techniques and technologies for successfully navigating it and our strategies and tactics for governing it is concretely historical. It is contingent upon numerical mediation, but numerical mediation is concretely historical itself. As we noted, it operates probabilistically, and thus numerical mediation is constantly modifying the grammar by which it enumerates in response to feedback from decisions and actions made on its basis. This circuit is rapidly accelerated when we consider the fact that humans increasingly use instruments, tools, techniques and technologies to enumerate an ever-increasing portion of the world’s elements and numerically mediate entities and objects that exceed human vision. Think here of things ranging from epidemics and pandemics to black holes to neutrinos to climate. It is precisely this extension of numerical mediation through techniques and technologies that increasingly makes state governance possible. As Ian Hacking notes,

Statistics has helped determine the form of laws about society and the character of social facts. It has engendered concepts and classifications within the human sciences. Moreover the collection of statistics has created, at the least, a great bureaucratic machinery. It may think of itself as providing only information, but it is itself part of the technology of power in a modern state. (1991, p. 181)

Governance requires numerical mediation. As such, that governance is implicitly founded upon consent to a mobile and historical aporia: namely, the perpetual reduction and abstraction of the world into numbers. A focus on the historical roles of numerical mediation in governance can help to highlight this aporia, demonstrate the price of admission for large-
scale governance, and help situate strategies and tactics for social intervention in the political.

In particular, it is the task of this project to fill a critical gap in our knowledge of the emergence of new forms of power, knowledge, and subjectivation that emerged during the industrial period in the United States that continue to operate today. In large part it is an attempt to examine the American context from the perspective of Michel Foucault’s theories of governmentality. This work requires translation, modification, and at times tedious detail. Yet, it pays dividends. Foucault’s framework helps to highlight the emergence of what we will term a ‘big data’ problematic in the United States in the latter half of the nineteenth century. Following Jeremy Packer’s (2013) lead, we can understand this ‘big data’ problematic as a network of competing forces arranged in such a way that it inflected the social production of problems to be solved, and by inflecting them it also implied their technical solutions. As we’ll see, these social problems are always grounded in the complexity, heterogeneity, and distribution of social elements at the national scale. These elements include individuals, objects, associations between either or both of them, communications, tools and instruments, and discourses and bodies of knowledge.

The inflection caused by the ‘big data’ problematic frames these social problems in terms of the need to be able to totalize the social world in such a way that signs, symbols, and meanings are consistent throughout. Without consistency, the capacity to integrate new elements or differentiate and individuate subsets of elements is lost. This inflection always implies the technical solution to the problem: numerical mediation. Numerical mediation, as we’ll see, is the process by which social elements get enumerated, such that they can be
distinguished as one element of a set. Number is thus the grammar for all elements of the set, and as such, it totalizes that set by guaranteeing the consistency of its elements and offering a process for distinguishing elements from non-elements. Numerical mediation will also designate the more advanced operations of integration and differentiation of subsets. The technical solution of numerical mediation always also implies the technological solutions of distinct machines and instruments to facilitate numerical mediation at the desired scale. Foremost among these technological solutions is computation – first via electromechanical tabulators, then electronic computers, and finally bulk synchronous parallel processors.

It is very difficult to speak at the level of abstracted generality when it comes to the couplings of social problems to technical solutions in the ‘big data’ problematic, despite the fact that numerical mediation has huge stakes in our contemporary world. As Mark Hansen writes, “[M]edia conditions our situation […] by giving the empirical-technical infrastructure for thought, by specifying a certain technical materiality for the possibility of thinking, media remains ineliminible, if unthematizable, aspect of the experience that gives rise to thought” (2006a, p. 298). Following Ben Peters, we might understand this unthematizable dimension of media as due to the continuous cycles of contestation, negotiation and institutionalization of media, which correlate to our uncertainty when it comes to finding ways to describe their objects, terms, uses, purposes, and/or impact (2009, p. 18). For him, our goal of locating the “few basic ideas” of a medium necessitates an examination of the many social elements and material technologies that instantiate those basic ideas over time (Peters, 2009, p. 22).

This emphasis on media over mediation has led many astray in their attempts to locate the basic ideas of computation. For example, Friedrich Kittler, suggests one must turn
to the physical hardware of the computer to locate the basic ideas of computation, for 
software is simply a layer of algorithms for manipulating hardware that obscures the true 
nature and materiality of computation (2013, p. 224). Lev Manovich makes the exact 
opposite move, looking to infuse media studies with the knowledge of computer science to 
produce software theory, which alone can recognize the medium as the message in the case 
of computation (2001, p. 48). As we’ll see in chapter two, Kittler’s project is fraught and 
implicitly admits to the problem that the cycles of contestation, negotiation, and 
institutionalization pose for the diachronic examination of specific hardware. Manovich 
comes to explicitly admit that computer science alone cannot explain software as media: 
“Software studies has to investigate the role of software in contemporary culture, and the 
cultural and social forces that are shaping the development of software itself” (2013, p. 10).

It is their reliance on discrete objects over processes embedded in large sociotechnical 
systems that leads both theorists to fundamentally identify computation with the technical 
mediation of writing, speaking, and seeing. For Kittler, “[T]he computer functions […] as a 
general interface between systems of equations and sensory perception” (2010, p. 228). His 
entire genealogy of the precursors to the computer ignores IBM and the electromechanical 
tabulator in favor of gramophones, film, and typewriters. Likewise, Manovich’s (2001) 
canonical project argues that film is the precursor to computation. While he does invest some 
time analyzing the history of punch card tabulators, inevitably the computer is merely a 
‘calculator, control mechanism, or communication’ device until it returns to its historical 
origins in film and becomes a media processor (2001, p. 26). This lack of focus on the most 
direct precursor to electronic computers however is in no means exclusive to media studies.
Its narrow focus is repeated in widely read and cited studies of the computer from science, technology, and society (Edwards, 1996), in traditional historiography (Ceruzzi, 2003, 2012), and even in technical histories of IBM’s early computers (Bashe et al., 1986). There is thus a corollary argument to be made here about the importance of earlier computational research, development, and applications for understanding the basic ideas of computation even today.³

In our infinite task of examining the unthematizable role media play in our ability to think, we might follow Alexander Galloway in his argument that media studies needs to return to the distinction between media and mediation. There are important distinctions between the two that are getting lost, particularly as media studies positions technical media – and on at the increasingly specific machine-by-machine level – as the starting point for critical analysis. For Galloway, “A philosophy of mediation will tend to proliferate multiplicity; a philosophy of media will tend to agglomerate difference into reified objects” (2012, p. 17). Here mediation is not confined to the technical media devices that may catalyze it, but instead can be more broadly understood as “a middle – a compromise, a translation, a corruption, a revelation, a certainty, an infuriation, a touch, a flux” (Galloway, 2012, p. 18). With this understanding, first, we can let go of the notion of ‘the computer,’

³ Many standards for computational hardware and its peripherals crystallized in the period between 1890 and 1940, including things like the use of electricity and binary digitality, circuit relays and very basic logic gates, plugboard programming and removable plugboards for stored programs, alphanumeric printing, and increasingly autonomous processing. These standards crystallized in response to a particular discourse of big data that primarily emphasized both accuracy and speed, but would also come to demand things like interoperability, peripherals, smaller sizes, networks, and internetworks, but never at the expense of accuracy.
which is already a tenuous abstraction at best. It’s explanatory capacity seems limited as we leverage the computational objects most near to us – laptops, smart phones, tablets – to police its impossibly porous boundaries that continually allow semiotic bleed out to virtual machines, pseudo-computers, computational peripherals, large-technical systems, and bulk synchronous parallel computation. Instead we can look to computation as technical processes for data collection, processing, storage, and transmission that are facilitated by and embodied in a diverse set of machines. Once we’ve made this move, it is much easier to situate numerical mediation as a basic idea of computation. As Lisa Gitelman has noted, “[E]very medium […] can only be understood in relation to its others. Varied and variable conditions of mediation make any medium knowable as such” (2010, p. 28). Like Foucault, what is interesting here are the interconnections, not the primacy of a certain function, aspect, or machine (200b, p. 362). We must look to the interconnection between numerical mediation, socio-political problems, techniques and technologies of computation, and governmentality within what I have called the ‘big data’ problematic.

Despite his focus on film, this is not something that Manovich disagrees with; as for him all computational objects are numerical representations (2001, p. 27). This means that all computation rests on the sampling and quantization of analog signals for its data input, and thus all computation is representational in the sense that it digitizes the world. In exchange for this reduction to number, the world is offered the new cultural form of the database. For Manovich, the database has since replaced narrative with structured collections of data in gigantic unordered lists (2001, p. 225). Unlike narrative, which generates a single linear sequence that is always the same, the database is dynamic and repeatedly produces new
information by allowing the robust manipulation of its data (Manovich, 2001, pp. 214–228). As we’ll see, this is a possibility engendered by the ‘big data’ problematic itself, which demands this sort of pliability for the ongoing governance of the living – whose dynamism mirrors the function of the database. Here we must heed Jacques Derrida’s warning when he writes,

> Computer technology, data banks, artificial intelligences, translating machines, and so forth, all these are constructed on the basis of that instrumental determination of a calculable language. Information does not inform merely by delivering an information content, it gives form, ‘in-formiert’, ‘formiert zugleich’. It installs man in a form that permits him to ensure his mastery on earth and beyond. (1983, p. 14)

What Derrida is getting at here is that in presenting totalities for human knowledge, numerical mediation gives those totalities a form. This form corresponds to the grammar of the mediation that is embodied across the technical machines for data collection, processing, storage, and transmission, as well as the techniques, institutions, strategies, and tactics that allow that mediation to operate at the national scale.

But neither is there any such thing as ‘raw’ data, as data collection is always-already a grammatization (see Gitelman & Jackson, 2013). Arjun Appadurai argues that Foucault’s project “destroyed the innocence of the archive” (2003, p. 18). We might then follow Gitelman and maintain as our goal the disruption of the innocence of the database (2010, p. 32). But this goal is one that needs to be extended, as many contemporary analysts have pointed to a similar need to demonstrate the epistemological, political, and ethical implications of algorithms (Beer, 2009; Cheney-Lippold), code (Cox, 2013; Kitchin &
Dodge, 2014; Munster, 2011), software (Frabetti, 2014; Manovich, 2013), interfaces (Galloway, 2012), networks and internetworks (Galloway & Thacker, 2007; Mackenzie, 2010; Starosielski, 2015), memory (Chun, 2011b), optics and vision (Halpern, 2015; Kittler, 2010; Parks, 2005) and the cloud (Hu, 2015; Peters, 2015), to name but a few. But beyond the technical aspects, it has been shown that the analysis of computation must extend to deal with embodiment and phenomenology (Hansen, 2006b), the banalities of everyday life (Fuller, 2012), material practices of labor (Dyer-Witheford, 1999, 2015), the environment and the extraction of natural resources (Maxwell & Miller, 2012; Parikka, 2015), the history of surveillance (Mattelart, 2010), predictive analytics and the production of crises (Chun, 2011a, 2013; Uncertain Commons, 2013), as well the accelerated production of information that leaves people disoriented, ignorant, or apathetic (Andrejevic, 2013; Crary, 2013; Hayles, 2012; Stiegler, 2015; Virilio, 2000).

Towards this end, the unique contribution of this project will be to analyze computation through the lens of numerical mediation. This analysis will require a deep engagement with the emergence of governmentality within the ‘big data’ problematic in the United States, and thus will always be a contextualized analysis of the concrete operations of numerical mediation in its material embeddedness. There are corollary contributions here as well, such as identifying neglected influences on the history of computation. There are theoretical arguments about the hole in Foucauldian theory left where an articulation of mediation, communication, and technology would have been appropriate. There are methodological arguments about how to properly fill that theoretical hole during practical applications that look to take into account media and communications technologies. And
lastly, there are individual arguments in each of the analytical chapters about demography and census-taking, risk management and insurance, public opinion and democracy, and machine learned knowledge and artificial intelligence. For now, we will move on to a very rudimentary articulation of numerical mediation in general that will be further developed and rigorously contextualized throughout the analytical sections of the project.

**Numerical Mediation, or, How Enumeration Precedes Nomination**

PROMETHEUS. [...] Number too, supreme among skills, I invented for them, and letters in combination, the record of all things, the mother and crafter of poetry.

Aeschylus, 2008, 457-461, p. 113

[N]umeracy almost always, perhaps always, precedes literacy.

Hacking, 1982, p. 287

The traditional story of Prometheus begins with the fault of Epimetheus, his brother Titan, who was charged with distributing attributes to animals at their origin. Lacking foresight, Epimetheus ran out of attributes at the last animal, the human. At this point, Prometheus moved to correct his brother’s error, stealing the arts of civilization and fire from Zeus and gifting it to humankind, a crime for which he was chained for all eternity to have
his liver eaten from his body each day by an eagle. This story runs from Hesiod to Plato’s
Protagoras, where it was embedded in the history of Western philosophy. From Plato to
Jacques Derrida, one could argue that philosophy’s most frequent interpretations of the story
are fundamentally rooted in the gift of logos, the word, language, reason, and its technical
supplementation through prosthetic supports like writing. As Aeschylus makes clear in
Prometheus Bound, this is only half the story, for Prometheus gave humans number, which
he considers ‘supreme among skills’. Perhaps in hindsight this story was so often overlooked
because of a problematic translation of the Greek concept of number: arithmos.

As Martha Nussbaum (1979) has artfully demonstrated in her analysis of Philolaus’
response to Parmenides and his Eleatic Conventionalism, arithmos was intimately bound up
with the capacity to apprehend, recognize, and even name an object. As Nussbaum notes, the
translation of arithmos as ‘number’ is problematic because a contemporary understanding of
number implies abstraction, whereas for the ancient Greek, arithmos more often conveyed
the sense of that which gets counted, in contrast to the mechanism by which we count (p. 89-
90). As Nussbaum writes,

The most general sense of arithmos in ordinary Greek of the fifth century would be
that of an ordered plurality of its members, a countable system or its countable parts.
The notion of arithmos is always very closely connected with the operation of
counting. To be an arithmos, something must be such as to be counted — which
usually means that it must either have discrete and ordered parts or be a discrete part
of a larger whole. To give the arithmos of something in the world is to answer “how
many” about it. (p. 90)
This notion of number is that which runs from Homer to Aristotle, and it is one in which the very act of perception is dependent upon the skill of number, the ability to bound or delimit a thing such that it can be recognized as a discrete object. We call this skill *enumeration*, and it is only atop this skill that humans are able to recognize ordered pluralities or subdivisions of objects, and thus it is the bedrock of all counting, classifying, and measuring. Number is thus also the bedrock of apperception. To be perceived is to be enumerated.

This something that continues to resonate with mathematics today. Brian Rotman notes that it is universally excepted that numbers can only be conceived – ‘practically, experientially, conceptually, semiotically, historically’ – on the basis of *counting* (1993, p. 6). Rotman writes,

The numbers arise—historically, psychogenetically, instrumentally, socially—in relation to acts of counting; they are seen to repeatedly issue from and accompany counting; and they are, as far as is possible to tell, incomprehensible in the absence of a complete familiarity with the particular repetitive signifying activity that we all seem to invoke by that term. [...] Counting presents itself as prototypical of the very business of sign creation itself. We count by repeatedly enacting the elemental process of creating identity by nullifying difference, repeatedly affixing the *same* sign “1” to individuated “things”—objects, entities—that are manifestly not the same qua individuals in the world-before-counting from which they have been taken. (1993, pp. 50–51)

Our differentiation and integration of elements, objects, and entities in the world is dependent on this activity of counting. Here we find the origin of the digital and numerical mediation in
the fingers, which humans use to represent numerosities before ever learning symbolic representations for them (Butterworth, 1999; Fuson, 1988; Rusconi et al., 2005). In fact, in our first few years of life, what scientists call ‘finger gnosis’ is the best predictor of our current and future ability to count and utilize numbers (Fayol et al., 1998; Gracia-Bafalluy & Noël, 2008; Noël, 2005). And this relation between digital counting and our fingers does not stop after childhood (Andres et al., 2008, Fischer, 2008). Fingers are the basis of our ability to establish isomorphy (Gelman & Gallistel, 1978; Gallistel & Gelman, 1992), and to keep track of numbers and facilitate their mental manipulation (Alibali & DiRusso, 1999). While a full review of the scientific literature is outside of our purview here, the brief detour was meant to reify the notion that our capacity to nullify the infinite differences of absolute specificity such that we might totalize objects and entities under the sign of ‘1’ is predicated on our inherent tendency toward enumeration or counting.

In critical theory however, the primary story of Prometheus’ gift describes only language, and is rooted in poetry and a metaphysics of presence, most clearly exemplified by the work of Martin Heidegger. One must look to Alain Badiou, a philosopher who privileges the mathematical, for the contrasting narrative. He writes: “The Greeks did not invent the poem. Rather, they interrupted the poem with the matheme” (Badiou, 2006, p. 126). In Badiou’s mathematical ontology, existence is tied to nomination. In order for something to be, it must have a (proper) name. And for Badiou, all nomination requires enumeration, save one exception, nothing (p. 66-67). Here we can see the alternate history of Western thought, in which the very act of signification is afforded only by enumeration, by arithmos in the Greek sense of rendering something discretely, either as an organized plurality or a part of
one. In a strong interpretation, *Being* is literally preceded by the function of enumeration and nomination, but a lighter one might instead argue that ontology is epistemologically limited by this function. For it is the ability to count any given entity or object as one thing that is at the basis of Aristotle’s system for establishing the differences between them, and using this set of difference to establish species and genera classifications for the world. For Badiou, the history of the Western world is the history of science and mathematics in their ability to numerically mediate the world. And this ability is fundamentally grounded upon what Badiou refers to as the ‘count-as-one’, a function that can render multiplicities consistent such that they are susceptible to mathematical operations like formally determining their elements or constituent subsets.

What I mean to take from all of this is that number may be the first medium, if not in ontology, then certainly in epistemology. Language, be it written or spoken, is operative across time. It is mnemotechnical; it engages in processes of hypomnnesia and anamnesis that require the presumption of at least two moments. Where language operates in the interstice between moments, number can operate at a single point. Number operates in the thickness of the present moment – in what Alfred North Whitehead would term ‘presentational immediacy’, or what William James would call ‘the specious present’ – by rendering the discrete and affording the immediate perception of differentiated objects prior to their recognition and representation, their naming, classification and categorization. In so doing, it is enumeration that affords nomination, and thus it is number that is at the bedrock of our distinctions between what is in being and non-being, what exists and what does not. Enumeration precedes nomination. Thus what we term innumerable we must also term
innominable. To repeat our opening refrain: number is thus the primary medium by which chaos communes with order.

In the case of the ‘big data’ problematic and computation, numerical mediation has a curious capacity to present new objects for human knowledge. As Katherine Hayles notes, “When objects acquire sensors and actuators, it is no exaggeration to say they have an unwelt, in the sense that they perceive the world, draw conclusions based on their perceptions, and act on those perceptions” (2012, p. 17). As Mark Andrejevic has explained, the forms of ‘knowledge’ operative in ‘big data’ computations exceed the limits of human comprehension, in particular because for the computer, the data needn’t be understood, only put to use. It engages a logic of ‘knowing without knowing,’ where simply feeding a critical threshold of data into the machine to be processed in accord with simple axioms or models will allow unpredictable correlational patterns to emerge (Andrejevic, 2013, pp. 21–26).

Chris Anderson (2008) writes,

The new availability of huge amounts of data, along with the statistical tools to crunch these numbers, offers a whole new way of understanding the world.

Correlation supersedes causation, and science can advance even without coherent models, unified theories, or really any mechanistic explanation at all.

Here, what it all boils down to is that “with enough data, the numbers speak for themselves” (Anderson, 2008). It is precisely at this point that Derrida’s critiques of the metaphysics of presence best align with Badiou’s arguments about the matheme. For Derrida (1997), the origin of all sense is the trace, whose difference opens appearance and signification into an indefinite deferral of presence that can never be located absolutely. He writes, “From the
moment that there is meaning there are nothing but signs. We think only in signs” (1997, p. 50). We might make a parallel move and note that from the moment there is number, everything becomes enumerable and we think only through numbers. And rather than absence and presence, representation and presentation, all that we are met with is numerical mediation.

This numerical mediation that is neither fully absent or fully present, representational or presentational, can perhaps be best thought through Bruno Latour’s description of mediation in science. In his studies of Louis Pasteur’s encounter with lactic yeast, Latour found a continual struggle to conceptualize the event. For in an attempt to historicize, the lactic acid continually overflowed the historical framework. Once it was discovered, it had always-already been there in such a way that really, Pasteur happened to it (Latour, 1996, pp. 81–82). However, at the same time, this event marked an invention of lactic yeast. Fermentation pre-existed (knowledge of) lactic yeast, but it was at this moment rearticulated and gradually affixed with the constructions of the institutions of science, such as stable properties, a set of instruments, and experimental practices (Latour, 1996, pp. 82–85). Latour writes,

Nowhere in the universe does one find a cause, a compulsory movement, which permits one to sum up any event in order to explain its emergence retrospectively. If it were otherwise, one would not be faced with an event, with a difference, but only with the simple activation of a potential, the mere actualization of a cause. Time would do nothing and history would be in vain. The discovery-invention-construction of lactic yeast requires that it be given the status of a mediation, that is, of an
occurrence that is neither altogether a cause nor altogether a consequence, nor completely a means nor completely an end. (1996, p. 88)

It is precisely this model that allows us to conceptualize the process of numerical mediation without the baggage of a metaphysics of presence. There is often an event in the computational processing of big data in which some statistical entity or object composed of a correlational network between data points is discovered-invented-constructed in such a way that it is at least in part \textit{causa sui}. As we will see repeatedly in the analytical section of this project, the computation of big data sets offers a site of numerical mediation through which new scientific objects can be known and manipulated to alleviate social problems. The discover-invention-construction of these new scientific objects has an always-already-thereness to it that, coupled with their affirmative social utility, precludes any real desire of a return to a time when they were not (known to be) in existence.

The fact that events of numerical mediation in big data sets are in part \textit{causa sui} is the primary reason that we will continue to use scare quotes around ‘big data’ problematic. For a big data set is subject to what mathematicians refer to as the sorites paradox. Rotman gives the example of a heap of grains upon which is performed the operation of removing a single grain at a time until none are left. The paradox is that unless we acknowledge a qualitative change at some point where the heap is transformed into a non-heap, the quantitative change will leave one with a heap even when all the grain has been removed. Rotman argues that this paradox is the result of “a mismatch between what syllogistic logic predicts as the outcome and what is manifestly the case about some aspect of physical reality” (1993, p. 55). Essentially, there must at some point be a difference that makes a difference, where a
A qualitative shift is produced that is not definable on the level of quantitative identities (Rotman, 1993, p. 56). What this means for us is that there is some qualitative shift or emergent property of numerical mediation that occurs in the computation of *some* big data sets, at which point the numbers speak for themselves. The scare quotes are meant to reflect the fact that within the problematic, the word ‘big’ does not indicate a quantity but instead a qualitative state of numerical mediation. The problematic is oriented around numbers that speak for themselves, and techniques and technologies that can catalyze numerical mediation. Thus, a sorites paradox rests at the heart of the ‘big data’ problematic, and it is also for this reason that data is never big enough and processors are never fast, accurate, and efficient enough.

All that said, the ontological argument is not my true argument, as I am interested in the role of numerical mediation in the establishment of governmentality. As Ian Hacking notes, “Enumeration demands *kinds* of things or people to count. Counting is hungry for categories” (1982, p. 280). Let us look to actual practices of counting to critique numerical mediation. Let us look to the *categories* of enumeration if we are to map the modern conjuncture of power, knowledge, and the self. As Foucault writes,

> It is the actual instruments that form and accumulate knowledge, the observational methods, the recording techniques, the investigative procedures, the verification mechanisms. That is, the delicate mechanisms of power cannot function unless knowledge, or rather knowledge apparatuses, are formed, organized, and put into circulation, and those apparatuses are not ideological trimmings or edifices. (2003b, pp. 33–34)
Foucault claimed that all of his investigations up to the point of *The Birth of Biopolitics* were meant to flesh out apparatuses, and he notes, “the coupling of a set of practices and a regime of truth form an apparatus (*dispositif*) of knowledge-power that effectively marks out in reality that which does not exist and legitimately submits it to the division between true and false” (Foucault, 2008, p. 19). In his later work Foucault moved from analyzing solely discursive formations\(^4\) to include “the said as much as the unsaid” (1980, p. 194).

It is precisely this move towards ‘a thoroughly heterogeneous ensemble’ that affords us the opportunity to supplement his theory with notions of mediation, communication, and technology. Perhaps this intervention was inevitable given the English translation of *dispositif* to encompass instruments and tools, but our analysis of governmentality in the United States in the second part of this book will quickly demonstrate that we must look to the instruments, observational methods, recording techniques, investigative procedures, and verification mechanisms that allow numerical mediation to count things if we are to

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\(^4\) In *The Archaeology of Knowledge*, Foucault writes “Whenever we can describe, between a number of statements, such a system of dispersion, whenever, between objects, types of statement, concepts, or thematic choices, one can define a regularity (an order, correlations, positions and functions, transformation), we will say, for the sake of convenience, that we are dealing with a discursive formation” (1972, p. 38). Discursive formations are engendered by an *episteme*, which Foucault describes as “the strategic apparatus which permits of separating out from among all the statements which are possible those that will be acceptable within, I won’t say a scientific theory, but a field of scientificity, and, which it is possible to say are true or false” (1980, p. 197). He further notes, “[W]hat I call an apparatus is a much more general case of the *episteme*; or rather, […] the *episteme* is a specifically discursive apparatus, whereas the apparatus in its general form is both discursive and non-discursive, its elements being much more heterogeneous” (p. 197).
understand governmentality as it manifested itself in the late nineteenth and twentieth centuries. Perhaps more importantly, we will immediately see that these instruments, observational methods, recording techniques, investigative procedures, and verification mechanisms of numerical mediation all require the computer in order to reach a stable state.

Towards that end, the first part of the project will offer in-depth examinations of Foucault and his interlocutors. The first chapter will examine Foucault’s theories of power, knowledge, and the self, with a specific eye to the emergence of governmentality and its subsidiary technologies of bio-power, security, and discipline. As we draw out the late eighteenth and nineteenth century shifts in scientific knowledge, confessional practice and medical care, and the use of statistics to modulate a national milieu to ensure security and improve the population’s health and hygiene, we will see that they are all rooted in a ‘big data’ problematic. It is for this reason that numerical mediation becomes the key to understanding the operations of governmentality. And further, because governmentality’s successful realization is dependent upon numerical mediation, it thus also demands an analysis of the media, technologies, and instruments that catalyzed its numerical mediation.

The second chapter picks up from the first, examining Foucault’s methods of archaeology and genealogy as potential tools for investigating numerical mediation and its technical catalysis by computation. In particular, it looks to a trend in German media scholarship that is often called ‘media archaeology’ in English. German media archaeology understands itself as a similar response to Foucault, looking to demonstrate the place of technical media in discursive production. Yet, particularly as it is editorialized for English-language audiences, there is a flattening of Foucauldian theory towards increasingly strict
archaeology. As such, this chapter explores Foucault’s own arguments for the extension of the archaeological method via genealogy. It then subsequently analyzes the work of three key German media theorists – Kittler, Wolfgang Ernst, and Siegfried Zielinski – to demonstrate the ways in which they either stumble at the limits of archaeology or implicitly leverage genealogy to get past those limits. In closing, I put forth some principles for media genealogical scholarship that will serve as the methodology for the project.

The second part of the project will provide an analysis of the rise of governmentality in America and demonstrate how its rootedness in the ‘big data’ problematic leads to social problems being continually articulated through the lens of numerical mediation. This articulation already implies their solution by the introduction of new techniques and technologies for computation. The third chapter will thus trace the emergence of the first electromechanical computer built by Herman Hollerith for the 1890 U.S. Census. It was this computer that would allow Hollerith to found the company later renamed International Business Machines (IBM). The electromechanical computer arose because of a particular problem of demography. By the mid- to late nineteenth century, the United States had experienced a rapidly accelerating increase in population, who were both increasingly concentrated in urban areas and distributed across the country with the advance of the frontier. This was coupled with an increasingly centralized government, rapid industrialization, and technological advances – most notably the advent of the railroad and the telegraph. By the late nineteenth century, the amount of data that needed to be collected to enumerate the population was becoming prohibitive, and the production of the statistical correlations increasingly required for governance atop that enumeration was lagging to the
point that census superintendent’s worried they might not publish their results before the next decennial census had commenced. It was precisely this social problem that implied its technical solution in the development of early electric tabulators.

For Foucault, the emergence of biopower is fundamental to governmentality, and it is vested in the understanding of a symbiotic relationship between the State and its population (Foucault, 2008; Packer, 2008, p. 271). Through biopower, the state begins to operate at the level of populations. Rather than disciplining individual bodies, it looks to collectively manage society at the level of population by attempts to alter things like birth rates, mortality, health, life expectancy, etc. As Ian Hacking writes, “Life became not only an object of thought but an object of power: it was not merely individual persons who might be subjected to the orders of the sovereign, but Life itself, the life of the species, the size of the population, the modes of procreation” (1982, p. 279). This chapter argues that in the context of the United States, the emergence of biopower as a technology of governmentality is clearly rooted in a ‘big data’ problematic that implied numerical mediation and computation as the appropriate response. This numerical mediation totalized the American population, and thus made it available for human knowledge in unprecedented ways.

The fourth chapter examines the way in which the ‘big data’ problematic inflected the social problem of risk and vitality, specifically examining the history of actuarial calculations and insurance agencies in the United States. Similar to the census, a social problem manifested itself in the insurance agency during the end of the nineteenth century and into the twentieth century. While insurance agencies had previously experienced many problems with the unavailability and inaccuracy of data for their actuarial calculations, these problems
were exponentially intensified during the period as insurance sought to capture new markets and poach the healthiest clients from one another. Both of these activities required them to not only totalize mortality to produce a universal table for all applicants, but to increasingly integrate new sets of vitality, mortality, and credit data, among others. It was only through this integration that they were able to individuate risk classes and produce a numerical system that even clerks could use to accurately evaluate the risk of any applicant. This one of the first instances of differentiation and integration of elements and subdivisions of numerically mediated totalities, and thus is a very significant step in the manifestation of governmentality in America. Additionally, these developments were made possible by the adoption of computational technologies. During the period, IBM was increasingly looking to expand its market and find permanent customer bases, which allowed the problems of the insurance industry to deeply shape the trajectory of IBM research and development. During the period, the demands of the insurance agency were in large part responsible for the introduction of automatic card reading, better sorting mechanisms, removable plugboards for storing programs, and alphanumeric printing.

The fifth and sixth chapters collective analyze the manifestation of new problems in public opinion and democracy that were framed by the ‘big data problematic’. The fifth chapter looks at the traditional role of public opinion in American democracy, paying specific attention to theories of the public sphere and the press. It moves on to examine how the same alterations that produced problems for the census were increasingly challenging the effective practice of democracy in the United States. As the propertied white males of the bourgeoisie faced the prospect of increasingly literate working class and African American
citizens participating in public debate and determining the course of the country, there was a panic in the late nineteenth century that lead to theories about the unsuitability of the masses for sovereignty. A series of contrasting publications also arose that feared the advancement of oligarchy or fascism, as the machinations of government had been rendered increasingly opaque to the people and the complexity of contemporary issues exceeded their education, background, and attention-spans. By the 1920s, the theme of a crisis in democratic government would be crystallized in the publications of Walter Lippmann and John Dewey, both of whom helped to frame the social problem of a national democracy through the ‘big data’ problematic.

The sixth chapter will demonstrate how both Lippmann and Dewey’s framings of the problem of the democracy were responded to in the 1930s by the implementation of public opinion polls. In particularly, we look to the writings of George Gallup, who founded the American Institute of Public Opinion and the Gallup poll, and was more responsible than any other pollster for popularizing public opinion polls and developing a respect for them as both a civic and scientific endeavor. While earlier chapters demonstrated advancements in techniques of data processing, storage, and transmission through the use of punch cards and electromechanical computers, this chapter will trace the advancement of techniques that revolutionized data collection. These techniques leveraged the full enumerations made by the census and the registries of other government agencies to totalize the voting public. From that, they utilized statistical sampling methods to make probabilistic inferences about the totality based on the collection of only very partial data. This new technique of data collection constituted a feedback mechanism, through which new data could continually
modify a totality by inference. In the case of public opinion, this meant that voters could be surveyed repeatedly and trends could be established on certain social and political issues that could be individuated and differentiated such that correlations could be produced between any data classes. In so doing, national public opinion became numerical mediated for the first time, and computational technologies saw their first major advance in data collection.

The seventh and final chapter will jump ahead to examine the ways in which Google researchers respond to the social problem of automating data collection and knowledge production to keep pace with the information produced in the physical and social world. It must be noted that this chapter can in no way demonstrate the full scope of the ‘big data’ problematic in either the intervening years between this and the previous chapter, or across the social milieu at present. It is my hope that it will serve as an example to demonstrate the contemporary critical and analytical efficacy of the concepts of ‘big data’ problematic, numerical mediation, and computation that we have traced throughout the emergence of governmentality in America. That said, Google responds precisely in accord with these concepts. For Google, the entire web is filled with untapped semantic data that might offer insight into how we think and what we know, but this time at the collective level of the globe. Its goal is to capture as much of that data as possible, parse it with simple models, and let it speak for itself. The problem of semantic data is that it is not machine-readable, and it is produced at a rate that is impossible for human techniques of data collection to keep up with. As such, Google needed not only to develop a revolutionary new and fast database to handle all that data, it also needed to make giant leaps of progress in terms of automating data collection. For the first time in history, machines are successfully learning on their own from
very simple rules to extract billions of data points. But further, this continued collection of
data completes the feedback loop, as each new input data point works to iteratively produce
an ontology and schema which then inflects both the outputs that users see and the collection
of future data. In essence, the system is a site of continual and autopoietic numerical
mediation. This chapter examines these steps in terms of a machinic rhetoric, and argues that
not only has the process of numerical mediation been automated here, but also the rhetorical
act of determining what data to collect, in what form, and how.

Finally, the conclusion will look to tie the themes of the project together into the
grounds for contemporary critical and analytical interventions into the sociotechnical systems
grounded in the ‘big data’ problematic and governmentality. Our continued focus on
numerical mediation will afford us insight into the affirmative dimensions of power, while
our historical analyses will demonstrate how deeply entangled these new technologies of
power are with the emergence of the nationalized United States that we know today.
Together, they will offer an understanding of the need to continually produce contextualized
and pragmatic programs of resistance to facilitate change on a case-by-case and indefinite
basis. Throughout the conclusion we will look to highlight where those sites of resistance
might be found, and give tentative examples for how they might be engaged. Rather than
allowing ourselves the luxury of faith in a universal solution that permanently guarantees
liberty and justice for all, we will look at liberty as a practice that needs to be exercised by
continually seeking and producing justice on an ad hoc basis.
CHAPTER 1. The Theory of Governmentality

According to Gilles Deleuze, there are three ontological dimensions to Michel Foucault’s work which “are irreducible, yet constantly imply one another” (1988, p. 96). They are knowledge, power, and self. These three are concretely historical, and have no universal conditions. Instead, they are determined contextually by what can be seen and said, and thus always issue from a problematic. The problematic appears in every historical formation, asking what can be seen and said, what power can be claimed and what resistances mounted, what can I be and what can I become? Importantly, however, they do not vary in any progressive or linear passage (i.e., historically), but only vary with history (Deleuze, 1988, pp. 114-115). Knowledge continually produces formations that allow something new to be seen or said. Power assesses and establishes, reassesses and reestablishes, relations of force. And at the level of the self the production of new modes of subjectivation occurs (Deleuze, 1988, p. 120).

This chapter works to flesh out the these three entangled notions of power, knowledge, and the self, with a specific eye toward their alterations in the nineteenth century during the crystallization of governmentality. Foucault’s articulation of governmentality is here worth quoting at length:

By this word “governmentality” I mean three things. First, by “governmentality” I understand the ensemble formed by institutions, procedures, analyses and reflections, calculations, and tactics that allow the exercise of this very specific, albeit very complex, power that has the population as its target, political economy as its major
form of knowledge, and apparatuses of security as its essential technical instrument. Second, by “governmentality” I understand the tendency, the line of force, that for a long time, and throughout the West, has constantly led towards the pre-eminence over all other types of power—sovereignty, discipline, and so on—of the type of power that we can call “government” and which has led to the development of a series of specific governmental apparatuses (appareils) on the one hand, [and, on the other] to the development of a series of knowledges (saviors). Finally, by “governmentality” I think we should understand the process, or rather, the result of the process by which the state of justice of the Middle Ages became the administrative state in the fifteenth and sixteenth centuries and was gradually “governmentalized.” (2007, pp. 108–109)

For Foucault, governmentality is the story of a network of power, knowledge, and self triads that produce the bedrock of experience in the nineteenth and twentieth centuries. It is the process by which the very field of possibilities open to a population become open to ongoing modulation through synchronous statistical calculations tied to political economic imperatives.

This chapter will argue that Foucault’s history of governmentality is incomplete, as its realization is predicated upon new techniques of quantification afforded by numerical mediation, which later crystallized into electric computational technologies. The first three sections of this chapter will look to examine Foucault’s theories of power, knowledge, and the self that preface his articulation of governmentality. The first section of the chapter will

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5 I confess that this process requires exceedingly dense citation and analyses, as Foucault’s arguments are distributed across a wide breadth of texts that are quite often contradicted by their successors and that alternate
trace some of the shifts in epistemology, and especially science, which preface the emergence of governmentality. The second section will try to draw out a theory of the self and subjectivation from Foucault’s writing, and will look to tentatively tie confessional technologies to practices of data collection and processing through individuation as well. The third section will trace the emergence of two corollary political technologies, biopower/security and discipline, which serve as the mechanisms of power in governmentality. The fourth section will look to tie these first three together into a functional articulation of the governmental technologies, techniques, and practices that emerged in the eighteenth and solidified in the nineteenth century. In so doing, it will work to identify a gap in Foucault’s theories that can only be filled in by an understanding of numerical mediation and computation. The fifth and final section will look to make a rough articulation of a general theory of numerical mediation that will be fleshed out later as it is applied in concrete contexts.

**Synchronous Science for Living Life**

Foucault argues that the center of knowledge in the seventeenth and eighteenth centuries is the table, which is engendered by an articulated system of a *mathesis*, a *taxinomia*, and a *genetic analysis* (1989, p. 82). *Taxinomia* functions as power of imagination that renders apparent a continuum of things that was not readily apparent, and thus establishes a continuity. This continuity is organized by “*mathesis* as the science of terminologies. The payoff, however, is a strong articulation of governmentality and a clear notion of the role that numerical mediation and computation can play in filling in the gaps of Foucault’s theory.
calculable order and a *genesis* as the analysis of the constitution of orders on the basis of empirical series” (Foucault, 1989, p. 80). The table is formed by the application of the calculus of *mathesis* and *genesis* to the imagination’s *taxinomia* (Foucault, 1989, p. 81) The field of *mathesis* is filled by observation, a description of the visible “by four variables only: the form of the elements, the quantity of those elements, the manner in which they are distributed in space in relation to each other, and the relative magnitude of each element” (Foucault, 1989, p. 146).

The science of life corollary to the table is that of natural history and physiology, which Foucault argues is supplanted in the nineteenth century by biology and evolution. This is the site where science loses the holistic character of *mathesis* and becomes disassociated from philosophy, instead becoming disciplinarily canalized and policed (Foucault, 2003a, p. 182). This shift entailed a substitution of “anatomy for classification, organism for structure, internal subordination for visible character, the series for tabulation,” that would lead to the addition of temporality to the prior epoch’s spatially oriented observation, i.e. *history* (Foucault, 1989, p. 150). As Claire Blencowe notes,

> Life as conceived within biology cannot be reduced to that of individual, living, somatic beings. Life is trans-organic, beyond the embodiment of *individual* living organisms. It is beyond bodies because it is quasi-transcendental, outside of, at the same time as within, beings’ bodies. It is also beyond bodies because it proceeds through the destruction of bodies. […] With this, life becomes something above and below, before and after, as well as *within* living beings (*quasi*-transcendental). It is the *condition* of living beings, not a property of living beings. (2012, p. 49)
For Foucault (1989), this meant that the taxonomic conception of life was to be replaced by a synthetic one, in which a certain purposiveness and functionality is highlighted. This is a distribution of knowledge and categorization of objects more akin to organs in an organism, with life itself as the ground for these distinctions (see Jacob, 1973, pp. 88–92). Foucault writes, “From now on, [science] will raise specific problems of classification, problems of hierarchicalization, problems of proximity, and so on” (2003a, p. 182). As Blencowe argues, “What matters, from the point of view of bio-mental rationalities, is not the organism in itself, but the organism in its relation to trans-organic life, life itself, which is perpetuated in sex and in death” (2012, p. 51).

This new form of knowledge was predicated on what Foucault called ‘the gaze’. The gaze was a new form of perception – or even of sensation – that, with practice, allowed subjects to see what was previously invisible by foregrounding the isolation of features, the recognition of repetitions, variations, and differences, and the grouping and regrouping, and classifying of things by species or families (Foucault, 1973, p. 89). This gaze “was not bound by the narrow grid of structure (form, arrangement, number, size), but […] could and should grasp colors, variations, tiny anomalies, [and was] always receptive to the deviant. Finally, it was a gaze that was not content to observe what was self-evident; it must make it possible to outline chances and risks; it was calculating” (p. 89, emphasis mine). Again, this was spatial observation with the addition of a temporal element, that allowed for the classification of difference, and all that it entailed (change, becoming, chance, probability). As Foucault notes, it is only here that the calculation of times and risks through the ‘slow illumination of obscurities’ becomes possible, and through this “the sovereignty of the gaze gradually
establishes itself—the eye that knows and decides, the eye that governs” (p. 88-89). Most important for our purposes, Foucault writes, “New objects were to present themselves to the medical gaze in the sense that, and at the same time as, the knowing subject reorganizes himself, changes himself, and begins to function in a new way” (p. 90).

**Confessional Data and Subjectivation**

The full extent of this corollary transformation of subject and object – as produced by power/knowledge – would only get elaborated with Foucault’s *History of Sexuality* project. There Foucault finally traces the way in which individuals “are able, are obliged, to recognize themselves as subjects” (1990b, p. 4), here, for Foucault, entirely as subjects of sexuality, but one must understand sexuality here as the paragon of power/knowledge’s productions. He sets out to investigate “[T]he practices by which individuals were led to focus their attention on themselves, to decipher, recognize, and acknowledge themselves as subjects of desire, bringing into play between themselves and themselves a certain relationship that allows them to discover, in desire, the truth of their being, be it natural or fallen” (1990b, pp. 5-6).

For Foucault, subjectivation arises from the morality of sexual discourse, where morality is a tripartite system consisting of the moral code, the morality of behaviors, and the modes of conducting oneself. The moral code is an ensemble of prescriptive moral imperatives, with a complex interplay of relations with one another, that is transmitted both directly by agencies and institutions and diffusely (Foucault, 1990b, p. 25). The morality of behaviors is the way in which individuals conduct themselves in relation to the moral code,
their ability to comply more or less fully, to transgress more or less fully, to vary that code and adjust it to different contexts, whether consciously or unconsciously (Foucault, 1990b, pp. 25-26). Finally, the modes of conducting oneself refer to “the manner in which one ought to form oneself as an ethical subject acting in reference to the prescriptive elements that make up the code” (Foucault, 1990b, p. 26). Here the focus is less on the legal-juridical relation between prescription, action, and agent, and instead on the subject of moral action, who comes to know some truth about him or herself through the experience and subsequently can form a relationship of self to self.

Both the Greek and the Christian systems that Foucault analyzes have this tripartite schema, though they emphasize different aspects of it. The Greek system focused on forms of subjectivation, in which the modes of conduct were privileged. Here, the moral code and morality of behavior can remain rather rudimentary. Foucault writes:

Their exact observance may be relatively unimportant, at least compared with what is required of the individual in the relationship he has with himself, in his different actions, thoughts, and feelings as he endeavors to form himself as an ethical subject. Here the emphasis is on the forms of relations with the self, on the methods and techniques by which he works them out, on the exercises by which he makes of himself an object to be known, and on the practices that enable him to transform his own mode of being. (1990b, p. 30)

Here what is privileged is the self’s encounter with what we might term the it-self. The it-self is the self, but only a particular perspective of the self. It is the truth of the self as produced
by a particular system of power/knowledge, or within a particular apparatus. The *it*-self is at once subject-object; it is the truth of the subject produced as truth-object. The *it*-self is the object of the self, a construct with which it enters into relation, but at the same time it *is* the self, the self itself, the subject. This engages with the dynamism of becoming, subjective fluctuation, adaptation, and mutation at the individual level. It stresses the individual’s role in the subjectivation process, and encourages individual subjectivations through self-conduct.

By contrast, the Christian system focuses on *codes of behavior*, whose main focus is the moral code, which must be thorough, systematic, rich, and adaptable, and on the morality of behaviors, on the individual actions of agents’ coherence to or divergence from that code. It is a quasi-legal-juridical subjectivation that operates by enforcement and penalties, pedagogy and habit-formation. Here the subject understands his or her conduct vis-à-vis the law, as a morality of behavior that always risks offense or infraction (Foucault, 1990b, pp. 29-30). Here the relation between self and *it*-self is curtailed and rigidified. The dynamism of becoming is reconciled at the level of the code, which must proliferate itself both by infinite

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6 This term is a translation of the French word *dispositif*, and it is worth noting that this is a contested translation. Giorgio Agamben (2009) has dedicated a book to probing its meaning, though the end result of his investigation is a bit too amorphous for our purposes. Bernard Dionysius Geoghegan (2011) helpfully explains that alternate translations include ‘mechanism,’ ‘device,’ ‘deployment,’ and even ‘disposition.’ Geoghegan also notes that “The English term *apparatus* conflates *dispositif* with another French term, *appareil*, which may connote an instrument or tool” (2011, p. 99). It is precisely this conflation that can render apparent to English-language readers that Foucault’s articulation is, as we’ll see below, incomplete. Despite overtures to instruments and technologies, Foucault fails to provide a rigorous accounting for their agency in the crystallization of governmentality.
expansion and appropriation of the outside and by infinitesimal subdivision and increasingly precise delineation of the inside (which itself is already an outside of sorts). Here subjectivation is increasingly orchestrated, the relation between self and it-self increasingly prescribed, not so much by emphasis as by the obfuscation resulting from an intent focus on the code and, perhaps secondarily, the morality of behaviors.

The Christian system came to operate through the confession, which Foucault describes as “all those procedures by which the subject is incited to produce a discourse of truth about his sexuality which is capable of having effects on the subject himself” (1980, pp. 215-216). For him, “the truthful confession was inscribed at the heart of the procedures of individualization by power” (Foucault, 1990a, p. 58-59). The confession is by nature a dialogical practice in which both a code of behavior and a form of subjectivation are operative. In terms of the code of behavior, the confession is delivered to an authority “who prescribes and appreciates, and intervenes in order to judge, punish, forgive, console, and reconcile” (Foucault, 1990a, pp. 61-62). Foucault writes, “For us, it is in the confession that truth and sex are joined, through the obligatory and exhaustive expression of an individual secret. But this time it is truth that serves as a medium for sex and its manifestation” (Foucault, 1990a, p. 61). The truth produced by the confession that is capable of mediating sex and its manifestation is only produced against obstacles and resistances, which it must surmount in order to be formulated (Foucault, 1990a, p. 62). We demand that sex speak its truth, our truth, which is a deeply buried secret that escapes our consciousness, and at the

7 It is interesting to note here that in English, the same word, confessor, can refer to both the one receiving and delivering the confession.
same time assign it its truth, through the complex tactics we have developed to extract and interpret it (Foucault, 1990a, pp. 69-70).

The tactics of the confessional were largely constituted by classificatory and observational techniques. The classificatory schematization was continually made more expansive through the incorporation of perversions and more precise through the specification of individuals (Foucault, 1990a, pp. 42-43). The observational tactics continually grew in constancy and attentiveness, sought out curiosities to catalog, examined and insistently observed, and engaged in dialogical discursive practices that required great confidence, proximity, and interplaying of intense sensations (Foucault, 1990a, p. 44). One of the primary ways the confession was extended in recent history was through its clinical codification, its conflation with medical examinations, through which it became scientifically objective. Foucault writes:

The medicalization of the sexually peculiar was both the effect and the instrument of this. Imbedded in bodies, becoming deeply characteristic of individuals, the oddities of sex relied on a technology of health and pathology. And conversely, since sexuality was a medical and medicalizable object, one had to try and detect it—as a lesion, a dysfunction, or a symptom—in the depths of the organism or on the surface of the skin, or among all the signs of behavior. (1990a, p. 44)

8 In terms of homosexuality or “inversion,” Foucault notes, “The machinery of power that focused on this whole alien strain did not aim to suppress it, but rather to give it an analytical, visible, and permanent reality: it was implanted in bodies, slipped beneath modes of conduct, made into a principle of classification and intelligibility, established as a raison d’être and a natural order of disorder” (1990a, pp. 43-44).
The confession was also extended in numerous other ways. A general and diffuse causality of sexuality was assumed and justified an indefinite inquisition into all aspects of an individual’s life, as sex had an infinite and protean power, able to hide anywhere and be triggered by anything (Foucault, 1990a, pp. 65-66). Sexuality was assumed to lie dormant, and thus it could be obscure, hidden evading detection. Sexuality was no longer consciously hidden, but instead was hidden from the subject him or herself, and, as such, had to be extracted even if by force (p. 66) Further, a whole hermeneutics was developed for the interpretation of confessions. Foucault writes, “With regard to the confession, his power was not only to demand it before it was made, or decide what was to follow after it, but also to constitute a discourse of truth on the basis of its decipherment” (p. 67). Finally, the effects of the confession were medicalized and transformed into therapeutic operations. Here the coupling of sex and sin was replaced by the normal and the pathological. Further, sex would now “derive its meaning and its necessity from medical interventions: it would be required by the doctor, necessary for diagnosis, and effective by nature in the cure” (p. 67).

The dialogical practice of confession also contains a form of subjectivation. Foucault writes that it is “a ritual in which the expression alone, independently of its external consequences, produces intrinsic modifications in the person who articulates it: it exonerates, redeems, and purifies him; it unburdens him of his wrongs, liberates, and promises him salvation” (1990a, p. 62). Over several centuries the confession has evolved a procedure for the production of the it-self, which allows the self to know not so much its form, but instead allows the self to know that which divides it, perhaps determines it, and above all what causes the self to be ignorant of (the) it-self (pp. 69-70). Here power squarely resides on the
side of the authority, the one who listens silently, who poses questions as if he or she did not have the answers to them. It is the individual who confesses that is constrained, despite being the one who “knows” and answers, because his or her confession is subject to the hermeneutic procedures of the confessional. Foucault notes, “[T]his discourse of truth finally takes effect, not in the one who receives it, but in the one from whom it is wrested” (p. 62).  
Foucault writes, “These polymorphous conducts were actually extracted from people’s bodies and from their pleasures; or rather, they were solidified in them; they were drawn out, revealed, isolated, intensified, incorporated, by multifarious power devices” (p. 48). For him, this discovery is also an implantation of perversions into bodies as an instrument-effect of the medicalized confessional, which isolates, intensifies, and consolidates peripheral sexualities, measures the body, and penetrates subjectivation processes. Foucault notes that these codified sexualities have become rigid, “stuck to an age, a place, a type of practice,” yet continue to be transmitted by economic interests in coordination with medicine, psychiatry, prostitution, and pornography (p. 48). The entrance into the twentieth century is accompanied by the most highly codified understanding of sexuality in history, which we can imagine sharply delimits individual interventions in subjectivation.

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However, the agency of this taking effect can be differentially located, because, as we’ve seen, the process by which the it-self is produced varies. The subjectivation process it engenders can be orchestrated – and thus, in some sense, tending towards homogenization – through an emphasis on codes of behavior, or dynamically individualized – tending towards heterogeneity – through an emphasis on forms of subjectivation.
Technologies of Power for the Age of Big Data

For Foucault, these shifts in epistemology and subjectivation dovetail with major shifts in the operation of power. It is important to note that for Foucault, an examination of power that operates under the assumption that power is a negative mechanism of repression, or that it operates at a superstructural level, or that it operates only by imposing conditions of ignorance on its subjects is wrong both methodologically and historically (2003a, pp. 50–51).

For Foucault,

[Power] operates on the field of possibilities in which the behavior of active subjects is able to inscribe itself. It is a set of actions on possible actions; it incites, it induces, it seduces, it makes easier or more difficult; it releases or contrives, makes more probable or less; in the extreme, it constrains or forbids absolutely, but it is always a way of acting upon one or more acting subjects by virtue of their acting or being capable of action. A set of actions upon other actions. (2000c, p. 341)

Power operates largely through governance, but this too requires an expanded definition more akin to the one it had in the sixteenth century: governance applies far beyond the realm of the strictly political, the structure and management of the State, and into the governance of families, children, souls, invalids, etc. For Foucault, “To govern, in this sense, is to control the possible field of action of others” (2000c, p. 341). The modes through which power was able to manage the field of possibilities open to its subjects radically changed alongside the emergence of new sciences and secular confessional practices. In particular, new technologies of power had to be developed in response to demographic explosion and industrialization, which challenged traditional sovereignty’s capacity to govern at both the
detailed levels of individuals and the complex level of the mass (Foucault, 2003b, p. 250).

Drawing off the model used by cities to deal with outbreaks of the plague – a theme to which we will return in the second chapter – the first technology of governance to emerge was discipline. For Foucault, discipline is a *positive* technology of power that operates through surveillance and training, and is fundamentally inclusive and observational, continually appropriating data, formulating new knowledge, and utilizing this surveillance-based observational database to multiply the effects of power (2003a, p. 48). In this model, power operates at the level of individual bodies, measuring them against norms that it has produced through observation and analysis, and proceeds to train (or even punish) them as needed (Foucault, 2003b, pp. 242–243). From the multiplicity of disciplinary data, each individual body was correlated with an individuated *it*-self through confessional practices like medical examinations, and subsequently was subjectivated in relation to that individuated *it*-self. Further, this *it*-self was simultaneously linked up with the multiplicity from which it was individuated – disciplinary scientific epistemological apparatuses – and thus was constituted the feedback loop through which disciplinarity aggregated data while at the same time operating through individualized treatment regimes. The results of every instance of training (or punishment) are fed back into the apparatus; as Foucault notes, this new form of disciplinary power “fashions, observes, knows, and multiplies itself on the basis of its own effects” (2003a, p. 48). Disciplinary techniques emerged by the beginning of the eighteenth century “at a local level, in intuitive, empirical, and fragmented forms, and in the restricted framework of institutions such as schools, hospitals, barracks, workshops, and so on” (Foucault, 2003b, p. 250). These techniques would soon crystallize into a technology that
was transferable across different institutions and apparatuses (Foucault, 2003a, p. 49).

The second technology required “complex systems or coordination and centralization” (Foucault, 2003b, p. 250) in order to operate, and thus did not emerge until the end of the eighteenth and beginning of the nineteenth centuries. Foucault would first describe this technology of power as ‘bio-power,’ which in contrast to disciplinarity, is applied to living man, the synthetic man or the human species (2003b, p. 242).\textsuperscript{10} Its target was “a new body, a multiple body, a body with so many heads that, while they might not be infinite in number, cannot necessarily be counted” (2003b, p. 245). This new form of power looked for points where the population or species was affected by certain processes like birth, death, production, and illness. Its early manifestations were in medical care based on public hygiene and the formation of institutions charged with coordinating medical care, the centralization of information, and the normalization of knowledge. It also utilized insurance, savings, and safety measures to better distribute and alleviate social problems at the level of the population (Foucault, 2003b, pp. 242–244).

The biopolitical problem of the population or species is thus both a political and a scientific problem at once. It leverages statistics to normalize aberrant phenomena. Events that seemed random from the individual perspective become collectively regular at a large enough scale. Essentially, bio-politics treats all phenomena as serial, stretching them into the

\textsuperscript{10} It is important to keep in mind that the field of biopolitics mirrors our earlier articulation of governance and power in its openness. As Blencowe argues, “biopolitics pertains to something more general than ‘the politics of the body,’ invoking, instead, something like a ‘horizon of culture’, a ‘field of visibilities’, a ‘game of truth’ and a ‘cartography of force and affect’” (2012, pp. 1–2).
‘long run’ of statistical frequencies to establish bandwidths for normalization.\textsuperscript{11} For Foucault, this leads to the production of statistical estimates and speculative apparatuses like forecasts and risk analyses, whose purpose is never to intervene at the level of individuals but instead at the level of their generality, to modify rates of birth or mortality. Their most important function is to produce regulatory mechanisms that can maintain an equilibrium, an average, or a homeostasis by compensating for variations within an acceptable bandwidth from a norm. They locate a variable and install a security mechanism in so as to optimize its rhythms of change or vitality (Foucault, 2003b, pp. 246–247). In the example of theft, Foucault writes:

[T]he apparatus of security inserts the phenomenon in question, namely theft, within a series of probable events. Second, the reactions of power to this phenomenon are inserted in a calculation of cost. Finally, third, instead of a binary division between the permitted and the prohibited, one establishes an average considered as optimal on the one hand, and, on the other, a bandwidth of the acceptable that must not be exceeded. In this way a completely different distribution of things and mechanisms takes shape. (2007, p. 6)

\textsuperscript{11} Foucault writes “You can see that [the phenomena taken into account by bio-politics] are collective phenomena which have their economic and political effects, and that they become pertinent only at the mass level. They are phenomena that are aleatory and unpredictable when taken in themselves or individually, but which, at the collective level, display constants that are easy, or at least possible, to establish. And they are, finally, phenomena that occur over a period of time, which have to be studied over a certain period of time; they are serial phenomena. The phenomena addressed by biopolitics are, essentially, aleatory events that occur within a population that exists over a period of time” (2003b, p. 246).
Security mechanisms accomplish this by responding to reality in such a way as to cancel it out, limit, check, or regulate it, by modulating its natural ebb and flow (Foucault, 2007, p. 47). We can already see how the shift to evolutionary theory and biology, the highlighting of the species and vitalism, are implicit in this technology of governance. The acceptability of a bandwidth of deviation is predicated upon the notion of the species, it requires a (statistical) generalization of serial events to render individual anomalies into mass-level regularities, and only afterward can it individuate the ideal rate of change over time and, with the aid of (statistical) functions like the bell curve, permissible levels of deviation from that individuated ideal.  

We can also see the role of the secularized confession, as the articulation of the mass requires large amounts of individual data. In effect, the more individual data that can be collected, the more anomalies can be rendered regularities. Apparatuses of security are ‘centrifugal,” as Foucault explains,

> New elements are constantly being integrated: production, psychology, behavior, the new ways of doing things of producers, buyers, consumers, importers, and exporters, and the world market. Security therefore involves organizing, or anyway allowing the development of ever-wider circuits. (2007, p. 45)

Security operates atop a vast databank of details with little moral valence or use value in themselves. These details are necessary, inevitable, and natural traces of everyday life that only become pertinent at the level of the population (Foucault, 2007, p. 45). Foucault defines

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12 It is worth noting here that for Foucault, statistics is the main, if not sole, method by which the art of government was unblocked and biopolitics and security were made possible as technologies (2007, p. 104).
the population best when he writes:

> It is a set of elements in which we can note constants and regularities even in accidents, in which we can identify the universal of desire regularly producing the benefit of all, and with regard to which we can identify a number of modifiable variables on which it depends. (2007, p. 74)

This helps to explain the centrifugal tendencies of security mechanisms, as there is no way of knowing what capacities are contained in any potential big data sets. The ever-expanding databanks allow for the continuous search for an ideal rate of change that can operate as a norm, as the *it-self* of the population.

Foucault explicitly notes that the presence of the authority to which the confession is directed in a dialogue needn’t be *actually* present, but may instead be *virtually* present (1990a, p. 61). The case of a disembodied medical gaze still produces power/knowledge objects to which, even if they are produced at the level of population, individuals, in the end, must be related and form a relation with. A truth, even derived statistically from a population, will reveal something about an individual body when that body is placed into the statistically individuated classificatory table. Its operations on the population are, as we’ve seen, already tethered to the individual by desire. But further, that truth can operate on a body in two ways: First, in a legal-juridical or disciplinary sense (which are always security’s means of direct intervention at the level of the individual) by measuring an individual’s self according to the criteria of its table (i.e. by a code of behavior); Second, by providing information about that body to that body, by facilitating a relation between self and *it-self* that can allow for the self’s modulation of self-conduct (i.e., by a form of subjectivation).
It is important to note that these two technologies are not mutually exclusive, as for Foucault, biopower dovetails into, integrates, modifies, infiltrates, and embeds itself within disciplinary techniques. Biopower operates at a different scale, with different instruments, on different objects, and thus often works in tandem with disciplinary technology (Foucault, 2003b, p. 242). But even this is not the final case, as discipline is capable of abstracting itself from the local level and operating at the level of the State, while security is similarly able to individuate itself to operate in individual medical institutions, welfare funds, insurance agencies, etc. (Foucault, 2003b, p. 250). Foucault writes,

[D]iscipline was never more important or more valued than when the attempt was made to manage the population: managing the population does not mean just managing the collective mass of phenomena or managing them simply at the level of their overall results; managing the population means managing it in depth, in all its fine points and details. (2007, p. 107)

This perhaps because they both operate through and are mediated by normalization, as “the norm is something that can be applied to both a body one wishes to discipline and a population one wishes to regularize” (Foucault, 2003b, p. 253). In fact, Foucault is prone to call the society that emerges in the twentieth century the normalizing society, arguing that the norm of discipline and the norm of regulation intersect one another along an ‘orthogonal articulation’ (2003b, p. 253).

Foucault argues that there is a concrete difference between normation and normalization. Discipline operates by way of normation, which works to isolate individuals, places, times, movements, actions, and operations into components which can be seen and
modified to fit definite objectives by concrete sequences or co-ordinations that in practice train and permanently control individual bodies. For Foucault, discipline is prescriptive in the sense that it first establishes a norm, and only upon this *a priori* norm can *a postereori* identifications of the normal and the abnormal be made during training (2007, pp. 56–57). Security, on the other hand, operates by way of *normalization*, which works to processually integrate differential normalities, deduce a norm that is most favorable. Here “The normal comes first and the norm is deduced from it, or the norm is fixed and plays its operational role on the basis of this study of normalities” (Foucault, 2007, p. 63).\(^{13}\) Both processes require versions of a secularized confession, mechanisms for getting at the secrets of man and nature, the body and the world. Both processes individuate *it*-selves, albeit at different scales, mirroring the objects of their analyses that are then utilized to subjectivate bodies and modulate sequences.\(^{14}\) Their difference is in large part due to security’s need to operate in an ad hoc and iterative fashion, as it must regulate a series of events or possible elements from

\(^{13}\) On this rather challenging differentiation between normation and normalization, Blencowe helpfully explains: “As has been said, discipline *imposes* a (set of) diagrammatic norm(s) upon individual bodies whilst biopolitics regulates, fosters and secures the *autonormative* – self-organising – processes of biological life. A normalising society is one in which (at least) two very different types of normalising power operate: imposing norms *and* fostering autogenetic, autonormative processes of population: disciplining living bodies *and* fostering biological life” (2012, p. 61).

\(^{14}\) Though, Foucault is interested in a positive articulation of power, and thus we ought not understand this subjectivation process as one of pressure to conform. Normalization targets people with free will, and simply manages probabilities, delimits the spectrum of probabilities, or offers them better options (Blencowe, 2012; Dolan, 2005).
within a multivalent and transformable framework. Security must normalize the uncertain and the temporal within a given space (Foucault, 2007, p. 20).

This space is that of the milieu, which is the context in which bodies and objects can act at one another from a distance. It is both “medium of action and the element in which it circulates,” and thus implies both the problem of circulation and causality (Foucault, 2007, pp. 20–21). The milieu includes all of the natural givens of geography, ecology, etc. (i.e., rivers, marshes, hills) as well as all of the artificial givens of demography, psychography, communications networks, urban design, etc. which can serve as causal mechanisms or intermediaries in chains of actions (Foucault, 2007, pp. 20–21). The milieu is home to the various ‘butterfly effects’ that regulators are trying to map out and intervene in, and thus the milieu is also a ‘field of intervention’ such that entire population can be affected indirectly through the modulation of natural and artificial sequences.\(^\text{15}\) This technology works remarkably well in tandem with discipline, because for discipline, “The individual is much more a particular way of dividing up the multiplicity for a discipline than the raw material from which it is constructed. Discipline is a mode of individualization of multiplicities…” (Foucault, 2007, p. 12). For Foucault, discipline works to affect individuals “as a multiplicity of organisms, of bodies capable of performances, and of required performances” (2007, p. 21). Thus we can see that both security and discipline operate on a multiplicity: security through the establishment of normal sequences of events in the natural and artificial givens of

\(^{15}\) As Foucault explains, “What one tries to reach through this milieu, is precisely the conjunction of a series of events produced by these individuals, populations, and groups, and quasi natural events which occur around them” (2007, p. 21).
The Holes in Governmentality’s Genealogy

So, we can see now how some of the key features in Foucault’s genealogy of modern technologies of power and the self are interrelated. Biopower/security and discipline emerge as technological solutions to the rapid explosion of data points in eighteenth and nineteenth century societies that were rendering judicial sovereignty unable to deal with its subjects at both the micro- and macro-levels of governance, a fact exacerbated when we remember the broad scope of governance that Foucault wants to examine. These data points include, for example, growing populations that are both increasingly urbanized, and, in the case of the United States, spatially distributed, along with the pace of economic and technological changes accompanying industrialization. Both of these new technologies of governance operate through the power of the normal. Biopower/security does so by leveraging statistical frequency analyses of sequences of events to individuate their normal rhythms, their entanglement with other natural or artificial givens of the milieu, and finally locates the most favorable normalities to individuate as its norms and performs ongoing normalizations, within an acceptable bandwidth of deviation, at mass scale by modulating the frequency of events. In contrast, discipline does so by individuating a norm for its productive bodies from

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16 Foucault is somewhat unclear as to the role of sovereignty here, as he alternates between describing it as also operating on a multiplicity (2007, p. 12) and demonstrating its capacities to operate in tandem with discipline and security, while also arguing that the normation and normalizations of discipline and security are in conflict with and perhaps incompatible with the juridical system of sovereignty (2003a, p. 39).
the multiplicity of their milieu, and then utilizes a process of normation to train and punish actual bodies until the normalities match the predetermined norm, until the subject matches the *it*-self. Both processes require inter-institutional communication, transfer, and support, and both are capable of operating at variable scales ranging from the individual or institutional level to that of the State.

Both processes require confessional practices whereby data is extracted from bodies, from natural and artificial givens, at *massive scales* and *continuously*. And further, there is no way of knowing which data will be prove valuable a priori. One must run statistical frequency analyses on all data, look for correlations across all givens in the milieu, in order to trace the faint networks of causality across the grid of circulation and action. The normalities leveraged by biopower/security in particular only become apparent at mass scale, and thus, as we’ll see, we find the genealogical roots of the impetus towards ‘big’ data. Perhaps most important of all though is that the operation of these technologies is predicated on their ability to *integrate* the *differentials* of the milieu, to integrate normalities with one another. This means that the milieu must be totalized (Blencowe, 2012, p. 122; Osborne, 2008, pp. 110–111). The multiplicity must be consistent. Integration requires numerical identity as its guarantor, and can only operate atop a *numerical mediation* that is rendering the items of integration consistent with one another. This numerical mediation standardizes the natural and artificial givens, and the confessional data extracted from bodies (and minds). It does so by rendering the multiplicity within which they operate consistent, and thus numerically signifiable, and by rendering the milieu in which they are found totalized, and thus (numerically) seeable.
It will be the argument of this book that the realization of governmentality in the United States, along with its dual technologies of biopower/security and discipline, was only made possible by numerical mediation. It is only through quantification that big data can be continuously collected, processed, stored, and transmitted at the scale required by these technologies. Foucault at times comes close to this realization when he stresses the importance of statistics, and in particular when he describes the ‘case’ as the bedrock of all speculations about risk and dangerousness. In the case of statistically forecasting the spread of disease, he writes:

[T]he notion of case appears, which is not the individual case, but a way of individualizing the collective phenomena of the disease, or of collectivizing the phenomena, integrating individual phenomena within a collective field, but in the form of quantification and of the rational and identifiable. (Foucault, 2007, p. 60, emphasis mine).

Here we can see the mechanism previously described: The disease is both totalized and individuated on the basis of the ‘case’, which is an item in a sequence that, over the ‘long run’ becomes statistically generalizable and thus manageable. For Foucault, it is only atop the distribution of cases that one can identify risk, and it is only by individuating risk as an it-self to compare actual subjects and objects to that one can establish zones of lesser or greater danger (Foucault, 2007, pp. 60–61). The milieu must be quantified to become rational and identifiable for technologies of governance. Rationality and identifiability require ‘long run’ sequences of consistent (i.e., integrable) items in order to determine their distributions of probability. In short, they require numerical mediation. Having cleared a space for numerical
mediation in Foucault’s schema, we must turn to a meditation on methods and work to adapt Foucauldian methodologies to the investigation of media and communications technologies before beginning our analysis of governmentality in the United States.
CHAPTER 2. Media Genealogy as Method

Interest in Anglo-speaking countries of the overlapping arenas of German Media Theory, German “Media Science,” the work of Friedrich Kittler, Media Archaeology, and “Cultural Techniques” is clearly growing. Yet, just as clearly, the terminology and canon used to explain and give credence to this work differs widely. This section looks to derive a unique methodology from this discourse termed *media genealogy*. It will do so as a means of differentiating a kind of media analysis, largely historical, that is markedly attendant to the distinction that Michel Foucault introduced in his own work between archaeology, the term that best describes his work from the 1960s, and genealogy, which best describes the work he began in the early 1970s. The key difference of this latter work was its investment in the analysis of power, and later, the subject. The goal here is to demonstrate that this difference matters, that it can inflect the entire body of media studies scholarship that follows Friedrich Kittler, and additionally, that it can tie media studies scholarship into other historical investigations into scientific, technological, and cultural practices which are already highly attentive to concerns of power and/or subjectification.

In terms of the project at hand, this chapter will also serve as an introduction to the methods employed in the development of all the subsequent chapters of this text. The chapter will begin by outlining ‘media archaeology’ as it has been introduced to English-language audiences through the work of scholars like Jussi Parikka. This version of media studies recognizes itself as being heavily indebted to Foucault’s work, but restricts that commitment to his archaeological investigations of the 1960s. This first section will show that media archaeology fails to take Foucault’s warnings about the limitations of the archaeological
method. Next, this chapter will look at Foucault’s own arguments about these limitations and his shift to the genealogical method to highlight some of the inherent limitations of any strict media archaeology. Following that will be three sections dedicated to analyzing the work of three key German media theorists – Friedrich Kittler, Wolfgang Ernst, and Siegfried Zielinski – who are often presented to English-language audiences as the progenitors of media archaeology. Each of these sections will work to demonstrate the inherent limitations of the archaeological method, and often how each theorist already oversteps the limits of the archaeological method by implicitly performing genealogical analyses. The last section will look to establish some of the possibilities that media genealogy and problematization offer to media studies scholarship and to sketch out a media genealogical method to be used in the course of this project.

**Media Archaeology (for English-Language Readers)**

In Erkki Huhtamo and Jussi Parikka’s edited collection *Media Archaeology: Approaches, Applications, and Implications*, which for many served as the first English-language aggregation of media studies scholarship operating under the banner of ‘media archaeology,’ the editors describe Michel Foucault as ‘formative’ for many media archaeologists (2011, p. 2) and as the most prominent forerunner of “media-archaeological modes of cultural analysis” (p. 6). In fact, most scholars doing work that might be described as ‘media archaeology’ are influenced by, directly cite, and work through the central concepts of Foucault (Ernst, 2011, 2013; Kittler, 1990, 1997, 1999, 2010; Parikka, 2012; Siegert, 1999, 2015; Zielinski, 2006, 2013; Winthrop-Young 2002, 2011.). Across the
literature, it seems as if the archaeological component of media archaeology is always Foucaultian in its origins.

Jussi Parikka has done the most extensive work to aggregate media archaeological scholarship, as well as to elaborate the theories and methodologies most typical to a media archaeological approach. Parikka argues that Foucault’s influence is largely methodological and utilized for “excavating conditions of existence” for a given object (2012, p. 6). He writes, “Archaeology here means digging into the background reasons why a certain object, statement, discourse or, for instance in our case, media apparatus or use habit is able to be born and be picked up and sustain itself in a cultural situation” (p. 6). In Parikka’s most extensive treatment of Foucaultian methodology, he cites *The Archaeology of Knowledge* exclusively (p. 47-8), even paraphrasing what he understands to be the key methodological principles of the text (p. 48). Yet he does little work to translate a diachronic methodology for epistemology, which Foucault meant to excavate the discursive rules operative under an *episteme* that is temporally disjoined from history, into one that can articulate the technical mediatic inflection of discourse, let alone its correlation with power, ethics, or subjectification.

This leads us to point out an opening for a further investigation into the potential value of media genealogy: first, archaeology as a practice specific to media could be more thoroughly accounted for in order to elaborate its limitations, and second, a cursory review of the projects operating under the media archaeology banner demonstrates that they often overstep the methodological limitations of archaeology and begin to operate in a genealogical mode that is unfortunately under-recognized as such. These tendencies exist even in
Parikka’s own original work on the intersections of media and nature (2010; 2013b; 2014; 2015). In his most recent book on geology and media materialism, Parikka attempts to construct “a creative intervention to the cultural history of the contemporary” (2015, p. 4), by looking beyond the internal specifics of the machine, and instead taking machines as “vectors across the geopolitics of labor, resources, planetary excavations, energy production, natural processes from photosynthesis to mineralization, chemicals, and the aftereffects of electronic waste” (p. 139). As we’ll see below in our examination of the limitations to the archaeological method, this is a research agenda that seems genealogical through and through. We can find these same limitations in his work on insects and bestial media archaeology, where he hopes “to look at the immanent conditions of possibility of the current insect theme in media design and theory” (2010, p. xiv), which would seem to imply critique by problematization, an impossibility under strict archaeological methodology.

Parikka argues that “Media archaeological methods have carved out complex, overlapping, multiscalar temporalities of the human world in terms of media cultural histories…” (2015, p. 151-152). However, this is precisely what media archaeology cannot do – at least not alone – even though it is certainly what media studies more broadly conceived ought to do. This critical attention on Parikka is not meant to detract from the

17 This is in addition to Parikka here characterizing media archaeology as “a methodology of lost ideas, unusual machines, and reemerging desires and discourses searching for elements of difference in relation to mainstream technological excitement and hype, but not always connecting such ideas to political economy or ecology” (2015, p. 146). This methodology is precisely that which he ascribed to genealogy, and, as we’ll see below, is the methodological trajectory that would lead Siegfried Zielinski away from media archaeology.
highly productive and original work he has brought to the world, but instead to open up the
field of Foucauldian influenced media studies to the genealogical method and
problematization as well. As the herald of post-Foucauldian German media studies in the
English-speaking world, Parikka offers a convenient entry point to argue for this expansion
and to broaden the possibilities for future media studies scholarship.

At the Limits of Archaeology and Beyond

There is no pre- and post-archaeology or genealogy in
Foucault.

Dreyfus & Rabinow, 1983, p. 104

As Colin Koopman has elaborated at length, even in *The Archaeology of Knowledge*,
Foucault was hounded by a dissatisfaction with his own theorizations of historical continuity
in archaeological analysis (2013, p. 32-41). At the time of writing, Foucault was already
aware that he would be criticized for crudely affirming historical discontinuity (1972, p.
173). Foucault explicitly acknowledges that “Archaeology [...] seems to treat history only to
freeze it,” and later writes, “But, there is nothing one can do about it: several entities
succeeding one another, a play of fixed images disappearing in turn, do not constitute either
movement, time, or history” (p. 166-7). He even closes the text by questioning the possibility
of archaeologies other than those concerned with scientific epistemological practices,\(^\text{18}\)

\(^{18}\) Foucault writes: “One question remains in suspense: could one conceive of an archaeological analysis that
would reveal the regularity of a body of knowledge, but which would not set out to analyse it in terms of
sexuality, painting, and politics (p. 192-5). For him, analyses that remained too structural in nature “can never take place but in the synchronic cross section cut out from this continuity of history subject to man’s sovereignty” (Foucault, 1996a, p. 59). Foucault would soon come to believe that what all of his earlier works had failed to properly take into account was the problem of power, and he had done so because the archaeological method had presented him with a diachronic snapshot of discursive rules, bracketing the need for an explanation of how they had emerged and endured across time.19 By 1970, Foucault would posit the addition of a genealogical method to archaeology to help account for this, the two of which were originally meant “to alternate, support, and complete each other” (1972, p. 234).20 Here, as

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19 Foucault writes: “But what was lacking here [in The Order of Things] was this problem of the ‘discursive régime’, or the effects of power peculiar to the play of statements. I confused this too much with systematicity, theoretical form, or something like a paradigm. This same central problem of power, which at that time I had not yet properly isolated, emerges in two very different aspects at the point of junction of Madness and Civilization and The Order of Things” (1980c, p. 113).

20 Here Foucault made a first articulation of their difference, writing: “It is thus that critical and genealogical descriptions are to alternate, support, and complete each other. The critical side of the analysis deals with
Hubert Dreyfus and Paul Rabinow are apt to point out, Foucault has begun to outline a methodology for articulating the nondiscursive practices that effectively form a discourse (1983, p. 105).

As Foucault would elaborate in his essay “Nietzsche, Freud, Marx,” the depth of archaeology is here viewed from higher and higher up, producing a visible surface on which archaeological depth is laid out (1999a). It is on this surface that later, in his essay “Nietzsche, Genealogy, History,” Foucault would locate the “nonplace” at which adversarial wills would engage in the endless play of repeated dominations that leads to the emergence of forces (1999b, p. 377). It is these emergent forces that would be responsible for the production, schematization, maintenance, inflection, and reproduction of the rules that constitute discursive regimes. As Foucault writes, “Rules are empty in themselves, violent and unfinalized; they are made to serve this or that, and can be bent to any purpose” (p. 378). Their formation through the play of forces is anonymous, prior to the distinction of subjects and objects. Foucault writes, “Consequently, no one is responsible for an emergence; no one systems enveloping discourse; attempting to mark out and distinguish the principles of ordering, exclusion, and rarity in discourse; attempting to mark out and distinguish the principles of ordering, exclusion and rarity in discourse. We might, to play with words, say it practices a kind of studied casualness. The genealogical side of discourse, by way of contrast, deals with series of effective formation of discourse: it attempts to grasp it in its power of affirmation, by which I do not mean a power opposed to that of negation, but the power of constructing domains of objects, in relation to which one can affirm or deny true or false propositions. Let us call these domains of objects positivist and, to play on words yet again, let us say that, if the critical style is one of studied casualness, then the genealogical mood is one of felicitous positivism” (1972, p. 234).
can glory in it, since it always occurs in the interstice” (p. 377). At the level of the visible surface along which forces emerge and dominate one another, there are no identical points enduring across time, but the genealogist can isolate “substitutions, displacements, disguised conquests, and systematic reversals” (p. 378). It is here that the genealogist can recover history as series of interpretations and practices cutting across the temporal multiplicity of a field of forces.21

By the time *Discipline and Punish* was published, Foucault’s new theories had matured to a much more stable state. It is there that Foucault writes:

We should admit [...] that power produces knowledge (and not simply by encouraging it because it serves power or by applying it because it is useful); that power and knowledge directly imply one another; that there is no power relation without the correlative constitution of a field of knowledge, nor any

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21 Foucault writes, “If interpretation were the slow exposure of the meaning hidden in an origin, then only metaphysics could interpret the development of humanity. But if interpretation is the violent or surreptitious appropriation of a system of rules, which in itself has no essential meaning, in order to impose a direction, to bend it to a new will, to force its participation in a different game, and to subject it to secondary rules, then the development of humanity is a series of interpretations. The role of genealogy is to record its history…” (1999b, p. 378-9)

22 Foucault writes: “History, then, is not a single time span [durée]: it is a multiplicity of time spans that entangle and envelop one another. [...] In reality there are multiple time spans, and each of these spans is the bearer of a certain type of events. The types of events must be multiplied just as the types of time span are multiplied” (1999c, p. 430).
knowledge that does not presuppose and constitute at the same time power relations. (1995, p. 27)

Here we can also see a fully formed outline of power/knowledge, wherein knowledge is no longer isolated, and is instead always coupled to practices and power dynamics. It is this mutual inflection of power and knowledge that unfreezes time for Foucault, their intermingling having allowed for emergence in difference and repetition across temporal interstices. As Foucault notes, this ability to transverse the temporal axis in critique is not meant to better understand the past in terms of the present, but rather to produce the history of the present (1995, p. 31). As Dreyfus and Rabinow note, this new form of critique is able to locate the points at which “meticulous rituals of power” and “political technologies of the body” arose, took shape, gained importance, etc. (1983, p. 119). In so doing, Foucault finds a new way to offer up political opportunities to those that might seek them; his histories of the present delineate possible paths of attack, effects of truth ready for battle, in a struggle “waged by those who wish to wage it, in forms yet to be found and in organizations yet to be defined” (1996b, p. 262).

For Koopman, problematization is the unifying thread that ties together archaeology and genealogy under the banner of providing critique in the form of a history of the present (2013, p. 45-56). For Foucault, problems emerge when a field of action, behavior, or practice becomes uncertain and unfamiliar, is set upon by difficulties imposed by (often nondiscursive) elements surrounding it (e.g., social, economic, or political processes). Around this problem, a number of possible solutions or responses are posed simultaneously,
and these possibilities are conditioned by – but are in no way isomorphic to – their surrounding elements. Foucault writes “This development of a given into a question, this transformation of a group of obstacles and difficulties into problems to which the diverse solutions will attempt to produce a response, this is what constitutes the point of problematization and the specific work of thought” (1996c, p. 421). This notion of problematization, in conjunction with the concepts of temporal emergence and of power/knowledge produced by the cooperation of archaeology and genealogy, is the core of Foucaultian critique, here “critique now becomes an inquiry into the conditions set by problematizations as they manifest in the contingent emergence of complex intersections of practice” (2013, p. 48).

This mode of critique can track the play of forces, the contestations of power, that have produced the space of possibility for contemporary practice. As Koopman notes, “The point is not to discern how the intentions of those in the past effectively gave rise to the present, but rather to understand how various independently existing vectors of practice managed to contingently intersect in the past so as to give rise to the present” (p. 107). In the realm of media studies and media history, the problematization approach has the capacity to not only (archaeologically) articulate the specific affordances and constraints of a technical media apparatus’ functions of capture, processing, storage, and transmission, but also to (genealogically) articulate the clashes of power that resulted as multiple technologies were (counter-)posed as potential solutions within a problematic field, and thus trace the emergence of a stabilized (socio-)technical apparatus.
Friedrich Kittler and the Birth Site of ‘Media Archaeology’

Abraham might have built [the phonograph], and made a recording of his calling from on high. A steel stylus, a leaf of silver foil or something like it, a cylinder of copper, and one could fill a storehouse with all the voices of Heaven and Earth.

Villiers de’Isle-Adam qtd. in Kittler, 1999, p. 28-29

For Friedrich Kittler, the invention of media technologies requires a discursive apparatus to produce the problematic that transforms sketches, technical plans, and theories into concrete inventions (2010, p. 175-176). For example, he argues that differentiating technical media based on the human sensory channels they correspond to is arbitrary, for there are only multimedia systems (p. 133). Our capacity to differentiate them by such a correspondence only exists because “they were developed to strategically override the senses” (p. 36). Technical media were developed in the nineteenth century as a consequence of psychological and physiological research on the human body, but the reason that they emerged in that century and no other – be it earlier or later – is because of the particular discourse networks they emerged within and the technical skills that had produced the human body as a scientific object, an empirical body, rather than a transcendental subject (p. 175-
As Kittler writes, “After the individual sensory channels had been physiologically measured and technically replaced, what followed was the systematic creation of multimedia systems, which all media have since become. What emerged were simulations or virtual realities, as they are now called, which reach as many sensory channels as possible at the same time” (163). It is important to note here though that, as Villiers de’Isle-Adam recognized over a century ago, the raw materials required to produce the phonograph were readily accessible throughout all of human history, and could literally have been assembled at any time. Its construction was only rendered impossible by the lack of the appropriate discourse network.

Kittler writes, “Technical media are never the inventions of individual geniuses, but rather they are a chain of assemblages that are sometimes shot down and that sometimes crystallize,” (1999, p. 153) and further, “[B]ecause a human life is far too short to comprehend avalanches of technical innovations, teamwork and feedback loops become essential” (p. 157). This is akin to McLuhan’s argument that humans are but “the sex organs of the machine world, like the bee of the plant world, enabling it to fecundate and to evolve ever new forms” (2003, p. 68-69). McLuhan argues, “One of the most common causes of breaks in any system is the cross-fertilization with another system” (p. 59). On this point, Kittler agrees: “One must […] consider developmental teams, subsequent developments, optimizations and improvements, altered functions of individual devices, and so on; this means, in the end, an entire history of the industry” (1999, p. 34).

Let’s return for a moment to Kittler’s argument at the point where technical media are
no longer differentiable based on the human sensorium. At that point, technical media render
the human central nervous system superfluous to mediation (1999, p. 74). The human is lost
into the apparatus, and the so-called human is split into physiology and information


technology (p. 16). It is here that Kittler is moving past the archaeological method. His
work is concerned to trace the emergence of particular technical media, and it does so in
relation to the play of forces forming discursive rules, governmentality, strategies of
producing bodies, and technologies of the self that operate under the regimes of physiology,
anatomy, and psychometrics, particularly in relation to military endeavors. Technical media
arise out of distributed discursive networks composed of bodies of knowledge (such as
chemistry and physiology), objects of knowledge (such as precise chemical components),
distributed human research and development teams, techniques and technologies of
governmentality and the self, as well as recombinations of technological apparatuses. After
crystallizing, technical media quickly cut their roots and become mobile, intermixing and
recombining with one another, to the point where their original frame of reference holds little
explanatory power for their functioning.

In large part, Kittler’s analyses are indeed archaeological in nature. He is often
focused on demonstrating exactly how particular technologies function in relation to the ‘so-
called human,’ or as Kittler terms it, how they escape the grid of the symbolic. These
analyses are of specific inventions leading up to and including phonographs that capture the
real, or photo- and cinematographic devices that capture the imaginary. And while any given
device’s technological functioning – in terms of things like component arrays, wiring,
hardware, programming, etc. – cannot be explained by their original frames of reference,
While Kittler does trace specific technologies out of joint with any linear technological history, he is also invested in analyzing their disjointed emergence across the interstices of multiplicitous temporalities. He does so by producing multiple genealogies, like his work on ‘optical media,’ which traces a lineage from the camera obscura to photography to cinema to television, which affords him theories of optical mediation as a set of nondiscursive practices and techniques, crystallizing into variable media technologies, and operating under governmentality and subjectivation.

In his earliest work, Kittler describes his project as an analysis of “the network of technologies and institutions that allow a given culture to select, store and process relevant data” (1990, p. 369). Media genealogy highlights these (at times neglected) aspects of Kittler’s work. While many view the termination of Kittler’s history to be the obsolescence of the human in a post-mediatic world of digital computers and near autopoietic machines, we might take as a clue the sparse amount of his work that actually elaborates that world. Instead, one might see Kittler as diagramming a particular problematization in the contemporary, an arbitrary and contingent set of possibilities for the future in our current discourse. Despite the emphasis he places on it, the world Kittler imagines never arrives in his work in any teleological sense. If we take that to be true, it easy to envision Kittler as writing a history of the present, with an eye to one possible future that has not yet arrived, so that we might alter any of the multiplicitous strategies and tactics plotting our course. Even Parikka admits that in Kittler, at the birthplace of media archaeology, his two key insights – media as “systems for transmitting, linking and institutionalizing information” and the functioning of power in an age of technical media – are the result of a combination of both
archaeological and genealogical methods (2012, p. 68). Perhaps this is why Kittler eschewed his supposed affiliation with ‘media archaeology’ in the first place (Huhtamo & Parikka, 2011, p. 9).

**Wolfgang Ernst and Strict Media Archaeology**

Wolfgang Ernst’s understanding of media archaeology is derived from an extended investigation of archives and library science. His work can largely be situated in the post-1960 response to the grand narratives of historiography that looked to characterize an epoch through investigations into stable identities like the nation or State, often by totalizing archival data on groups of individual citizens meant to constitute its population. In particular, Ernst looks to couple German media theory with work on New Historicism in the United States by the likes of Stephen Greenblatt and Hayden White, as well as French ‘poststructural’ theorists like Foucault, Gilles Deleuze, and Jacques Derrida. For Ernst, Foucault left open the variable of media and mediation, and thus missed the ways in which the surface or interface of the archive is underlaid by operative agencies that establish an inherent order to things in their very (archival) production (2015, p. 8-9).

For Ernst, a genuine media archaeology historicizes the concept of the archive itself (p. 92-93), by examining it as the law of the sayable and the seeable (p. 12). Rather than imagining away the gaps and silences of the archive, it uses them to establish a model (p. 3), by looking for patterns in the data and examining “the figuration of their registrative texture” (p. 74). This is made difficult in the case of technical media, because they constitute a
dynamic archive (p. 84); they form series of data, rather than stories (p. 83-84), according to cultural-technical operations that can dynamically rearrange them into different information (p. 94). In a digital archive, “past, present, and future are nothing but segments, functional demarcations of differences in a dynamic data stream” (p. 94), and thus historiography is unable to operate. Ernst argues that only an archaeological method can reckon with data (p. 82).

Archaeology can do this by a sort of reverse engineering, by looking at the information configured out of the data to establish the law of the sayable and the seeable within the archive, which also requires an acceptance that media themselves are also ‘archaeologists’ (2011, p. 239). Media are made up of techno-epistemological configurations that always precede the discursive surface of the archive that humans engage with (ibid.). The root of media archaeology is not in historicizing particular inventions, but in establishing their arché, their laws of the sayable and seeable, immanent to their very source code (p. 240-241). For Ernst, this means that media archaeologists need to be competent in informatics, need to know the infrastructure of the technologies they critique, and need to perform media archaeology by using those same technologies (p. 242). He writes “Media theories work only when being tested against hard(ware) evidence” (p. 243). This is because media archaeology deals with the structural level of hardware, and not its history (p. 246).

For Ernst, none of this is to the detriment of cultural studies. Instead, media archaeology operates as a sibling field, paradoxically opening cultural studies to the “noncultural dimensions of the technological regime” (p. 244) because currently “the
machine is the better media archaeologist of culture” (p. 245). He writes, “[M]edia-archaeological analysis opens culture to noncultural insights without sacrificing the specific wonders and beauties of culture itself” (p. 245), and, “Media archaeology exposes the technicality of media not to reduce culture to technology but to reveal the techno-epistemological momentum in culture itself” (p. 252). But there is a readily apparent problem here in that this is a unidirectional causal mechanism, rather than a feedback loop. Ernst maintains that studying the interrelations between the two necessitates keeping them separate to rethink their terms and practices, and argues that media archaeology ought to uncover the external technological laws that are the primary agents of media history (2013, p. 25). Yet, he has an obvious trajectory by which these investigations can inform cultural studies, but little to say about what influence cultural studies might have on media studies in this ‘interrelationship’.

Ernst opened his career with a book that saw archives as enmeshing power and having internal politics (2015, p. 1), even in their digital and dynamic manifestations (p. 93-94). He saw the archive operating in league with power to generate an order of things, forms of literature and knowledge (p. 45). The texts contained in the archive are “monuments to power that have coagulated into writing” (p. 53), but what are data? Ernst seems eerily silent on the play of forces and the operation of power in the production/collection, processing, storage, and transmission of data. Ernst writes, “Power is what remembers, rather than who, as we have learned from Foucault” (p. 53). In the instance of a digital and dynamic archive, one that by necessity contains at least database and parsing algorithm, but likely also peripherals for preparing/producing data for input and for output via an interface, where does...
power lie? Is it solely with technical and mathematical laws for signal processing? Are there no options or variations amongst archival technologies that get infrastructurally embedded through sociotechnical processes? These (genealogical) questions are few and far between in Ernst, and it is precisely they that would benefit from a feedback loop between strict archaeological investigation and genealogy, be it a cultural studies variant or not.

Parikka acknowledges that “this archaeology starts to think through our mediatic world as the conditions for the way in which we know things and do them—knowledge and power” (Ernst, 2013, p. 6), and notes that Ernst leaves open the possibility for media genealogy, but continually describes genealogy as the (political) narration of counterhistories (p. 7; Parikka, 2011, p. 54). Parikka seems well aware of the potential critique of Ernst in terms of the absence of the political in his theories (Ernst, 2013, p. 8; Parikka, 2011, p. 54), but praises Ernst’s development of non-subjective approaches to the study of media, for Ernst’s ‘cold gaze’, which allows him to examine technology at the level of signal processing and develop theories of microtemporality and time criticality (p. 19). However, Parikka also argues that Ernst’s call for fostering media competency through education might be sufficient to transform his archaeological work into a history of the present à la Foucault (p. 14). What Parikka leaves unaddressed is how people working on the interrelationship of media and culture might create a feedback loop between the two, rather than leaving the relationship unidirectional, as Ernst does. And further, Parikka has little defense for the potential impossibility of leveraging Ernst’s media archaeology to critique contemporary or future technologies that are increasingly blackboxed and unavailable for reverse engineering and
technical tinkering.23

Siegfried Zielinski and the Abandonment of Archaeology

Siegfried Zielinski was perhaps the earliest scholar to popularize the term ‘media archaeology,’ arguing early on that from a pragmatic perspective it meant “to dig out secret paths in history, which might help us to find our way into the future” (1996). At the time Audiovisions: Cinema and Television as Entr’actes in History was published, Zielinski (1999) was already focused on the triad formed of technology, culture, and subject. There he expressed an interest in utilizing the work of British cultural studies, and Raymond Williams in particular, alongside more traditional German media theory; he also worked to distance himself from competition with other German media theory focusing more exclusively on “the techno-structure of media processes (like, for example, those of Friedrich Kittler and his pupils)” (1999, p. 21), to which he instead understood his work to be supplemental. While Audiovisions certainly focused on technological apparatuses, it consistently framed them within a particular context of cultural forms and viewing subjects.

Zielinski had early on articulated an anarchical tendency in certain ‘artists, theoreticians, and artist-theoreticians’ to “burn and burn up in the endeavour to push out as far as possible the limits of what language and machines, as the primary instances of structure and order for the last few centuries, are able to express and in doing so to actually

23 To be fair, Parikka raises these issues, but seems to have little to say about them (Ernst, 2013, p. 10-11, 14).
reveal these limits” (1996). This took center stage in his later book, *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*, where Zielinski (2006) began to reposition archaeology as (an)archaeology. This new articulation of media (an)archaeology was meant to escape the grand genealogical narratives of master media, and instead focus on isolating discrete instances of events, ideas, and objects in the past where the grand narratives were still in flux, and often ones that contradicted those narratives. Zielinski wrote: (The goal is to uncover dynamic moments in the media-archaeological record that abound and revel in heterogeneity and, in this way, to enter into a relationship of tension with various present-day moments, relativize them, and render them more decisive” (2006, p. 11).

Drawing on Foucault, Zielinski was interested in isolating divergent and disjunctive concrete specificities in a framework that resisted any attempt to totalize them into a narrative of linear progression, one that would instead maintain the tension of the in-between of its heterogeneous phenomena, of concepts and reality, of calculation and imagination. This was not to be taken as a philosophical study, but instead as “a collection of curiosities” (p. 34).

Zielinski described this collecting of curiosities as forming “a variantology of the media” (2006, p. 7), a project that he would extend across five edited volumes of curiosities before publishing his next monograph. In his most recent work, *... After the Media] News from the Slow-Fading Twentieth Century*, Zielinski seems to have come full circle, referring

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to his own project as a genealogy (2013, p. 24) and calling for others to produce ‘comparable thematic genealogies’ as well (p. 5). There his (an)archaeological investigations of specific media curiosities persist, belonging to “resistant particularities” and “free-floating singularities” (p. 24), but “they can also get dragged into the machinery of the systemic and thus also take on or be assigned a strategic character” (ibid.). This latter aspect is a new focus in Zielinski’s work, and demonstrates how (an)archaeologically excavated media must also be understood in terms of their embeddedness in overarching apparatuses, foremost of which are Foucault’s notions of truth, knowledge, and sexuality (p. 14). On this, Zielinski writes:

The media [as opposed to individual curiosities] have the character of a dispositif in the sense introduced by Michel Foucault — and following him, Giorgio Agamben. Their objectivations belong to the resources of knowledge and manifestation that structure power. The media are significantly involved in producing the cultural self, as well as co-constituting the sanctioned notions of the Other. (p. 24)

Zielinski’s work can here be seen to come full circle back to the grand genealogical narratives from which he departed by way of archaeology and (an)archaeology. Without the complementarity of these two methodologies, Zielinski is powerless to address what in [...] After the Media] has become a central problem for him: a history of the present capable of addressing the most pressing of our current political dilemmas in a productive manner.25

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25 There is little doubt that this is Zielinski’s concern, as the introduction alone bears references to concentration camps, nuclear bombings, and large-scale ecological disasters.
Parikka often delimits the scope of genealogy to the production of ‘counter-histories’ that trace the emergence of neglected and minor traits in history (2011, p. 54; 2012, p. 6). This is an understanding that may account in part for Zielinski’s initial divergence from media archaeology to (an)archaeology and variantology, but it has little explanatory purchase for either Foucault’s genealogical method and later understandings of problematization, nor for Zielinski’s more recent work. Genealogy is foremost a methodology for producing a history of the present, in which the role of the counter-, the minor, and the neglected is to establish the emergence of a particular apparatus and problematization delimiting the present and establishing the grounds of possibility for practice and utterance. Genealogy analyses the play of power from which historical moments emerge in their disjuncture, and rather than negating archaeological analyses, it lends them their contemporary stakes and significance. It is precisely for these reasons that in a text where Zielinski feels compelled to answer for media in the contemporary, he turns to genealogy.

**Media Genealogy as Method**

[K]nowledge is not made for understanding; it is made for cutting.

Foucault, 1999b, p. 380

In his first extended work, Kittler described the object of his analysis as an apparatus
composed of networks of technologies and institutions that operate at the level of culture by facilitating data collection, processing, storage, and transmission (1990, p. 396). Kittler’s (often implicit) methodologies are still perhaps the most robust and effective tools for performing media studies in terms of both archaeology and genealogy. For Kittler, technical media emerge piecemeal from a historically conditioned discourse network, combining, mixing, cross pollinating, and eventually crystallizing, all while gaining an increasing autonomy from the milieu in which they originated. A Kittleri an must examine corporations, militaries, bureaucracies, non-profit organizations, academies, inventors and development teams, and potentially spatially and temporally distributed contributions in the form of tweaks, developments, optimizations, alterations of functions, combinations, ad inf. This is perhaps the best example of an investigation that responds to the call to navigate between technological determinism and symptomatic technology, the Scylla and Charybdis of media studies.

In his earlier work, Jeremy Packer (2010, 2013) described media as encompassing a much broader range of technologies, all of which served to articulate and link things together in networks of forces, practices, knowledge, and institutions. It was in this sense that even infrastructures were always already media, and that media studies was required to take in a wide-ranging set of discursive and non-discursive utterances, statements, and grammars of architectures, diagrams, and backup plans that all work to hold together a given, and sometimes fragile, apparatus. Here we ought to expand this definition in response to our analysis of Kittler’s work, and articulate media as tools of governance that shape knowledge, produce and sustain power relations, while simultaneously forming their attendant subjects.
Media technologies are precisely those that allow for the extension of culture across time, for culture’s duration and endurance. As such, they have *a priori* stakes in the realms of the political, the ethical, and the epistemological. Media collect, store, process, and transmit data that is variously used to rate, coordinate, create, obfuscate, obliterate, translate, demonstrate, and even create virtuality, materiality, and reality itself. Beneath, beside, inside, and above—media omnipresence and omniscience approaches. Yet, we can see this rise as immanent to governance as it has taken shape across the globe in unevenly dispersed fits and starts over the past several thousand years.

What was already in embryo in Kittler’s work and has subsequently gone underdeveloped as German Media Studies turned towards developing a media archaeological method was an explicit analysis of the visible surface of contesting forces and power relations on which archaeological depth is laid out. In his definition of discourse networks, Kittler was already close to a notion of problematization that could investigate the fundamental role that media technologies play in determining the conditions of possibility, existence, and truth that articulate and define both subjects and objects in a given culture. Media archaeology’s interest in the concrete specificity of an individual technology can miss its larger role in the production and maintenance of a larger apparatus, even though that technology’s spatial and temporal location in such an apparatus is immanent to that very technology in its concrete specificity.

This idea is perhaps best demonstrated in the work of Paul N. Edwards, for whom any tool or technology and our understanding of it are linked through discourse (1996, p. 27).
Edwards defines discourse as follows:

A discourse, then, is a self-elaborating “heterogeneous ensemble” that combines techniques and technologies, metaphors, language, practices, and fragments of other discourses around a support or supports. It produces both power and knowledge: individual and institutional behavior, facts, logic, and the authority that reinforces it. It does this in part by continually maintaining and elaborating “supports,” developing what amounts to a discursive infrastructure. It also continually expands its own scope, occupying and integrating conceptual space in a kind of discursive imperialism. (p. 40)

Thus, any specific analysis of a technology, and specifically a genealogy, requires an examination of the discourse through which that technology has been produced as an object of knowledge for human thought. We have to understand the infrastructure of which it is a part if we want an accurate technical articulation of the object itself. For Edwards, this is to be accomplished through an ‘infrastructural inversion’ (2010, p. 20; see also Edwards, 2002).

Edwards argues that infrastructures often begin with large technical systems that go through a process of “invention, development and innovation, technology transfer, growth, and competition, consolidation, splintering or fragmentation, [and] decline” (2010, p. 10). As these large technical systems consolidate, “gateway” technologies emerge that allow heterogeneous and incompatible systems to interoperate (p. 10-11). These gateways allow standardized systems to merge into much larger networks that are much more flexible and robust, but require a replacement of top-down control with horizontal or distributed
coordination processes (p. 11). Further, even these networks become limited and eventually the demand for increased functionality produces gateways between networks to form “internetworks” or “webs” (p. 11-12). As Edwards notes, “in general *infrastructures are not systems* but networks or webs. This means that, although infrastructures can be coordinated or regulated to some degree, it is difficult or impossible to design or manage them, in the sense of imposing (from above) a single vision, practice, or plan)” (p. 12).

It is at this point that the scope of investigation for the crystallization of a single technology becomes unmanageable. For instance, to examine the emergence of even the simplest computers, one would need to consult, among other thing, Hughes’ (1993) monumental history of electrification in the United States and the emergence of electrical grids as infrastructure. Then one would need to consult the gateways by which that electricity was able to move from the grid into the computer and through its circuits to activate the hardware. And this is for a computer that has no software, interface, or Internet. As such, the analysis must always be in some sense iterative and limited. Like Kittler, we might produce a forever-delayed endpoint of investigation to pursue piecemeal and modify on the fly.

It is worth reiterating here that the extended criticism of media archaeology and some of its proponents is not to discourage media archaeological scholarship. Following Foucault, the archaeological method remains an essential element of critique, and one without which genealogy fails to function. Instead, this section has tried to demonstrate how the methodological commitment to archaeology often leads outside of itself, that at some point it requires a genealogical component, which, when added, lends media studies a relevance and
urgency it might not otherwise have. Opening media archaeology up to genealogical commitments – like the critique of power and subjectivation – allows media studies to better interface with hugely significant and often overlapping investigations from other disciplines with critical insights into media and technology. In what follows, you will see how some of these limitations, commitments, and interdisciplinary interfaces play out in an attempt to produce a genealogy of numerical mediation, ‘big’ data, and computation, specifically in relation to their roots in the U.S. Census, the insurance industry, and public opinion pollsters, as well as their current manifestations in Google’s Knowledge Graph.
It has become simply absurd to hold any longer that a government which has a right to tax any and all the products of agriculture and manufactures, to supervise the making and selling of butterine, to regulate the agencies of transportation, to grant public moneys to schools and colleges, to conduct agricultural experiments and distribute seeds and plant-cuttings all over the United States, to institute scientific surveys by land and deep soundings at sea, has not full authority to pursue any branch of statistical information which may conduce to wise legislation, intelligent administration, or equitable taxation, or in any other way promote the general welfare.

CHAPTER 3. Grand Confessions: A Counting for All Heads and Households

[W]hatever democracy may be, it is supported by the mechanical processing of anonymous discourse.

Friedrich Kittler, 1997, p. 63

State is the name of the coldest of all cold monsters. It even lies coldly and this lie crawls out of its mouth: “I, the state, am the people.”

Friedrich Nietzsche, 2006, p. 34

Contemporary media theory often takes its cues on epochal shifts in the history of media and communication technologies from the work of – or work inspired by – Friedrich Kittler. In his article “Dracula’s Legacy,” Kittler argues that “according to the conditions of 1890, all that matters is the technological ordering of all previous discourses” (1997, p. 73). For Kittler, it is the development of typewriters – both in the form of the machines that term now more commonly refers to and in the form of (predominantly female) human typists – that is at the root of a grand, bureaucratic revolution and the (supposed) emancipatory trajectory of twentieth century democracy.26 Here then, female typewriters mechanically process the anonymous discourse of our epigraph. This chapter will look to demonstrate that

26 Here Kittler draws on Bruce Bliven’s (1954) text The Wonderful Writing Machine.
– at least within the confines of the United States – Kittler has misdiagnosed the medium and the technology.

In the United States, 1890 marks the instantiation of another technology, the first electromechanical computational machine, which was developed by Herman Hollerith for the 1890 U.S. Census. This chapter argues that the use of Hollerith’s electromechanical tabulating machines in 1890 marks the first large scale application of electromechanical computation in history. It is from this point of electrified data processing that numerical mediation explodes into the twentieth century. As John Durham Peters notes, “Numbers mediate and orchestrate distant complex social relations” (2001, p. 436), and, more specifically, “Numbers in all their impersonality are democracy’s ideal language, suited for gods, machines, and collectives” (p. 435). Numbers are the cold language of the state and its statistics;\(^{27}\) when leveraged by computation they become a means of rendering or mediating aggregates, collectives, and complex systems that would otherwise remain untotalizable for humans, and thus innumerable and innominable in the realm of everyday human experience. It is only with the advent of electromechanical computation in 1890 that the real possibility of numerically mediating increasingly large aggregates of increasingly minute aspects of everyday life was secured. It is here that the unknown is drawn into the realm of human phenomenology and epistemology, is rendered discrete for nomination, and thus is brought

\(^{27}\) Peters notes: “Statistics, as the name implies, first had to do with numerical indices of the state and its rates of trade, birth, marriage, crime, and death” (2001, p. 439). It was only in the 1800s that statisticians came to “systematically apply those mathematical theories to the analysis of human populations or social and economic change” (Anderson, 1988, p. 6).
into time. Additionally, this is the site of big data’s birth, where issues involved in quantifying the qualitative become mere technological problems of data collection, processing speed, storage space, and transmission, all to be solved by engineers.

Peters also notes a division between the quantitative and the qualitative, between numbers and stories, finally writing, “Numbers pay tribute to our desire to be more than human; stories help us make sense of both that yearning and its impossibility” (2001, p. 447).

In large part this chapter is one potential story of many, meant to help us make sense of the birth and history of a particular conjunction of big data, numerical mediation, electromechanical computer processing, and governance – or decision-making more broadly – in the United States. In short, this story traces the problematic from which early tabulating machines arose and those tabulating machines’ early technical development in relation to that problematic in order to better understand the forces at work in the crystallization of electromechanical computation. The point of this story is to demonstrate that the core function of electrical computation – the digitization of input signals and their increasingly fast and complex processing via circuit relays and gates – had already been established at the turn of the century; that this core function crystallized in relation to a very specific problematic which still inflects contemporary computational theory, research and development, and practice today; and that this core function has recursively affected the problematic and social milieu from which it arose ever since.

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28 And here this is meant in the sense of being brought into time with rather than in the sense of rendering subject to physical time via thermodynamic decay, etc.
The first section of this chapter traces the problematic within which computation arose, namely, the need to more quickly and accurately process statistics to allow for better governance of increasingly large and complex societies. In particular, it examines the history of the U.S. Census as a social construct that lead to a series of data processing problems, and ultimately a crisis point large enough to spur the invention and adoption of early electromechanical computational devices in the form of Hollerith’s tabulators.

The second section of this chapter examines the technological development of tabulating machines from their pre-history into the early twentieth century, when they first crystallized into a stable enough form to buoy Hollerith’s Tabulating Machine Company – which would soon after be sold and renamed International Business Machines (IBM) under the leadership of one Thomas J. Watson, Sr. The somewhat technical nature of this section is meant to both highlight and demonstrate the emergence of certain features of computation that have served as precedents for a large portion of the field’s subsequent development in the United States, as well as too offer up some portion of those features’ genealogies.

The third section of this chapter examines the new types of knowledge and experiences that electromechanically computed census data brings into human epistemology and phenomenology, specifically from the perspective of governance. It will additionally question whether this process of mediation constitutes representation or presentation itself. The closing section highlights some of the affordances of this genealogy, as well as the implications of electromechanical computation’s radical expansion of the field of numerical mediation. This last section touches on electromechanical computation’s effects on human epistemology and phenomenology, and subsequently decision-making and governance.
The Problem of the U.S. Census

The United States was the first country to make provisions for a regularly scheduled census in its founding governmental documents. Sections 2 and 9 of Article 1 of the United States Constitution mandate a decennial census for the specific purposes of determining representation and taxation at the federal level. The Framers sought to provide a system of checks and balances to popular representation by linking the benefits gained from population-based representation to proportional penalties of direct taxation levied against states and local areas. Epistemological and ethical concerns were inherent in the census mandates of the Constitution itself. These mandates required a differentiation between whites, free blacks, slaves, and Indian populations, most noticeably brought about by the three-fifths compromise. As Margo Anderson notes, “An ongoing discussion of the meaning of differential population growth among the races, states, and regions was thus

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29 For specific histories of the spread of demographic practices in colonial America and the early United States, see Cassedy, 1969, and Cohen, 1982. For more general histories of the rise of statistics in the context of popular and political thought, see Porter, 1986, and Stigler, 1986.

30 As Margo Anderson notes in her social history of the U.S. Census, the framers of the Constitution were well aware of the impact that rapid and differential population growth was having and would have on representative practices in a democratic republic. The American population had already grown from around 250,000 people in 1700 to about 2.8 million in 1780 (1988, p. 10–11).

31 The direct tax and tariff systems were later abandoned in favor of income tax in the 1890’s. Income tax was struck down by the Supreme Court in 1895, passed by Congress as the Sixteenth Amendment in 1909, and finally ratified in 1913, formally marking the end of direct taxation (Anderson, 1988, p. 111).
written into the political fabric of the new nation” (1988, p. 13). From the beginning, the census served as a particular way of knowing the population, and a subsequent prescription for their interaction through representative and taxation practices, and also a way of measuring and leveraging strength in domestic and international conflict.32

Throughout the first 100 years or so of its existence, the census was a highly variable endeavor from decade to decade, with no permanent location, staff, methods or procedures. The census directorship was usually filled by high-ranking government officials (vice presidents and secretaries of state), but was then doled out through political patronage throughout the nineteenth century. Each decade the director would correspond with a large number of field marshals, who would then hire an enormous force of ‘enumerators’ at their

32 From the beginning it was recognized that census practices were intrinsically important to the management of conflict at both international and domestic levels. During the Revolutionary Way, propagandists used demographic data to demonstrate America’s military strength and war readiness (Anderson, 1988, p. 11). And, at the advent of the War of 1812, Americans took comfort in comparison between their 1800 and 1810 censuses and those of England. In 1811 it was shown that England’s population growth was declining, then sitting at around 12 million peoples, in comparison to America’s 7.2 million, and it was estimated that America would have a larger population than England as early as 1840 if projected growth trends bore out (Anderson, 1988, p. 21). In domestic conflicts, it is the census and the classification of differential populations into heterogeneous groups for comparison that bears implications for social, economic, and political power (Anderson, 1988, p. 4), and further, illustrates “the virtues or vices of particular regions, peoples, or ways of life in America” (p. 22). Census statisticians have quite consciously debated over and formalized the methods of measuring and categorizing populations, which quickly became the very concepts through which we understand social change. As Anderson notes, they have constructed the very “categories we think in” (1988, p. 4–5).
own discretion to collect data from individual households. These enumerators served as the point of contact between the immense ‘big data’ apparatus of the census and the population. It was their job to travel to each home in the country and not only enumerate its inhabitants, but, in the language of our introduction, to nominate them as members of various identity categories that were considered potentially important for governance. These nominations and the processes by which they were made fluctuated greatly. Each decade, Congress would debate over the reinstatement of the previous decade’s census legislation, often altering the census’ structure, including the data it was assigned to collect, the time frame in which and personnel through which it would collect that data, the time frame in which that data would be processed and delivered, the funding, and the approximate date at which the census would then be disbanded.\textsuperscript{33}

For its first 50 years, the census would collect data based on individual households as units.\textsuperscript{34} Thus, for its first few generations, the United States government could only statistically understand its population through property ownership and occupancy and as a series of households (i.e., properties were attributed to the household, not the individual). For the first two censuses, districting was erratic, and enumerators were not forced to physically visit the households they collected data on. It wasn’t until the 1810 census legislation that Congress mandated that districts be divided based on local geography and civil boundaries,

\textsuperscript{33} The U.S. Census would not be made a permanent institution until 1902.

\textsuperscript{34} While James Madison had proposed a much more detailed data set, including the age, sex, race, and occupation of each individual, the Senate largely ignored his advice, arguing it was a waste of time, energy, and funds (Anderson, 1988, p. 14; Cassedy, 1969, p. 216).
and that enumerators must actually visit individual households to collect data. The data on people contained within household units was continually expanded during these years, and the first attempts at special topics censuses were attempted.\textsuperscript{35} 1810 and 1820 saw the first attempts at a census of manufactures, but the results were plagued with errors and ambiguities from the data collection phase, and the efforts were abandoned in 1830 (Anderson, 1988, pp. 13-14, 18-19, 23-26; Wright & Hunt, 1900, pp. 13-39).

The 1830 census saw the development of a centralized staff in Washington, D.C. to edit and correct the tabulations, which were still done first by the enumerators, then tallied by the marshals, and then delivered directly to the Census Office for publication. While in 1810 enumerators only had to fill out two columns per household, by 1840 enumerators were filling out two-sided schedules with eighty columns for each household. As the tallying process became more cumbersome, the centralized staff in Washington, D.C. was again assembled to correct returns (Anderson, 1988, p. 26, 242; Wright & Hunt, 1900, pp. 32–39). This was partially in response to the growing demand for census data. By 1820, copies of the census were being sent to federal officials, state governors, congressman, and all colleges and

\textsuperscript{35} The 1800 census saw the staggering of white males into four age brackets, and white females into the same age brackets for the first time. The 1820 census saw the free black and slave populations categorized by sex and age for the first time, as well as crude occupational information, and data on unnaturalized citizens. The 1830 census collected data on the number and race of the “deaf, dumb, and blind” for the first time. The 1840 census expanded further, collecting data on the number of revolutionary war pensioners, schools and colleges, literacy, occupations, idiocy, insanity, as well as commerce and banking (Anderson, 1988, pp. 13–14, 18–19, 23–26; Wright & Hunt, 1900, pp. 13–39).
universities in the United States. (Anderson, 1988, 23–24; Wright & Hunt, 1900, pp. 25–27). The 1830 census resulted in 3,000 printed copies for distribution, each containing comparative data from previous censuses for the first time (Anderson, 1988, p. 25; Wright & Hunt, 1900, pp. 28–32).

As early as the close of the 1810 census, many of the problems of census-taking were becoming readily apparent. For instance, it was quickly recognized that the full force of government was required to successfully compile statistics on such a grand scale. As Anderson notes, in terms of data collection, “The census experience showed that building even a temporary field enumeration system required the force of law, a schedule for doing the work, adequate payment for work done, oaths of office, checking errors, and penalties for noncompliance” (p. 20). Further, the sophistication of the questions asked (i.e., data collection) was inversely correlated to the speed and accuracy of the final result (i.e., data processing). In a system that had trouble developing rigorous methodologies for quality control and fast tabulation because of its lack of mandated standards, its ad hoc construction, its constantly changing leadership and goals, and decentralized command structure, the “questions had to be simple and inquiries few in number if the results were to be reliable” (Anderson, 1988, p. 20).

A radical shift occurred in the 1850 census. As Anderson writes, “For the first time the federal government marshaled scientific and financial resources to discuss what should be asked on the census, how the information should be collected, and how it might be reported” (1988, p. 35). The household was abandoned in favor of the individual as the census’ unit.
Here we find the ground-zero of biopolitics’ emergence in the United States, as Ian Hacking writes,

One can tell the story of biopolitics as the transition from the counting of hearths to the counting of bodies. The subversive effect of this transition was to create new categories into which people had to fall, and so to create and to render rigid new conceptualizations of the human being. (1982, p. 281)

This effect is felt immediately. For example, a series of six schedules were developed for enumerators to fill out: one with information for whites and free people, one for slaves, one for people who had died in the previous year, one for agricultural data, one for manufacturing data, and a final schedule to be filled out by the assistant marshal with social statistics for the district.36 While it would take another thirty years for the census to produce an ‘avalanche of

36 On the specifics of each schedule, Anderson writes: “Schedule 1 was for the free population; it contained thirteen questions. These included the person’s name, address, age, sex, color, occupation, and place of birth. The schedule also asked whether the person had been married or had attended school within the year, whether the individual was deaf or dumb, blind, insane, idiotic, a pauper, or a convict, whether the person was illiterate if over age twenty, and the amount of real estate owned by the person. Schedule 2 was for the slave population. It requested the name of the slave-owner, the name, age, sex, color, and place of birth of the slave, and whether the slave was deaf and dumb, blind, insane, idiotic, or a fugitive. It also contained inquiries on the number of children each woman had borne and whether the children were alive. Schedule 3, for persons who had died in the previous year, asked questions similar to those on the population schedule. Schedules 4 and 5 requested information on agriculture and manufacturing by farm or establishment, respectively. Schedule 6 asked the assistant marshal to provide a broad description of “social statistics” for his subdivision, including information on taxes collected, schools, newspapers, pauperism and crime, wages, religion, and libraries” (1988, p. 37).
printed numbers,’ the trend certainly starts here. The 1850 census was also the first census to be centrally tallied, an operation that was made exponentially more difficult by the number of schedules, and the change to individuals as units (Anderson, 1988, pp. 35–49; Wright & Hunt, 1900, pp. 39–50). This increased the number of units to be processed by a factor of 7.5 (Heide, 2009, p. 19). The 1860 census largely mirrored that of 1850, with the exception of Congress authorizing the Census Office to collaborate with the War Department on developing useful statistics for the Civil War in 1862 (Anderson, 1988, p. 64). The 1870 census also followed suit, only veering in its development of industrial statistics, and cartography and data visualizations (p. 78).

Let’s take a moment here to clarify terms. In this account, data collection should indicate the process of questioning, including both the types of questions and their methods of being asked. Data collection serves as the point of contact between the census apparatus and the population. It is thus also the primary data input for the apparatus. Data processing should indicate the mechanisms for ensuring that collected data is turned into (actionable) information with the requisite speed and accuracy for governmental decision-making. The important thing that this distinction allows us to note here is that throughout its early history

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Anderson demonstrates the usefulness of the Census Office’s data in the following anecdote: “General William Tecumseh Sherman made the most notable use of such statistical information in his march through Georgia to the sea. Sherman acknowledged the debt he had to the Census Office for the information both at the time of the march in 1864 and after the war. ‘No military expedition was ever based on surer data,’ he wrote to his daughter Ellen. The data made it possible for northern commanders to operate with short or no supply lines, to live off the land, and thus to move faster than traditional armies” (1988, p. 64).
the census seems to have more often understood data processing as the point for innovation and intervention in this apparatus. This is because census legislation mandated a direct headcount of the population, and usually that a number of other complicated materials be collected during that process that otherwise would have trouble getting completed (like censuses of agriculture, manufactures, etc.).

There was no practical way of reducing the number of enumerators, which hovered between forty and fifty thousand in both 1880 and 1890, and no efficient way to train them, as they were only marshaled once every ten years. Enumerators weren’t even tested on their abilities to fill out forms or write legibly until the 1900 census, and their “character and diligence” were taken on the word of district supervisors (Willcox, 1900b, p. 270). This latter qualification was important, as enumerators were paid at determined rates per living inhabitant, farm, manufacturing establishment, entry on a mortality schedule, or any other data point they were assigned to collect, and thus had potential reason to fabricate data. And even when performing his duty faithfully, an enumerator was challenged by the complexity of the task at hand. Francis A. Walker, superintendent of the 1870 and 1880 censuses, as well as esteemed economist and statist, and later president of MIT, wrote, “A census agent who is carrying about a portfolio full of blanks, and has been charged with a whole pamphlet of instructions, relating to all sorts of subjects, cannot be expected to be as active, alert, and attentive in collecting the statistics of inhabitants as if he were charged with this duty only” (1888, p. 148). For example, for the 1890 census, over 25 million schedules weighing more than 300 tons were distributed to enumerators (Wright & Hunt, 1900, p. 71). Each enumerator was responsible for carrying anywhere from ten to thirteen kinds of schedules at
This burden was met with common and vigorous field complaints about the difficulty of enumeration (Willcox, 1900b, p. 267).

It was thus well understood that there was no panacea for the data collection problems faced by the census, and thus it was to data processing that census officials turned as a potential site to implement a cost effective and practical solution to their problems. As such, it is data processing concerns that largely structure the problematic emerging in American governance. Data collection is continually expanded and amended to take into account new items of potential interest to the government, while data processing becomes the chief obstacle to actualizing those interests. It is precisely through this problematic that the crisis reached in the 1880 census was understood and articulated, and it is in relation to this problematic that, as we shall see, the first large-scale electromechanical computation took place in America.

The 1880 census saw the director for the first time able to select the entire staff of the U.S. Census Office, from administrators and special collection editors to enumerators, and competency was supplemented for patronage, at least for a time. The task of the census was also greatly increased, as it was now to collect data on urbanization, manufacturing, mining, electrical utilities, agriculture, trade, transportation, services, education, mortality and vital

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38 N.b., “The schedules of inquiry intrusted to the census enumerators consisted of the four general schedules relating to population, agriculture, manufactures, and mortality, eight supplemental schedules calling for special information concerning the defective, dependent, and delinquent classes, and the special relating to Union survivors of the war of the rebellion” (Wright & Hunt, 1900, pp. 70–71).
statistics, to name but a few, as well as its general information on the population. The 1880 census was by far the most expansive in history, published in 22 volumes plus a Compendium (Anderson, 1988, pp. 83–100). The U.S. Census Office was faced with an ever-expanding population, stretching into more and more remote lands, only becoming accessible to the census with the development of railroads in the latter half of the nineteenth century. It increasingly expanded its enumerator base, which led to many more errors to be corrected for in the data processing phase. Additionally, its centralization led to the need to tabulate many more records by a much smaller number of people, while at the same time the number of pages in reports that were expected of it rapidly increased. And lastly, the inclusion of new items on enumerators’ schedules meant that there were more items to be tallied, and more correlations to be computed. As Charles J. Bashe, Lyle R. Johnson, John H. Palmer, and Emerson W. Pugh note,

To obtain the population count from the enumerators’ schedules was a big but relatively easy task. The larger task came in deriving counts for selected combinations of attributes, a laborious process that required several passes over all the schedules. These passes inherently involved some duplication, and portions of them had to be repeated whenever inconsistencies were detected. (1986, p. 2)

As you can see from Table 1 below, the 1880 census utilized nearly six times the enumerators as its predecessors to compile nearly seven times the total published pages, all with barely more than double the central office force. Early on in the process of the 1880 census the increasing concern that the full results would not be published before the next
census commenced had taken root, and it became a dominant concern in plans for the 1890 census.

Table 1. Growth of the decennial census, 1790 to 1890\(^{39}\)

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Total U.S. Population in Millions</th>
<th>Number of Enumerators</th>
<th>Maximum Size of Office Force</th>
<th>Total Pages Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>1790</td>
<td>3.9</td>
<td>650*</td>
<td>n/a</td>
<td>56</td>
</tr>
<tr>
<td>1800</td>
<td>5.3</td>
<td>900*</td>
<td>n/a</td>
<td>74</td>
</tr>
<tr>
<td>1810</td>
<td>7.2</td>
<td>1,100*</td>
<td>n/a</td>
<td>469</td>
</tr>
<tr>
<td>1820</td>
<td>9.6</td>
<td>1,188</td>
<td>43</td>
<td>288</td>
</tr>
<tr>
<td>1830</td>
<td>12.9</td>
<td>1,519</td>
<td>28</td>
<td>214</td>
</tr>
<tr>
<td>1840</td>
<td>17.1</td>
<td>2,167</td>
<td>160</td>
<td>1,465</td>
</tr>
<tr>
<td>1850</td>
<td>23.2</td>
<td>3,231</td>
<td>184</td>
<td>2,165</td>
</tr>
<tr>
<td>1860</td>
<td>31.4</td>
<td>4,417</td>
<td>438</td>
<td>3,189</td>
</tr>
<tr>
<td>1870</td>
<td>38.6</td>
<td>6,530</td>
<td>1,495</td>
<td>3,473</td>
</tr>
<tr>
<td>1880</td>
<td>50.2</td>
<td>31,382</td>
<td>3,143</td>
<td>21,458</td>
</tr>
<tr>
<td>1890</td>
<td>63.0</td>
<td>46,804</td>
<td>3,447</td>
<td>26,408</td>
</tr>
</tbody>
</table>

*Estimated (records destroyed by fire).

The tardiness of some of the later volumes along with the successive deficiency-appropriations that were made to complete the massive project envisioned for the centennial census led to a heated series of newspaper attacks and pressure on Congress in their consideration of the next census legislation for 1890 (Walker, 1888, pp. 135–136). Although the original plan was for the expansions of the 1880 census to be confined to the centennial census, its encyclopedic nature was to be imitated again in 1890 with only minor modifications (Walker, 1888, p. 146; Willcox, 1914, p. 440). These encyclopedic results, despite some problems with accuracy, were quickly considered to be of intrinsic value to a

\(^{39}\) Data reproduced from Anderson, 1988, p. 242.
rapidly growing and increasingly federalized government. In 1888, Walker writes, “What the country wants is more information, not less. There never was a time when the demand for statistics was everywhere so great as at present” (1888, p. 160). And, as Walker notes, this demand truly extended from Congress to corporations, from newspapers and tabloids to the general population, with eager requests for early information on the results of the 1880 national enumeration having come at nearly a hundred times the rate of 1870 (pp. 147–148, 160–161). Again, the criticisms about speed, accuracy, and costs were largely interpreted as a crisis of data processing.40

In response to this crisis of data processing, the 1890 census would be the first to incorporate electromechanical machine tabulation technologies. It also saw a resurfacing of the patronage system, which led to an under-qualified staff and many problems in its administration. While it abandoned some of the more esoteric volumes of the 1880 census, it added detailed volumes on mineral industries, churches, mortgage indebtedness, transportation industries, and insurance. While the Hollerith machine was not used in these tabulations, the speed with which the general count was completed allowed more time to be devoted to these collections (pp. 106–109). Anderson writes of the development of the Hollerith tabulating machine:

40 As Walker writes, “The more weighty objection to the present system is found in the inability of the Census Office, no matter how completely organized and ably administered, to deal, at once adequately and seasonably, with the vast, heterogeneous mass of returns which are thus poured in upon it. Either the work of examination and revision must be hurried and perfunctory, or else compilation and publication must be protracted over a very long period” (1888, p. 149).
It is even reasonable to suggest that the major achievement of the 1890 census – the successful introduction of machine tabulation – resulted from the peculiar disabilities American census takers faced. The constraints of a political system dominated by partisan patronage in conjunction with the need to record and report the data quickly for constitutional purposes had prompted significant technological innovations in data processing. In the politically turbulent 1880s and 1890s, Congress and major sectors of public opinion had demanded more and better census data. But the nation did not create a central statistical office to collect and publish information about the economy and society in its own right. And so the census faced broad demands but inadequate funding and administrative support. (1988, p. 109)

As noted previously, the Census Office understood this primarily as a problem of data processing, as the representational aspect of its legislation mandated a direct headcount that made decreasing the sample size impossible. Data collection could only be improved slightly by better-designed survey schedules, and things entirely outside the Census Office’s hands, such as transportation and postal systems. What was needed was a revolution in data processing.

**Solving the U.S. Census Problem**

The labor of organizing and energizing a census is such as no man can conceive who has not himself undertaken it, or, at least, stood close by and watched
the machine in full operation.

Francis A. Walker, 1899, p. 101

Herman Hollerith, born February 29th, 1860 in Buffalo, New York, would go on to develop the first electromechanical computation machine capable first of processing, and later of storing, vast quantities of data. He was educated at the Columbia College School of Mines, which he left in 1879 to take up work on the 1880 U.S. Census, though he would later submit essays on his patented work to receive a PhD in 1890. While at Columbia, Hollerith received a rigorous education blending elements of practice with theory, of physics and chemistry with engineering, though he never took a course on electricity or statistics (Austrian, 1982, p. 2). Electrical engineering was only introduced in 1882 with Thomas Edison’s invention of the incandescent lamp and the installation of the first electric company, the Pearl Street electric power system, in New York. Classes in electrical engineering would not be offered at Columbia until 1889 (Heide, 2009). At the 1880 Census Office in Washington, Hollerith was assigned “to collect statistics on steam and water power used in iron and steelmaking” (Austrian, 1982, p. 4), and also voluntarily computed life tables for Dr. John Shaw Billings, a special agent directing the vital statistics division of the census. It was to Billings that Hollerith would grant full credit for the inspiration of his tabulating machine (Austrian, 1982, pp. 5–7).

41 The transition of focus from processing to storage took place in the 1930s. For more information see Heide, 2009, esp. p. 4.
While there are multiple accounts of the actual source of Hollerith’s inspiration, nearly all cite the earlier Jacquard Loom, despite different narratives for how Hollerith first encountered it. In 1804, Joseph-Marie Jacquard, a Lyons-based silk weaver by trade, patented a new loom that employed punched cards to automatically control the system. James Essinger notes that, at the time, the Jacquard Loom “was unquestionably the most complex mechanism in the world” (2004, p. 37). It was automatically and continuously fed in a reliable and rapid way, and was exceedingly flexible. Employing as many as 50,000 punched cards for a single pattern – most notably Jacquard’s own face – these looms were capable of processing an incredible amount of data (Austrian, 1982, p. 16). They have subsequently been the inspiration for the majority of the attempts to build the world’s first computers, which Essinger refers to as “the first Jacquard looms that wove information” (2004, p. 159), including both of Charles Babbage’s engines and the Hollerith Tabulating Machine. The difference between their approaches is in Hollerith’s limitation of the computational problematic to the ‘narrow class of data processing tasks’ essential to the census. As Bashe et al. note, “In contrast to Babbage, who had sought to press technology to the very limit and to attain utmost generality of purpose, Hollerith designed within accepted engineering limits and started by tackling a specific application” (1986, p. 3).

It is unclear exactly how Hollerith came into contact with the Jacquard looms, though it is clear that they were very popular at the time. One account has Dr. Walter F. Willcox, an associate of Billings’, quoting Billings as saying that he had specifically mentioned the

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42 For a detailed history of the development of punched card computation focused on Jacquard, see Essinger, 2004.
Jacquard loom to Hollerith during their dealings at the 1880 census (Truesdell, 1965, pp. 30–31). Other accounts trace Hollerith’s first interaction with the Jacquard loom to his brother-in-law, Albert Meyer, who was in the silk-weaving business himself (Austrian, 1982, p. 17). Before leaving the census, Hollerith took a position as a clerk to get a feel for the work of computation, and left believing he had a potential solution to the census’ problems (Austrian, 1982, p. 8).

After spending about a year developing his ideas while teaching at MIT, in 1883 Hollerith left to take up a position as a clerk at a patent office. The average number of patents that were processed in the 1880s was 32,277 per year (Heide, 2009, p. 29). Many of them dealt with electrical engineering, which had just been introduced a year prior in New York City. Hollerith poured over the patents and resigned just six months later to begin developing a prototype of his own machine. He was already harboring the idea that would lead to the first electromechanical processing of digital information, in which a hole in a punched card would stand for a numerical quantity, or the presence or absence of a specific item or quality. This idea would lead to a series of 31 patents spanning the years 1889 to 1919 (Hollerith & Hollerith, 1971, p. 72).

Hollerith’s initial prototype was a paper tape machine (see Hollerith, 1889b), much like Alan Turing’s imagined universal discrete machine, in which a continuous strip of paper contained a series of two holes corresponding to various pieces of data. The strip was punched by hand with the same tools used in train and trolley stations, and run through metal cylinders. Two pins protruding from the upper cylinder were aligned with the two horizontal hole positions in the tape and would close an electric circuit by touching the bottom cylinder.
each time a hole was passed underneath them. The circuit would then trigger an electromagnet that would move a simple counter (Heide, 2009, p. 29; Hollerith, 1889b). Some aspects of this design would later resurface in Hollerith’s dynamic brush readers, but there were a number of prohibitive problems rooted in the census’ problematic. The first problem with the initial design was the exceeding length of the rolls of paper and their durability as they ran through machines at high speeds. Further, the subsequent movement to cards would allow data to be prepared more easily and at different times, sorted more easily for cross-tabulation, and more easily corrected in the event of errors (Truesdell, 1965, p. 40).

In the preceding patent though, Hollerith had already formulated his essential idea, which would constitute “the basis of all further inventions and applications of the system” (Hollerith & Hollerith, 1971, p. 72). Hollerith solved the problems of the paper tape machine by radically altering the machine and developing a series of complementary machines to assist its functioning. His first move was to shift from paper tape to punch cards. The cards were originally developed with data points surrounding their edges, to give

43 In U.S. Patent No. 395,781, Hollerith writes: “The herein described method of compiling statistics which consists in recording separate statistical items pertaining to the individual by holes or combinations of holes punched in sheets of electrically nonconducting material, and bearing specific relations to each other and a standard, and then counting or tallying such statistical items separately or in combination by means of mechanical counters operated by electro-magnets the circuits through which are controlled by the perforated sheets, substantially as and for the purpose set forth” (Hollerith, 1889a).

44 For the best succinct explanations of the functioning of the 1890 model of the Hollerith Tabulating Machine, see Hollerith, 1894, and Truesdell, 1965, pp. 35–56.
the hand punch easier access. The tedium of punching each point by hand soon led Hollerith to develop what he would term the “pantograph punch”. The pantograph punch used a swinging arm, with a punching device and cradle for the punch card nearer the fulcrum, and a labeled plate with a series of holes corresponding to the punch card into which a needlelike “finger” near the end of the level would descend upon depression. Pressing the needle into a hole in the plate would create a corresponding punch in the card at the back of the machine (Heide, 2009, p. 25; Truesdell, 1965, pp. 43–44).

This new development allowed the card to be filled with data entry points. The new cards contained 24 columns of quarter-inch squares, for a total of 288, with 4 columns reserved for geographic identification, and a clipped corner to help keep them neatly stacked. Further, the labeled plate at the front of the pantograph punch allowed Hollerith to print nothing but serial numbers on his cards, and thus we see the first functional existence of pure, machine-based data (Truesdell, 1965, pp. 39–40). The Census Office was filled with 63 million blank cards with series of holes only legible to machines, whose electric circuitry and switches converted their binary data into digitally quantified information on complex systems, most notably the population.

The tabulating machine itself was made up of a press connected by a series of electrical relays to a series of counters. Punched cards were set into the press on top of a rubber plate that contained 288 holes corresponding to the positions in the card. Each hole contained a deposit of mercury, which was connected by a wire to a binding post on the back of the supporting framework. Hinged above was a pin box, with 288 spring-loaded pins,
again corresponding to the positions in the card, each connected electrically to the unit and grounded. When pressed down, the pins corresponding to positions in the card with holes would enter the mercury and complete a circuit, while those corresponding to positions without holes would retreat into the spring box. The circuits initiated would activate electromagnets connected to dial-based counters divided into one hundred units, each with two hands, one for individual units, and the other, employing a carrying device, for hundreds of units. The counters could thus advance to 9,999 before needing to be copied down by hand and manually reset one at a time. There were 40 counters to a machine, each 3 inches square, which could be plugged into the machine without needing to rewire anything (Heide, 2009, p. 25; Truesdell, 1965, pp. 47–51). Through this method the population became totalizable in a nuance directly corresponding to the enumeration of the punched cards – in the double sense of both the cards’ design and the process of their being punched out – and the complexity of the configuration of circuits and dials in the tabulator. It was through this new technology that the population was rendered subject to governance.

These new technologies of governance were more complex than would appear at first glance, not only because of the capacity for circuit relays to produce correlations and recognize data patterns, but also because of the method Hollerith devised for facilitating the cross-tabulation of punched card sets. For cross-tabulation purposes, each tabulating machine was equipped with a sorting box, connected by electric relays to the press. The first sorting box was a horizontal model, with a series of compartments held closed against the tension of a spring. When a card was tabulated, an electric relay would trigger an electromagnet in the armature at the front of the box, which would cause the corresponding sorting compartment
into which the card was to be placed to open automatically. The machine’s operator then
easily closed the lid after having deposited the card into the appropriate compartment. Cards
could be sorted by individual data points, or by multiple data points in combinations with one
another (Truesdell, 1965, pp. 51–52). This process allowed the census takers to produce
increasingly complex correlations between their data sets that would otherwise have been
impossible given the limitations of the circuitry and number of dials in the machines. It is
important to note that this also marks the instantiation of batch processing in computation, a
data processing method that would later be popularized by IBM and embed itself in electrical
computation to this day, particularly in database management and updates.

Perhaps the most impressive feature of the tabulating machine was its incorporation
of electrical relays to allow for programming. Relay circuits were capable of opening or
closing all the relays involved in any given combination, at which point the counting circuit
is completed, and its impulse goes through all of the relays remaining open and triggers the
counting mechanisms’ electromagnets. The use of relays allowed Hollerith to perform cross-
tabulations at the same time as simple headcounts. It is conceivable that he could have built a
machine containing enough relays and counters to tabulate all of the census data in one round

45 And here is a source of Friedrich Kittler’s (2013) move in “There Is No Software” to collapse the distinction
between hardware and software, and of his lamentation of the contemporary lack of user access to hardware
programming. As Alexander Galloway notes, “‘[P]rogramming’ a computer originally meant patching circuits
together using cables or connectors and thus ‘software’ began historically not as executable software
applications as we know them today but as any sort of service labor performed in or on informatics machines”
of processing the cards, but limited by the practical number of counters, the difficulty of programming and maintaining such a sophisticated wiring schema, and the ability to supplement for this loss through the sorting box left most machines running with at most three or four relays in any given circuit (Truesdell, 1965, pp. 53–55). This was additionally attributable to the relative lack of sophistication in electrical component technologies at the time, as Hollerith’s early machines were powered by barrels of battery acid, used liquid mercury as a conductor, and thus did not have consistent enough voltages or precise enough resistors to build more complex circuits. In a situation of inconsistent electrical flows, the only accurate differentiation is between on and off, presence or absence of flow, literally corresponding to a 0 or a 1 directly experienced by human operators in the movement or rest of a dial.

Programming the machines was very difficult work, as many small wires had to be disconnected and soldered into new positions for each tabulating process. Hollerith first solved this problem by renting the machines out and guaranteeing their maintenance for the duration of their use (Heide, 2009, p. 31). The renting of tabulation machines set a strong precedent that would be kept up for many years afterwards. What is important to note here is that what was being purchased by the census, and soon after by many other companies, was computation, not a computer, which at the time still referred to the tabulator’s – likely female – operator. It is at precisely this point that a genealogy of computation itself can thus take root, as it is here that the entanglement of sociality, the human, technique, technology, the machinic, and computation are most transparently intertwined, a point that we will return to in the next section.
Hollerith piloted his machine in the tabulation of mortality statistics for Baltimore in 1887 and New Jersey soon after, and then in the tabulation of vital statistics for the New York health Department in 1889 (Hollerith & Hollerith, 1971, pp. 71-72). In 1889, Robert P. Porter, the director of the 1890 census, devised a test to determine who would be awarded the contract for the tabulation of the 1890 census. Hollerith had two competitors in the Hunt and Pidgin systems. In the test, Hollerith’s machine allowed for transcription times (i.e., the punching of cards from hand-written sheets) of about two-thirds those of his nearest competitor, and tabulation times (i.e., the processing of punched cards) of about one-eighth those of his nearest competitor (Truesdell, 1965, pp. 42-43). He was awarded the contract, and near the end of the census operators of his machines were processing around 7,000 to 8,000 cards per day (p. 56). Not long afterward, the Hollerith Tabulating Machine Company would become the International Business Machines Corporation (IBM), which would enshrine Hollerith’s standards for decades with minor variations and peripherals developed so that the machine could be exported and adapted to respond to similar problematics to that of the census across the world.

**Governance and the Mediation of Complex Systems**

Walter Willcox, chief statistician of the 1900 census, and, like Walker, one time president of both the American Statistical Association and the American Economic Association, described the basic unit of the census as follows:

To the historian, lawyer or statesman, the population is the primary fact and the land
surface is that area over which the population exercises sovereignty. But to the
Census Office the land surface is the primary fact and the population is that part of
humanity which resides on it. The count of population results from adding the number
of residents in each of fifty thousand enumeration districts, the census of farms results
from gathering the farm statistics in each district, and the same is true in a measure of
the vital statistics and the manufacturing returns. The enumeration district or, in office
parlance, the E.D., is the geographical unit of the census. (1900b, p. 263)

As illustrated by this passage, the census’s basic building blocks were the elementary facts
about small areas, like number of residents, births and deaths, etc., which operated as the
batches it would process. Its batch processing methods were then able to produce these same
elementary facts about local areas at any scale ranging from local to national, and to correlate
these elementary facts with one another as well as different batches with one another to
produce staggering new insights into the population of the country.

Through electromechanical computation, statistical investigation was able to rapidly
produce, identify, and categorize increasingly complex patterns across data points including
population (age, sex, color, place of birth, occupation, parent-nativity, illiteracy, etc.),
agriculture (farms, crop yields, etc.), manufactures (product output, workforce, etc.), wealth,
taxation, local public indebtedness, telegraphs, railroads, internal commerce, lumbering,
 quarrying, and mining interests, fisheries, newspapers and periodicals, schools, libraries,
churches, hospitals, asylums, workhouses, reformatories, other ‘institutions for the afflicted,
defective, dependent, and delinquent classes’, death and causes of death, ad inf. (see Walker,
Like Dr. Frankenstein, these early statisticians and economists stitched these patterns together into a totality that they called the national population, lurching forward through time in a shambling decennial stride. What this expedient metaphor makes clear is that – despite its inaccuracies at the time, which we’ll return to shortly – numerical representation was already able to present the population as an empirical and knowable object in 1890. What Americans previously thought about mythically, if at all, has radically changed senses: it has been organized and totalized; it has become an object of scientific knowledge. Just prior to the 1890 census legislation, Walker writes:

In order that they may be of the widest popular and highest scientific value, the results of every enumeration should be fully and freely discussed and profusely illustrated; the various classes of facts should be carefully correlated; and all should be shown on the background of the geographical, geological, and meteorological conditions within which they exist, and in their historical connections. Our previous experience has distinctly and unmistakably shown that, if this is not done by the Census Office, it will not be done at all. The statistical skill and experience which are requisite for the work are possessed by very few, while the clerical labor involved is far beyond the means of individuals. (1888, p. 146)

The census, then, is responsible for producing the national population as an object of scientific knowledge, a task that can only be accomplished by an institution expert, enduring, large, and evenly dispersed across the country by Constitutional decree. The result of this
thrust is a singular site of mediation, where, like Pasteur’s invention/discovery of bacteria, the national population first comes into a relation with the individual. And rather than telescope or microscope, we have a centralized room of computers – female body + tabulator – with communication vectors to some fifty thousand mobile input mechanisms – male body + writing mechanism + postal system.

The inaccuracies in early census data correlate precisely to the components of numerical representation in new media as defined by Lev Manovich (2001), even before the introduction of electromechanical computation. Manovich argues that numerical representation is the first fundamental aspect of new media, and that it relies on a digitization process whereby continuous data is sampled and quantized – presumably so that it can be manipulated computationally (2001, pp. 27–28). There will always be representational loss (i.e., inaccuracy) in this transfer due to the fact that the sample rate and quantization array cannot be infinite (i.e., continuous). In the case of the census, these inaccuracies are a direct hindrance to the effectiveness and efficiency of governance, and thus were identified in stride with the emergence of computation as problems – and here we can mark the next phase of the problematic that will be taken up in the proceeding chapters.

The problems with governmental sampling rates was perhaps best articulated by Willcox, who wrote, “Statistical statements of absolute amount or of rate, based upon records not made until the end of the period to which the statements apply, are likely to be only a minimum limit of the truth, and to depart from the truth by a variable, and usually an indeterminate, amount” (1900a, p. 459). These problems were complicated by the fact that
the date of the actual census taking, which always occurred in June, was coincident with many Americans’ vacations, and thus the sample rate was synched with a time when enumerators were most likely to either receive answers about a household occupant not physically present from a related person, or be met only with an unoccupied house (Willcox, 1900b, pp. 269–279).

For Willcox, the accurate check on decennial census data was to maintain ongoing registration reports through the country, “which record the current of people, products, or acts deemed worthy of entry” (1900a, p. 459–460), yet the United States had very few and largely inaccurate registration records. This presented severe problems for compiling death rates, birth rates, marriage rates, divorce rates, and crime rates, and thus precluded the United States – at national, state, and local levels – from accurately managing its health and occupations, its rate of births, marriages, or divorces in any locality or class, as well as the rates and types of crimes in any given area or among any given class.46 By 1890, arguments were already being floated for a permanent census office with continuously maintained – and thus trained – staff (see Willcox, 1914) and by 1900 we see entrenched argumentation for the governmental need for continuous data collection on its citizens through registration, collaboratively maintained by the partnership of a permanent statistical office in Washington with state and/or municipal registration offices. In fact, Willcox writes, “A census which does not blossom in registration is almost as sterile as capital which does not blossom in

46 It is perhaps telling here that Willcox considers divorce to be the least problematic of these because, at the time of his writing, it had become a matter of judicial record and thus inaccuracies from incomplete reporting could be supplemented and cross referenced (1900a, p. 473).
income” (p. 472). The census became a permanent institution two years after Willcox published that statement, and by the same act was charged with facilitating registration, most importantly developing birth registration areas and a standard registration system (Brumberg, Dozor, & Golombek, 2012).

Quantization existed in the census’ delineation of the classes into which each individual’s responses must be fit by the enumerators. For instance, by 1890 there were only eight classes to categorize an individual’s race: white, black, mulattoes, quadroons, octoroons, Indian, Chinese, and Japanese. The Japanese class was making its first appearance in the census, and African American identities would later be collapsed into simply white and black, or white, black, and mulatto. Enumerators were required to determine a class for each individual, and so the racial makeup of the entire nation was understood through the lens of these racial classes regardless of how accurately they represented the actual racial makeup of each individual in the country. While this example of the inaccuracy resulting from the quantization of race is rather obvious, we might look to one of Walker’s examples for a more complex instantiation of the same logic:

Thus, in 1860, the distribution of the population, according to ages, was into the following classes: under 1, 1–5, 5–10, 10–15, 15–20, 20–30, 30–40, and so on, by decennial periods upwards; in all, 14 classes. In 1870, under the demand for more minute information regarding the number of persons of school age, of voting age, of military age, etc., the following classification was adopted: under 1, 1, 2, 3, 4, 5–10, 10–15, 15–18, 18, 18–20, 21, 21–5, 25–30, 30–35, and so on, by quinquennial periods
upwards to eighty years, and thence upwards by ten-year periods; in all, 25 classes.

Even so, the occasions for distributing population according to ages were not considered to have been fully met; and, in compliance with numerous and pressing requests, including resolutions of conventions and public bodies, the ages of the population of 1880 were ascertained by single years, amounting to over one hundred specifications. (f.n., pp. 136–137)

The census statisticians ran into continual problems with the flattening of age into the classes they offered, such as the rounding of ages skewing the rates of births in the census year, the number of students to expect in public schools, the number of men of voting and/or military age, etc. These problems would persist until the census began recording exact dates of birth for the individuals it enumerated, which created an accurate enough repository for most problems of governance. While this example’s solution is accurate enough for nearly any governmental purpose, it still necessarily implies a certain amount of flattening and inaccuracy. That said, the majority of quantization schemas in the census do not have nearly such tidy solutions, and the problems their inaccuracies pose for governance persist as a constant source of negotiation in the data collection process.

**Numerical Representation and the Logic of Computation**

The key feature of democracy is its preference for quantity over quality: In democratic decision making the simple size of the vote takes precedence over its
justice, excellence, or wisdom. The many overpower the few; counting trumps argument.

John Durham Peters, 2001, p. 434

This story has traced the problematic within which early tabulating machines arose and examined their early technical development in relation to that problematic in order to better understand the forces at work in the crystallization of electromechanical computation. While budgetary needs for revenue between decennial censuses would push Hollerith – and later IBM – to market tabulating machines to railroad companies for shipping accounting and to insurance agencies for actuarial calculations and billing, the most significant technological modifications that came about from these interactions were arithmetical operations and alphanumeric printing. The core function of the machine – translating binary inputs (punched hole / no hole) into electrical base signals to be modified by circuit relays and gates – had already crystallized, and it is precisely this core function that we see recursively affecting the social milieu from which it arose. IBM would continue to produce slightly modified forms of punch card tabulators that preserved this core function for decades, all the while this technology produced an unexpected and partially self-driven expansion as it responded to new needs that its makers were unaware even existed – precisely because these needs hadn’t existed before the machine itself posed new questions.

By the close of World War II, the epistemological problematic that punched card tabulators addressed would expand to include financial instruments and accounting practices,
systems of transportation, multiple forms of insurance, public opinion measurement, the
regulation of health, social welfare, military conscription, and genocide. What is interesting
to note here is that every census from 1860 to 1890 aroused some dissatisfaction among the
general public, Congress, and or professional statisticians and economists (Willcox, 1914, p.
457). The 1890 census in particular was challenged because it did not show a large enough
population growth to match the ongoing trend of the country, a point of much pride amongst
both Congress and the general population, and thus contentious in nature. Yet, in the debates
that ensued – and the later reflections by census officials on the errors – the problems with
the population count in the 1890 census were attributed to “gross errors in the enumeration”
(Willcox, 1914, p. 444), and by that they meant people, not the new tabulating machines.

From its very onset, the assumption that computation has the capacity to represent the
world is almost never challenged. In fact, even the question of the accuracy and reliability of
electromechanical computation machines is rare – especially with audiences already familiar
with the technologies – and is often confined to technical debates amongst engineers,
statisticians, and economists. Instead, disagreeable computations (i.e., outputs) are near
universally attributed to disagreeable inputs, to the human factors in computation. It is my
contention that this perspective comes from more than the simple man and machine
conceptualizations so admirably interrogated by Georges Canguilhem (2008). Instead, the
near complete inability to fault the machine stems from its blurring of the lines between
presentation and representation. Even if the mechanism of its presentation is rife with
inaccurate representations – be they due to problems in sampling or in quantization – the
totalization called ‘population’ will slouch forth, however rough a beast it may be.
Representational problems, like inaccuracies, are like cellular degenerations that may not necessarily fell an organism. What I mean to say by this is that the presentational component of the census apparatus – the experience of and access to knowledge about the national population, its very facticity and reality – often barred people from seriously questioning the mediation through which it became available for experience and knowledge. Just as Pasteur could not un-see bacteria, no matter how inadequately his explanations of and predictions about it might be, the national population persists as a problem put to the individual to this day.

This is not to say that the inaccuracies of representation are unimportant in such a history of computation. The perspective produced by big data parsing is exactly parallel to the model of electric circuit relays, in which binary inputs (punched hole / no hole) individually and/or collectively trigger a counter whose tally moves up by units of one.\textsuperscript{47} This binary process is one of digitization, similar to base-ten or finger-counting, and thus implies a discreteness in the grossest sense of the word. The scale of any tabulation machine, however precise, has gaps that grow increasingly small with computational complexity, eventually converging at the limit of the infinitesimal. This is because each movement in position from the decimal point requires additional computation, which is why it would take an infinite amount of time to calculate $\pi$ regardless of processing speed. As such, lines,

\textsuperscript{47} And even in the later machines developed for insurance and accounting tabulation, which were addition machines rather than, strictly speaking, counting machines, the process is still engendered by a binary, and at base is a process of addition comprised of counting. The Hollerith Machine of the 1890 Census could perform the same operations, but would require significantly more time to do so.
curves, and bells jump across an archipelago of data points, like so many arrows from Zeno’s bow, and data points themselves flicker and shift with each new degree of precision in their measurement. Scales whose precision tends towards infinitesimally small units become increasingly capable of simulating an equivalent of analog representation, and surely if four decimal places were enough to engineer a craft that could take humans to the moon, then these simulations are competent for many of their applications in governance. But it is in the necessary digitality of computer processed numerical mediation that we find the inevitable, perhaps increasingly small, element of frigidity in numerical representation. The logic of big data renders systems and collectives in a level of detail unimaginable to human experience, but it also renders the individual in the most reductive and freezing tree of binaries. As Peters notes, “The fleshy residuum of finitude escapes simulation” (1999, p. 237).
As time goes on it will become more and more the duty of every actuarial society to gather materials for the investigation of special classes of risks varying according to occupation or otherwise, and to abstain more and more from the mere piling together of heterogeneous materials toward the formation of another conglomerate table.

CHAPTER 4. The Body Electric: Computing Death and Taxes

To assume a risk, to take it, make it your own, to master it, or even just to enjoy the existential thrill of it, was a birthright of the democratic soul, a soul born in commerce. […] For in the end capitalism itself assumes risk. It assumes, in other words, that financial instruments of its own making can adequately stabilize its own unpredictable rhythms.

Jonathan Levy, 2012, p. 18

As Daniel Bouk explains, the story of insurance in the United States is the story of “Americans seeking certainty and security in an unsettled, industrializing nation and becoming statistical subjects in the process” (2015, p. xi). For generations, the security of American citizens had been vested in the land, which, as diligent followers of John Locke, (white, male, etc.) Americans would mix their labor with, simultaneously producing the objects needed to sustain life, and staking ownership of those means of production. The land became their property, passed on through generations, and familial risk was confined to crop failures. It was only with the rapid industrialization and urbanization of the United States that the population experienced a semblance of contemporary risk. Skilled laborers with no property to sell but their bodies and techniques experienced the precariousness of capital, as unemployment, injury, ill health, and early death could for the first time disrupt not only their lives, but their entire family’s as well. The incapacitation of the adult male body was the
modern salted earth. And it led to the modern equivalent of crop diversification, diversification of risk by collectivization.

In the landmark 1842 case Farwell v. Boston & Worcester R.R. Corp., an engine-man who lost the use of his right hand when his train ran off the tracks because of a mistake made by a switch tender sued the company that had contracted him for damages. The judge presiding ruled that as a free man, free and able to negotiate his own salary and having received the benefits of the enlarged salary of an engine-man, Farwell had thus also freely and personally taken ownership of the risk entailed in the job. As Jonathan Levy notes, *Farwell* thus hedged a risk, as in to enclose and bound a future contingency within the inviolate sphere of self-ownership. But it also suggested the second historical meaning of the word “hedge.” For the outcome of the decision was that the same personal “risk” could be offloaded onto an insurance corporation and thus hedged financial. An accident insurance policy could not bring back Farwell’s right hand. The peril inextricably rested with him. But the risk did not have to. (2012, p. 13)

It is at this point that we can locate the origin of modern risk in the United States. It is here that risk is first understood to be susceptible to being enclosed and bound, and thus necessarily it is capable of *enumeration*. But further, risk is understood as a commodity, to be bought and sold, regulated and mediated by the free market.

The uncertainty of the future and its inherent risks as engendered by capitalism stand in stark contrast to its affordances, and they serve as its perpetual motor, as it continually strives to generate, manage, and exploit this temporal rhythm of intermittent crises prefaced only by uncertainty and speculation (Levy, 2012, p. 14). As Uncertain Commons explains,
If finance was the first modern practice squarely oriented toward an uncertain future as simultaneous threat and opportunity, speculation was the concept that tied together thought and money, intellect and capital. It bound together imaginations of the future and financial investments in the future; in fact, the future, indeed the common human future of the Enlightenment, sutured the two registers of speculation. (2014, p. 11)

This speculation was the product of statistical and probabilistic epistemologies that came to prominence during the Enlightenment, and it was nowhere more operative than in the attempts to mitigate – and later modulate – risk through the insurance industry. Life insurance companies were key actors in the development of modern finance and capitalism, and opened up new possibilities for governance that would later be adopted by the welfare state from the private sector.48

As we’ll see, the life insurance industry began with the grand notions of actuaries who sought to discover a universal Law of Mortality, applicable to all human beings. This Law of Mortality, once discovered, could then be correlated to a compound interest table in order to produce an adequate ongoing payment to collectivize risk across a sufficiently large number of people. In so doing, individual crises could be easily mitigated at the scale of the population. This thought process is markedly similar to that outlined in the previous chapter, where the primary goal is to mediate a totality – here risk at the level of the population, or even the species – such that it becomes knowable, and predictable, if not avoidable. However, by the end of the eighteenth century, insurance companies had become aware of a fundamental problem with this conceptualization. As Bouk explains,

48 See Bouk, 2015; Buley, 1953; Clough, 1946 James, 1947; Keller, 1963; North, 1954; and Stalson, 1942.
Actual life insurers struggled to square probabilistic, statistical methods with a business that contracted with individuals—indeed, a business that often treated individuals differently, demanding of one applicant more payment, rewarding to another’s bereaved family a smaller claim. Statistical and probabilistic methods could not discriminate so finely: they did not deal with individuals. So life insurers brought in lawyers and investigators, and most importantly, doctors—alongside countless clerks and tabulating machines—to process, evaluate, and forecast individual lives. (Bouk, 2015, xii–xiii)

In essence, the life insurance industry was not simply looking to govern at the level of the population, where knowledge at the scale of a massive totality—like population or species risks—were actionable. Instead, life insurers needed a way to return from that abstract knowledge to the actual individual at their counter applying for insurance. The insurance industry needed a way to individuate its risks, but also a way to do so in a uniform way across all applicants.

It will be the contention of this chapter that this social problem is co-emergent with a set of computational technologies, and the entanglement of the two inflects the entire history of big data in the United States, turning it from the grand endeavors of numerically mediating heretofore unknown totalities, to the everyday practice of individuating them through further numerical mediation on an ongoing basis, such that individual lives can be subjectivated and managed through them. What is outlined here is the first instance of a big data problematic leading to the technological subjectivation of the human. It also instantiates the electrification of (predominantly white, male, etc.) bodies, which, numerically mediated by oral, physical,
and chemical examinations, were put into contact with their collectivized risk as totality, and further subjectivated in accordance with ideals and norms derived from that totality.

The first section of this chapter will trace the co-emergence of insurance with early capitalism and the modern State. It will trace the histories of early mortality studies and compound interest tables, as well as the techniques of governance surrounding them. The second section will examine the early history of the insurance industry in the United States, with a particular eye to the complications that arose in practice from the theory of the Law of Mortality. The third section further examines the results of two major crises in American insurance industry, the depression of the 1870s and the 1905 Armstrong investigations. It argues that these challenges produced an urgent need for the individuation of risk in tandem with an emerging data processing crisis.

The fourth section examines the industry response to these crises and examines its attempts to individuate risk, including producing more advanced actuarial analyses, constructing complex inter-company communication networks and data exchanges, extracting relevant and homogeneous data from doctors, and supplementing this information with regional government data and credit reports. In particular, it examines the Medico-Actuarial Mortality Investigations as the first instance of the numerical mediation of individuated risk. This section demonstrates the manifestation of a data processing crisis, and the fifth section sets out to examine how that crisis was mitigated through the introduction of electric computation, and conversely led to new research and development in early computational technologies. In tandem, these two sections work to demonstrate the co-emergence individuation techniques with the computational technologies that were invented.
to render them possible. The concluding section returns to the literature that seeks to outline the nature of modern insurance, and, following Bouk’s work, seeks to rearticulate that outline through the dual lens of individuation and computation.

**The Emergence of Insurance in Capital and the State**

[S]afety from an evil which may lurk in the future is as real as any other commodity…

Elizur Wright, 1876, p. 149

Some of the earliest instances of the use of statistics as techniques and technologies of governance – specifically oriented toward decision-making in the sense of speculating about the future in order to better manage risk – are to be found in the rise of epidemiology in sixteenth century England. In response to outbreaks of major epidemics, the English began to draw up mortality tables in order to better manage urban health in the face of plague and leprosy. According to Michel Foucault, plague epidemics, “made mortality so dramatic that there was an interest in knowing how many people were dying, where they died, and of what cause” (2007, p. 67). Whereas the response to leprosy was a large scale production of practices of internment, relocation, and (religious) purification, the plague, more interestingly for our purposes, was met with observational and analytic techniques in the city, and the continual collection, processing, storage, and transmission of data (Foucault, 2000a, p. 146). As Foucault writes, in the case of the plague:

Medicine’s political power consisted in distributing individuals side by side, isolating them, individualizing them, observing them one by one, monitoring their state of
health, checking to see whether they were still alive or had died, and, in this way, maintaining society in a compartmentalized space that was closely watched and controlled by means of a painstaking record of all the events that occurred. (ibid.)

This was implemented through an “emergency plan,” initiated at each outbreak of the plague. People were not only quarantined to their individual homes, but also each to his or her respective room in that home (as much as it was possible). The city was divided into districts, each with a district head supervising the inspectors who patrolled the street, maintaining the quarantine. These inspectors were to present daily reports of their observations and surveillances to the mayor. Most importantly for us, the inspectors were to investigate each quarantined domicile on a daily basis. The inhabitants were ordered to show themselves at the window to verify that they were still alive. Anyone unable to present themselves was assumed to be infected, and was removed from the city to a special infirmary. The inspectors were to keep an exhaustive record of these window presentations, and thus of the number of living and dead, updated daily. Finally, houses were continually disinfected with perfumes and incense (Foucault, 2000a, p. 145).

Already we can see here an epidemiology that has developed in terms of binding disparate experiences of sickness into an enumerable complex totality, a process from which emerges certain individuated properties susceptible in the worst case merely to prediction, and in the best case to management. And already we can see here the notion that complex objects like plague epidemics are a social problem, and thus are to be mediated and understood at the level of the population. The isolation of the temporal and spatial rhythms of plague outbreaks, the speculation, anticipation, and preparation for its manifestation and
duration, as well as the ongoing decision-making about and management of bodies, space, and discourse surrounding the outbreak are all governmental responsibilities, as it is only at such a level that they can be well met. It was a small step from the intermittent wielding of this speculative apparatus to combat individual outbreaks of epidemic diseases to its expanded operation in the ongoing management of vitality and mortality in the population.

The first mortality or vital statistics of a general population (i.e., one not imminently threatened by epidemic disease) were published by John Graunt in London in 1662. Graunt was a draper by trade, but had been following the London Bills for Mortality, which reported weekly deaths in the city, over a number of years and compiled a general table of the ages at which the deaths would have occurred were they evenly distributed⁴⁹ (Lewin & De Valois, 2003, pp. 83-84). As we can see from Table 2 below, despite its methodological problems, the function of the mortality table is already apparent. Not only can we determine the likelihood that any given person will live to a certain age (e.g., 40% likelihood of living to age 16, 3% likelihood of living to age 66), but we can also determine the probability of death between any two age brackets. This probability hovers between 36 and 37.5% until one reaches the age of 46, at which time it rapidly increases.

⁴⁹ N.b., the London Bills of Mortality did not include the age of the person whose death they reported until 1728, at which time they began classifying them within broad age groups (Lewin & De Valois, 2003, p. 87).
Table 2. Graunt’s mortality rates

<table>
<thead>
<tr>
<th>Age</th>
<th>Number Alive</th>
<th>Deaths at this Age</th>
<th>Chance of Death Before Reaching Next Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>36</td>
<td>36%</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>24</td>
<td>37.5%</td>
</tr>
<tr>
<td>16</td>
<td>40</td>
<td>15</td>
<td>37.5%</td>
</tr>
<tr>
<td>26</td>
<td>25</td>
<td>9</td>
<td>36%</td>
</tr>
<tr>
<td>36</td>
<td>16</td>
<td>6</td>
<td>37.5%</td>
</tr>
<tr>
<td>46</td>
<td>10</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>56</td>
<td>6</td>
<td>3</td>
<td>50%</td>
</tr>
<tr>
<td>66</td>
<td>3</td>
<td>2</td>
<td>66.7%</td>
</tr>
<tr>
<td>76</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>86</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

This trend would eventually unite with one of its corollary techniques in England, that of managing interest rates for money lending. Between 1170 and 1700, England saw great fluctuations in its economy, specifically in prices (Mayhew, 2013). This was coupled with the decline of the institution of serfdom, which would disappear by the reign of Elizabeth I (1558-1603). The disappearance of serfdom led to an increased need to manage wage labor and property rental (Hilton, 1969). Their coupling was a primary factor in the development of money lending techniques, which would eventually be legalized at interest rates up to 10% per year in 1571 (Lewin & De Valois, 2003, p. 82). As early as the 1240’s, the English

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50 Table data reproduced from Lewin & De Valois, 2003, p. 84.
Jewish community’s bonds – excluding any interest rates – totaled nearly a fifth of all the circulating coin in England, with most debtors being noblemen, knights, and major monasteries (Stacey, 1995). Gregory Clark has demonstrated that interest rates in England ranged from 9 to 12% between 1170 and 1300, and argues that the economy would have collapsed without the availability of credit (1981; 1998). The 1571 Act of Parliament that legalized interest-based money lending was meant to secure the availability of credit and regulate its interest rates. Simple and compound interest tables had existed since the fifteenth century, but the legalization of usury for English Christians led to a more serious pursuit and expanded publication of simple and compound interest tables. By 1585 the mathematician Simon Stevin of Bruges published a user-friendly set of simple and compound interest rates that allowed lenders to more easily calculate the sum of any series of payments accrued in a given period, or what is called an ‘annuity certain’ (Lewin & De Valois, 2003, p. 81).

The first actuarial tables proper, i.e. containing both mortality statistics and compound interest rates for the valuation of life annuities, were published by Edmund Halley of the Royal Society in London in 1693. Halley’s table was based on data collected by the pastor of Breslau, Caspar Neumann, from his church registers between 1687 and 1691. These registers did provide the age of the deaths they recorded, and thus allowed for a more accurate calculation of mortality rates. As Christopher Lewin and Margaret De Valois note, “Although Halley had pointed out how to use the table in conjunction with compound interest functions in order to obtain the purchase price which should be paid for a stream of regular payments throughout life, i.e. a ‘life annuity’, the calculations were very laborious in practice” (2003, p. 87). Despite the efforts of Simon Stivon, and subsequent developers in the
interceding hundred years, the integration of risk into compound interest rates remained too difficult for widespread usage, a theme we will return to in the next section.

It wasn’t until compound interest tables were fused with vital/mortality statistics through the intermediary of statistical probability that there emerged a (market-based) speculative technology for the social management of risk.\textsuperscript{51} It is at that point that we find collectivized risk as an enumerable object of knowledge. It is important at this point to mark the co-emergence of speculative technologies with capital itself. As Uncertain Commons write:

But most scholars agree that speculation becomes global—that is, consolidated as a standardized practice with its specialized instruments across a projected totality of human activity—with the rise of modern global capitalism in the seventeenth century. The two semantic registers of speculation—the one cognitive (to ponder the future) and the other economic (to buy and sell so as to profit from market value and hence to invest in future profit)—become indisputably interlinked by the close of the eighteenth century. […] This means that the economic-semantic register of speculation emerges specifically at the moment that many scholars have identified as a period of intensification and an exponential leap in the development of finance capital. (2013, pp. 10–11)

From the perspective of media studies, we ought to note what it might mean for capital to be co-emergent with technologies of risk management. The shift from the accumulation of

\textsuperscript{51} Despite originating later than marine and fire insurance, life insurance was the first insurance industry to adopt probabilistic methods. See Daston, 1988, pp. 131–133.
wealth to capital, from mercantilism to capitalism, requires the constant mediation of the commodity as the operative agent in the growth of money out of money (i.e., $M \to C \to M^1$). This mediation is the site of commodity fetishism, which appears to be the primary mediation of capital. What we can see from this short history though is that this mediation is secondary, already supported by and predicated upon the mediation of risk operative in speculative technologies.

**Totality and Security in American Life Insurance**

What we know of this matter, so far as we know it, is called the law of mortality [...] The bearing of this law of the mass on the fate of the individual is called, in mathematical language, the Doctrine of Chances. It supplies to mankind, in regard to a great many subjects, a sort of substitute for fore-knowledge, or prophetic power, more or less useful.

Elizur Wright, 1876, p. 148

Mortality rates were first calculated with the use of census data by Pehr Wargentin in Sweden in 1766. However, census data was rife with problems of its own until at least the

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52 N.b., there has always been a deep entanglement between demography and mortality tables. Foucault notes this explicitly, “[E]ighteenth century demography could only begin inasmuch as some countries, and England in particular, had established mortality tables that made a quantification and knowledge of the causes of death
middle of the nineteenth century. The data collected had to be transcribed, tallied, transmitted, tallied again, and then cross referenced by hand, which necessarily limited the number of variables on which data could be collected and further introduced many stages at which errors and miscalculations could intrude. There was also a significant time lag, as censuses were performed infrequently in most countries throughout the eighteenth and nineteenth centuries. The United States Census of 1780 was the first regular census in history, and was set to occur decennially. As we’ve seen, frequently the tabulation of the census results took such an extraordinary amount of time, particularly when attempts were made to expand the scope of the data set, that there was worry of the full results not being published before the commencement of the next decennial census. Further, in the United States, the amount of personal data collected on individuals was sparse until the mid-nineteenth century, and it wasn’t until 1850 that census data shifted from being collected based on household units to actual individuals. This may be the leading factor in the establishment of methodological and data sharing practices across actuarial societies and organizations of insurance companies.

Prior to 1840, the majority of life insurance in the United States was provided by voluntary mutual aid associations, with a small amount coming from localized stock companies where the initial capital for paying out claims was provided by investors in exchange for returns (Yates, 2005, pp. 13-14). In reflecting on the early days of actuaries in America, Walter S. Nichols would reflect at the Second International Congress of Actuaries in 1898:

possible” (2007, p. 67).
In Europe, life insurance was a natural growth in which the development of its scientific principles went hand in hand with their practical application. In America, it was an exotic introduced as a business known to be successful in England. […] We borrowed our rates and contract forms from abroad, and with little knowledge of the principles at first, treated this business as an ordinary mercantile venture, requiring only the skill of the accountant to adjust the income and outgo of the company. (1898, p. 196)

Or further, as E. J. Moorhead wrote of the period 1809–1858, “An account of the first half-century of actuarial practice on this continent is mainly the story of individual, inexperienced mathematicians poring over books and figures in search of guidelines to discharge unfamiliar responsibilities” (1989, p. 3). In this period, the problem was in large part understood as a problem of professionalization, in the sense that a professionalized actuarial body could collectively produce better materials, gain a larger voice within their companies, and either lobby for or collaborate in the production of better governmental vital statistics.

The hindrance of inaccurate actuarial tables of rates cannot be overstated. Rates that are too low pose the obvious problem of catastrophe when policies are cashed in. However, there is the potentially less obvious, but equally severe problem posed by rates that are too high: not enough people purchase policies to safely collectivize risk. This precarious position was recognized early on in the American insurance business, when in 1831 the New York Life Insurance and Trust Company, then in its infancy, submitted a report to the Chancellor of New York State that read:

If the tables are too high, it prevents insurance; upon the number of the insured
depends the safety of the company. While it is few, the risk is great. It is decidedly the interest, therefore, of the company to encourage insurances by making the tables as low as by any prudent calculation they can be made. (1902, p. 231)

It is clear that from its first moments in the United States, the speculative apparatus at work in collectivizing risk is balanced on a knife blade whose cutting edge is prudent calculation. The success of the entire endeavor depends on the ability to calculate accurately and – as we’ll see when the number of data points necessary for consideration reaches a certain scale – quickly.

As Levy explains, these calculations were vested in the probabilistic concept of unity, atop which the law of mortality was able to operate. Levy writes, “[Unity] was the basis for the calculation of life probabilities, but also for the subsequent expansion of the actuarial framework for it also contained a worldview, an epistemology concerning the link between present and future” (2012, p. 81). In mathematical terms, this meant that unity was expressed by the numerical value 1, and against that standard all probabilities could be measured as ratios, and too which any probability and its opposing improbability would add up. What this meant was that all probability ranged between absolute certainty at 1 and absolute impossibility at 0, and, more importantly, that its distance from 0 was equivalent to its probability and its distance from one was always conversely the equivalent of its improbability. For example, a ½ probability was 50% likely and was always opposed by an equivalent ½ or 50% improbability. What this meant in practice for actuaries is that given a mortality table such as Table 3 below, one could easily calculate the probability that any
Person would live to a particular age through simple algebra.\textsuperscript{53}

Table 3. Law of mortality for insured lives\textsuperscript{54}

<table>
<thead>
<tr>
<th>Completed Age.</th>
<th>Number surviving at each Age.</th>
<th>Deaths in each year.</th>
<th>Completed Age.</th>
<th>Number surviving at each Age.</th>
<th>Deaths in each year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100,000</td>
<td>676</td>
<td>55</td>
<td>63,469</td>
<td>1,375</td>
</tr>
<tr>
<td>11</td>
<td>99,324</td>
<td>674</td>
<td>56</td>
<td>62,094</td>
<td>1,436</td>
</tr>
<tr>
<td>12</td>
<td>98,650</td>
<td>672</td>
<td>57</td>
<td>60,658</td>
<td>1,497</td>
</tr>
<tr>
<td>13</td>
<td>97,978</td>
<td>671</td>
<td>58</td>
<td>59,161</td>
<td>1,561</td>
</tr>
<tr>
<td>14</td>
<td>97,307</td>
<td>671</td>
<td>59</td>
<td>57,600</td>
<td>1,627</td>
</tr>
<tr>
<td>15</td>
<td>96,636</td>
<td>671</td>
<td>60</td>
<td>55,973</td>
<td>1,698</td>
</tr>
<tr>
<td>16</td>
<td>95,965</td>
<td>672</td>
<td>61</td>
<td>54,275</td>
<td>1,770</td>
</tr>
<tr>
<td>17</td>
<td>95,293</td>
<td>673</td>
<td>62</td>
<td>52,505</td>
<td>1,844</td>
</tr>
<tr>
<td>18</td>
<td>94,620</td>
<td>675</td>
<td>63</td>
<td>50,661</td>
<td>1,917</td>
</tr>
<tr>
<td>19</td>
<td>93,945</td>
<td>677</td>
<td>64</td>
<td>48,744</td>
<td>1,990</td>
</tr>
<tr>
<td>20</td>
<td>93,268</td>
<td>680</td>
<td>65</td>
<td>46,754</td>
<td>2,061</td>
</tr>
<tr>
<td>21</td>
<td>92,588</td>
<td>683</td>
<td>66</td>
<td>44,693</td>
<td>2,128</td>
</tr>
<tr>
<td>22</td>
<td>91,905</td>
<td>686</td>
<td>67</td>
<td>42,565</td>
<td>2,191</td>
</tr>
<tr>
<td>23</td>
<td>91,219</td>
<td>690</td>
<td>68</td>
<td>40,374</td>
<td>2,246</td>
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<tr>
<td>24</td>
<td>90,529</td>
<td>694</td>
<td>69</td>
<td>38,128</td>
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<td>25</td>
<td>89,835</td>
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<td>70</td>
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<tr>
<td>26</td>
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<td>703</td>
<td>71</td>
<td>33,510</td>
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<tr>
<td>27</td>
<td>88,434</td>
<td>708</td>
<td>72</td>
<td>31,159</td>
<td>2,362</td>
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<tr>
<td>28</td>
<td>87,726</td>
<td>714</td>
<td>73</td>
<td>28,797</td>
<td>2,358</td>
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<tr>
<td>29</td>
<td>87,012</td>
<td>720</td>
<td>74</td>
<td>26,439</td>
<td>2,339</td>
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<tr>
<td>30</td>
<td>86,292</td>
<td>727</td>
<td>75</td>
<td>24,100</td>
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</tr>
<tr>
<td>31</td>
<td>85,565</td>
<td>734</td>
<td>76</td>
<td>21,797</td>
<td>2,249</td>
</tr>
<tr>
<td>32</td>
<td>84,831</td>
<td>742</td>
<td>77</td>
<td>19,458</td>
<td>2,179</td>
</tr>
<tr>
<td>33</td>
<td>84,089</td>
<td>750</td>
<td>78</td>
<td>17,369</td>
<td>2,092</td>
</tr>
</tbody>
</table>

\textsuperscript{53} Elizur Wright provided the following one: “It has been observed that of a certain number, \(a\), of persons aged \(n\) years, \(b\) persons, and no more, have lived to complete the age of \(n + q\) years, and we assume this particular fact to represent a natural law or general fact, then the numerical value of the chance of a person aged \(n\) years living through \(q\) more years is the ratio or fraction \(\frac{b}{a}\), and if \(b = a\), \(\frac{b}{a} = 1\) is the numerical value of certainty.” (1865, p. 360). The addition of variables for monetary units and interest require more complicated algebra. See Wright, 1865, pp. 360–354.

\textsuperscript{54} Reproduced from Wright, 1865, p. 6. N.b., continues onto next page.
The important thing to note here is that actuaries took this probabilistic conception of unity as both an epistemological tool and a metaphysical creed (Levy, 2012, p. 82). They understood themselves to be unearthing a law held as a natural constant. Elizur Wright, often considered to be the Father of American Life Insurance, described it as follows:

Observations on the population of particular localities, and of entire nations, on annuitants who have the strongest pecuniary motive to live, and who have often been selected for their strength and vitality, and on insured lives that have an almost equally strong pecuniary motive to die promptly, have resulted in scales of decrement differing so little from each other and from a regular curve, that one must be profoundly skeptical not to believe in the existence of a perfectly graduated scale,
curve or law, which nature works after as her pattern or type. With the final cause of this fact, which may be regarded as one of the most interesting discoveries of modern science, we have nothing to do here. (1865, p. 4)

Framing the curve as a *discovery*, Wright precluded analyses of its constancy, and particularly of its origins or its *invention*, from actuarial discourse. Wright and the actuaries of the mid-nineteenth century believed they had discovered a totality that could be experienced and known by humans, that could even be expressed *formally*. However, its characterization as a universal totality exterior to human society precluded it from being operationalized.

Most of the early large-scale insurance companies in the United States that emerged in and after the 1840s were organized as mutual funds. Life insurance was considered to be a largely moral issue by the American public at the time, which was very dubious of any company’s profiting off of death and at the expense of the surviving family. Mutuals often offered participating policies in which all profits exceeding their operating costs and development were redistributed to their policyholders, and thus they in large part circumvented the public’s moral contestations and ensured their expansion (Yates, 2005, pp. 13-14; Zelizer, 1979, pp. 18-19). The stock-based firms saw the mutuals’ success, and after the 1840s often balanced returns with mutual aid by limiting the returns distributed to shareholders. The largest stock-based firms restricted their profits to between 5 and 10%, and prior to 1905 the dividends for all stock-based life insurance companies that were distributed to their shareholders were never in excess of 1% (Keller, 1963, p. 16, 42; Yates, 2005, pp. 14-15). The rhetoric of mutual aid and philanthropy were thus an essential component of the
early development of life insurance companies in the United States, and it was only through this rhetoric that they gained public legitimacy.

This is not to say that there were not abuses, as the industry operated with little to no regulation prior to 1958, and was continually subject to regulatory expansions into the twentieth century. The first major regulation in 1858 established the need for the state Commissioner of Insurance to regulate policy values by calculating their reserves for all licensed companies. Elizur Wright, Massachusetts’ Commissioner of Insurance, based his regulatory policies for the state on the British Combined Experience Table of 1843 with 4% interest. Additionally, as Moorhead writes:

The role of the companies was simply to furnish the data; the [state] insurance department had to calculate the reserves, a task that had been said to be prohibitively onerous for just a single company, let alone for the policies of all domestic and out-of-state companies. But Wright had invented an “Arithmeter” […] to ease the work of calculation and did not shrink from drafting several of his many children to assist him. (1989, p. 19)

There are two things worth noting here that illuminate the role of government in the history of insurance. First, the possibility of regulation is from its first instantiation understood as a problem of data processing, and indeed one warranting a technological solution. Thus the collectivization of risk in the United States is always-already tied to computation, and particularly to its mechanization, and later, electrification.

Second, regulation requires the establishment of standards maintained and held in accord by a legitimating body or bodies, namely, the state and its various bureaus, as well as
professional organizations of statisticians, actuaries, medical doctors, and insurance company managers. From this initial point on, the ability of the state to regulate the prudence of calculations – and thus the knife blade upon which the entire endeavor rests – both facilitates insurance by establishing homogeneity amongst pricing and ensuring the stability of individual firms, and hinders insurance by requiring each new calculation to be accepted under state and/or federal law. It is likely this hindrance of regulation that insurance men railed against throughout the latter half of the nineteenth century.

Elizur Wright would go on to facilitate the state legislature’s passage of an additional regulation in 1861 requiring insurance companies to offer withdrawal or surrender values to policyholders upon early termination of contracts, and would remain a force for the regulation of insurance, leading many to describe him as the “Father of American Life Insurance”. This legacy would be contested for more than a century, especially as the call for regulation was heightened by the insurance crises of the 1870s, which saw 91 insurance companies fail while only 25 new firms were launched (Moorhead, 1989, p. 34). In his 1892 presidential address to the Actuarial Society of America, D. P. Fackler noted that the pressure upon managers, agents, and actuaries to grow their companies created a temptation to compete for clients – with actions such as lowering premiums, etc. – that was both dangerous and unlikely to be voluntarily limited or ceased (p. 356). Fackler thus appeared to admit the need for further regulation, despite having in 1891 described regulatory legislation as ‘unwise and hasty’, as an impairment’, and as ‘one of the greatest latent dangers to the cause of life insurance’ (1892, p. 111). As late as 1940, Henry H. Jackson, a member of the American Institute of Actuaries and early historian of the profession who was well aware of
these problems in nineteenth century insurance, argued that Wright ought better be called the “Father of Dictatorial Legislation for Life Insurance” (p. 105). The dual function of regulation as both facilitator and hindrance seems to manifest itself continually in the discourse, as actuaries both admit the need for and begrudge state regulation at once.

This hindrance might best be illustrated by the American Experience Table, which was a mortality study conducted in 1861. The American Experience Table represented the experience, in fact, of a single company, the Mutual Life Company of New York, because its constructor had been unable to secure mortality data from any other companies (Moorhead, 1989, p. 24). The table offered an analysis of Mutual Life’s first fifteen years of policies, including how many insured people had died, let their policies lapse, and survived to pay another premium. According to the table, middle-aged American men lived longer than their counterparts according to the imported British tables. Mutual Life adopted the table to set dividends in 1861, and then to set premiums in 1867, all of which allowed them to lower the cost of insurance in America (Bouk, 2015, p. 22). The table was seriously lacking in rigor. It’s constructor, Sheppard Homans, a prominent actuary working for Mutual Life, would later describe its terminal age, ninety-six, as “a happy accident, or a happy thought” (1890, p. 33). Nonetheless, Mutual Life’s close relationship with New York legislators and regulators led to the American Experience Table being chosen as the state standard for valuing policies. As Bouk writes, “That meant that regardless of the table a company used to set its premiums, it had to show the state that it had sufficient reserves to cover its liabilities as computed using MONY’s table” (2015, pp. 24–25). Partly because of its embeddedness in state regulation, the American insurance industry would continue to use the American Experience Table until
as late as 1935 (Moorhead, 1989, p. 24). There would be no widely agreed upon American mortality tables circulating until the 1870s, and even those were rife with the inaccuracies of having inaccurate registries of births and deaths in the nation (Levy, 2012, p. 82), as well as limited to the law of mortality for given ages outside of subsequent individualizing correlations.

What we can take from all of this is that actuarial calculations were made possible in the United States by census data, and thus insurers faced many of the same problems as the census takers themselves, most notably problems with and questions about the collected data. These problems were particularly pressing for actuaries looking to guarantee the precision of the precarious calculations that they were routinely required to make, as the growth of an entire industry was hinged on that very precision. Early actuaries largely understood this to be a professionalization problem that could best be approached by a professional body that could collectively lobby the government for better data collection, lobby the industry to keep better records and heed calculations, and participate in a nationwide discourse and network of data sharing, particularly through multi-company studies, yearly conferences, and publications. In short, conversely to the census takers, actuaries understood this to be a problem of data collection.

Belief in the Law of Mortality meant that an actuary’s calculations, though laborious because of scale, were actually quite simple once the data was made available. For the most part, data fit a clean natural curve, and where it didn’t, it only required minor statistical smoothing to ensure it did. This data collection problem, though, was not unidirectional, as states increasingly began collecting data from the insurance industry to ensure it was in
compliance with a growing body of legal regulations. It was the combination of the belief in the universality of the Law of Mortality and the regulatory goals of the state that a table as flawed as the American Experience Table could be produced, embedded, and maintained so long past its tenure. In the next section, we will see how two crises in the American insurance industry – the 1870s depression and the Armstrong Investigation of 1905 – produced a disruption that opened up a space for the eventual de-universalization of the Law of Mortality.

**Two Crises in the American Insurance Industry**

Ten years ago this business of life insurance was […] purged by a fire such as no other business had ever been subjected to, and during that cleansing process, ideals for action were enunciated, and, to the slight degree possible, were written on statute books, which have so molded the practice of our business that to-day it is the cleanest, most honestly conducted business in the country…

A. A. Welch, 1917, p. 168

As previously mentioned, the first major crisis that the maturing insurance industry faced was the depression of the 1870s. As Bouk writes,

Industry observers almost universally interpreted failures as a judgment rendered by wrathful economic gods against companies designed less to pool and distribute
policyholders’ money than to support the extravagant lifestyles of ill-prepared company officers. […] Still, those companies that survived the panic offered—implicitly, in their actions—yet another interpretation: failure had been encouraged by the narrowness of life insurers’ markets. Some companies, as a result, looked to diversify regionally. (2015, pp. 25–26)

In the wake of the depression and massive company failures, the industry sought to further collectivize risk to increase security by embracing southerners, westerners, workers, women, children, and people of color. The strategy, in other words, was to become too big to fail, and to better alleviate the individually anomalous events of crisis by increasing the scale at which they were statistically mediated. This expansion would lead from a mere eight hundred thousand Americans insured on the books in 1872 to over ten million by the turn of the century (Bouk, 2015, xxii–xxiii). It is worth noting here that this expansion of the speculative apparatus to manage risk across disparate and different geographies, socioeconomic classes and employments, genders, races, genetics and body types, and personal habits and proclivities drastically increased the number of variables at work in the prudent calculations upon which the entire enterprise was founded. Attempts to produce correlations across these new variables created a data processing problem for many firms. They had the strategy, but would lack the tactics to fully implement it until electric tabulators were incorporated into the actuarial apparatus.

Of what are known as the “Big Three” insurance companies at the turn of the century, New York Life Insurance Company and Mutual Life Insurance Company of New York were organized as mutuals, and the third, Equitable Life Assurance Society, operated as a stock-
based company Yates, 2005, p. 15). These companies offered what is often referred to as “ordinary” insurance, which were relatively large policies, often in the thousands or tens of thousands of U.S. dollars, for which policyholders paid annual premiums. Their response to the crisis of the 1870s included extending the areas in and to which they would offer this type of premium insurance, but also the introduction of a new type of insurance policy. These three companies all offered “differed dividend” or “tontine” policies, introduced by Henry Hyde of Equitable Life Assurance Society, which “paid no dividends to policyholders early in policy life but promised to pay higher dividends later to surviving policyholders who maintained their policies without lapse over long periods, thus delaying policyholder recognition of rising costs” (Yates, 2005, pp. 15-16; see also Bouk, 2015, pp. 19, 91–92). As Bouk notes, “Insurers nearly always won in this deal, since with deferred dividend policies they got to hold on to (and invest) those savings for a very long time” (2015, p. 92). By 1900, each held insurance in force – the total value of policies yet to be paid out – of over one billion U.S. dollars, which had more than tripled since 1885 (Stalson, 1962, pp. 798-799). And by 1905, two-thirds of all insurance in force – approximately nine million policies in a time when there were only eighteen million policies – was constituted by tontine policies (Ransom & Sutch, 1987, pp. 385–386).

The Big Three would later be joined by two additional companies, Metropolitan Life Insurance Company and Prudential Life Insurance Company, both of which rose to power
after the crisis of the 1870s by offering industrial insurance. Industrial insurance firms offered small policies, often denominated in the hundreds of U.S. dollars, which were largely meant to cover funeral and burial expenses for lower-class urban workers. Their premiums were collected weekly in denominations of nickels and dimes, and thus they incurred higher operational costs (Yates, 2005, p. 17). Industrial insurance was largely meant to supplant fraternal insurance societies, and, indeed, both of these two companies had roots in fraternal organizations (Beito, 1999, p. 24; Keller, 1963, p. 10). These companies appropriated the rhetoric of public service from fraternal organizations, and thus circumvented moral outcry from the public (Carr, 1975, pp. 10-22), despite the fact that the ratio of their high operating expenses incurred by their weekly premium collections to money paid out to policyholders was twice as high as the Big Three “ordinary” insurance providers (Keller, 1963, p. 53; Yates, 2005, p. 17). By 1905, the two largest industrial insurance companies, Metropolitan Life Insurance Company and Prudential Life Insurance Company both held insurance in force exceeding one billion U.S. dollars (Stalson, 1962, pp. 798-799).

By 1905, the company presidents and investment committees responsible for investing the capital accrued by their insurance companies – which correlated directly to their insurance in force – had caught the public’s attention with their extravagances. Bouk explains, “[L]ife insurers had in recent years used policyholder money (an extraordinarily large and growing pot of it) improperly to inflate their own salaries, buy political influence,"

55 It is worth noting that Metropolitan only became a successful company with its introduction of tontine policies (Bouk, 2015, p. 20). Additionally, both Metropolitan and Prudential would mutualize in 1915, as would Equitable in 1918 (Moorhead, 1989, p. 129). Thus, all of the Big 5 would become mutual funds by 1920.
serve the needs of big investment banks, and otherwise betray the public’s trust…” (2015, p. 89) This attention quickly highlighted the large amount of power they wielded in the world beyond insurance by funneling their capital into their friends’ and associates’ investment banks, railroad bonds, finance mergers and trusts (86). As Morton Keller explains,

With involvement in high finance as much an expression of personal executive desires as of inescapable business requirements, it was difficult for these leaders to draw a line between private and corporate interest. Officers and directors were involved as individuals in many of the ventures to which they committed their companies’ funds. (1963, p. 143)

Medical directors and actuaries were well aware of these tendencies in their industry, but with little power to intervene, they were forced to participate in devising strategies that emphasized volume and growth over profit so that their executives would have larger reserves and more time to invest them (Bouk, 2015, p. 86). The Armstrong Investigation led to many strict regulations on the industry, and a more permanent emphasis on state regulatory bodies serving as ever-watchful eyes over the industry. Most notable among the results was the 1906 ban on tontine policies.

As we’ve seen in this section, in response to the depression of the 1870s, the insurance industry developed new strategies for success. This late nineteenth century strategy of rapidly growing insurance in force by pursuing new regions and classes of clients was largely reliant on the use of tontine policies to free up capital for investment. The insurance industry expanded rapidly through the use of tontine policies. By the turn of the century, the four companies that primarily offered them each had more than a billion dollars in insurance
in force. By 1905, two-thirds of all insurance in force in the United States was composed of
tontine policies, which had allowed for the liberal use of capital by company presidents and
committees highlighted during the Armstrong Investigations. With the death of the tontine
policy, the insurance industry found itself in a precarious position. Company presidents and
investment committees were loath to give up the access to capital they had previously
enjoyed. Insurers needed some way to identify and attract persons with more longevity
amidst a population rendered largely heterogeneous by the introduction of so many variances
in risk class (i.e., region, race, gender, occupation, etc.), so that they could leverage their
capital for longer durations before paying out claims. In the next section, we will see how
this need to individuate risk profiles catalyzed the development of an apparatus for radically
expanded data collection, processing, storage, and transmission.57

56 It is worth noting here that this need to better analyze risk classes so as to individualize insurance policies to
fit each customer’s risk profile pre-existed the Armstrong Investigation, as we’ll see in the next section. It
simply became a more critical problem for the industry afterward, and correlates well with the rapid uptake of
tabulator technologies and expansion of medical and actuarial studies on different classes of risk in the quarter-
century following the investigation.

57 On this, Bouk writes: “Efforts to individualize and standardize risk making—and, when possible, automate
it—on a national scale renewed the lease on life for the industry’s writing networks because it did what
executives wanted. It increased the speed and efficiency of medical selection. It limited distractions in the form
of griping policyholders or agents. And it opened life insurance to a wider swath of the population. In short, it
made it possible for medical directors to go on making more and more of the nation into risks, while investment
committees went on centralizing economic power. That more Americans became more widely and intensively
interpreted through the statistical lenses of the impairment and risk factor was a secondary effect” (2015, p. 88).
Individuation and Control in American Life Insurance

It is more important for the future interests of life insurance to learn how fisherman compare with farmers, how physicians compare with clergymen, how brewers compare with manufacturers of soda-water, and the like, than it is to gather together all these heterogeneous materials into one grand average in the form of a new life table.

McClintock, 1900, p. 374

As we’ve noted already, the insurance industry had a vested interest in offering the lowest premiums possible. By the twentieth century, life insurance companies were interested in expanding their customer base as widely as possible, not only to secure the collectivization of risk but also to guarantee themselves capital to invest. The lowest possible rates, though, were also aimed at a particular type of customer: the customer with the most longevity. The longer an insured person lived, the longer the company could invest their capital while collecting premiums before having to pay out a claim. This had become an increasingly important factor after the government crackdown and the banning of tontine policies had deprived insurance moguls of the investment capital they had grown accustomed to having at their disposal.

Insurers had early on discovered that offering a flat rate held constant to the law of mortality did not make for the best business, so they began subdividing the population into classes, each with its own risk factor. The Law of Mortality, as demonstrated in Table 3, was
always understood through at least the singular class of age, with different probabilities of
death based on whole number age brackets in increments of 1. Life insurers would over time
add classes based on regions, types of policies, years the policies were purchased in, gender,
occupation, race, family history, medical history, sexual habits, alcohol use, etc. The
consideration of risk classes would allow insurers to safely offer better rates to customers
projected to live longer lives, as well as to adjust their rates so that they might safely offer
insurance to riskier clients. This trend was responsible for an explosion in the data being
collected, processed, stored, and transmitted in the American insurance industry.

As early as 1848 actuaries began to be recognized and recognize themselves as part of
a scientific community and profession (Lewin & De Valois, 2003, p. 79). While actuaries had
long since shared data and methodology through publication and correspondence, the first,
albeit failed, attempts to build professional and scientific associations began in 1859 (Keller,
1963, pp. 8-9; Moorhead, 1989, pp. 17-42; Yates, 2005, p. 18). These early attempts at
international associations of actuarial sciences and insurance companies for the purposes of
sharing techniques and technologies, pooling data, and lobbying state and federal
governments did not crystallize until 1890. The Actuarial Society of America (ASA), the
Association of Life Insurance Medical Directors (ALIMD), and the National Association of
Life Underwriters (NALU) were all formed between 1889 and 1890 (Moorhead, 1989, pp.
29-31, 45-46, 50; Yates, 2005, pp. 18-20). It was largely through these sorts of associations
that actuaries and insurance companies interacted directly with tabulating machine vendors to
coordinate the development of tabulating technology in the first half of the twentieth century
As we’ll see, this relationship was largely responsible for the developments in automatic controls, data verification, data expansion by way of larger punched cards, numeric and then alphabetic printing, and subtraction operations (p. 6).

By 1900, Emory McClintock was spearheading the charge to produce large inter-company mortality studies of specialized risk classes. McClintock argued that the future of actuarial science and the insurance industry writ large was in the analysis of special classes of risk, rather than in the aggregation of heterogeneous materials into a grand table of averages. McClintock, essentially, declared the death of the Law of Mortality at the turn of the century. Instead, he was interested in finding the many gradations of risks between classes, whose correlations he thought capable of producing a nearly endless amount of interesting and valuable facts (1900, p. 374). He described the method of analysis as follows:

To carry out such special investigations properly it is necessary to segregate a certain class of risks and to determine whether it is on the whole a class of good risks, and to do this it is necessary to compare the mortality and loss experience upon the selected class with some chosen standard which represents the experience of an ideal class of

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59 In 1892, Daniel H. Wells had agitated for the analysis of the effects of policy type and size, residence, heredity, occupation, withdrawals, height and weight, use of alcohol, and smoking habits. But, as Moorhead notes, “His emphasis was less upon the value of such knowledge in improving risk selection within a company than upon the danger that variations might render premiums and reserves that were safe for one company to be hazardous for others” (1989, p. 63).
good risks. (p. 375)

In this early paper, McClintock posited an ideal risk, and alternately termed it the “normal loss” experienced (ibid.). Already in its first instantiation we can see the mechanism of subjectivation here, as the ideal risk profile is produced by adjusting the mass aggregate to serve as an ideal norm, against which the deviation of special classes can be evaluated.

In 1903, McClintock led an intercompany mortality study decades in the making. McClintock’s study used an English table to calculate his ideal risk profile, and against it measured ninety-eight special classes of risks derived from the records of thirty-four life insurance companies extending as far back as 1870 (Moorhead, 1989, p. 64). The problem with this initial study was that an understanding of each risk class’ deviation from an ideal norm did not in itself provide a consistent numerical mediation of risk capable of integrating these various risk classes. In other words, you could tell the risk of a generic class, but not of a specific individual, because specific individuals always occupy multiple classes, almost always with both positive and negative deviations from the norm. Despite its shortcomings,

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60 McClintock described the ideal risk he had been working with in his private studies as follows: “I have assumed as an ideal standard, for insurances more than four years in force, an annual mortality of seven-eighths of that of the American table at each age; for insurances more than one year and less than five years in force, seven-tenths, and for insurance less than one year in force four-tenths, of the mortality according to the same table” (1900, p. 375). He would go on to admit the potential imperfection of this initial articulation, but at the same time would note that he could not be far off from the numbers obtainable by a more perfect standard (p. 375–376).

61 The results were published by the Actuarial Society of America as Experience of Thirty-Four Life Companies upon Ninety-Eight Special Classes of Risk in 1903.
this method was the future of actuarial science. As a result, Bouk notes, “Actuaries became more invested in insurers’ correspondence networks, the data they produced, and the theory of risk they relied upon. They laid the groundwork for a proliferation of risk classes and the more precise personalization of risk rating” (2015, p. 84). What was lacking was a method of numerical mediation that would allow insurers to quickly and accurately sum the positive and negative valences of the risk classes to which an individual applicant belonged.

In the early twentieth century, only New York Life had been working towards utilizing a numerical method for categorizing all of its applicants as acceptable or substandard. As Bouk notes, “By 1919, a handful of companies employed a similar system, while many others used parts of it. By midcentury, nearly all companies had moved to some kind of numerical method” (2015, p. 152). This widespread adoption was made possible by the collaborative efforts of medical doctors belonging to the American Life Insurance Medical Directors Association (ALIMDA) and actuaries belonging to the Actuarial Society of America (ASA), who published a series of detailed reports working towards the individuation of risk and the establishment of a numerical method, and later became a permanent body in charge of publishing yearly mortality reports.

The numerical method was pioneered in a joint ALIMDA and ASA project titled the Medico-Actuarial Mortality Investigations, begun in 1907 and published in five volumes between 1912 and 1914. As Bouk explains, “The study, made possible by Hollerith sorting and tabulating machines, eventually considered almost three hundred possible factors affecting mortality—including 168 hazardous occupations, 99 medical impairments, 15 locales, and 9 classes dealing with race and sex” (2015, p. 153–154). These calculations
include all existing records of relevance dating back to 1885 from forty-three insurance companies, including the Big Five. The included companies owned 97% of all insurance in force in the United States and Canada in 1885, and 90% at the time of the study (America Life insurance Medical Directors Association & Actuarial Society of America, 1912, p. 8). At the time, only Equitable, Penn Mutual, New York Life, and Phoenix mutual were employing Hollerith machines, but the committee in charge of the investigation decided to use them for the entire study and volunteered a method for companies not using punched cards to offer their data on sheets to be translated into punched cards by the committee itself (ibid.). The end result was the beginnings of a numerical mediation of individuated risk classes, such that any constellation of risk classes could be integrated through simple arithmetic. This numerical system allowed clerks to simply add and subtract risk values for each risk class attributable to an individual applicant, and thus, without need for the intervention of an actuary or a medical doctor, a clerk could quite accurately determine whether or not to accept an applicant, and which types of policies and premiums that applicant qualified for.

The investigation used 45-column punched cards that could be filled with the predetermined codes for policy numbers, ages at issue, years of issue, durations, cause of termination, ninety-four causes of deaths, two-hundred occupations (with flexibility for adding eight-hundred more), special classes (including four groups of women and two groups of ‘colored risks’), ninety-nine impairments (with nine columns allowing for three impairments to be registered per policy, as well as space for accompanying symbols designating the time elapsed since the attack), ten types of build, one thousand kinds of
policies, amount of insurance up to $999,900 in denominations of one-hundred, habitat (including county or city, state, and country) (America Life insurance Medical Directors Association & Actuarial Society of America, 1912, pp. 129–131).

The study used a second card to record build information on 221,819 men and 136,504 women. The first seventy pages of the report are largely comprised of tables of correlations between height, weight, age, gender, and fluctuations over time. All of this data allowed for the production of the ten types of build specifications that were used to classify insurance risks, in addition to medical reports on applicants’ bodies’ impairments. All of that data was to be continually collected and fed through electric tabulators to produce statistical correlations that would then modulate those bodies by determining their risk profiles – and thus future savings and economic stability – and increasingly through non-profit organizations’ and governmental public health campaigns. Through insurance, millions of bodies became tethered to a continentally distributed network of (human) sensors disseminating millions of data points through communications channels to be digitized and electrically computed into totalities, subsequently subdivided into pure and discrete risk classes for arithmetic manipulation. Levy does well to point this out when he writes,

The insurance principle did not create communities that could be located in actual, fixed places. It was difficult to even imagine such communities. Risk communities became even more abstracted from place, as actuarial science plucked individual lives out of their local worlds, spawning webs of statistical interdependence between them. (2012, p. 87)

All of this was made possible by innovations to Hollerith’s tabulating machine, as will be
outlined in the next section. For now, we must further pursue the changes in the insurance industry that necessitated the adoption of electric computation.

Insurance companies had also developed deep relationships with America’s doctors throughout the latter half of the nineteenth century, just as statistical education in medical school was giving way to laboratory-based topics. During that time period medical statistics were increasingly relocating to other institutions, including asylums, hospitals, and insurance agencies (Bouk, 2015, p. 62). Insurers increasingly purchased private archives of medical records from doctors for use in actuarial calculations to better individualize risk assessment, and afterward would often demonstrate to doctors the use of statistical findings in etiology (ibid.). Insurance companies often regarded doctors as needing to be taught a new discipline before they could approach vitality from the perspective of statistics, as the correlations deemed meaningful by statistical analysis in an actuarial department were not always commonsensical, let alone compatible with medical discourse. Brandreth Symonds gives the example in 1905 of a correlation between fluid discharge from the ears and the development of tuberculosis (pp. 55–56).

As Bouk notes, “Insurers’ statistics allowed such analytical leaps—from ear fluid to the most feared disease of nineteenth century America—pointing out correlations that no one else had the capacity to see. That did not point to causation necessarily, but that was not a problem” (2015, p. 62). By the 1890s, the medical profession’s income from insurers was several million dollars a year, and that arguably constituted their largest source of income outside of regular practice (p. 71). That amount of business allowed insurance companies to

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utilize disciplinary methods to increase doctors’ cooperation, thoroughness, accuracy, and promptness in filling out standardized forms on patients referred to them by the insurance industry. Bouk tells us, “Medical directors instituted formal medical and family questionnaires, insisted on height and weight measurements, dictated the use of tools like the stethoscope, and introduced ways to analyze urine chemically” (p. 72).63

The incorporation of medical data was just one bureaucratic extension of the actuarial calculations. Others included investigations of prospective customers for fraud in their application, which became increasingly necessary after the customer base was so widely expanded and complexified after the crisis of the 1870s. This often led to the employment of credit reporters and their archives of data on individual capacity, character, and capital, or in other cases, such as Mutual Life, of the development of an in-house investigative department to pursue similar ends (Bouk, 2015, pp. 64–69).64 Symonds also helped to found the Medical Information Bureau (MIB), which drew on and expanded an earlier initiative to circulate

63 See also Davis, 1981; Porter, 2000.
64 Bouk describes the department in Mutual Life: “In 1890, only a year after it hired Brandreth Symonds, the company bought a copy of Charles B. Holmes’ files and access to his correspondent network. Holmes Mercantile Agency had only recently opened its doors, but MONY thought it could use Holmes’ intellectual capital as the foundation for its own National Commercial Agency, which would eventually develop the capacity to look into about 20 percent of all applicants’ financial and personal pasts. There, allied to the Department of Revision—which in 1894 alone investigated nearly twenty-five hundred medical examiners too—MONY built credit reporters’ systems into their risk-making process. […]Most life insurers came to rely on inspection reports to make risks. Some joined MONY in building their own inspection services. By 1909, New-York Life’s inspectors could call for reports from about sixteen thousand informants” (2015, pp. 68–69).
rejected applications amongst companies, and extended it to include the data for all individuals – including policyholders – who were considered to have any sort of “impairment”. These impairments contained any class of risks that could be identified by a medical doctor, which Symonds helped to produce a standardized taxonomy and codification for. The MIB radically increased the number of circulating documents amongst insurance agencies, as well as the need to continually process that stream of new data. This was only complicated by the fact that the MIB was a secret organization, which banned its members from referencing it to either other companies or applicants, and even imposed penalties on its members for mentioning it even to their own staff, agents, or managers (pp. 85–86). As Bouk notes, “It democratized surveillance and simultaneously made secrecy all important” (p. 85). The insurance industry was thus one of, if not the first massively automated, secret, and policed surveillance apparatuses in human history.

With their rapid expansion in the last quarter of the nineteenth century, life insurance companies experienced steep inclines in operating expenses. Their expense rates – operational costs versus income – rose from approximately 12% in 1870 to 19% in 1903 (Keller, 1963, p. 52; Yates, 2005, p. 16). This became a major concern for all insurance firms during the 1890s depression (Yates, 2005, p. 17). This was largely a factor of the scale of their data collection, processing, storage, and transmission. In 1896, Metropolitan Life Insurance Company reported completing 83 million operations in its actuarial filing section alone (Yates, 2005, p. 24). JoAnne Yates writes:

For actuarial purposes, a firm’s home office maintained information about the person insured (e.g., age, health, occupation), supported its extraction, calculated many
statistics based on it, and developed or modified products in light of it. To meet differing state regulatory requirements, it computed and reported various statistics on all its policies (e.g., value of policies and associated reserve requirements by state) and its financial transactions (including investments). For internal management purposes it maintained a cost accounting system, personnel records, sales records, financial accounts, agency accounts, and so on. (Yates, 2005, p. 22)

The magnitude of these operations was only exacerbated by the weekly premium collections occurring in industrial insurance companies. As such, “[I]nsurance companies increasingly used tabulating equipment not just in actuarial calculations but in operational processes such as billing and accounting” (Yates, 2005, p. 80).

What I hope to have demonstrated in this section is, firstly, that it was only by the incorporation of electric tabulators into this workflow that the rate of data collection, processing, transmission, and storage necessary for this nationally distributed apparatus of census data and government records, insurance regulators and state departments, medical doctors, investigators and credit reporters, medical directors (including their aggregate forms, like the MIB), actuaries (including their aggregate forms, like the ASA or the multi-organizational mortality studies), millions of clients, billions of dollars, as well as correlations between all of them and even their subdivisions, was possible. And secondly, I hope to have demonstrated that the purpose for that apparatus was to return from the scale of population, at which point something like vitality and mortality becomes knowable in the human species, to increasingly specific and concrete instantiations of that knowledge. The ultimate goal here is to quickly and accurately enumerate risks at the level of the individual,
or, in other words, to produce a subject of risk. I’d like to turn now to some of the advancements in tabulator technology that crystallized in response to this problematic and made the insurance apparatus – and thus risk itself – possible as we know it today, before tackling the theme of the return from totality to the subject in the concluding section.

**IBM and the Insurance Agencies**

The years after 1890 saw many improvements in Hollerith’s machines, though the majority of them were reserved for private industry. The 1900 census superintendent was barely convinced to rent new machines in the middle of its processing, and afterward the census would slowly distance itself from Hollerith, as it became a stable and continuous entity, as his initial patents expired, and it could build similar machines of its own (Heide, 2009, p. 47). Hollerith had already been working with Prudential on introducing his tabulating machines into their actuarial departments in the early 1890s, but by 1910 his work had come to fruition. He was by then receiving steady business from many of the largest insurance companies, including New York Life, Equitable, Penn Mutual, Home Life, and Phoenix Mutual (Yates, 2005, pp. 47-48). In 1911, Hollerith would sell his Tabulating

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Machine Company (TMC) to the Computing-Tabulating-Recording Company (CTR) for more than a million dollars, as well as a generous yearly salary for staying on and essentially designing whatever he wanted (Bashe et al., 1986, p. 6). The vigor with which Hollerith had pursued these contracts correlates well to his falling out with the director of the 1910 census, as he had lost his contracts with the Bureau of the Census in 1905 – and thus his primary revenue stream (ibid., p. 5). The improvements that CTR made to its tabulators and peripheral technologies in the first three decades of the twentieth century had been essential to securing and maintaining these contracts, and, as we’ll see, fueled a shift in computational technologies towards the individuation of elements of the totalities they had previously been producing. In 1924, CTR change its name to International Business Machines (IBM), and it was under that banner that the company solidified its position of dominance in the international market for electric computation devices.

Herman Hollerith’s work on vital statistics with Dr. John Shaw Billings left him well aware of the limitations of his original tabulators when it came to arithmetic (Bashe et al., 1986, p. 4). As Hollerith would later note in a 1919 letter to J.T. Milson, to resolve these limitations, he had turned his attention to the statistics of agriculture during the 1890 U.S. Census: “Here was a question of adding, not counting” (qtd. in Austrian, 1982, p. 109). He knew that counting was a much simpler mechanical task than addition (Heide, 2009, p. 32), but had long been interested in developing adding machines and incorporating them into his counting machines. In 1884, while he was drawing up his first patents, Hollerith negotiated the purchase of the rights to Tolbert Lanson’s adding machine. Lanson’s machine was

for the censuses of numerous foreign nations.
capable of taking numbers as they were written on a sheet of paper, from left to right, adding the columns, and carrying sums (Austrian, 1982, p. 10). Hollerith soon abandoned the machine to work full time on the tabulation machine he was developing for the 1890 census, and also because the machine proved too expensive to manufacture at the time. He returned to the machine at the tail end of the 1890 census (pp. 104-105). Hollerith used the agricultural data from the 1890 census to begin further developing his adding machine in the Census Office, though agricultural data was not recorded or tabulated by punch cards at the time. He continued to develop it after receiving offers from life insurance agencies and railroad accounting departments, eventually developing a punch card driven electric adding unit. The new adding tabulators had four adding units, resembling cash registers, whose results were displayed through glass windows (Heide, 2009, pp. 40, 47). By 1914, as Bashe et al. note, “The tabulator could be ordered with up to five accumulators, each with as many as eight decimal digits of capacity” (1986, p. 6–7).

These adding units were called accumulators. Each accumulator had a number of ten-position wheels with visible numerals, each representing a digit position. As Bashe et al. explain, “The electrical circuit for each dial counter was effectively made and broken as many times as necessary to register the digit represented in a corresponding card column. A supplemental carry mechanism was provided” (1986, p. 4). These adding tabulators were soon capable of simulating subtraction as well. The first method was to have separate columns with punched holes representing numerical credits and debits, the two of which were summed separately with their subtraction occurring at set stopping points during the processing by clerks. By 1928, this method was supplanted by the development of techniques
to complement numbers during keypunching such that the tabulator was ‘tricked’ into performing subtractions themselves (ibid., p. 12). IBM would soon add multiplication capacities to their machines in 1931 (see ibid., pp. 14–15). These new arithmetic techniques were essential to securing the continuous business of private companies for IBM, and in the case of the insurance industry, were instrumental in the production of numerically mediated individuated risk classes – in short, the capacity to add or subtract the amount of risk posed by any individual applicant such that an appropriate premium and policy could be issued.

Hollerith also developed a mechanical feed to increase the speed of processing through automation. The mechanical feed required a new processing method, and Hollerith developed one similar to his earlier idea of the paper tape processor, which he called dynamic brush card reading. Here cards acted as insulators, passed between brass rollers with a series of steel brushes aligned with each column, which closed circuits each time they touched brass through a punched hole in the card. Bashe et al. explain the mechanism as follows:

Bashe et al. give the following explanation of complementation: “As a hint of how complementation worked, assume a three-position accumulator. The accumulator may hold any integer from 000 to 999. The complement of a nonzero number in this range is derived with respect to 1,000, so that the complement of a credit 32 is 1000 minus 032, or 968. If the accumulator happens to be standing at 063 and 968 is added in an attempt to obtain 1031, the upward carry into the implied fourth position is lost (effectively subtracting 1000) and the result is 031, as it should be for the operation 63 + (-32). On the other hand, a problem arises in the operation 23 + (-32), which leads to 023 + 968 = 991. The desired result is -9, but to obtain this answer, 991 must be complemented and labeled as a credit. In dealing with complements, the left-most counter wheel in an accumulator is reserved so that a 9 in that position will always imply a complement. Lacking the left-most 9, the content of the accumulator is said to comprise a ‘true number’” (1986, p. 12).
Stationary, electrically conductive brushes, one per card column, swept the moving card and made contacts through holes in its columns during the reading cycle. Once the circuit for a given column had been made, the time remaining in the cycle determined the distance that a decimal counter wheel would be moved by an electromagnetically controlled clutch. (1986, p. 5)

As Heide notes, “All parts of the machine were synchronized with the movement of the card and registered the digit value of a hole according to its row on the card” (2009, p. 60). These machines were much more complex to manufacture, as the original 1890 machine had no turning parts, in contrast to the new machines which contained electromotors; however, processing speeds were greatly increased, with average speeds of 210 cards per minute, about five times that of a manual feed (Heide, 2009, pp. 54, 60-61).

Additionally, Hollerith devised a new punch that functioned as a one-handed typewriter. The card was placed under the keys, which would advance column by column, punching holes according to the keys that were pressed by its operator. This punch was more precise and allowed for narrower column widths on punch cards, and thus more data points (Heide, 2009, p. 47). Continual advances in decreasing the size of brush heads for reading punch cards and increasing the precision of card punchers allowed more data to be fit onto a single card. By 1907 the standard punch cards had increased from 24 to 36 to 45 columns (Heide, 2009, p. 47). The Medico-Actuarial Mortality Studies, as we've seen, were made

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67 As mentioned in the previous chapter, Hollerith’s approach to computation differed from Babbage’s in that he sought out specific applications first, using them to constrain his process of invention, and designed within the accepted limits of engineering of his time. In essence, Hollerith leveraged an analysis – however intuitive – of
possible by utilizing the 45-column cards and Hollerith tabulating equipment. The success of those studies and similar applications taking use of the maximum amount of data storage possible on individual cards led to continual calls from the insurance and accounting industries for expanded storage capacity throughout the 1920s. By 1928, IBM introduced the 80-column punch card as the new industry standard, which would remain standard until World War II. This introduction was based on the discovery of new methods to reduce brush widths while retaining reading accuracy, as well as that rectangular punched holes proved mechanically stronger than the conventional round holes (Bashe et al., 1986, p. 11–12). The capacity to store more data on each card cut down the cost of wasted space, allowed for easier storage and transport of cards, and most importantly, for the production of more complex correlations between data points, which was essential to the individuation of risk. The increases in processing speeds and accuracies further facilitated the individuation of risk, by allowing for the ongoing processing of millions of records accounting for billions of dollars of insurance in force.

The machines running 80-column punched cards retained reverse compatibility, and, in 1932, translating machines called “reproducers” were introduced to help automate the data migration fully to 80-column cards. These reproducers remained a part of the product line
after the transition had been made, however, as they proved useful for everyday purposes. As Bashe et al. note, “During reproductions, fields could be rearranged or omitted, fields from various card files could be consolidated by making successive passes, and redundancy in keypunching could be reduced” (1986, p. 14). One can immediately see the utility of the reproducer for the insurance industry, which for decades prior to its introduction had been engaged in a massive communication network for file or record sharing, originally facilitated in large part by the Library Bureau’s card systems (Bouk, 2015, p. 80). Individuated insurance pricing is in fact predicated on the capacity of insurers to efficiently and accurately share huge volumes of records, coupled with an increasing need to efficiently and accurately process those records once they have been received. The reproducer was an ideal fit for such business practices, and even afforded companies the capacity to determine which data to have copied over. As such, the reproducer’s functions of rearrangement and omission serve as some of the first instances of selecting privacy settings, permissions, and sharing options in electric computation.

Hollerith also developed and patented an automatic control mechanism for his machines, which eliminated the need for constant operator oversight in 1914, and introduced a verifier for insuring the accuracy of punched data during its production without the need of duplicate cards, long a concern of the insurance industry, which was available for sale by

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68 It is perhaps this legacy that led to the introduction, around the same time, of a numerical “interpreter” capable of printing card content in the unused space of at the top edges of punched cards. As Bashe et al. note, “After a card deck had been sorted on an interpreted field, the deck acquired some of the convenient, manual-access properties of the card catalogs made familiar by libraries” (1986, p. 14).
Prior to 1914, the automatic feed tabulators Hollerith had invented were operated by the use of “stop cards,” which were essentially punched cards that would halt the tabulating machine that could be interspersed in decks of punched cards at the points where the tabulation required clerical intervention (such as to perform subtraction). The introduction of automatic group control was based on an earlier Hollerith patent. As Bashe et al. explain:

This technique involved reading each card twice, so that the first reading of a given card would coincide with the second reading of the previous card. Whenever an identification field—the “group indicator”—changed from card to card, the machine would pause, permitting the operator to record subtotals and clear accumulators as desired. (1986, pp. 8–9)

The new automatic control mechanism allowed for faster and more accurate data processing, but as we’ll see below, also had the added benefit of increasing the flexibility of data processing applications by allowing new forms of automated batch processing.

As Bashe et al. note, “Sorting was indispensable because desired subtotals could not be obtained unless cards were tabulated in correct order. Subtotals by selected category are as essential to accounting as to census processing” (1986, p. 10). In short, batch processing was essential to the individuation schemas being developed in the insurance industry. This was because producing accurate subdivisions of the totality they had already derived – namely, the grand actuarial tables that had discovered correlations between the Law of Mortality and appropriate compound interest rates to mitigate its crises – was the only method for building accurate risk classes to better individuate applicants as risks. Hollerith’s original tabulating
machine configuration had utilized a magnetic lock mechanism to improve speed and accuracy during massive computations, but the sorting machine still relied on a clerk’s body to transfer cards from the press into the sorter. This was early on recognized as a site in need of improvement, especially if Hollerith’s machines were to respond to the needs of private industry, which were more heterogeneous, and thus required more flexibility, than those of the census.

To improve efficiency, Hollerith developed an automatic sorter – the Type 70 Vertical Sorter – in 1908 to complement his other new designs. The Type 70 could automatically sort cards that, for the first time were being automatically processed as well, at rates up to 250 cards per minute (“IBM Card Sorters,” 2013). After being read, cards were dropped into one of 13 shoots, 12 for sorting and 1 for rejects. It was largely the use of these machines that allowed the Medico-Actuarial Mortality Investigation to begin producing risk assessments of individual risk classes, and thus they were essential to the establishment of the numerical method in the insurance industry. The only drawback was that the fast processing required frequent emptying of the sorting box, as each chute could hold only 200 cards before it became overfull and began to crumple the punch cards (Heide, 2009, pp. 60-61).

In 1925, IBM would return to a horizontal model with the introduction of the Type 80 Horizontal Sorter, capable of sorting 450 cards per minute (“IBM Card Sorters,” 2013). Reflecting on its history, IBM explains,

The machine uses a direct magnetically operated control for the chute blades which replaced a much more complex mechanical device in the older machine. The Type 80
grouped all cards of similar classification (such as “sales by products”) and at the same time arranged such classifications in numerical sequence. (“IBM Type 80,” n.d.).

These new sorters were thus simpler, more efficient, and more robust. Their increase in function was largely due to the incorporation of sort brushes in the machine that allowed it to sweep cards column by column looking for a designated digit or constellation of digits, as well as to order arrange those cards in sequences. The Type 80 was also the first model to offer an optional plugboard for more robust sorting (“IBM Card Sorters, 2013). A plugboard essentially allowed the machine to be rewired on the fly and to sort cards in ways equally complex to the ways the tabulator could compute them.

Plugboards had originally been devised by Hollerith as an added feature to his machine that he would perfect throughout the years in order to help their operators make simpler programming choices and detect errors. Hollerith first installed a plugboard in the head of the press in his original machines, which consisted of a series of sockets that would allow operators to shift the configurations of little cables in order to alter the programming of the machine during processing or between tabulations. He also connected bells to the counters that would ring each time a card was correctly registered. In particular, during the 1890 census these plugboards and bells could be synched to particular enumeration districts, so that cards from other districts accidentally mixed in would not tabulate (Heide, 2009, p. 47; Truesdell, 1965, pp. 51, 55). This advanced use of electric circuitry actually allowed for a much simpler machine than its fully mechanical equivalent, and also offered a great deal of programming flexibility (Heide, 2009, p. 30). Shortly after World War I, IBM was able to
simplify the accumulators in their tabulating machines, which eliminated the need for a large number of circuit relays and produced space to bring the plugboard to a place of prominence in the front of tabulating machines (Bashe et al., 1986, p. 8).

The increasingly complex use of plugboards for ongoing and heterogeneous tasks led to renewed concerns about the setup time for tabulating machines. Complex plugboard configurations could take more time than it had in the 1890s to resolder connections during setups for the simpler tabulations of the time. The solution was the 1933 introduction of removable control panels, which Bashe et al. note had two main advantages, “(1) they could be wired ‘off line,’ that is, away from the punched-card machine and without interfering with its operation, and (2), at the cost of additional panels, a setup could be stored and used again and again” (1986, p. 17). It is here that we can see the first movement of programming away from hardware, and some of the basic impulses later realized in software, such as the ability to run multiple programs atop the same hardware with minimal need for reconfiguring it.

The capabilities allowed for by clever use of the plugboard were complimented by imaginative uses of punched cards as well. As Bashe et al. note, “In 1927, automatic group control was generalized to permit subtotals within subtotals within subtotals. Subtotals could be printed—via the “summary punch,” a duplicating keypunch modified for connection to a tabulator—saved in a punched deck for further processing” (1986, p. 11). These printed summaries quickly became essential tools in the everyday decision-making of large numbers of managers spread across many industries and states (ibid., p. 21). These strategies were expanded soon after the introduction of the 80-column card, when two smaller columns – column X or 11 and column 12) were added to the unused space at the top of the cards. These
spaces could be utilized in what were called ‘X punches’ to note debits and credits, and thus were essential components of ‘tricking’ the machines into performing subtraction. X punching also allowed for ‘field’ and ‘class’ selection in processing, as Bashe et al. explain,

In a “field selection,” one of two card fields was selected and routed to a given accumulator as indicated by the presence or absence of a flag punch. In “class selection,” on the other hand, a card field was selectively routed to one of two accumulators. What the use of card-contained flags meant in practice was that more data processing tasks could be done in one pass of a card file. Versatility was enhanced, moreover, in that field and class selection enabled cards of differing formats to be processed together, as might be convenient when new requirements suggested format changes. (ibid., p. 13)

The expanded capacities that these new strategies for increasing the flexibility for data processing offered to the insurance industry were essential in establishing the numerical method – and thus the individuation of risk – that has remained with us ever since. It is only by increasing the speed, accuracy, and for the first time, complexity, of electric computation that the insurance industry was able to operationalize the individuation of risk at the scale of many millions of people with many billions of dollars of insurance in force.

In 1907 the Hollerith tabulating machine had crystallized into a rather stable state with dynamic brush card reading, 45-column punch cards, stop-card functions, keyboard punches, plugboard programming, automatic vertical sorting boxes, and compact adding machines (usually up to 5 per machine). It was largely this configuration that first garnered industry adoption and made possible the Medico-Actuarial Mortality Investigation, which
would inspire what Ian Hacking (1982) would call ‘an avalanche of printed numbers’. In 1916, Oscar H. Rogers, M.D., and Arthur Hunter, A.S.A., who both served on the Joint Committee in charge of the Medico-Actuarial Mortality Investigation and both worked at New York Life during its implementation of the numerical system for individuating risk an, suggested that ALIMDA and the ASA continue their cooperative work. They established the Joint Committee on Standards – renamed the Joint Committee on Mortality in 1923 – which continued publishing massive intercompany studies, including the following: 1918: “Standard Mortality Ratios Incident to Variations in Height and Weight,” 1920: “Functional Heart Murmurs and Intermittent Albuminuria,” 1921: “The Influence of Family History on Mortality,” 1925: Blood Pressure Study, 1929: Joint Occupation Study and Occupational Mortality Ratings, and 1931: Medical Impairment Study. In 1934 the Joint Committee would take charge of the publication of annual mortality reports examining risk classes across the majority of the insurance industry’s policies, which would continually be supplemented by more specific analyses (Moorhead, 1989, pp. 111–113). In addition to this explosion of collaborative studies performed by the Joint Committee, Moorhead notes, “In the six years 1919 to 1925 inclusive, there were no fewer than forty [individual company mortality studies] printed, on many topics from general mortality to those of individual types such as abstainers, specific countries, various substandard classes and policy plans. These provided enlightenment for both risk selection and premium determination” (p. 113).

Largely in response to the insurance industry needs generated by this avalanche of printed numbers, by 1925 IBM had introduced automatic group control programming, a verifier to insure cards were punched accurately, and could simulate subtraction via its
accumulators. In 1925, internal polls coordinated by actuarial and insurance societies reported that 47% of responding companies used Hollerith’s (or, since 1924, IBM’s) tabulating machines (Yates, 2005, pp. 91-96). In the succeeding five years, IBM had introduced its Type 80 Horizontal Sorters with plugboard capacities, its 80-column cards with reproducers, interpreters, and X punch capacities, and complementation strategies for automatically performing subtraction, all to meet specific industry demands. By 1930, IBM’s market penetration of insurance companies had risen to 85% (ibid.). IBM’s monopoly on the insurance industry’s tabulating needs was finally established when it introduced its numerical and alphabetic printing tabulators to market, called the IBM 285 Numerical Accounting Machine and the IBM 405 Alphabetic Accounting machine, in 1931 and 1934 respectively.

Bashe et al. argue that “Mechanical bookkeeping systems with keyboards, accumulators, and ledger sheets could compete rather effectively with the arithmetic and

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69 Additionally, it had a number of ongoing research and development projects centered on industry needs, such as the development of numeric and alphanumeric printing capacities and the Type 80 Sorter, which came out too close to the polling to be adequately reflected in the adoption numbers.

70 Complementation was made much easier with the introduction of IBM’s Type IV Tabulator, which largely automated the process even in the event of negative sums. See Bashe et al., 1986, p. 13 for more.

71 These two machines quickly came to dominate IBM’s business. Bashe et al. note, “At the close of 1943, IBM had 10,000 tabulators on rental. Of these, approximately 64 percent were Type 405 alphabetic accounting machines, 30 percent were numeric printing tabulators (mostly Type 285), and 6 percent were nonprinting tabulators” (1986, p. 21). Additionally, in 1943 IBM had rented out 10,200 Type 80 sorters, effectively making it their most popular rented product (“IBM Type 80,” n.d.).
printing capabilities of the tabulator, but ledger-style documents could not be rearranged as efficiently as cards” (1986, p. 11). This rearrangement achieved by tabulators was itself twofold, existing in the rearrangement of card data via electrical circuits and relays to dials, wheels, and printers, and the rearrangement of punch card themselves through increasingly sophisticated sorting mechanisms. In essence, the tabulator was able to gain a foothold in industry and become incorporated into everyday life only through the need to individuate totalities. The computation of a totality was at the time a rare thing, occurring only in circumstances where resources and large forces of human labor for data collection could be marshaled like the decennial census. What was relevant to ongoing business and everyday life was more akin to the registration components of the census, the ongoing data collection and processing at the level of the individual. The inevitability of the computer came out of a dual move, the first being the capacity to enumerate a totality, and the subsequent being the capacity to individuate that totality for the sake of ongoing modulation of human bodies. Only an electric computation can make that dual move. Only a machine can numerically both mediate the population and individuate its subjects. And that dual move was made possible by the dual problematics of census and registration, counting and arithmetic, population and individual.

**Individuation of Risk, Subjectivation of Bodies**

[T]he ideas at stake—big questions about the possibility of certain knowledge, the responsibility of individuals to society, and the nature of equity or fairness—
bubbled up for public consideration. In selling insurance, companies simultaneously sold competing epistemological, social, and ethical positions.

Daniel Bouk, 2015, p. 15

For François Ewald, insurance is tripartite: it is at once an institution embedded in some social and objective context, an imaginary that finds uses for itself in given social and economic contexts, and an abstract technology that employs a schema of rationality for combinatorics (1991, pp. 197-198). As a technology, insurance engages risk by “breaking down, rearranging, ordering certain elements of reality,” and this last function constitutes insurance at its most essential, as a ‘calculus of probabilities,’ rather than a practice of compensation or reparation (p. 199). In short, insurance is first and foremost an application of statistics, thus it is formally statistical, regardless of the context in which it is applied (i.e., death, retirement, injury, etc.). Ewald treats risk largely at the level of collectivity or population (pp. 199, 203-204). He writes, “Strictly speaking there is no such thing as an individual risk; otherwise insurance would be no more than a wager. Risk only becomes something calculable when it is spread over a population” (p. 203). While Ewald is perfectly correct in stressing the necessity of calculation at the level of population, what remains unthought, or rather merely alluded to, is the way in which members of this population are individualized according to their position in the collective statistical body. Ewald does acknowledge this; he writes, “The risk defines the whole, but each individual is distinguished
by the probability of risk which falls to his or her share” (p. 203), but outside of some vague
overture, this aspect of insurance and risk is not the focus of his argument. Ewald writes that
insurance produces a particular type of objectivity, that takes particular familiar events and
gives them “a kind of reality which alters their nature,” and, as such, “insurance is the
practice of rationality potentially capable of transforming the life of individuals and that of a
population” (p. 200, emphasis mine). It has been my task here to provide some preliminary
thoughts on the way in which insurance technologies altered the nature or reality of our
understanding of the future through speculation, risk, and statistical individuation, which has
transformed our understandings of both our lives and familiar events ever since.

Daniel Defert comes closer to the task at hand, while still focusing much of his
analysis on the level of population. For Defert, insurance establishes series of data,
determines thresholds, medians and margins, and engages in an indefinite analysis of
variations in populations (1991, p. 215). He writes:

The overall effect of this is to open up a population to indefinite analysis into more
and more finely detailed sub-classes of risk. Insuring a population means classifying
it, subdividing it in line with a scale of degrees of risk and with an analysis of
behaviours, thresholds, marginal categories which are first excluded, then treated as
special sub-classes while excluding still more marginal groups, and so on. (p. 219)
We can already see here Defert’s movement towards consideration of the individual vis-à-vis
its position in a collectivity. While the statistical operations are surely performed at the level
of population, their outcome is always a table, one which organizes and classifies its objects
with ever increasing specificity and accuracy. The individual is assigned a highly specific
position within this table, and thus in the collective, most visible in the contractual level of contribution he or she must make to participate in the insurance body. For Defert, the movement from mutual aid societies to insurance constitutes a verticalization of collective engagement of risk. After the actuarial operations at the level of population produce their tables, each member of that population is linked individually and serially as a client to a central management structure. He writes, “Its [insurance’s] entire juridical framework consists in the contract between individual client and the company manager” (p. 231). And further, “Between the alternatives of arbitrary private benevolent patronage and obligatory state responsibility, insurance offers a space of regulated freedom” (p. 231).

It is precisely this individualizing, vertical, and serial relationship between clients and managers that Robert Castel overlooks in his tracing of the movement from dangerousness to risk. For Castel, the innovation of this shift is that “the new strategies dissolve the notion of a subject or a concrete individual, and put in its place a combinatory of factors, the factors of risk” (1991, p. 281). Again, Castel is perfectly correct to understand the abstract technology of statistics as insurance’s formal element, and the population as the target of this statistics’ application. Following Ian Hacking, who argues, “When we use a statistical law not only to predict and organize phenomena but also to explain them, chance is well on the way to being

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72 It is important to note that Castel is looking into medical practices of uncovering dangerous individuals, rather than actuarial practices. However, his model of risk still applies. The same vertical structure could be seen in the relation between individuals identified by risk statistics applied at the level of population and their positioning on a medical table.
tamed” (1991, p. 189), Castel understands risk to be precisely this statistical taming of the probability of undesirable events.

The problem with the notion of dangerousness was its embodiment in concrete individuals or groups, which lead to the need of individual or face-to-face processes of etiology and care. Each individual needed to be probed by a medical gaze in order to uncover his or her (individual) probability of committing undesirable acts (i.e., to assess his or her dangerousness). Risk escapes this conundrum by taking the population, rather than the individual, as its primary point of application. It statistically deduces correlations and factors in a heterogeneous body of data, and only subsequently identifies individual risks by their embodiment of these statistically derived profiles. But this is precisely what Castel overlooks: relying on a form of individualization in order to operate and engendering certain forms of individualization are not the same. While statistical operation at the level of population has no need of the individual, it does produce a schema for individualization by creating tables and ordering functions, which it subsequently applies at the level of the individual. And in so doing, Castel overlooks Hacking’s most important argument:

The erosion of determinism and the taming of chance by statistics does not introduce a new liberty. The argument that indeterminism creates a place for free will is a hollow mockery. The bureaucracy of statistics imposes not just by creating administrative rulings but also by determining classifications within which people must think of themselves and of the actions that are open to them. The hallmark of indeterminism is that cliché, information and control. The less the determinism, the more the possibilities for constraint. (p. 194)
Foucault tells us that “[S]overeignty is exercised within the borders of a territory, discipline is exercised on the bodies of individuals, and security is exercised over a whole population” (2007, p. 11). Security operates on phenomena at the level of series of probable events, on which it performs calculations, and establishes an optimal bandwidth in terms of cost that it considers acceptable (p. 6). Security apparatuses are centrifugal, in that they continually incorporate and appropriate new territories, which they subsequently organize and modulate. And the phenomena on which they operate are taken to be natural, inevitable processes that can only be cost-effectively modulated to a certain degree (i.e., the acceptable bandwidth) (p. 45). The population on which security operates is not a ‘primary datum,’ but in a state of constant variation with the climate, its material surroundings, legal codes, culture and custom, moral and religious schemas, means of subsistence, etc. (p. 70-71).

Each of these variables is in itself modifiable, and thus lends to the naturalness of population. This naturalness is further expanded by the statistical capacity to find constants and regularities in accidents, chance, individual conduct, and conjunctural causes, even though they appear to vary chaotically (Foucault, 2007, p. 74). Perhaps the most interesting aspect here is the way in which individual people’s conduct can be bound up into a system of population that is available for statistical analysis and security operations of modulation. Foucault argues that this comes about by the positing of one essential invariant in each individual, which can serve as the sole mainspring of action for the population as a whole, and that is desire (p. 72). He writes, “The production of the collective interest through the play of desire is what distinguishes both the naturalness of population and the possible artificiality of the means one adopts to manage it” (p. 73). One must ask here, however, what
does it mean to take an individual’s desire as a manipulable tether to this variable aggregate called population? Giorgio Agamben notes that it is this (all-too-human) desire that lies at the root of every dispositif, and that dispositifs only attain their specific power functions through the capture and subjectification of this desire (2009, pp. 16-17). He writes, “[E]very apparatus implies a process of subjectification, without which it cannot function as an apparatus of governance, but is rather reduced to a mere exercise of violence. […] Apparatus, then, is first of all a machine that produces subjectifications, and only as such is it also a machine of governance” (pp. 19-20).

In this instance, desire is constituted by speculation, a certain disposition towards the future comprised by anticipation, first in the sense of preparedness, and second in the sense of management. It is a desire to mitigate death by extending life both actually through the modulation of bodily practice and virtually through the extension of productive labor past the death of the body, specifically to secure the class status of the family left behind. This desire can be collectivized, and in fact is only realizable through its collectivization in the social distribution of risk. And further, this desire can be managed by a constellation of cooperating companies whose financial stability rests on their insured bodies’ longevity. To do so, however, risk classes need individuating and the actuarial apparatus must produce a subjectification, namely the ideal risk profile and norms for deviation from it proposed by Emory McClintock as the basis for individuated risk.

This was all in accord with the law of large numbers, which Porter defined as “the proposition that the frequencies of events must, over the long run, conform to the mean of their probabilities when those probabilities fluctuate randomly around some fixed, underlying
value” (1986, p. 12–13). In the original case, actuaries simply had to find the fixed Law of Mortality and correlate it with compound interest tables. However, the need to lower premiums to better collectivize risk and attract clients with more longevity, as well as the need to expand into new regions and classes of people in search of an expanded client base, required the a dynamic and iterative underlying value, rather than a fixed one. As Bouk notes,

Making risks did not stop with arithmetic or mathematics. Risk makers also looked to salesman, jurists, and economists for help in assigning prices to lives. And they turned to doctors, credit reporters, and statists to learn how to categorize and class. Then using those categories, they devised bureaucracies that could write and reduce a life to an index card. (2015, p. xxv).

In our terms, the modern insurance industry required an ongoing numerical mediation that

(1) continually abstracted the actual world into a totality by ‘big’ data collection and processing, (2) subsequently subdivided and subtotaled that totality repeatedly through increasingly complex data processing operations to produce abstract risk classes, (3) established an ideal individual risk profile with established norms of deviation from it, and (4) provided a schema for integrating the numerically mediated risk classes to which an actual (real world) applicant belonged for comparison to that ideal risk profile. It was thus that the insurance apparatus could align the desire of the individual, the population, and the company to the mutual benefit of all.
This is the picture painted in the first half of the twentieth century by the insurance industry. It utilized a conjunction of desire to spread statistical individuation practices through the American public. As Bouk writes,

> The propagation of the modern conception of death’s gospel (of control and change trumping prediction) did more than anything else to open new spaces for the statistical to engage (and win over) the individual. [...] Americans showed a new interest in thinking with such by-products—and submitting themselves to further risk making—now that statistical individuation offered hope for a better future. (2015, p. 150)

By articulating the problem of society’s need for individuation post-totalization, the insurance industry had already posited the solution: electric computation of ‘big data’ at scale, increasingly subdivided into generic classes after having been totalized. In doing so, the insurance industry effectively spearheaded the charge to shift the focus of computation from counting to arithmetic, from totality to individual, from tabulators to *business* machines. It permanently altered the course of computational research and development by spurring the development of precursory software, computational peripherals, like sorting machines and printers, and inter-tabulator networks communicating through millions of verified, translated, and interpreted punch cards physically transported by post. It was precisely these insurance industry techniques and IBM computer technologies that had matured in the first three decades of the twentieth century that offered renewed opportunities for governmentality in America, most specifically in the passing of the Social Security Act of 1935. However, by that time the insurance industry had already accomplished the major feat of individuating a
totality at the scale of national population, and in so doing had produced an iterative feedback loop running from actual American bodies to that totality and back. As we’ll see in the following two chapters, the inevitable next step was producing the same feedback loop for American minds and the discursive totality called public opinion. In the case of insurance, this loop could predict and modulate mortality, and establish requisite payments to offset its eventual actualization. As such, we might say that by electrifying their bodies, insurance applicants could gain definitive, individuated knowledge of their death and taxes.
Uniformity and standardization may provide an underlying basis for differentiation and liberation of individual potentialities. They may sink to the plane of unconscious habituations, taken for granted in the mechanical phases of life, and deposit a soil from which personal susceptibilities and endowments may richly and stably flower. Mobility may in the end supply the means by which the spoils of remote and indirect interaction and interdependence flow back into local life, keeping it flexible, preventing the stagnancy which has attended stability in the past, and furnishing it with the elements of a variegated and many-hued experience.

CHAPTER 5. The Local and Political In Sight: No Language Without Faces

The early to mid-20th century saw the most rapid expansion of the federal government in history. This expansion is most often talked about in terms of the New Deal. As David Kennedy has noted, “Into the years of the New Deal was crowded more social and institutional change than in virtually any comparable compass of time in the nation’s past” (2009, p. 251). For Kennedy, the pattern put in place by Franklin Delano Roosevelt and the Democratic party throughout the New Deal years can be summarized in the single word: security (p. 253). The New Deal not only saw the short-lived, but rapid, expansion of programs like the Civilian Conservation Corps and the National Industry Act, but also instituted enduring programs like The Federal Deposit Insurance Corporation, the Securities and Exchange Commission, the Federal Housing Administration, the National Labor Relations Board, the Fair Labor Standards Act, and the Social Security. He argues that each development had the same cardinal purpose, “not simply to end the immediate crisis of the Depression, but to make life less risky and more predictable, to temper for generations thereafter what FDR repeatedly called the ‘hazards and vicissitudes’ of life” (pp. 253-254). Kennedy writes, “Roosevelt sought to enlarge the national state as the principal instrument of the security and stability that he hoped to impart to American life” (p. 254).73 However, the

73 It is interesting to take the Social Security Act as an example, which Kennedy holds up as the paradigm of FDR’s security regime. By 1937, 27 million citizens were already entitled to old age pensions. Their salaries and wages paid, along with other identifying information, was housed in an enormous store of punched-card registers at the administration’s headquarters in Baltimore, Maryland. The entire apparatus was predicated upon
New Deal is better envisioned as the end point of that epoch in American history known as Progressivism, which also happens to be coincidental with the development of tabulator technologies.

Carey (1995) has described Progressivism as being constituted by three distinct but interrelated agendas. The first agenda was an attack waged by middle-class professionals on the plutocracy and the concentrated economic power of the elites who had come to constitute a national social class which these professionals wished to hijack. The second was to leverage dually capitalist and Enlightenment ideals of merit-based status determinations, science and rationality as cornerstones of decision-making at the expense of tradition, and to preface middle-class politics over those of the elites and, more importantly, the working class. This was largely achieved by intensifying the activities of the national government through sweeping reforms and leveraging it as a mechanism to help disrupt the power of political bosses and urban machines in American cities. And the third agenda was to foster cultural movements that worked to define new styles of American life in terms of child rearing and familial relations, aesthetic sensibilities, urban planning, personal conduct, education, and science. As Carey writes, “The three wings of progressivism were joined to one common desire: a desire to escape the merely local and contingent, an enthusiasm for everything that was distant and remote, a love of the national over the provincial” (1995, p. 387).

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the technologies and standards developed by IBM – and earlier by Hollerith, TMC, and CTR – that we’ve traced in the previous two chapters (Heide, 2009, p. 1).
As Randall Holcombe demonstrates, there was little federal growth throughout the 19th century. Growth in federal expenditures began in the later half of the 1890s, achieving wartime peaks in World War I and World War II. In neither instance though do the expenditures return to or dip below their prewar levels (1996, p. 175). Holcombe traces this to the rise of Progressivism in the 1890s, and goes to great lengths to demonstrate the continuance of this trend even under the Harding, Coolidge, and Hoover administration, each of which championed a “return to normalcy,” to Progressivism. He demonstrates that the 1920s saw increased federal spending in terms of law enforcement, public domain, commerce, agriculture, labor interests, immigration, public education, public improvements, and territorial and local government (p. 186). As J. Ronnie Davis (1971) has shown, these administrations demonstrate that a number of the ideas popularized by Keynes in the 1930s were already taking root in standard American economics by the 1920s. These administrations were keen to form alliances between academic institutions, private foundations, and government – as exemplified by the creation of the National Bureau of Economic Research – to increase the availability of federal knowledge for decision-making and security purposes (Holcombe, 1996, p. 196). The 1920s saw an increased willingness of the federal government to expand its role in the everyday economic lives of its citizens. As Holcombe notes, “If the trends of the 1920s had continued, federal growth would have been substantial with or without the Great Depression and with or without the New Deal” (p. 197).  

74 It is important to note that this expansion did not just take place in federal bureaucracy, executive power, and legislative power, but also in the judiciary. The early 1900s saw the beginning of the process of incorporation,
The government was thus progressively distanced from its citizens, yet increasingly invested in the modulation of their everyday lives. And this electorate, as evidenced by more than a hundred years of census data, was increasingly differentiated, expanding to unprecedented numbers, and developing huge urban concentrations. Graham Wallas described the results of the progressive agenda as follows:

Fifty years ago the practical men who were bringing the Great Society into existence thought, when they had time to think at all, that they were thereby offering an enormously better existence to the whole human race. Men were rational beings, and, having obtained limitless power over nature, would certainly use it for their own good. [...] The Great Society, even if it should deprive men of some of the romance and intimacy of life, must, they thought, at least give them such an increase of security as would be far more than an equal return. (1916, pp. 5–6)

Never had there been so much need for and doubt about the possibility of popular representation and for mechanisms of communication between individuals and the federal government. There had also never been so much possibility for government intervention into the everyday lives of citizens through security mechanisms developed throughout the history by which the Supreme Court systematically imposed the Bill of Rights and its subsequent amendments upon the states, one by one. For a history of incorporation, see Amar, 1998, pp. 181-230, and Curtis, 1986, esp. pp. 171-211.

75 As Anderson notes, “We date the end of the frontier from the 1890 census, the creation of the urban nation at the 1920 census” (1988, p. 2).
of the census, and whose capacities were exponentially increased by the development of electric computation.

This chapter analyzes the shifts in the conventions of democratic government that took place in the late nineteenth and twentieth centuries, with a particular eye to the different articulations of the role public opinion had in an increasingly complex and centralized national democracy. This chapter argues that public opinion was increasingly posed as a social problem within the larger ‘big data’ problematic of American governmentality. It is within this problematic and that public opinion polling emerged as the technical solution to the problem of the public in the 1930s. And it is against the backdrop of this deeply rooted discourse on the role of the public that the pollsters would frame their new technologies. However, a common narrative for the period emerged in the 1980s that obscures some of the important relations of force in the problem the public posed. This chapter then will largely look to clarify the context from which public opinion arose in preparation for the subsequent chapter in which polling technologies will be examined in detail.

As we’ll see in the first section, American democracy was predicated on the model of individuals managing face-to-face relations at the local level, a model that was thrown into crisis by both the Progressivist program and the factors that we saw complicating both the work on the census and actuarial calculations in the previous chapters. The second section will trace some early attempts to manage the problem by proposing new ways of thinking about and engaging both the public and the press. These early attempts will crystallize in the

76 Namely: population explosion, increasingly dense urban populations, increasingly remote rural populations, expanded electorates and consumer bases, etc.
third section, as we situate the writings of Walter Lippmann and John Dewey, who, in the 1920s, helped frame the problem that the public opinion pollsters would address in the 1930s. In the fourth and fifth sections we will closely trace the writings of Lippmann and Dewey respectively, looking to demonstrate both that they were largely in agreement with one another, and that both of their suggestions for moving forward with the project of democracy in the United States form the bedrock upon which public opinion polling was implemented in the 1930s.

_Vox populi, vox Dei: Discourse Networks and the Body Politic_

The light of the public is the light of the Enlightenment, a liberation from superstition, fanaticism, and ambitious intrigue. In every system of Enlightened despotism, public opinion plays the role of absolute corrective.

Carl Schmitt, 1985, p. 38

There are many competing claims about the roots of the radical shifts in conception of public opinion that took place in the latter half of the eighteenth century; many of these accounts look to France and England for their examples.\(^77\) Previously the body of the king had served as a physical manifestation of the kingdom, representing the political whole (Kantorowicz, 1957; Peters, 1995). As Baker notes, the radical shift found divine right and

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ultimate authority shifted from the body of the king to public (1990, p. 172). The phrase originally used to decry a great danger which had once been used in a sermon against Charles I was reintroduced and quickly popularized: *vox populi, vox Dei*. The voice of the public was now invested with the divine right of (self-)sovereignty, as it was only the people – and by that, of course, we mean the propertied bourgeoisie men of the time – that might serve as a theoretical check on the power of an arbitrary state (Peters, 1995, p. 8–9). For Carey,

The public was brought into existence by the conditions of the 18th-century city and by the printing press itself. The public was activated into a social relation by the news and, in turn, the primary subject of the news was the public: the opinions being expressed in public by merchants, traders, citizens, and political activists of the time. (1995, p. 381)

In essence, the public was a group of people – including potentially strangers — who gathered in coffeehouses, salons, and similar venues to discuss and debate the news (Carey, 1995; Gouldner, 1976). The outcomes of these discussions and debates were subsequently the content of future news. These spaces were free of both state and religious interference, because they often were based in private property, the historical stronghold of the bourgeoisie (Gouldner, 1976, p. 99). These spaces were public by virtue of their openness to

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78 Carey is not alone in seeing the press as the condition of possibility for the bourgeois public sphere. See also Habermas, 1989, pp. 15–26; Peters, 1995.

79 As Carey explains, “[The press] reflected and animated public conversation and argument. It furnished material to be discussed, clarified, and interpreted, which constituted information in the narrow sense; but the value of the press was predicated on the existence of the public and not the reverse” (1995, p. 382).
anyone, including strangers (Peters, 1995). The end result was thus what Habermas (1989) would describe as ‘the public reasoning of private people’.

At the time, a statement of opinion was understood to be a subjective, prejudicial, probabilistic, or authoritative utterance – the last sense being akin to a doctor’s medical opinion (Hacking, 1975; Peters, 1995). It also had a collective sense, tied to the Greek notion of *doxa*, or what was commonly held by many people to be true (Habermas, 1989, p. 89; Peters, 1995, p. 5). It was further modeled after the Greek Pnyx and the Roman Forum, intended to require the physical meeting of local bodies for dialogue and general discourse. As Rousseau would argue in *The Social Contract*, this meant that the state was subject to upper size limits if it was to be well-governed (1968, p. 90). These ideas were mirrored in the American context; as Peters notes, the twin pillars of Jeffersonian democracy are the ‘self-sufficient individual’ and the ‘self-contained community’ (1989, pp. 250–251). The democratic process required competent individuals be afforded the opportunity to meet for face-to-face discussions of ideas and actions, and thus they might constitute a public whose voice could carry to the ears of their representatives in government.  

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80 Or so goes the idyllic narration that often accompanies theories of the public sphere. In actuality, these venues were restricted by class, race, gender, ability, and a number of other factors. When previously undesirable participants started to make their way into public venues more frequently in the nineteenth century, the educated bourgeois white men retreated to the private space of men’s clubs (Carey, 1995; Gouldner, 1976; Habermas, 1989).

81 In a letter to William Wirt, Jefferson would describe this method as a harmony of pace and interests, a cooperation through the sacrifice of meeting in the middle, such that the constituents of the masses might be undivided in union, or in our terms here, a public (Williams, 1913, p. 7).
would later describe the American government as a series of ‘little republics’ (1969; See also Smith, 1985).  

Yet the emergence of the bourgeois public sphere is also tied to the circulation of newspapers, and thus there is already some confusion from a theoretical standpoint about the entanglement of speaking and writing, direct and indirect discourse. Carey (1995) seems to stress localization, and the fact that actual, physical spaces contained groups of physically present human bodies, even while Peters notes that at this point in time the public already existed in a transnationally “dispersed process of communication” (1995, p. 9). As we’ll see below, Carey’s emphasis draws on a longstanding trend in American thought that stresses physical proximity and face-to-face relations to decry the loss of the public sphere. In contrast, for Peters the originality of the public in this mode is the fact that “it bases social solidarity on participation in discourse rather than on locality or personal acquaintance” (1995, pp. 9–10).

In order for public discourse to be functional, it needed an operative logic, which was quickly located in the Enlightenment emphasis on criticality and rationality. While these terms have come to be articulated as transcendental properties of the subject, present or

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82 De Tocqueville would also warn that “All passions fatal to a republic grow with the increase of its territory, but the virtues which should support it do not grow at the same rate” (1969, p. 159).

83 As Carey notes, “[T]he public was taken to be critical and rational—critical in the ordinary sense that nothing in public was to be taken for granted, everything was to be subject to argument and evidence, and rational, again in the ordinary sense, that the speaker was responsible for giving reasons for believing in any assertion, so that there was no intrinsic appeal to authority” (1995, p. 381).
absent in any given individual, at the time they required subjectivation mechanisms to foster “ordinary human practices: a willingness to answer questions, to be forthright, to disclose hidden motives, and to avoid dragging in notions like God or Science to save an argument when it begins to weaken,” as well as to foster “public habits, manners, and talents: the ability to welcome strangers, to avoid intimacy, to wear a public mask, to shun the personal, to clamp some control on affect, and, in general, to achieve some psychological distance from the self” (Carey, 1995, pp. 381–382). More than any of this, though, the operation of the public demands literacy. Thus the newspaper as a technology and medium for publicizing discourse was always-already supplemented with corresponding techniques of the self. And further, the cultivation of a reading public would further extend the reach of communications networks and the disseminations of ideas in print, as well as increase the size of the voting public by the end of the nineteenth century. These developments would frighten the bourgeoisie and stimulate publications about the potential crises facing the United States, while at the same time stimulate some of the most utopian political aspirations in history.

As Peters notes, “The supposed power of public opinion sometimes reached great heights of fancy and bluster in Enlightenment talk” (1995, p. 12). By 1800, Tunis Wortman (1970) would describe public opinion as capable of dispelling the evil illusions of magic woven by despots and of making tyrants tremble on their thrones. For some contemporary thinkers, this sort of language demonstrates that public opinion was more of a rhetorical invention than anything else (Baker, 1990; Gunn, 1983; Peters, 1995). The power of the masses were invoked mostly as a rhetorical trope or an imagined prospect, often to reallocate the divine right of sovereignty to the bourgeoisie, and this bit of sophistry did not go
unnoticed, nor did the thought of its coming to fruition cease to scare bourgeois thinkers. As J. A. W. Gunn notes, public opinion was “vulnerable to the rude shocks administered by day-to-day contact with ignorance, prejudice, and a servile loyalty to power ministers and traditional institutions” (1983, p. 306). By 1821, G. W. F. Hegel would describe public opinion as deserving to be both respected and despised (qtd. in Peters, 1995, p. 13). De Tocqueville (1969) would write of the ‘tyranny of the majority’ to describe the potential abuses of public sovereignty, a phrase which would reverberate through discussions of the role of the public in democracy for more than a century.

While John Stuart Mill would at one point describe the public as “a collective mediocrity,” he would also argue that public opinion could escape the confines of the Pnyx or Forum by complimenting its representative system with the press (1952, p. 302, 330). In essence, political representation must be coupled with symbolic representation (Peters, 1995, p. 15). In so doing, the public is produced as a visible fiction through the newspaper, as political communication both happens within and constitutes the public sphere (Peters, 1995, p. 16). Echoing Benedict Anderson’s (1983) notion that the idea of nationalism is predicated on the production of an imagined community, Peters writes,

The public in this view is real, but it is formed of symbols. In reading the newspapers, the public reads about itself, and thus finds ways to come into existence. […] The imagined public is not, however, imaginary: in acting upon symbolic representations of ‘the public’ the public can come to exist as a real actor. (1995, p. 16)

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84 This was a view that Mill and Tocqueville shared (see Tocqueville, 1969, p. 518).
Fears of and hopes for the public were tied to the material mechanisms through which it was constituted, and reflect both the discourse and the media and communications technologies of their time.

The uncanny ability of an imagined community to escape the imagination and wield agency as a real actor in American politics would befuddle those who reflected on it for a century. Continuous attempts would be made to solve the epistemological problem of the public, to perfect systems of representation for engaging it or techniques and technologies for governing or controlling it. As we’ll see in the next section, the social changes of the latter half of the nineteenth century would put notions of the public and the press into crisis, as both were continually reformed to retain conceptual agency in mass society.

**Herds, Mobs, Masses, and the Fourth Estate**

Public opinion had originally been situated as valuable in its capacity to make the workings of government transparent, since those workings largely were public debate and discussion, which were publicized through the press (Habermas, 1989). However, the nineteenth century saw the population continually explode in numbers, while it became increasingly concentrated in urban centers and distributed along the frontier, all of which was complemented by increasingly complex agricultural and manufacturing practices and economics during industrialization, and new transportation and communication technologies like the rail (including its advances for postal service), the telegraph, and nationally disseminated daily news. America had entered a mass age, in which society was increasingly understood at the national level and as a complex entanglement of the masses and their

Whereas eighteenth century thinkers had thought society might be rendered transparent to itself through the use of public opinion, the nineteenth century demonstrated society’s opacity under the new tenets of capitalist social order (Foucault, 1980b; Peters, 1989, p. 259). The American public had become so large, distributed, and complex that it was beyond the sensation of any human. As Peters explains,

Society thus became an epistemological problem: To act in it, one first had to identify it. The crisis in social scale was a crisis in social representation. The United States was no longer a community of communities but a society. Its problems were those of sheer magnitude: industrial monopolies, the confusion of cities, and the misery of immigrants. (1989, p. 249)

The individual and the local community, pillars of Jeffersonian democracy, were increasingly understood to have lost their meaning (Peters, 1989, p. 249). Increasingly complex causal chains were entangled across the nation, and the new profession of sociology legitimated itself by claiming exclusive capacity to trace out the causal mechanisms of mass society (Haskell, 1977; Peters, 1989). Public opinion was in crisis and was also hotly contested as theorists began to question the capacity of the masses in an industrial age and to argue the place of expertise in governance.

In 1876, the sociologist Herbert Spencer (1896) would argue that society was empirically inaccessible, and could only be understood through organismic allegories, with
industry as the digestive system, distribution as circulatory system, and government as nervous system. As Peters explains, Spencer could find no centralized brain, and argued that it was at the point of a social intelligence or sensorium that the analogy broke down since self-consciousness only occurred at the level of individuals (Peters, 1989, p. 249). We might read this as a failed attempt to resuscitate the body of the king, in the sense that enumerating the organs and boundaries of the body of the masses might allow sovereignty to live on in a new body, and might allow that body to exercise the same self-consciousness as the king. Advocates and critics of democracy alike would critique this failed attempt and take it upon themselves to transcend it in one way or another. In the 1890s, John Dewey would argue that Spencer’s failure was due to his reliance on the material dimensions of society, rather than its spiritual dimensions of “intellectual interdependence and communication” (Peters, 1989, p. 250). The democratic response is one to which we will return in the next section, but for now we must trace the conservative responses, as they set the ground for Lippmann and Dewey’s interventions.

The 1890s also saw the advent of ‘crowd psychology,’ which extended Spencer’s analyses, but also served as a conservative critique of democratic movements (Barrows, 1981; Nye, 1975; Peters, 1989). In 1895, a Frenchman by the name of Gustave Le Bon would publish a treatise on crowd psychology that was an immediate conversation point and was translated into English and published in America by 1896. Le Bon (1896) argued that when individuals entered a crowd, they were subject to a collective unconscious that would, at least for a time, fuse them into a single being. As Le Bon wrote,
Contrary to an opinion which one is astonished to find coming from the pen of so acute a philosopher as Herbert Spencer, in the aggregate which constitutes a crowd there is in no sort a summing-up of an average struck between its elements. What really takes place is a combination followed by the creation of new characteristics… (1896, p. 6)

The emergence of this new crowd-mind of collectivized unconsciousness could short-circuit their capacity to reason and stimulate them to barbaric acts, as sentiments spread virally amongst the highly mobile masses. As such, it was important to learn to classify crowds, study their workings, in order to govern them, or at worst, avoid being governed too much by them (Le Bon, 1896, p. xxi). For Le Bon, crowds were particularly dangerous because they were uncritical and irrational. He writes, “A crowd thinks in images, and the image itself immediately calls up a series of other images, having no logical connection with the first” (1896, p. 23). For Le Bon, the mind of the crowd was cinematic, divorced from the constraints of critical reason so integral to the practices of oration and writing that fostered public opinion. As such, Le Bon argued that orators might abuse this cinematic sensibility by utilizing exaggeration, affirmation, and continuous repetition in place of critical reasoning and argument (1896, p. 36).

The English surgeon, Wilfred Trotter, furthered Le Bon’s arguments at the turn of the twentieth century.85 He argued that evolution showed that animals – including humans –

85 Trotter first published two articles in 1908 and 1909, which were then later compiled and added to in 1917 for his book *Instincts of the Herd in Peace and War*. While Trotter worked as a surgeon, he had deep sympathies
operated through a principle of gregariousness that allowed them to cooperate as herds. Animals acted in unison for fear of the vulnerability of isolation, and thus were largely reactive in nature to avoid being left out of the herd. For Trotter, “when free communication is possible by speech, the expressed approval or disapproval of the herd will acquire the qualities of identity or dissociation from the herd respectively” (1917, p. 40). The human is unique because in using its expanded capacity for communication it has developed a conscience, which Trotter argues is an internalized sense of herd approval or disapproval that does not need the herd to actually approve or disapprove. It is important to note that here conscience is not moralistic, but instead is a direct result of the gregarious instinct; conscience “is in no sense derived from a special instinct forcing men to consider the good of the race rather than individual desires” (Trotter, 1917, p. 41). For Trotter, this is the root of human instinct and the basis of most opinion and decision-making.

Trotter argues that in a collective sense, humans are incapable of the suspense of judgment required for science, for they are “too anxious to feel certain to have time to know” (1917, p. 35). He thinks that the irrationality of human beliefs is so self-evident that it doesn’t even warrant examination. Trotter writes:

Nowadays, matters of national defence, of politics, of religion, are still too important for knowledge and remain subjects for certitude; that is to say, in them we still prefer the comfort of instinctive belief, because we have not learnt adequately to value the capacity to foretell. (1917, p. 35)

for sociology, which he saw being denied its rightful place as a scientific advance on par with astronomy, physics, chemistry, biology, and psychology (1917, p. 35).
The capacity for educated speculation and scientific analysis requires a suspension of judgment, rational thinking, and in general, practices of communication that individuate oneself from the herd. What they require is “a power of intercommunication of absolutely unprecedented fineness” that can achieve scientific and humanitarian ends (1917, p. 62). For Trotter, this project of perfect intercommunication is coupled with a need to “readjust the mental environment” of the masses such that they can meet the new communications without ‘resistiveness’ or ‘mental instability’ (1917, pp. 62–64). We might say that if Le Bon is afraid of the masses’ susceptibility to film, Trotter is afraid of their susceptibility to the environs of the cinema.

After working alongside William James, Boris Sidis would in 1898 publish *The Psychology of Suggestion: A Research Into the Subconscious Nature of Man and Society*, in which he would analyze crowd and mob mentalities. Sidis argued, “Large, massive social organisms produce, as a rule, very small persons. Great men are not to be found in ancient Egypt, Babylon, Assyria, Persia, but rather in the diminutive communities of ancient Greece and Judea” (1898, p. 299). Similar to Le Bon, Sidis argued that dense concentrations of individual led to a pressure towards conformity that destroyed personality, and by disaggregating consciousness left crowds susceptible to fleeting bouts of indirect suggestion, but also always capable of becoming mobs, which were subject to direct suggestion (Sidis, 1898, pp. 297–300). The mob is monotonous, uninhibited, and subject to entrancement. It has a self of its own (Sidis, 1898, p. 304). Sidis writes, “Like a cannibal it feeds on human beings” (1898, p. 304). It grows exponentially as it devours people, disaggregating their consciousnesses and assimilating their ‘subwaking’ selves. Sidis writes, “For the gregarious,
the subpersonal, the uncritical social self, the mob self, and the suggestible subconscious self are identical” (1898, p. 264). And Sidis warns us that, “The subwaking mob self slumbers within the bosom of society” (1898, p. 308).

Perhaps most importantly though, offers an appendix filled with mathemes for integrating the various factors contributing to pure suggestion in a disaggregated consciousness. Sidis writes, “The results of our investigation enable us to formulate in the symbolical language of mathematics the relation of normal and abnormal suggestibility” (1898, p. 370). He even offers a formula for deriving the amount of energy that is aroused in a crowd by a hero who sends waves through the numerous members of that crowd. Sidis derives the following, “In short, we may say that while the numbers of the mob grow in an arithmetical progression, the energy of the mob grows (approximately) in a geometrical progression. The growth of mob-energy may be graphically represented by a curve” (1898, p. 379). The crowds, mobs, herds, or masses might be uncritical, unreasonable collective agents with emergent properties and distributed selfhood, but the application of a simple curve function allows Sidis to return them to their individual state. In numerically mediating the totality, he was able to individuate its relevant members through subdivision. This is a tactic that we will return to, as it is a rather ignored instance in the history of public opinion polling and the press, despite foreshadowing the work on attitude and intensity measurements that psychologists wishing to numerically mediate qualitative data would perform in the 1930s.

While earlier writers had been able to stress the progress towards social harmony that was achieved through the increasing unification of the social spirit, most thinkers were driven towards the materiality of media and communications technologies, with increasing concern
that the scale of modern life would prove too disruptive to surmount. For example, in the
1890s, Gabriel de Tarde had also taken on Spencer’s legacy, arguing against Spencer that the
press and statistics constituted the next step in the evolution of the social body, as they were
both forms a social sensation (Peters, 1989, p. 251). As Peters explains, by 1901 Tarde
would define the public as “a noncontiguous social collectivity dispersed in space but united
by common symbols; it is a social form whose size rules out full face-to-face acquaintance”
(1995, p. 10). Tarde would thus turn more deeply to statistics and the newspapers as potential
means for uniting the public. He argued that statistics could “project moving patterns of a
society—its crimes, births, or marriages” as a sort of social cinema (Peters, 1989, pp. 251–
252) and further, “[S]tatistics are to society what the eyes and ears are to the individual:
means of orienting to the world” (1989, p. 252). In the future, Tarde envisioned newspapers
filled with graphics and charts that, when combined with advanced statistical techniques,
would render society easily and naturally visible to all its constituents. For Tarde, “The
newspaper would be a phantasmagoria of instantaneous vision of the social body, a crystal
ball for viewing currents in the social organism” (Peters, 1989, p. 252). As Peters explains,
“The newspaper, then, is not to be a place of reading and interpretation but of vision and
sensation. Tarde gives us a televisual newspaper…” (1989, p. 252).

This account of the role of the newspaper is fitting for the era, as the 1890s also mark
the origin of the modern era of journalism, which is constituted by the rise of the national
magazines and mass urban newspapers, both utilizing wire services to produce more

86 Here I rely on Peters’ (1989) account of Tarde, as the text to which he refers – Les Lois de L’imitation and
L’opinion et la Foule – have yet to be translated into English.
immediate, continuous, and homogeneous news across the country. As Carey explains, “Throughout the 19th century, the public sphere increasingly split into regional and class-based warring factions, organized around political parties and a partisan press. Journalism became an organ of such parties or, however independent, nonetheless ideologically aligned with political parties” (1995, p. 384). Veiled by the opacity of complex modern affairs, captains of industry, party bosses, political machines, and pressure groups came to dominate American government. In this corrupt system, journalism established itself as the ‘Fourth Estate,’ an unofficial extension of government meant to offer checks and balances on the other three, while at the same time remaining independent of the state, the parties, the political machines, the pressure groups, and the wealthy elite.

As Michael Schudson (1978) has shown, this is the birth site of objectivity in journalism. Carey describes this new version of the press as follows:

In this rendition, a democratic press was the representative of the people, of people no longer represented by political parties and the state itself. It was the eyes and ears of a public that could not see and hear for itself, or indeed talk to itself. It went where the public could not go, acquired information that the public could not amass on its own, tore away the veil of appearances that masked the play of power and privilege…

(1995, p. 389)

In order to accomplish this task, the press needed to become increasingly powerful by latching onto the First Amendment and expanding it as far as possible, disseminating news at massive scales and continuously to generate revenues to fund its endeavors, and often to pool capital for news coverage by engaging in syndications and joint studies. Peters argues that
there are two potential roots of public opinion, the first is in the sense of something that people collectively participate in, which he terms the ‘social-political sense’ of the public, and the second is in the sense of publicizing something, making it common knowledge or openly visible for the masses, which he terms the ‘visual-intellectual sense’ (1995, p. 14).

The social-political operations of the press had long been centered on a ‘two-step flow’, in which the press provided material for citizens to then discuss further, which, as we’ve noted, would be the contents of future news (Katz & Lazarsfeld, 1955; Peters, 1995). For Carey, this shift in the press constituted a wholesale loss of these social-political operations in favor of their visual-intellectual counterparts. He writes, “The press no longer facilitated or animated public conversation for public conversation had disappeared. It informed a passive and privatized group of citizens who participated in politics through the press” (1995, p. 389). In essence, it had been a lot easier to make great strides in the visual-intellectual components of public opinion than it had been in the social-political components (Peters & Cmiel, 1991). As we’ve seen in the previous two chapters, sociotechnical systems advancing rapidly in terms of data processing, storage, and transmission. Electric tabulators, hot-lead linotypes, telegraphs, telephones, radio, mail by rail all made it easy for centralized organizations to process data and disseminate it to the masses with great ease. The problem that emerges at scale is one of data collection, of a feedback mechanism that can operate at mass scale such that a monologue can be turned into a dialogue. But it can’t be stressed enough that this was not a purely technical issue; it was sociotechnical, in the sense that even granted a dialogue, there was the question of whether in the midst of such anopaquely complex society, the public could have anything say if given the chance. In the next section
we will see how Walter Lippmann and John Dewey framed this problem in a way that contemporary scholars still use to investigate public opinion and the press, and that certainly constituted the problem that the public opinion pollsters of the 1930s saw themselves as offering a solution to.

**The Lippmann–Dewey Exchange**

In the 1920s Walter Lippmann and John Dewey would offer analyses of the dual problem of the public and the press in an exchange that would make a permanent impression on American thought. In a sense, both Lippmann and Dewey can be understood as responding to the problem of ‘The Great Society,’ a moniker that Graham Wallas had popularized in his 1916 book of the same name. In its preface, Wallas addresses the book directly to Lippmann and describes his work as analyzing the large-scale social organization of the modern state with a particular eye to the rise of anti-intellectualism in the twentieth century (1916, p. v). Wallas writes,

> During the last hundred years the external conditions of civilised life have been transformed by a series of inventions which have abolished the old limits to the creation of mechanical force, the carriage of men and goods, and communication by written and spoken words. One effect of this transformation is a general change of social scale. Men find themselves working and thinking and feeling in relation to an environment, which, both in its world-wide extension and its intimate connection with all sides of human existence, is without precedent in the history of the world. (1916, p. 3)
Wallas depicts the Great Society as a national-scale territory so continuously and rapidly traversed by transports and communications that it is at once global in its extension and local in its intimacy. It is precisely this formulation that both Lippmann and Dewey would use as their starting point.

Lippmann and Dewey’s extensions of this formulation continue to be dominant framing mechanisms for contemporary investigations into society, politics, the State, the Nation, and the Public. As Sue Carter Jansen argues, “Contemporary interest in the exchange is evident in virtually all of the social sciences, most of the humanities, applied studies such as law, journalism, education, and even computer science… Accounts of the exchange have now generated a bibliography too large to fully track” (2009, p. 222). Starting in the mid-1980s, however, Carey would reframe the writings of Lippmann and Dewey as a great debate, a framing mechanism soon employed by other prominent historians who helped to cement its place in the discourse of the 1990s and early 2000s (Bender, 1987; Fallows, 1996; Lasch, 1995; Westbrook, 1991, though to a lesser extent).

Since Lippmann and Dewey’s writings, theorists had come to describe American politics as a ‘democracy without citizens’ (Entman, 1989), where the public was not the subject but the object of politics (Ginsburg, 1986). Carey traced this situation back to Lippmann, arguing that it was with Lippmann that one could find the creation of an elite class of experts “who would mold the public mind and character: men and women dedicated to making democracy work for the masses, whether the masses wanted it or not” (1995, p. 390). For Carey, this cemented the public as spectator and the press in its visual-intellectual dimensions, where from the private spaces of their living rooms, Americans would read,
listen, or watch in a constant state of agitation and boredom as experts engaged in ‘talk-show gossip’ and ‘petty manipulation,’ with their only power being to ratify one expert judgment or another (1995, p. 391). Following Dewey, Carey longed for the recovery of the practical engagement and agency of the public that he imagined existed so strongly in the pre-1890 days of individuals in their local communities. However, we might best follow Foucault and leverage history to prevent ourselves from giving in to what he terms the ‘ideology of the return’ (2000b, p. 362); many theorists have demonstrated that this imaginary history that Carey – as well as Habermas, and even Dewey, for that matter – traces is woefully inaccurate (Eley, 1992; Fraser, 1990; Landes, 1988; Ryan, 1990; Schudson, 1992). There was never anything close to democratic access to the public sphere in Europe or America.

Carey also saw Dewey as representing “pragmatism, democracy, community, and communication as a humane and humanistic/hermeneutic practice in which everyone gets to participate in making meaning” (Jansen, 2009, p. 233). For him, this was necessarily a contradiction to the analyses and suggestions that Lippmann had put forth. However, Jansen and Michael Schudson have both since demonstrated rather definitively that Carey’s framing of Lippmann and Dewey’s writings in the 1920s as a great debate was wholly inaccurate.

87 It is worth noting that Carey is purposefully reading things back into history to provide a somewhat fictional, but contemporarily actionable, account of the public. His thoughts here are directly tied to television, through which three commercial networks kept people glued to their televisions – especially for major political events, like the Kennedy assassination (see Dyan & Katz, 1992). Carey writes, “The nation sat down to be counted as citizens of a continental, 24-hour-a-day republic” (1995, p. 384). And these effects extended to the parties themselves, who, through television, became cults of personality and permanent fund-raising machines, in order to pay for television advertisements and fill them with screen-worthy politicians (Carey, 1995, p. 391).
(Carter, 2009; Schudson, 2008). As Schudson notes, there is little evidence that Lippmann understood himself to be in a debate with Dewey, and he never published any response to Dewey’s *The Public and Its Problems* (2008, pp. 1031–1032). Dewey certainly considered himself to be responding to Lippmann, as he explicitly notes his indebtedness to both Lippmann’s *The Phantom Public* and his earlier book *Public Opinion* in a footnote in *The Public and Its Problems* (1954, fn. 1, pp. 116–117). While Dewey diverged at certain points from Lippmann’s analyses, he regarded them favorably, and wrote positive reviews of both *Public Opinion* and *The Phantom Public* that Dewey submitted and published in Lippmann’s journal, *The New Republic*. There are huge problems with Carey’s admittedly fictionalized rendition of the pre-twentieth century public sphere, foremost among which are that it was never even theoretically, let alone actually, a space open to the people in its entirety.

Romanticizing this period whitewashes the thorny issues of class, race, gender, sexual identity, and related identity categories and geopolitical positions that barred the majority of the American population from exercising political agency, as well as the histories of struggle for each iota of agency that these groups have since gained – a struggle far from complete today (Jansen, 2009, pp. 223–224). Framing the exchange as a debate also obfuscates the greater challenge that both Lippmann and Dewey struggled with their entire lives, a challenge that has never been either successful refuted or solved, namely “how to preserve and expand the forms of democracy that are possible in complex, heterogeneous, technologically advanced societies” (Jansen, 2009, pp. 237–238). As such, we’ll now return to Lippmann and Dewey’s writings in hopes of articulating that great challenge that both men

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helped to crystallize in the 1920s, but which, as we’ve seen, had its roots back at the dawn of the progressive era. Additionally, it will be demonstrated that it is every bit as much Dewey as Lippmann who lays the groundwork for public opinion polling in the 1930s.

Walter Lippmann and the Democratic Fiction of *vox populi*

The public will arrive in the middle of the third act and will leave before the last curtain, having stayed just long enough perhaps to decide who is the hero and who is the villain of the piece.

Lippmann, 1993, p. 55

For Walter Lippmann, American democracy was challenged by the complexity of twentieth-century society, which he argued was “not visible to anybody, nor intelligible continuously as a whole” (1993, p. 32). It was not just that the public was uninformed about what was or ought to be happening, or why, it was impossible for anyone to be informed about society as a whole such that they might have opinions on all matters of government. Everyday individuals were particularly ill equipped for the task, as there was an ever-expanding gulf between the centers of the decision-making in the Great Society (Lippmann, 1993, p. 171; see also Lippmann, 1922, pp. 253–275). In general, Lippmann understands this to be a structural given, and one that cannot be escaped if we are to live in modernity. Every attempted solution meant to reallocate agency to the public is doomed to failure, including
the use of eugenics, biology, education, and morality (Lippmann, 1993, p. 25). The reasons for failure of the latter two are informative.

Lippmann explains that the rapidity of change combined with the depth of specialization of modern knowledge was such that most individuals could not even grasp all of a speciality, and none might gain knowledge of society in its entirety, as the constant change produced a continuous need to update one’s knowledge, fully occupying even the specialist. For the general population, Lippmann writes, “The most they can conceivably attempt is the teaching of a pattern of thought and feeling which will enable the citizen to approach a new problem in some useful fashion” (1993, p. 17). In essence, the best option is to teach some version of critical thinking, a flexible type of methodological knowledge fashioned for the (speedy) times. But even in such a case, Lippmann is unconvinced that it would work, as he sees it unlikely to be implemented in the first place, unlikely to be well received, and, those who do benefit from it are unlikely to dedicate their ingenuity to civics. Some might try to supplement this with a moralist education, which, by installing a good conscience in the public might motivate it towards civic duty. But morality fails, Lippmann explains, because as Socrates long ago demonstrated, “a code of right and wrong must wait upon a perception of the true and false” (1993, p. 20). Without a factual ground to operate upon, conscience has no way of enumerating the objects it might weigh. And for Lippmann, this is not the result of an atrophied public will that just needs civic exercising. The dual solutions of more direct democracy or socialism both fail, as they only throw the citizen more often and more deeply into the labyrinth of the unknown (1993, pp. 25–28).
Since there can be no such thing as an ‘omnicompetent citizen’ in the mass age, Lippmann looks to supplement government with independent experts and intelligence agencies. These experts “would deal with problems of definition, of terminology, of statistical technic, of logic; they would traverse concretely the whole gamut of the social sciences” (1922, p. 392). These experts would “represent the unseen,” including “people who are not voters, functions of voters that are not evident, events that are out of sight, mute people, unborn people, relations between things and people,” and would have “a constituency of intangibles” (Lippmann, 1922, p. 382). Contrary to many mistaken interpretations, including Carey’s, the expert would not be in charge of putting forth policies or taking part in governance beyond offering the facts, the true and false upon which good and bad, right and wrong can be argued (Lippmann, 1922, p. 382). The expert would evaluate means, not ends. And this designation is mobile, as an expert is also a member of the public, specifically when it comes to all of the areas in which s/he is not an expert (Lippmann, 1993, p. 100).

89 Lippmann explicitly acknowledges the danger of allowing experts to craft policy, and is deeply concerned with properly defining the role of the expert so as to avoid that scenario as much as possible. Referring to his proposed intelligence agencies staffed by experts, he writes, “Unless their function is correctly defined they will tend to pass on the facts they think appropriate, and to pass down the decisions they approve. They will tend, in short, to become a bureaucracy” (1922, p. 384). Interestingly, the model he ends up recommending is much like today’s tenure process in the American education system.

90 In his turn to expertise, Lippmann is in concurrence with Wallas, who had argued in The Great Society that the major problem of the time – and impetus for his writing – was that the sociologists and politicians alike were not informed on the advances being made by psychologists that resulted from their “applying new and more exact methods to the examination of the human mind” (1916, p. 17). While Wallas supported a general
Lippmann admits that at the time of his writing, it would be difficult to even envision the form that intelligence agencies like this might take, let alone their finer details. He looks approvingly to efforts in the Census Bureau, the Geological Survey, and the Department of Agriculture (1922, p. 381). However, Lippmann’s future is one where a much larger number of agencies produce a lot more data which is freely and publicly shared. He writes, “The number of social phenomena which are now recorded is small, the instruments of analysis are very crude, the concepts often vague and uncriticized” (1922, p. 395). It is only when the internal knowledge of every agency is made material, collected, processed, stored, and transmitted amongst all other agencies, that we will have some idea of the full potential of Lippmann’s plan (1922, p. 377). Lippmann writes, “It is difficult to see why all this material, except a few diplomatic and military secrets, should not be open to the scholars of the country” (1922, p. 392). It is essentially only through big data analytics that Lippmann sees a possibility for experts to establish “common versions of unseen events, common measures for separate actions,” and produce a ground upon which government can operate nationally as effectively as it had – in theory, at least – operated locally (1922, p. 396). To do so requires an uninterrupted publicity, but one for experts sharing statistical measurements and data sets, not for the public. These experts were to commune with one another, and to educate policymakers, rather than the public, on facts and means. As Lippmann explains,
“We live at the mere beginnings of public accounting. Yet the facts far exceed our curiosity” (1993, p. 33).

Lippmann thus diagnosed the ‘information bomb’ more than seventy years before Paul Virilio (2000) would publish his text of the same title, and its source was not World War II – as that was still more than a decade away for Lippmann – but instead was the avalanche of numbers produced by American bureaucracy, made possible by the aid of electric computation and ‘Hollerith cards’. For Schudson (2010), this is the genealogical ground-zero for the use of databases in journalism. He agrees with Manovich’s assessment, and notes that this trajectory moves journalism increasingly towards the logic of the database, whose functions emphasize massive data collection, processing, storage, and transmission, and away from the logic of narrative. As Schudson notes, for Lippmann the lack of journalistic professionalization combined with a subject-matter too complex for individual reporters or newspapers to deal with necessitated the introduction of ‘political observatories,’ which would “examine human affairs with scientific instruments, methods, and outlooks” (2010, pp. 100–101; see also Lippmann, 1922, pp. 53–56). These political observatories alone were capable of establishing a ground of facticity – or, in Foucauldian terms, a regime of truth – that would then be made accessible to politicians and journalists. For Lippmann, the future of democracy required the production of an adequate “machinery of record” to establish the truths and falsehoods of the social world (Schudson, 2010, p. 101). Lippmann looked to the stock market and baseball scores as examples of adequate machineries of record that might be emulated by political observatories in their analyses of other aspects of social life (1922, p. 216).
Essentially, Lippmann envisioned a world in which all aspects of society had become numerically mediated and subject to the types of data processing already at work in the Census Bureau. This type of numerical mediation and data processing would require techniques of data collection, which saw little advancement until the pollsters of the 1930s, data storage, to save a database against which new collections could be verified, processed, and correlated, and data transmission, as this type of data processing would require that records be reproduced and circulated across government agencies and political observatories in a vast network of data communication. In short, Lippmann is here operating within the same ‘big data’ problematic traced out in the previous two chapters, where social problems are continually produced in such a way that they always-already imply numerical mediation as their solution, but at such a scale – as implied by the ‘big data’ moniker – that numerical mediation would only be possible if facilitated by electric computation.

For Lippmann, it might have been a recent phenomenon that society had become so complex as to warrant the need for political observatories. However, he views the idea that the majority had ever held any inherent wisdom, sovereignty, or divinity as sheer mysticism and an idealization of power. Actually handing full sovereignty over to the masses inevitably results in either failure or tyranny. He writes, “The theory of democracy has not recognized this truth because it has identified the functioning of government with the will of the people. This is a fiction” (1993, pp. 60–61). For Lippmann, this is a fiction perpetuated by both nationalists and socialists who have propagandized the public into an organic body with mind, soul, and purpose called Society, the Nation, or the Community (1993, pp. 145–147). This nullified the agency of individuals, who, in their attempts to appeal to this collective
being were actually appealing to nobody and putting truth in the back seat (Lippmann, 1993, pp. 149, 158–159). For Lippmann, this is a manifestation of the ancient problem of the One and the Many, that lead critics to continually theorize “how many separate organic individuals can be united in one homogeneous organic individual” (1993, p. 161). The confusion is largely avoided when we recognize that society is not a being, but instead is simply the aggregate of all the adjustments and relations between individuals and their things (Lippmann, 1993, pp. 161162). Action is for individuals. The complexities of government have never been either the act or will of the people. In truth, offering the public a chance to voice its opinions and vote is only superior to other forms of government from an ethical standpoint, as debate and voting are a sublimation of physical violence that prevents “the force which resides in the weight of numbers” from leading to civil war (1993, p. 48). As Lippmann writes, “Constitutional democrats, in the intervals when they were not idealizing the majority, have acknowledged that a ballot was a civilized substitute for a bullet” (1993, p. 49).

That said, a political theory free from the fiction of vox populi, vox Dei can soberly analyze public opinion and find some uses for it beyond merely patronizing the masses into pacifism. Lippmann explains,

Since the general opinions of large numbers of persons are almost certain to be a vague and confusing medley, action cannot be taken until these opinions have been factored down, canalized, compressed and made uniform. The making of one general will out of a multitude of general wishes is not a Hegelian mystery, as so many social philosophers have imagined, but an art well known to leaders, politicians and steering
committees. It consists essentially in the use of symbols which assemble emotions after they have been detached from their ideas. (1993, p. 37, emphasis added)

Because feelings are less specific than ideas, a political leader can homogenize them into a mass of desires. Lippmann explains that because this unified sentiment is both intensified and less specific, it can be narrowed down to a few alternatives for the public to select from that will then be executed by the leaders in control of the public’s energy. Action requires the merger of the masses’ distinct views into an identical result. This result must be a common idea, and thus as the complexity and heterogeneity of the individuals in the mass increases, the simpler must be the ideas they hold in common. Yet even this function is limited to rewarding or punishing a result, accepting or rejecting an alternative, since the public is external to the actual people in charge of executing these actions (Lippmann, 1993, pp. 37–42). The public is thus quite susceptible to special interests and propaganda (Lippmann, 1993, pp. 101–104). Yet, Lippmann hopes that this might be the purpose of debate in a democracy. He writes, “Open debate may lead to no one conclusion and throw no light whatsoever on the problem or its answer, but it will tend to betray the partisan and the advocate. And if it has identified them for the public, debate will have served its main purpose” (1993, p. 104). At that point, the public can engage in its true purpose, supporting or opposing actors via elections. While Lippmann did believe it may be possible to demonstrate support or opposition through intermittent elections, there is no possibility that the public might exercise judgment on issues and proposals when causal mechanisms are deeply entangled and the population runs into the millions (Lippmann, 1993, p. 175).
For Lippmann, any successful democratic form was going to have to “provide a way of overcoming the subjectivism of human opinion based on the limitation of individual experience” (1922, p. 397). His inclination was to look to a class of experts who might collect, process, store, and transmit data on as many facets of everyday life under American governance as possible. We had to give up our fictions about a totalized and organic social body, collective consciousness, and divine sanction, and instead look to material traces of adjustments and relations between people and things at mass scale. Action, was individual. Voice, was individual. The society in which individuals lived existed, but unknowably, as an innumerable thing whose teeming informational density never left us with a consistent object for analysis. Lippmann sought a way past Aristotle’s maxim that people’s political faculties were limited by the range of their vision (1922, p. 396). His answer was to equip experts with telescopes, so that they each might see much farther, but only in small slivers at a time.

John Dewey on Participatory Communication Networks and Instrumental Feedback

By its very nature, a state is ever something to be scrutinized, investigated, searched for. Almost as soon as its form is stabilized, it needs to be re-made. […]

The formation of states must be an experimental process.

Dewey, 1954, pp. 32–33
In his response to Lippmann’s analyses of the contemporary role of the public in democratic government, John Dewey agrees on many points. Firstly, Dewey also disagrees with the theorists of the last quarter of the nineteenth century, and Trotter in particular. Individuals do not blend together into a single being, and if they did the end result would not be a state (Dewey, 1954, p. 10). Similar to Lippmann, Dewey understands this type of thinking to be the result of a false problem of the One and the Many, and one acutely onset due to the rapid social change of the machine age (1945, pp. 190–192). If people do somehow become dis-individuated into a mob, this is not the normal state of things, nor is it the result of ‘some mysterious collective agency’ that has taken control of a collectivized will. It is simply the result of some individual that knows how to take advantage of people, to lead them as a mass into mob conduct, such as the boss of a political machine or the president of a company (Dewey, 1954, p. 18). These are de facto associations between individuals that are brought about through leadership, and often through manipulation, propaganda, and/or demagoguery. The problem with such theories, Dewey argues, is that their objects are not independent of human desire. In contrast to the mathematical and physical sciences, the social sciences are analyzing an object that is mobile because it is dependent on (often changing) human interests and purposes, and this object cannot be rendered static by any methodology. Dewey writes, “The more sincerely we appeal to facts, the greater is the importance of the distinction between facts which condition human activity and facts which are conditioned by human activity. In the degree which we ignore this difference, social science becomes pseudo-science” (1954, p. 7).
A proper social science then must recognize that there is no collective being at the heart of society that unifies individual people through its transcendental agency. For Dewey, “[A human] becomes a social animal in the make-up of his ideas, sentiments, and deliberate behavior. What he [or she] believes, hopes for and aims at is the outcome of association and intercourse” (1954, p. 25). Thus, society is a mobile network of associations and communications between people that express their ideas, feelings, and actions. For Dewey, these networks of associations and communications do not automatically generate a state:

The state is not created as a direct result of organic contacts as offspring are conceived in the womb, nor by direct conscious intent as a machine is invented, nor by some brooding indwelling spirit, whether a personal deity or a metaphysical absolute will. When we seek for the origin of states in such sources as these, a realistic regard for facts compels us to conclude in the end that we find nothing but singular persons, you, they, me. We shall then be driven, unless we have recourse to mysticism, to decide that the public is born in a myth and is sustained by superstition. (1954, pp. 37–38)

Dewey wants to escape such conceptions of “The State” because they necessarily “lend themselves to illusions” (1954, p. 68). Investigations as to the origins of the (a specific) state must be able to empirically delineate the integrated principle by which a network of diversely associated and intercommunicating individuals can operate as a whole in a community (Dewey, 1954, p. 38). This is essentially a problem of scale for Dewey, of “drawing lines between the too close and intimate and the too remote and disconnected” (1954, p. 39). For the integration of the community rests on the ability to identify and
distinguish the public that constitutes it. Dewey writes, “Indirect, extensive, enduring and serious consequences of conjoint and interacting behavior call a public into existence having a common interest in controlling these consequences” (1954, p. 128). The public is distinguished by its identification of a common interest in controlling the consequences of its conjoint and interacting actions. This is the common integrative principle by which individuals become communities. The problem here is that to be able to identify and distinguish itself, the public needs both a common interest and the agency to control causal mechanisms to further its common interest. Both are challenged by the Great Society and the modern State, in which individuals often cannot comprehend, let alone intervene in, the security mechanisms that determine means and control collective actions.\(^9\) As Dewey notes, the meaning of the Great Society is “that it exists, and that it is not integrated” (1954, p. 128).

We can see an example of this in Dewey’s articulation of the law, which draws heavily on David Hume. For Dewey, men are shortsighted, a condition exacerbated by ‘appetite’ and ‘passion,” and it is the law that is able to extrapolate the ‘remote’ and ‘long-run’ consequences of action. It provides a check on immediacy. We can already see that his account is fundamentally statistical. Dewey writes, “For a rule of law, although it may be laid

\(^9\) It is worth noting here that Dewey betrays himself slightly here by maintaining a traditional notion of causality in the wake of the Great Society. In reality, probability and statistics are concerned with correlations rather than causes. As such, he ought to be looking at networks of correlations replacing traditional causal chains. If causality is ever attributable in such a system, it is retrospectively and with the acceptance of a certain degree of reductionism.
down because of a special act as its occasion, is formulated in view of an indefinite variety of other possible acts. It is necessarily a generalization; for it is generic as to the predictable consequences of a class of facts” (1954, p. 56). It is the law that is able to collectivize experience, to extrapolate statistical frequencies for different generalizable classes of action, and subsequently to modulate the temporal duration of attention on the individual’s behalf.

He further writes, “[T]he law as ‘embodied reason’ means a formulated generalization of means and procedures in behavior which are adapted to secure what is wanted. Reason expresses a function, not a causal origin” (1954, p. 57). The law is no longer in its traditional place as a technology of juridical sovereignty. Instead, Dewey envisions the law as a mechanism of security. The uses statistical technologies to generalize normalities by extracting and abstracting empirical data. From these normalities, it can produce a norm. This norm is not an end, but rather a most-favorable-normality that serves as means or a function by which to continuously modulate behavior at a collective scale. But in Dewey’s reimagining of the law there is always the problem of scale. He writes, “[I]f reasonableness is a matter of adaptation of means to consequences, time and distance are things to be given great weight; for they effect both consequences and the ability to foresee them and to act upon them” (1954, p. 57). In effect, when causal chains become too complicated, distributed, or long-term, they may exceed the individual’s capacity to determine the most-favorable normality, if not statistical analysis itself, and thus curtail the effectiveness of law.

This is precisely what has occurred in the Great Society writ large, and it is linked in particular to the emergence of new technologies in production and commerce. Dewey writes,
The local communities without intent or forecast found their affairs conditioned by remote and invisible organizations. [...] The Great Society created by steam and electricity may be a society, but it is no community. The invasion of the community by the new and relatively impersonal and mechanical modes of combined human behavior is the outstanding fact of modern life. (1954, p. 98)

For Dewey, the local community is not conscious of and has no direct control over these complex causal networks under the management of remote and invisible organizations. This is in spite of the fact that the entire purpose of democratic government at the level of national and territorial states was to afford local communities some agency in governance. In the Great Society, the public is too remote from government to be anything but a fictional concept that justifies the behavior of officials and obscures the operations of bosses and political machines (Dewey, 1954, p. 117, 120). This problem is exacerbated by the ‘machine age,’ which has “enormously expanded, multiplied, intensified and complicated the scope of the indirect consequences, have formed such immense and consolidated unions in action, on an impersonal rather than a community basis, that the resultant public cannot identify itself” (Dewey, 1954, p. 126). In this state, individuals feel rather than perceive consequences. These complex causal chains have consequences that are suffered by individuals in their everyday lives, yet they remain mysterious, as their causal chains cannot be articulated and thus their origins remain unknown. The public cannot “canalize the streams of social action and thereby regulate them,” and thus it remains “amorphous and unarticulated” (Dewey, 1954, p. 131). In such a state of being even the expert has difficulty establishing cause and effect, and often can only do so retroactively (Dewey, 1954, p. 135). How can the ordinary
man or woman who is denied the appropriate amount of leisure time to seriously pursue
causal investigations be expected to engage in politics (Dewey, 1954, p. 138)?

For Dewey, the Great Society is complimented by a “democratic public [that] is still
largely inchoate and unorganized” (1954, p. 109). Associations and communications have
become dynamic and are continuously changing, which creates too many publics, publics
diffuse and disorganized that cannot manage to integrate themselves with one another since
they cannot establish enduring common interests, let alone control their own collective
actions (Dewey, 1954, p. 140, 137). A public must share attachments and have deep issues as
their common denominator. Yet, attachments require stable and constant relationships. In the
Great Society, there are no longer any such relationships because of the acceleration and
mobility that now characterize association and communication (Dewey, 1954, p. 141).
Dewey explains, “Only geographically did Columbus discover a new world. The actual new
world has been generated in the last hundred years. Steam and electricity have done more to
alter the conditions under which men associate together than all the agencies which affected
human relationships before our time” (1954, p. 141). The problem is that the advancement of
technological factors has accelerated to the point that society was unable to develop ideas,
and specifically mental and moral beliefs, to keep pace with it. Social ideals and standards
need to be connected to the means for their achievement, otherwise our social aims, desires,
and purposes will not have the advantage of actual instrumentalities at their disposal (Dewey,

For Dewey, “Symbols control sentiment and thought, and the new age has no
symbols consonant with its activities” (1954, p. 142). He argues that while society has
developed unprecedented physical tools of communication, it has not developed corollary symbols to communicate the thoughts and aspirations that are congruous with those communication technologies. What is needed is the formation of common symbols, so that we might communicate effectively about communication, and specifically communications technologies. In essence, we need to find a way to talk about the medium, not the message, or, about the medium as the message. If we cannot, then “the public will remain shadowy and formless, seeking spasmodically for itself, but seizing and holding its shadow rather than its substance” (Dewey, 1954, p. 142). Until we can find a way to collectively produce meaningful symbols about technology, we cannot hope to identify and distinguish a public in the Great Society. And further, those symbols must be congruous with technology in its instrumentality, meaning two things: (1) we need something like a media studies approach to technology and communication in order to effectively understand their social implications; and (2) the public is not a commune of luddites, but instead is meant to utilize technology and communication to its advantage if it is to identify and distinguish itself in this new social world. It is only after the public has been formed that any fundamental changes to the machinery of society might be made (Dewey, 1954, p. 146).

The creation of signs and symbols is our only method of arresting the flux of the Great Society and stepping outside it so that we might analyze its movements. This creation of meaningful signs constitutes the interposition of a new medium, by which a process can be broken down into a set of interrelated, recordable, and preservable meanings. Dewey writes, “Recollection and foresight are possible; the new medium facilitates calculation, planning, and a new kind of action which intervenes in what happens to direct its course in the interest
of what is foreseen and desired” (1954, p. 153). This new medium allows a community to share meanings and thus collectively negotiate combined action. It is thus only through the perfection of a technologically informed practice of communication that we might solve the problems of the Great Society, such that “genuinely shared interest in the consequences of interdependent activities may inform desire and effort and thereby direct action. […] This is the meaning of the statement that the problem is a moral one dependent upon intelligence and education” (Dewey, 1954, p. 155). Thus, education the prerequisite for a public that can effectively produce common signs and symbols to articulate the process of technology and communication such that it might form common sentiments and foment common action in terms of them.

For Dewey, the public can never transcend the average intellectual level of its constituents (1954, p. 60). The type of perfected communication he envisions requires that signs and symbols be available to the entire social collective. But Dewey understands this struggle to be always-already implied by democracy, and he in fact traces it back to de Tocqueville, who he claims understood that despite the mediocrity of its officials and the folly of its public passions, democracy has the benefit of an inherent educative element that exists in no other form of political regulation. Dewey writes,

It forces a recognition that there are common interests, even though the recognition of what they are is confused; and the need it enforces of discussion and publicity brings about some clarification of what they are. The man who wears the shoe knows best that it pinches and where it pinches, even if the expert shoemaker is the best judge of
how the trouble is to be remedied. Popular government has created public spirit even if its success in informing that spirit has not been great. (1954, pp. 206–207)

The strongest feature of democracy for Dewey is this inherent need for collective consultation and discussion to identify the ends, if not the means, of government. And it is worth noting that this is in fact in agreement with Lippmann. Dewey readily admits that the means for realizing the needed educative program in the Great Society do not exist yet, and that it is absurd to speculate what their final form might be. He does, however, look to the sciences for one aspect that he is willing to postulate in advance: “We can borrow much from the spirit and method of science even if we are ignorant of it as a specialized apparatus. An obvious requirement is freedom of social inquiry and of distribution of its conclusions” (1954, p. 166).

Dewey understands the formation of public opinion to be isomorphic to the communication of the results of social inquiry, and thus, “whatever obstructs and restricts publicity, limits and distorts public opinion and checks and distorts thinking on social affairs” (1954, p. 167). Public opinion is a judgment about public affairs, and thus is predicated on methods of investigating and reporting capable of “detecting the energies which are at work and tracing them through an intricate network of interactions to their consequences” (Dewey, 1954, p. 177). Without these methods, public opinion is intermittent, often appearing only in times of crisis, and is arbitrary. Inquiry needs to be continuous “in the sense of being connected as well as persistent,” and “as nearly contemporaneous as possible” (Dewey, 1954, pp. 178, 179). The accuracy of speculations about the future and anticipations of probabilities
is dependent upon “systematic, thorough, and well-equipped search and record” (Dewey, 1954, pp. 178–179). Dewey writes,

A glance at the situation shows that the physical and external means of collecting information in regard to what is happening in the world have far outrun the intellectual phase of inquiry and organization of its results. Telegraph, telephone, and now the radio, cheap and quick mails, the printing press, capable of swift reduplication of material at low cost, have attained a remarkable development. But when we ask what sort of material is recorded and how it is organized, when we ask about the intellectual form in which the material is presented, the tale to be told is very different. (179)

Here we can understand Dewey as again arguing two things: (1) while we are great at talking about messages, we have little or no language for talking about media and mediation; and (2) the material conditions for the very articulation of such questions is lacking because the dissemination of information is unilateral and thus lacks the capacity to receive feedback.

Contrary to the Carey’s interpretation, Dewey’s emphasis on educative and participatory democracy does not preclude experts (see Schudson, 2006). Dewey warns that government by experts is always-already an oligarchy (1954, p. 208), however, as we’ve seen, Lippmann tends to agree and spends a lot of time considering how experts can be kept separate from policy-making and governance while at the same time remaining accountable to the public. Both writers agree that experts can provide useful input on means. Dewey wants to stress the role of the public in determining ends, or ‘where the shoe pinches’. As such, he is very interested in the methods that precede the counting of heads (i.e., voting),

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including methods of discussion, consultation, and persuasion. Dewey writes, “the essential need, in other words, is the improvement of the methods and condition of debate, discussion and persuasion. That is the problem of the public” (1954, p. 208). This improvement is dependent upon publicized inquiry, which is largely the work of experts who discover and make known the facts upon which policy framing and execution depends. The public needn’t learn how to carry out social inquiry, but instead only needs to develop the capacity to “judge the bearing of the knowledge supplied for others upon common concerns” (Dewey, 1954, p. 209). While Lippmann is less optimistic about the public’s capacity to do so, Dewey thinks that the amount of intelligence required for such judgments is often exaggerated.

The intelligence required for democracy is limited by too things. First, we do not have adequate data to operate good judgment, a deficiency that cannot be offset by any amount of innate capacity of mind. Dewey writes,

> Until secrecy, prejudice, bias, misrepresentation, and propaganda as well as sheer ignorance are replaced by inquiry and publicity, we have no way of telling how apt for judgment of social policies the existing intelligence of the masses may be. It would certainly go much farther than at present. (1954, p. 209)

The second limitation can only be understood once we replace our notion of native intelligence with one of effective intelligence, in which mental capacity is dependent on education and social conditions, including implements, utensils, devices, and technologies. Dewey writes,

> Capacities are limited by the objects and tools at hand. They are still more dependent upon the prevailing habits of attention and interest which are set by tradition and
institutional customs. Meanings run in the channels formed by instrumentalities of which, in the end, language, the vehicle of thought as well as of communication, is the most important. (1954, p. 210)

Before moving on with our analysis of Dewey, it is important to draw out a missing link in Dewey’s argument here, which is numerical mediation. It is number as much as language that is the vehicle of thought and communication, and increasingly so in the machine age as numerical mediation constitutes the ground of facticity atop which moral judgments might be made. As we’ve repeatedly seen, enumeration precedes nomination. To return to Dewey, what we can see here is that the judgment on the political agency of the masses is deferred with a Spinozan wave of the wand – we know not yet what the (social) body can do. And further, Dewey understands intelligence through instrumental canalization. His is an empirical, embodied, and effective concept of mind. The political capacities of the public are thus tied to the object and tools at hand, and specifically the new affordances brought about by electric computation’s mediation of number and letter in the machine age.

Political philosophy under Dewey becomes political science. Rather than prescribing what the State ought to be, it is to create methods for experimentations in governance (Dewey, 1954, p. 34). These methods are not looking for universals, but empirically embedded specificities. They incorporate feedback mechanisms such that they change with their material and empirical conditions. They stress method and education over the absolutistic logic of prescriptive philosophy. And they incorporate experts as operators of the instruments of public and publicized inquiry (Dewey, 1945, pp. 193–206). Dewey describes the end goal as follows,
The highest most difficult kind of inquiry and a subtle, delicate, vivid and responsive art of communication must take possession of the physical machinery of transmission and circulation and breathe life into it. When the machine age has thus perfected its machinery it will be a means of life and not its despotic master. (1945, p. 184)

Thus, for Dewey, the machines must become participatory if they are to act as a means of life rather than as its despotic master. Even if we might one day wish to be rid of them, we can only operate in and through them, as machines canalize our effective intelligence and disrupt any regimes of signification in discord with their inner logics. As we’ll see, this is precisely what the pollsters of the 1930s thought that they were doing: engineering a feedback mechanism to compliment the unilateral disseminations of mass media, fostering scientific knowledge of the public for the public, and producing a continuous and instantaneous mechanism of inquiry that, through the co-operation of the newspaper as disseminator and poll as feedback mechanism, might both constitute and be constituted by public opinion.

Near the end of his text, Dewey would make a radical departure from some of the statements he had made earlier. He would assert that if the Great Society were to become a Great Community, it must recapture local, face-to-face interactions between people. Dewey writes, “Democracy must begin at home, and its home is the neighborly community” (1954, p. 213). To be fair, this is not a simple wish for a return to a previous or imagined era, as we might see in Carey. Dewey acknowledges the future utility of the technological advancements of the machine age, including uniformity, standardization, mobility, remote and indirect interaction, interdependence, and flexibility (1954, p. 216–216). Yet, for him...
their future utility is fully grounded upon a return to local communal life and face-to-face communications. This new local community will be different, in the sense that it will be “alive and flexible as well as stable, responsive to the complex and world-wide scene in which it is enmeshed” (Dewey, 1954, pp. 216–217). Yet it will still be constituted through face-to-face relations.

What might here look like a bit of backpedaling can be traced to Dewey’s denigration of vision and writing in favor of sound and speech. He readily admits that the fixed and frozen words of written-visual mediation is necessary to disseminate information, but it is merely a precondition for the actual constitution of the public, which requires the ‘wingèd words’ of word-of-mouth face-to-face dialogue. Dewey writes,

The connections of the ear with vital and out-going thought and emotion are immensely closer and more varied than those of the eye. Vision is a spectator; hearing is a participator. Publication is partial and the pubic which results is partially informed and formed until the meanings it purveys pass from mouth to mouth. (1954, pp. 218–219)

From our vantage-point in the contemporary moment, it is easy to recognize the wrong-headedness of this leftover reserve of conservativeness that Dewey retains in spite of himself. First, numerical mediation is primary, in the sense that enumeration precedes nomination. Especially in the case of the Great Society, the capacity to form common signs and symbols has as its pre-requisite the numerical mediation afforded by electric computation. Without computation, you cannot enumerate the complex correlational networks of the Great Society. Second, we have the benefit of Andre Leroi-Gourhan’s (1993) and Jacques Derrida’s (1997)
demonstrations that speech is predicated upon writing and the technical supplementations of instrumentality – a concept that Dewey articulates, but backs away from in his preference for the spoken word.

Third, Steve Goodman (2012) has demonstrated that sound can be a weapon of war, and that the ear demonstrates the Spinozan principle that the capacity to affect is coupled with the capacity to be affected. You cannot close your ears. They are in a constant and largely inescapable relation to their acoustic environment, and, as Peter Sloterdijk (2016) has aptly demonstrated, twentieth-century warfare’s central strategy is to attack the environment in such a way that all bodies are affected through their constant and inescapable relation to it. And lastly, both Marshall McLuhan (2003; see also McLuhan & Powers, 1992) and Walter Ong (2002) have looked for a contemporary resurgence of orality in technologically mediated ‘global villages’. These ‘global villages’ have never manifested themselves – despite utopian tech writing at the advent of home internet in the 1990s – and if we follow Dewey’s logic, this is because the signs and symbols of orality do not keep pace with technology. Computation is not oral; it is numerical. As such, we might understand Dewey’s final wish as one for the production of new consistencies, durabilities, and stabilities in the social such that we might form new attachments and locate new common interests upon which to identify and distinguish ourselves as a public. And rather than looking to face-to-face spoken-word communication, we might look to numerical mediation as the ground upon which such consistencies might be established.
What is becoming clearer with each passing day is that techniques like the press, the radio, or the polls of public opinion are instruments which may be used either to make democracy work better or to enchain it in its own fetters. Undoubtedly, they are “instruments of power,” but, in the last analysis, it is not those who administer them, but the public itself, which sets the limit within which they can operate. The limitation and shortcomings of the polls are the limitations and shortcomings of public opinion itself.

George Gallup & Saul Forbes Rae, 1940, *The Pulse of Democracy*, p. 282
CHAPTER 6. Politics Beyond the Range of Vision: Computing Word and Deed

As we’ve seen, both Lippmann and Dewey looked for innovative methods by which democracy might be preserved and expanded in an increasingly distributed, complex, heterogeneous, and technologically advanced society. For Lippmann, the only hope was to use intelligence agencies and political observatories staffed with experts to create vast social databases, and leverage these databases to produce statistical analyses of means that might be conveyed to policy-makers and journalists. The utility of these statistical analyses is predicated on these agencies’ ability to produce an adequate machinery of record, meaning they must succeed in a vast scheme of data collection, processing, storage, and transmission, the latter of which ought to be as unimpeded and publicized as possible. In essence, Lippmann argued that the socio-political world must be numerically mediated. The idea of a collective social being had to be given up in favor of a complex web of relations and associations between individuals and things. The role of the public was to intermittently decide on the worthiness of their policymakers, and to leave the rest to them and the experts informing their decision-making.

For Dewey, social science needed to emulate the mathematical and physical sciences if it was to have any hope of describing the continuously metamorphosing web of association, communication, and action between individuals. Dewey concurred that the notion of a collective social being was foolhardy, and only obfuscated the machinations of the individuals truly in power. As it stood, the public was inchoate and unrealized because it was left without a principle of integration to let it identify and distinguish itself. There was
nothing to form an attachment to, and thus no stable interests to share. This condition was continually exacerbated as the rate of technological change accelerated, to the point were even experts had difficulty establishing the causal mechanisms behind everyday events in the Great Society. The only way out was to perfect our methods of communication by creating signs and symbols that could arrest and ascribe meaning to the flux of technological change. However, these new signs and symbols could only work if (1) they were produced through scientific inquiry and publicized, and (2) they were produced through and in accord with the media and communications technologies they were meant to describe. In essence, Dewey prescribed scientific inquiry and media studies. The latter was complimented by a need to introduce feedback mechanisms to unilateral communications technologies like the newspaper and the radio. In combination, these approaches could increase the effective intelligence of the population and allow them to judge the bearing of expert knowledge even if they could not produce it themselves. For Dewey, the machines of the Great Society needed to become participatory, and the public needed to reestablish its intimacy, self-knowledge, identity, and distinguishing characteristics.

In the 1930s George Gallup and his fellow public opinion pollsters responded to all of these demands with innovations in data collection and newspaper syndication schemes that they understood to be one piece towards solving the puzzle. This is important to keep in mind, because, as we’ll see, Gallup understood himself as a scientist providing a method that was meant to be continually developed and adapted, and consistently recognized its limitations and argued for the need to couple it with educational programs and face-to-face dialogue. Additionally, attempts to numerically mediate public opinion were by no means a
new phenomenon in the 1930s. As Sarah Igo notes, speeches, rallies, strikes, elections, and letters to the editor had all served to both gauge and demonstrate public opinion before the pollsters intervened (2007, p. 106). Additionally, since at least the middle of the nineteenth century American newspapers had been conducting straw polls, which were essentially composed of ballots that had been distributed with the publication, filled out by subscribers or purchasers, returned by mail to be tallied, and their results printed in subsequent papers (Jensen, 1969; Robinson, 1932; Smith, 1990).\footnote{Gallup himself would argue that the “earliest counterpart of modern opinion surveys” occurred in pre-election tallied held prior to the controversial 1824 U.S. Presidential election, which saw Andrew Jackson lose to John Quincy Adams by decision in the House of Representatives after having secured a majority of the electoral vote (Gallup & Rae, 1940, pp. 34–35). As Smith (1990) notes, Gallup would eventually note that only one of these pre-election tallies was conducted by a newspaper-run straw poll out of Raleigh, North Carolina (Gallup, 1972, p. 240). For more on the history of straw polls prior and into the 1930s, see Crossley, 1937; Jensen, 1969; Robinson, 1932, 1937a, 1937b; Smith, 1990.} Regardless of their origin, by the twentieth century these straw polls were an everyday phenomenon in the United States and often garnered millions of responses prior to presidential elections (Gallup & Rae, 1940).

The straw polls were complimented by a host of other attempts to numerically mediate public opinion. Communities of workers, students, farmers, fraternities, clubs, and neighbors took it upon themselves to survey their constituents and subsequently submitted these ‘people’s polls’ indicating their opinions on candidates and social issues to newspapers for publication (Herbst, 1995; Igo, 2007, p. 106). Attempts to quantify public opinion could be found in the federal government, and especially the Department of Agriculture, as well as in private industry and American universities. Increasingly sociologists published their
attempts to quantify subjective attitudes, a trend that would continue to blossom alongside public opinion polling. Psychologists developed tools and psychometrics that could be used, for example, to measure morale in the workplace or the armed forces (Igo, 2007, pp. 106–107). As we’ve seen in the previous chapter, the social problem of the public that emerged in the ‘big data’ problematic implied its own solution: numerically mediated feedback. James Beniger (1986) concurs, aptly describing all of these developments up to and including public opinion polls as ‘mass feedback technologies’. Across all sectors of the Great Society, these mass feedback technologies were becoming essential to the strategies and tactics, and the techniques and technologies of governance.

This chapter argues that the public opinion polling technologies that emerged in the 1930s constituted the first feedback mechanism that could operate at the national scale. This feedback operated increasingly quickly, tending towards real-time. It was able to do so not only via numerical mediation and electrical computation, but also required innovations in data collection techniques that could leverage the full enumerations we’ve previously examined to quickly make inferences with an acceptable degree of error about the numerically mediated and totalized population, or any of its integrable and differentiable subdivisions.

This introduction has offered an overview of the history of ‘mass feedback technologies’ that pre-existed the crystallization of public opinion polling in the 1930s. In the first section we will examine the foundations of public opinion polling primarily through the
writings of George Gallup. Here the focus is particularly on the techniques and technologies pollsters introduced to innovate data collection. We will see how these innovations, when coupled with electric computation’s data processing capacities, constitute the genealogical roots of ‘real-time’ and continuous data collection. These technologies constitute a negative feedback mechanism to the increasingly ‘real-time’ and continuous dissemination of news through newspapers, radio, and television, numerically mediating a national dialogue between the public and itself. In the third section we will look at how the new technology required corollary confessional techniques to be developed to prepare the American public to participate in public opinion polling. In the final section, we will examine some of the criticisms of public opinion polling in light of our investigations. As we will see, it is largely through the perversion of the concept of public opinion polling into an unprecedented technology of numerical mediation and its framing as a panacea for all the ailments of the (mass) social body in the Great Society that it becomes the condemnable abomination described by Carey (1995) and, to a lesser extent, by Peters (1995). This section instead posits a more nuanced approach to future critical analyses of public opinion polling.

93 While Gallup was but one of a dozen men working in the early 1930s to produce public opinion technologies, he was their most vocal champion and established the Gallup poll, which was much more widely disseminated and continues to maintain a prominent place in American society and history.
Counting all the Leaves on all the Trees

[L]ife is too short for the pursuit of omniscience by the counting in a state of nervous excitement of all the leaves on all the trees.

Lippmann, 1993, p. 34

George Gallup and his fellow public opinion pollsters erupted into American public life at the close of the 1936 U.S. presidential election. For years *The Literary Digest* had been operating a straw poll that collected millions of mail-in ballots from its readers in order to forecast election results. It had successfully predicted the outcome of every presidential election from 1916 to 1936, by which time the *Digest* would refer to itself as ‘the Bible of millions.’ In the run-up to the presidential election the *Digest* would leverage ‘tele-auto’ lists composed of names and addresses of American citizens who maintained telephone services and/or registered their automobiles to mail out ten million ballots. Slightly less than twenty-five percent of these ballots were returned, leading to a total of 2,376,523 (Gallup & Rae, 1940, pp. 41–42). For the first time in its history, the *Digest* would forecast the election disastrously incorrectly, ending up with a 19-point error and incorrectly predicting a Landon victory. Gallup and Saul Forbes Rae – his co-author for *The Pulse of Democracy* – would later write, “Virtually all of the *Digest*’s error was undoubtedly due to two other factors which determine accuracy in this field of opinion research—cross section and timing” (Gallup & Rae, 1940, p. 71). According to them, the *Digest*’s straw polls had achieved their remarkable track record between 1916 and 1932 because during that time public sentiment
had not been divided along class lines. Their use of ‘tele-auto’ lists reflected the opinions of those members of society that were securely in the middle class, as evidenced by their ownership of telephones and automobiles. This mistake lay dormant for years until the intensification of the Great Depression. Then the ‘ill-fed, ill-clothed, and ill-housed’ lower third of American citizens became disillusioned and distinct cleavages appeared dividing voters into lower and upper classes (Gallup & Rae, 1940, p. 48).

Gallup received his doctorate in applied psychology from the State University of Iowa in 1928 after completing a dissertation proposing objective methods for analyzing reader interest in newspaper content. He had previously worked for the St. Louis Post-Dispatch to help canvas readers’ opinions of the paper while an undergraduate. After working with newspapers, Gallup would begin offering advertising consulting in 1931, and the next year would take the position of director of research in Young & Rubicam’s marketing department. He would retain this position for fifteen years while working on his own time to create and manage the Gallup poll (Igo, 2007, pp. 116–117).94 In 1932, concurrently with taking his position at Young & Rubicam, Gallup began drawing on his peers’ work in universities on psychometrics and attitude intensity quantification and from corporations’ marketing departments to develop a methodology for polling public opinion at a national scale in the United States (Gallup & Rae, 1940, p. 45; Gallup, 1948, p. 75). Gallup and Rae would describe it as “a new apparatus of criticism and analysis” (1940, p. 46).

94 There are interesting and continuous ties between marketing and public opinion, with nearly all public opinion pollsters drawing their primary incomes from advertising consultancy and/or market research. For more information on them, readers might begin with Igo, 2007, esp. pp. 109–118.
Gallup used his new apparatus to detect the skewed results of the Digest’s straw poll early on, and gambled the future of his endeavor on the accuracy of his predictions. Through the American Institute of Public Opinion, Gallup launched a campaign to inscribe statistical sampling into the minds of every U.S. citizen. Beginning on July 14, 1936 – a full two months before the Digest had even mailed its blank ballots out – Gallup would begin utilizing the newspaper syndication scheme he had set up to loudly and continuously predict the straw poll’s failure; he would even predict its final results, including its degree of error, and diagnose its problem (Gallup & Rae, 1940, p. 75).

Gallup had been busy preparing for just such an opportunity. He and his colleagues had worked hard to professionalize public opinion polling. They had helped establish the journal The Public Opinion Quarterly, which they regularly contributed to alongside leading social scientists. Gallup formed the American Association of Public Opinion Research as well, which offered credentials to pollsters. Gallup, as did most pollsters, refrained from voting to demonstrate his disinterest in political outcomes, as a token to help establish the objectivity and scientificity of his endeavor (Igo, 2007, pp. 118–119). By 1936 he had also set up a syndication deal for a triweekly report called America Speaks! that would see the results of his Gallup polls printed in 60 major American newspapers. By the time he and Rae published The Pulse of Democracy in 1940, Gallup had capitalized well on the Digest’s failure. He had grown his syndication to 106 newspapers, and was reaching an estimated audience of eight million Americans with each of his reports (Igo, 2007, pp. 104, 117). And the entirety of this movement was centered on an innovation in data collection. This innovation was statistical sampling, and it was primarily through sampling that the pollster
sought to escape the constraints on mass democracy outlined by Lippmann and Dewey. In terms of Lippmann’s metaphor, sampling techniques could allow all the leaves on the tree to be totalized without being counted. As we’ll see, this was accomplished in part by a sleight of hand, as the full enumerations of the Census Bureau, along with government registries – like, for example, those maintained by the Department of Commerce and the Federal security Administration – were and continue to be essential prerequisites to statistical sampling. However, with an accurate census, sampling can totalize social objects for analysis incredibly quickly and, subsequently, near continuously, in effect totalizing each tree as one happens upon it.

As Frederick Stephan notes, the history of statistical sampling is particularly difficult to trace. Its development is scattered across many scientific fields and technological advancements, often confined to subordinate sections of academic publications whose titles provide little or no hints that they may at some point address the subject of sampling. Sampling has roots in science, commerce, manufacturing, agriculture, education, and government administration, and has often been intertwined with the collection of census data, particularly its special volumes (Stephan, 1948, p. 12). For Theodore Porter (1986), statistical sampling had its roots in astronomical methods for calculating standard error such that multiple observations of stellar objects might be averaged out to produce the most accurate numerical records.95 While these methods of error analysis were used to help balance

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95 As Porter explains, “The exponential function $\frac{1}{2\pi} e^{-x^2/2}$, later to become known variously as the astronomer’s error law, the normal distribution, the Gaussian density function, or simply the bell-shaped curve, was introduced by Abraham De Moivre [in the 1730s]. […] De Moivre’s discovery received little attention until
incomplete data sets in demographics in the eighteenth century, it was not until the middle of the nineteenth that Adolphe Quetelet would – to some degree unwittingly – begin to broaden their applications and break their exclusive association with error analysis (Porter, 1986, p. 100). Quetelet writes:

> It would appear, then, that moral phenomena, when observed on a great scale, are found to resemble physical phenomena; and we thus arrive, in inquiries of this kind, at the fundamental principle, that *the greater the number of individuals observed, the more do individual peculiarities, whether physical or moral, become effaced, and leave in a prominent point of view the general facts, by virtue of which society exists and is preserved.* (1968, p. 6, emphasis in original)

At one and the same time Quetelet broadens and betrays statistical sampling. The latter (italicized) portion might as well be the motto of security technology par excellence, and certain bears an uncanny resemblance to Google’s modus operandi in research and development, as we’ll see in the next chapter. Yet, the first portion indicates that, as Porter explains, that Quetelet did not view his discovery “as an indication that the mathematics of

Laplace began writing on probability during the 1770s. Laplace saw this method of approximation as invaluable, for he hoped to use it in conjunction with the new technique of *a posteriori* probability […] to predict distributions of events in the future, or to infer the existence of real causes, from a record of past occurrences. […] The applicability of the mathematics of chance to demographic problems reaffirmed Laplace’s view that probability theory was generally usable as a means for narrowing the range of uncertainty…” (1986, pp. 93–94).
error had been conceived too narrowly, but as clear evidence that human variation could be understood in the same terms as errors of observation“ (1986, p. 100).

Rather than leveraging the promise of probabilistic estimates of uncertainty latent in Laplace and near explicit in Quetelet, social statistics would largely ignore that promise until the twentieth century. As Porter notes, “Statists and statisticians were almost unanimously distrustful of sampling, and emphasized at every opportunity the importance of complete enumeration” (1986, p. 236). And this was for good reason, as the accuracy of inferences produced through sampling was dependent on reliable information about the population. Without an accurate complete enumeration there was no way to determine how representative any given sample would be of the whole. Throughout the nineteenth century, error analysis was for the most part confined to those places where large numbers escaped human grasp, and was most often first met with an attempt to make a complete enumeration of those large numbers. It is not surprising then that wide scale use of error analysis to make inferences about the population based on representative samples of it did not take root in the United States until the majority of the kinks in the U.S. Census had been worked out. For Porter, the only noteworthy exceptions where probability was leveraged in the human sciences prior to the twentieth century are in insurance and medical statistics, the subject of our previous chapter (1986, p. 237).

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96 It is worth noting that, as Porter explains, Quetelet had not proposed the use of error analysis “to infer attributes of a population from some subset of it, but to infer the existence of underlying causes from a complete census” (1986, p. 237).
Gallup explicitly drew on the scientific roots of error analysis and statistical sampling both to develop his methods and to argue for their scientificity. He would simultaneously argue that there was nothing more natural, or in fact necessary, than sampling, as everyday humans abstract from their total experience and select parts to represent the whole in order to make judgments about the world around them (Gallup & Rae, 1940, p. 57). He defined a universe as “the total area or group from which a sample is to be selected,” and noted that universes might be homogeneous or heterogeneous. In the first instance, random sampling would due. Gallup here provides the example tasting a (thoroughly stirred) bowl of soup, where any random spoonful can represent the whole (Gallup & Rae, 1940, pp. 56–57). Heterogeneous universes though required specific methods like ‘stratified’ or ‘controlled’ sampling in order to be accurately represented by their parts. As Gallup explains, the American public is such a heterogeneous universe. It is a ‘mosaic’, a complex network of associated individuals clustered into social groups that each maintains common attitudes. Gallup writes, “Individuals do not dwell in a vacuum. Considerations of geography, occupation, age, sex, political affiliation, race, religion, and general cultural background are the basic determinants of their experiences and opinions” (Gallup & Rae, p. 60). People’s lives determine their thinking, and common experiences in life can lead to individuals collectively sharing similar ideas and points of view. America is thus constituted by “several publics which cut across each other” (Gallup & Rae, 1940, p. 62). We can already see the logic of totalization and individuation at work here. Gallup writes, “individuals are not atomized, identical units; they are essential elements of social groups, and they at once reflect and mold the view of the groups of which they are members” (Gallup & Rae, 1940, p. 63). In
short, if you can individuate the relevant subdivisions of the totalized population, then you can represent the whole by its parts – within a certain acceptable bandwidth of error.

In preparation for 1936, Gallup had been looking into stratified sampling, which was a method for grouping the units to be sampled by certain classes prior to collecting them. These groups were called ‘cross sections’. Then, during the sample, random units can be selected for each of the established cross sections. Gallup writes, “This tends to increase the likelihood that each of these groups will be properly represented in the sample and at the same time retains all the essential features of a random sample” (1948, p. 25). From this method, Gallup would focus on developing *quota sampling*, which was a quick and cost-effective method for collecting representative samples.\(^97\) Essentially, quota sampling leveraged pre-existing government data, like the census, election figures, and other bureaucratic registries to establish a quota for how many people must be sampled for each characteristic deemed relevant (Gallup, 1948, p. 29). These quotas were to be proportionate to the numerical size of the subdivision of the population they represented (Gallup, 1948, p. 27). For example, in his polls for the 1936 election, Gallup determined “urban-rural balance, economic status, age, and sex, as the basic factors” to be taken account of, and thus built his ‘miniature electorate’ out of proportional quotas for each of these characteristics (Gallup & Rae, 1940, p. 73).

\(^97\) At the time, the only other option Gallup considered was known as *area sampling*, which essentially used detailed maps to randomly assign sample areas to be completely enumerated. While this method was more scientifically sound, Gallup considered it to be too slow for continuous public opinion measurement, as well as too costly and running the risk of re-interviewing the same respondents (Gallup, 1948, pp. 28–30).
Rather than a list of names to be interviewed, it was simply these quotas that were disseminated to interviewers. These Interviewers were then responsible for locating residents of their community with the pre-determined characteristics and securing interviews to meet each of their quotas. Gallup argued that providing a list of names would be too slow, costly, and would disrupt the ‘anonymity’ of the response (Gallup & Rae, 1940, p. 112). For example, socioeconomic class was broken down into seven cross sections: wealthy, average-plus, average, poor-plus, poor, old-age assistance, and on relief or W.P.A (see Gallup & Rae, 1940, pp. 110–111). Interviewers were charged with getting a set number of interviews from people in each socioeconomic cross section. At the time, their methods for doing so were crude. For, while these cross sections were correlated with yearly wage minimums and maximums, people were often selected on sight. One interviewer related an anecdote to Gallup of approaching a man in ‘laborer’s clothing,’ assuming him to be of poor or below status, only to find out he was a state morals investigator and “a Republican to boot” (qtd. in Gallup & Rae, 1940, p. 115). Another interviewer had been going to public-welfare offices to collect their on relief interviews before the officials became suspicious, at which point the interviewer devised the ingenious solution of posting up outside a nearby grocery store whose sign read “RELIEF CHECKS ACCEPTED HERE” (qtd. ion Gallup & Rae, 1940, p. 115).

98 While Gallup had used mailed ballots in 1936 and supplemented them where they did not meet his quotas by interviews, he quickly abandoned that and collected all samples through face-to-face interviews for all his subsequent polls in the 1930s and 1940s (Gallup & Rae, 1940, p. 74).
As Gallup noted, “Interviewing methods are not rigid; they may be adjusted according to the interviewer’s own set of local problems within the general limits of his week-to-week assignment” (Gallup & Rae, 1940, p. 116). The important part was to fill the quotas for each cross section by any means necessary, as simply increasing the size of the sample was the most efficient, speedy, and cost-effective solution to any problems with accuracy. Gallup would use anywhere from 3,000 to 60,000 interviews for studies of national issues, with an upper limit closer to 9,000 for more general studies of opinion on issues (Gallup & Rae, 1940, p. 69). Gallup noted that as few as 100 interviews could easily represent the nation if they were sampled correctly, but his larger numbers were an insurance against inaccuracies in the interviewing process (1948, p. 17). From the beginning though, Gallup would argue that “both experience and statistical theory point to the conclusion that no major poll in the history of this country ever went wrong because too few persons were reached” (Gallup & Rae, 1940, p. 68). The answer was in the method of data collection, not the amount of data collected. Or at least, one could leverage the complete enumerations being made elsewhere alongside an innovative method to more rapidly and accurately infer the movements of the totality.

While establishing these cross sections and their proper quotas was difficult, it was not a mathematically intensive puzzle. Gallup argued that all it required was common sense and the capacity to continually dig into census reports, income-distribution reports, studies of

99 The only real limitations were that interviewers were asked to refrain from re-interviewing the same people more than once per year, and to refrain from interviewing more than one member of the same family or household on any single assignment (Gallup, 1948, p. 61).
voting affiliation and participation, and any other available complete enumerations and registries that detailed information about the population relevant to voting behavior (Gallup & Rae, 1940, p. 80; Gallup, 1948, p. 12). As such, the accuracy of the polls is entirely dependent on the accuracy of these initial enumerations. The accuracy of the cross sections is dependent on the interviewer, but has many available checks along the way. Interviewers were required to conclude their interviews by obtaining and recording the person’s occupation, income bracket, race, age, educational attainment, as well as whether he or she owned a telephone, owned an automobile, and had voted in the last election (Gallup, 1948, p. 61). Once the completed ballots had been returned from the interviews and entered onto Hollerith cards, pollsters used IBM tabulators to verify that their final data set contained the accurate proportions of the classes they had determined relevant (Gallup, 1948, p. 35). They could also tabulate them against other polls to look for large shifts in any of their cross sections that might indicate an interviewer had been providing incorrect and/or falsified data.

The best check on the accuracy of the polls was their comparisons to one another, both past and present, and their ability to predict elections. This why Gallup argued polling ought to be conducted by myriad institutions, both public and private, rather than solely by the government. Gallup acknowledged that there was no mathematical way to determine the margin of error for quota sampling because the randomness of the selection factor of the interviewer was incalculable (Gallup, 1948, p. 30). Instead, he staked all of his scientificity on a table he borrowed from Professor Theodore Brown of Harvard University (see Table 4 below), which provided the standard error that could be expected based on the number of people interviewed and the percentage split between them in opinion.
Table 4. Size of sample necessary to be accurate within predetermined limits

Where Opinion Divides Percentagewise As Follows

<table>
<thead>
<tr>
<th>Range of Error</th>
<th>20–80%</th>
<th>25–75%</th>
<th>30–70%</th>
<th>35–65%</th>
<th>40–60%</th>
<th>45–55%</th>
<th>50–50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1%</td>
<td>1,440,000</td>
<td>1,687,500</td>
<td>1,890,000</td>
<td>2,047,500</td>
<td>2,160,000</td>
<td>2,227,500</td>
<td>2,250,000</td>
</tr>
<tr>
<td>0.2</td>
<td>360,000</td>
<td>421,875</td>
<td>472,500</td>
<td>511,875</td>
<td>540,000</td>
<td>556,875</td>
<td>562,500</td>
</tr>
<tr>
<td>0.3</td>
<td>160,000</td>
<td>187,500</td>
<td>210,000</td>
<td>227,500</td>
<td>240,000</td>
<td>247,500</td>
<td>250,000</td>
</tr>
<tr>
<td>0.4</td>
<td>90,000</td>
<td>105,469</td>
<td>118,125</td>
<td>127,969</td>
<td>135,000</td>
<td>139,219</td>
<td>140,625</td>
</tr>
<tr>
<td>0.5</td>
<td>57,600</td>
<td>67,500</td>
<td>75,600</td>
<td>81,900</td>
<td>86,400</td>
<td>89,100</td>
<td>90,000</td>
</tr>
<tr>
<td>0.6</td>
<td>40,000</td>
<td>46,875</td>
<td>52,500</td>
<td>56,875</td>
<td>60,000</td>
<td>61,875</td>
<td>62,500</td>
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<tr>
<td>0.7</td>
<td>29,388</td>
<td>34,439</td>
<td>38,571</td>
<td>41,786</td>
<td>44,082</td>
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<td>45,918</td>
</tr>
<tr>
<td>0.8</td>
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<td>26,367</td>
<td>29,531</td>
<td>31,992</td>
<td>33,750</td>
<td>34,805</td>
<td>35,156</td>
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<tr>
<td>0.9</td>
<td>17,778</td>
<td>20,833</td>
<td>23,333</td>
<td>25,278</td>
<td>26,667</td>
<td>27,500</td>
<td>27,778</td>
</tr>
<tr>
<td>1.0</td>
<td>14,400</td>
<td>16,875</td>
<td>18,900</td>
<td>20,475</td>
<td>21,600</td>
<td>22,275</td>
<td>22,500</td>
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</table>

Range of Error: 1.5 1.0 0.5 0.4 0.3 0.2 0.1

<table>
<thead>
<tr>
<th>Range of Error</th>
<th>20–80%</th>
<th>25–75%</th>
<th>30–70%</th>
<th>35–65%</th>
<th>40–60%</th>
<th>45–55%</th>
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<td>7,500</td>
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<td>9,600</td>
<td>9,900</td>
<td>10,000</td>
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<tr>
<td>2.0</td>
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<td>4,219</td>
<td>4,725</td>
<td>5,119</td>
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<td>5,569</td>
<td>5,625</td>
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<td>2,700</td>
<td>3,024</td>
<td>3,276</td>
<td>3,456</td>
<td>3,564</td>
<td>3,600</td>
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<tr>
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<td>1,600</td>
<td>1,875</td>
<td>2,100</td>
<td>2,275</td>
<td>2,400</td>
<td>2,475</td>
<td>2,500</td>
</tr>
<tr>
<td>3.5</td>
<td>1,176</td>
<td>1,378</td>
<td>1,543</td>
<td>1,671</td>
<td>1,763</td>
<td>1,818</td>
<td>1,837</td>
</tr>
<tr>
<td>4.0</td>
<td>900</td>
<td>1,055</td>
<td>1,181</td>
<td>1,280</td>
<td>1,350</td>
<td>1,392</td>
<td>1,406</td>
</tr>
<tr>
<td>4.5</td>
<td>711</td>
<td>833</td>
<td>933</td>
<td>1,011</td>
<td>1,067</td>
<td>1,100</td>
<td>1,111</td>
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<tr>
<td>5.0</td>
<td>576</td>
<td>675</td>
<td>756</td>
<td>819</td>
<td>864</td>
<td>891</td>
<td>900</td>
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</table>

Range of Error: 6.0 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.4 0.3 0.2 0.1

<table>
<thead>
<tr>
<th>Range of Error</th>
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<th>25–75%</th>
<th>30–70%</th>
<th>35–65%</th>
<th>40–60%</th>
<th>45–55%</th>
<th>50–50%</th>
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</thead>
<tbody>
<tr>
<td>6.0</td>
<td>400</td>
<td>469</td>
<td>525</td>
<td>569</td>
<td>600</td>
<td>619</td>
<td>625</td>
</tr>
<tr>
<td>7.0</td>
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<td>344</td>
<td>386</td>
<td>418</td>
<td>441</td>
<td>455</td>
<td>459</td>
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<tr>
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<td>295</td>
<td>320</td>
<td>338</td>
<td>348</td>
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<tr>
<td>9.0</td>
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<td>233</td>
<td>253</td>
<td>267</td>
<td>275</td>
<td>278</td>
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<tr>
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<td>169</td>
<td>189</td>
<td>205</td>
<td>216</td>
<td>223</td>
<td>225</td>
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</table>

Range of Error: 15.0 10.0 9.0 8.0 7.0 6.0 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.4 0.3 0.2 0.1

<table>
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<tr>
<th>Range of Error</th>
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<th>30–70%</th>
<th>35–65%</th>
<th>40–60%</th>
<th>45–55%</th>
<th>50–50%</th>
</tr>
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<td>99</td>
<td>100</td>
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<td>18</td>
<td>18</td>
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<td>9</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

100 Reproduced from Gallup & Rae, 1940, p. 70.
In interviewing 3,000 to 6,000 people, Gallup could expect to be off by anywhere from 0.5% to 3.0% in 997 out of 1,000 polls. In actuality, by 1947 the Gallup poll would have an average error of 3.9% in its predictions for 392 elections (see Table 5 below). This figure had been steadily decreasing as the Gallup poll progressed. It had averaged an error of 5.6% from 1936 to 1940, an error of 3.4% between 1940 and 1944, and an error of 2.9% between 1944 and 1957 (Gallup, 1948, pp. 68–70).

Table 5. Average error for Gallup Poll election forecasts, 1936 to 1947

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Elections</th>
<th>Mean Average Error for Period</th>
<th>Mean Average Error All Elections to End of Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1936–Oct. 1940</td>
<td>136</td>
<td>5.6%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Nov. 1940–Oct. 1944</td>
<td>109</td>
<td>3.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Nov. 1944–Dec. 1947</td>
<td>147</td>
<td>2.9%</td>
<td>3.9%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>392</td>
<td>3.9%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

These figures provide an approximation, though certainly not precise in any mathematical sense, of the effect of errors in quota sampling. This is of course complicated by the fact that these numbers are based on election polls, which are particularly difficult to forecast. Elections require the pollster to determine who will actually turn out to vote, which requires consulting previous voting records as well as establishing the level of

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101 Reproduced from Gallup, 1948, p. 68.
disenfranchisement in each state. They are subject to random variables like weather, last-minute events and crises, as well as political machines’ ability to get the vote out. And lastly, elections – and especially presidential elections – are often very nearly split, meaning that the standard error in them is higher than it might be in other polls where the majority might exceed 60 or 65% of the people. Thus, despite its crudeness in comparison to today’s benchmarks for election forecasting accuracy, the Gallup poll was remarkably accurate for its time. The key point of intervention to increase accuracy at the time was innovating the method of sampling. Alternative methods to quota sampling could offer greater accuracy, but at greater cost in both capital and, more importantly, time. Sampling innovation needed to occur within the confines of the quota sampling method. What Gallup needed was an educational campaign for both interviewers and the American public that might persuade them of the importance of accurately offering up details about their thoughts and lives to a mobile force of political confessors.

**American Confessions in the Great Society**

No one has yet found a better way of discovering what people think than by talking to them.

Gallup, 1948, p. 39

The interviewing process began with the production of quotas and questions, and it is to the latter that we now turn. Gallup was clearly aware of the power that was implicit in being the one who framed the questions that would be put to the public. He writes, “to select
issues is to determine what is important” (Gallup & Rae, 1940, p. 92). In determining the issues to be investigated, Gallup instituted broad guiding principles to be followed. Collectively, the issues that the Gallup poll dealt with were supposed to cover as many aspects of contemporary life as possible, covering all commonly held concerns about politics, the economy, society, and morality. These issues needed to be intimate to the public, rather than remote or hypothetical, such that a large portion of the public could be expected to have considered them and formed an opinion about them. They also should not shrink from covering the banalities, at times, of everyday life. And lastly, issue determination necessitated a temporal awareness of the duration and attention span of public opinion.\footnote{Gallup and Rae describe public opinion as “a phenomenon of temporary surface currents, as well as long-term ground swells” (1940, p. 94).}

The public was increasingly less likely to have formed an opinion about events the further back in the past or the further ahead in the future they were. These broad principles were then hammered out concretely in week-to-week conferences of the editorial board and research executives for the Gallup poll.

The editors and researchers at Gallup’s American Institute of Public Opinion followed as many trends in the news as possible, maintained an ongoing dialogue about past, present, and future questions, drafted those questions into long lists, and eventually winnowed them down to the triweekly poll questions (Gallup & Rae, pp. 93–94). Gallup also notes that the AIPO considers questions suggested by interested outsiders, including but not limited to: the editors of the newspapers that publish its polls, as well as from Congressman and high-ranking officials in government agencies (1948, p. 49). The fact that newspapers
have some input is hardly surprising, as they footed the bill for the AIPO’s operations. However, as Gallup notes, the syndication scheme included newspapers that leaned to both sides of the aisle, which for him essentially canceled out any impetus to lean in one political direction or another in the phrasing of questions (1948, p. 107).

This was again complemented by the fact that public opinion polls were being conducted by multiple organizations across the country, and there was also a growing archive of previous data, all of which new results could be checked against. As Gallup would put it, the pollster who lied was a fool, because you could only be dishonest once (Gallup & Rae, 1940, p. 219). A pollster would be trading a career’s worth of paychecks for a single payday if they falsified their results. Polling did not happen in a vacuum. Other agencies had incentive to dispel fraudulent polling operations, as they saw their future as vested in the professionalization of the field and its scientificity.\textsuperscript{103} For these reasons, Gallup maintained a strict syndication policy which barred newspapers from making any changes to the results or the interpretations of the results that were issued by the AIPO. Gallup would claim in 1940 that there had been no attempts to manipulate the results of his polls to suit editorial policy by any of the newspapers that syndicated his triweekly report (Gallup & Rae, 1940, p. 118).

Gallup was much more concerned about the entrance of unintentional bias into the phrasing of Gallup poll questions than about propaganda and manipulation by newspapers. This was for a practical reason: unintentional bias was more difficult to detect (Gallup & Rae, 1940, p. 98). Words mean different things to different people, which meant that the

\textsuperscript{103} Gallup also supported the establishment of a regular audit that would periodically examine the nation’s polling operations to ensure the soundness (Gallup & Rae, 1940, pp. 273–277).
editors and researchers at the AIPO had to be constantly vigilant about how the public might interpret their language differently from how they had intended it. Again, Gallup instituted broad guidelines that were supplemented with technological solutions. The guidelines included conciseness of questions, use of common or day-to-day words, avoiding emotionally inflected words, avoid bias or suggestion, include all important alternatives as responses, offer these alternatives as soon as possible (rather than spend time framing them), and print out long and complex questions so that the respondent might read them over (Gallup & Rae, 1940, p. 101). This was complimented by the introduction of the split-ballot technique, whereby two (or more) versions of a question were printed and distributed to different interviewers to test across each cross section. A quick tabulation of the results could then determine if any of the versions had biased a particular cross section (Gallup & Rae, 1940, pp. 102–103; Gallup, 1948, pp. 50–51). Records of which words and phrasings biased results were then kept, as the AIPO worked to build a “neutral vocabulary–a public-opinion glossary–within the comprehension of the mass of people” (Gallup & Rae, 1940, p. 106). As Igo notes, however, bias was still able to slip in by the vocal intonations and supplemental phrasings offered by the interviewer, which might account for some of the excess deviation noted above (2007, p. 128).

Once a relevant issue had been determined and a set of unbiased and understandable questions was developed for it, they were forwarded along with the quota figures to interviewers. Each poll generally employed about 250–300 interviewers (Gallup, 1948, p. 57). Interviewers were largely chosen by the recommendation of ‘responsible’ members of the community, like educators or lawyers, and were largely trained by mail with no
supervisory structure other than post-hoc statistical verification (Igo, 2007, p. 128). Around ninety percent of them had attended or were attending college and, because interviewing was part-time labor, most of them also had other occupations. They met Gallup’s criteria of being intelligent, experienced, educated, conscientious, alert, open-minded, gregarious, and being in touch with their communities. It was wholly their responsibility to engage ‘random’ people in the community and secure their cooperation in being interviewed. They needed to be as scientific as possible and practice their observational and analytic skills, both to fill out supplemental information like how people phrased their responses or what their reactions to questions were. For all of this, Gallup assumed the interviewers must also be keenly interested in the study of public-opinion (Gallup & Rae, 1940, pp. 108–109; Gallup, 1948, p. 56).

Gallup thought that the best way to get to know what the public’s convictions are is to sit down and talk face-to-face in a friendly interview. He was less interested in theoretical questions about whether their expressed opinions actually represented their true convictions isomorphically, than in practical questions about how to ‘most nearly represent’ those convictions within an acceptable margin of error. For Gallup, these practical questions were best answered by the actual experiences of interviewers (Gallup & Rae, 1940, p. 230). In practice, people were often only guarded when they were unsure of the interviewers’ identity and purpose, fearing that they might be ill intentioned or worse, door-to-door salesmen. Transparency was key to the entire polling endeavor, as the more the public knew about the Gallup poll, the more likely individuals were to participate willingly and honestly. One interviewer from Indiana told Gallup, “I have never known anyone who, when he knew the
significance of the polls, didn’t evidence a keen delight in answering the questions even when they concerned his religious and political faiths” (qtd. in Gallup & Rae, 1940, p. 231). This was a common experience for interviewers. For Gallup, the combination of the surveys’ anonymity with broad public knowledge of their fact-finding objectives with people’s curiosity about the questions and how their answers stacked up against their neighbors was all the motivation necessary (Gallup & Rae, 1940, p. 232).

All of Gallup’s writing constitutes a public relations campaign on behalf of public opinion polling, but one he felt was born of civic duty rather than a distortion of the facts to manipulate his audience. Igo describes polling as a ‘solicitous science’ that needed to court and cultivate the public just as much as it needed to survey the public (2007, p. 151). This was in large part because, as she notes, “It was not obvious in the 1920s that citizens would accept prying questions from market researchers or opinion surveyors, or that they would trust the assembled answers as either trustworthy or true” (2007, p. 3). Each publication not only increased the visibility of the Gallup poll, but also preached its civic importance and its reliance on the public’s cooperation. By the 1940s, Gallup had built a statistical and mobile confessional machine that combined techniques for determining issues and questions, a common language, a mobile host of confessors, and an educational campaign to demonstrate the civic import of the endeavor. This educational campaign demonstrated to people the mechanism by which public opinion polling worked on their behalf, communicating their thoughts and desires not only to politicians but also to one another. And the repeated stress on its accuracy and intimacy produced a nation of statistical subjects who, to a greater or lesser extent, understood themselves and their place in the nation through the
polls. When such a subject position was produced within this vast web of strategies and
tactics, techniques and technologies, the American people became disposed to confess their
secrets: their thoughts, hopes, convictions, voting record, party affiliation, income, education,
ad inf. As one interviewer noted, “It’s not unusual for people to confide their troubles, after
all, I’m a complete stranger—and it’s someone to talk to” (qtd. in Gallup & Rae, 1940, p. 236). If there was a difference between expressed opinion and secret conviction, it did not
manifest itself in the voting booth; as long as the predictions were successful, Gallup was
satisfied with the metaphysical soundness of the endeavor (Gallup & Rae, 1940, p. 233).

The Homunculus in the Machine

Not only have the polls demonstrated by their accuracy
that public opinion can be measured; there is a growing conviction that public opinion must be measured.

Gallup & Rae, 1940, p. 6

As we’ve seen, the social world of early twentieth-century America is constituted by
large-scale bureaucracy and nationalized governance, increasingly complex correlational
networks determining modern affairs, a rapid acceleration of technological development with
specific influences on transportation, communication, and mechanization. In this Great
Society, the worry of de Tocqueville’s ‘tyranny of the majority’ or of the mob, herd, crowd,
or masses had become inverted. In the wake of political machines, pressure groups, and
propagandists, Gallup fought on behalf of “the inarticulate and unorganized majority of the
citizens” (1948, p. 5). Gallup saw himself as directly responding to the demands of the Great Society, in which political parties and machines, nation-wide associations, pressure groups, national newspapers, the telephone, motion pictures, and radio had left American citizen disenchanted and the public as the phantom of its former self found by Lippmann (Gallup & Rae, 1940, p. 13). Gallup and Rae write, “The problem of building machinery for directly approaching the mass of the people and hearing what they have to say demands solution” (1940, p. 13). Following Lippmann, they describe public opinion polls as the first step to fulfilling Lippmann’s wish for a machinery of knowledge adequate to the Great Society (1940, p. 142). They explain,

Continuous polls can constitute a kind of public-intelligence service in the field of social groups and opinion, and will indicate in a measurable way tendencies which would otherwise be subject to speculation and guesswork. In the light of this knowledge, existing institutions may be better able to perform the democratic purposes to which they are dedicated. (1940, pp. 142–143)

Again following Lippmann, one such way that they can do so is by serving as a medium to guide politicians in their decision-making (Gallup & Rae, 1940, p. 142). The polls “provide a basis of fact on which more intelligent decisions may be made” (Gallup & Rae, 1940, p. 278). They are “merely fact-finding agencies” (Gallup, 1948, p. 7).

Gallup is optimistic about the capacity of the public to engage in democratic government. He argues that the opposing point of view easily gives way to fascism, and that the antidemocratic tendencies of Le Bon, Tarde, and Trotter are actually disproved scientifically by the polls. For Gallup, a lack of faith in the people contradicts the foundations
of Jeffersonian democracy (Gallup & Rae, 1940, pp. 253–261). The determination of ends and values is not based on specialized knowledge or the faculty of intelligence alone. For Gallup, these values “are compounded from the day-to-day experience of men and women who together make up the society we live in” (Gallup & Rae, 1940, p. 266). Like Dewey, he believes that the person wearing the shoe knows best where it pinches. The chief political task of the age is to produce the mechanisms by which the public, with its needs, values, and opinions of ends, can be put in a continuous feedback loop with the experts who analyze means and the politicians and administrators that devise, maintain, and execute public policy (Gallup & Rae, 1940, p. 275). Gallup repeatedly turns to instances of the public’s aptitude to self-govern, including the demonstration through polls that the public supported the dissemination of information and aid of programs to control venereal disease despite government officials claiming it was too taboo to mention in public, as well as the public’s support for building up the U.S. Air Force years prior to World War II.

Gallup agrees, however, with both Lippmann and Dewey that the evaluation of means is the domain of experts in most cases in the Great Society. He is a practical thinker and readily admits that there are many things that cannot be done by public opinion, and that there are things that the public will not have the requisite knowledge to judge soundly (Gallup & Rae, 1940, pp. 264–265). Gallup and Rae write,

Public opinion is not a deity, neither is it infallible. It is not something above and superior to the opinions of ordinary men and women organized in a political community. It is as good, or as bad, as the human beings whose ideas and aspirations make up the total stream of opinion. It is not the product of an omniscient group
mind, but rather a dynamic process resulting from the communication and interaction of individuals in an ever-moving society. (1940, p. 15)

It is precisely because both governance and opinion are dynamic processes that there is “no fixed and timeless standard of right, no revealed formula for the avoidance of error” (Gallup & Rae, 1940, p. 288). Like Dewey, he understands democracy to be a self-educational process that requires ongoing thought, action, participation, information, and the voicing of opinion to operate; it is more than an anonymous completion of a ballot form (Gallup & Rae, 1940, p. 12).

For Gallup, there is a structural problem in the machinery of our democratic institutions that leaves citizens uneducated, or with so little economic security that they fall victim to false panaceas, and have no time or opportunity to engage in civics (Gallup & Rae, 1940, pp. 286–287). These structural problems demand ongoing and deep societal changes to foster the conditions under which democracy can work effective. Public opinion polls are not the solution, but merely a supplement to help facilitate civic education, discussion, and engagement (Gallup & Rae, 1940, p. 278). Gallup and Rae write, “Measuring public opinion is only one aspect of the whole problem—the other important aspect lies in the use of critical principles of interpretation on the part of the members of the public” (1940, p. 280). And for them, this need to foster critical principles of interpretation in the public through educational programs extends to the polls themselves; they offer up an initial list of criteria that the public might use to evaluate the social statistics they encounter in their everyday lives (Gallup & Rae, 1940, pp. 280–282). In perhaps there most Dewey-esque moment, Gallup and Rae explain public opinion in a democracy thusly,
The kind of public opinion implied in the democratic ideal is tangible and dynamic. [...] It acts and learns by action. Its truths are relative and contingent upon the results which its action achieves. Its chief faith is a faith in experiment. It believes in the value of every individual’s contribution to political life, and in the right of ordinary human beings to have a voice in deciding their fate. Public opinion, in this sense, is the pulse of democracy. (1940, p. 8)

For them, the public lives up to these standards in most cases. The instances where the public demonstrates an ineptitude for self-rule are few and far between. And because democracy is an experimental process, they see nothing but progress in the future. Gallup even speculates that the perfection of communication technologies and statistical sampling might surmount these problems all together: Gallup boldly prophesies that “not until the millennium is reached will every voter be informed on every matter of public importance” (1948, p. 85).

To return to our initial agitator, it is not only difficult to follow Carey’s dichotomization of Lippmann and Dewey, it is difficult to understand his castigation of public opinion polling. Carey writes, “Today, polling—a word that comes, interestingly enough, from the old synonym for voting—is an attempt to simulate public opinion in order to prevent an authentic public opinion from forming” (1995, p. 392). What Carey is mourning the loss of here is a participatory process of collective meaning-making, the communications that lead to people making up their minds about things. This loss is entailed by a national press acting as fourth estate, disseminating pre-constituted collective meanings en masse on behalf of the people; this is the loss of a purely spectacle-visual oriented newspaper. Gallup and Rae understand themselves to be aligned with this position, scoffing
at the audacity of the press to deem itself the true *vox populi* (1940, p. 13). Gallup’s project was to *supplement* what existed, not to offer a panacea for the ills of society. He wanted to offer a feedback mechanism that would engage the masses. By interviewing a sample of them he could quickly and effectively determine their current convictions as well as the gaps in their knowledge. The poll was to be a supplement to the education system as well, demonstrating what areas of knowledge needed fostered so that the people might make up its mind. And the result of a single poll was not the end of the story, but the fodder for a national discussion that would help people become aware of issues and make up their minds about them. As Gallup and Rae explicitly note, “People cannot hold opinions until they have heard about the issues. They must have had the chance of ‘listening in’ on a full debate between interested partisans” (1940, p. 234). After listening in and then engaging in conversations with their community, the public would collectively get the opportunity to speak again at the next poll, which would then serve for further discussion. At the time, this was the only practical method for constituting the very mechanisms of public opinion Carey held so dear at the level of the Great Society. It is understandable that using an imaginary period of participatory democracy as a starting point would lead one to condemn public opinion polling. But what Carey misses in such an approach is the real struggles of a material democracy, already nascent in the seventeenth century when it would have been put into crisis by actually extending participation to all Americans (i.e., African Americans, women, and the un-propertied lower classes).

Peters makes a similar, but more compelling argument against the pollsters. Peters follows a host of critics of public opinion polling arguing that Gallup and his peers were
actually producing nonpublic opinion (Blumer, 1948; Habermas, 1989; Peters, 1995). For him, the polls turn the public into a mere demographic segment and/or data set such that opinion can only be generated through the ‘machinery of polling’. As such, the constitution of public space is solely in the hands of experts (Peters, 1995, p. 20). For Peters, this is compacted by the fact that people are interviewed in the privacy of their homes and anonymously, which he argues “completely fails to capture a public element” because anonymity precludes the speaker from having as much at stake in a public utterance (1995, p. 20). On this point, we must disagree on multiple accounts. First, the constitution of public space in the United States was always predicated on private space, as Peters (1995) himself demonstrates. The private ownership of the places of public meetings was what freed the speakers from the intervention of church and state, and later, when the elites transitioned to men’s clubs, it freed them from the intervention of the lower classes.

Second, Peters (1995) and Carey (1995) both stress the necessity of the public sphere being open to the stranger. Since at least Ancient Greece, the stranger has been tied to anonymity and secret identity: all strangers were to be welcomed rather than identified as friend or foe, for any stranger might be Zeus in disguise or at least bring Zeus’ fury. The logic of identification is one that is tied to power formations, to distinctions of friend and enemy, insider and outsider. As Foucault (1999d) has demonstrated, authorship understood as the identification of the writer of texts disseminated in and to the public is tied to the Church’s need to identify and punish heretics, the State’s need to identify and punish committers of treason, and only much later to Capital’s need to attribute property ownership. It is not clear that democracy is predicated upon all public statements being traceable to the
mouths that uttered them, and in fact a mix of both anonymous discourse and identified discourse might be the most realistic route to functional democratic discourse. And lastly, polling was modeled after voting, which had at the time all too recently become a private affair to curtail intimidation before or punishment after a person’s vote. Polling not only resembled voting, though; it accurately forecast voting practices, as we’ve seen. If the anonymous poll respondent has no skin in the game, then we must also reconsider the voting booth itself. Once more, none of this seems as problematic when we take Gallup at his word that polling is a supplement to, not a replacement for, voting and the formation of opinion. There is no way that we can read Gallup at his word and assume that the public’s only role was to read the polls. Gallup wanted to see new educational programs implemented, especially ones directed towards civics and that might offer the critical and analytical skills necessary to engage in public life in the Great Society – including the ability to recognize the limitations of polls and critique them.

Peters’ more compelling critique comes from his understanding of the public that resulted from the entire system of American governance after the introduction of the polls. Here the public came to participate only as a condition of action for those in power. The public had no direct agency. It participated only in the sense that it was enumerated by polling machinery. These machines flattened the public’s ‘opinions’ to produce a majority that might then be wielded as the legitimating device for policies in a system of consensus politics (Peters, 1995, pp. 21–23). Despite the pollsters’ claims that they were treating an aggregate of dispersed individuals, the published outcomes of polls were continually articulated as a symbol of the whole (Peters, 1995, p. 19). Despite their arguments that the
public was a network of individuals, pollsters’ programs used the pronoun “we” in their titles and content, expressing a univocal viewpoint distilled from the plurality of the masses, despite the fact that most of their “we”-based majority opinions expressed but a slight majority (Igo, 2007, pp. 14n0-141).

As Peters notes, “However much social scientists of public opinion have sought to banish the legacy of corporatist social thought from their methods, as soon as their findings are transferred back into political discourse, such findings cannot help but assume older meanings” (1995, p. 24). Elisabeth Noelle-Neumann has argued in her theory of the ‘spiral of silence,’ this representation of public opinion based on balloted majority influences public opinion. The fear of being out of step with the majority can be silencing. Igo explains how polling was able to produce the majority as an individuated normality with bandwidths of deviation established to either side of it that might classify each American’s position in relation to that majority opinion (2007, p. 149). It seems hard to believe that there would be no process of subjectivation corresponding to that, seeing as Gallup notes repeatedly that the subject confessing his or her secrets to the interviewer is in large part motivated by a desire to know how his or her answers compare to the neighbors’ (Gallup & Rae, 1940; Gallup, 1948). This process of situating oneself in relation to the polls was only compacted by the fact that the public had a particularly difficult time finding ways to debunk the polls (Igo, 2007, pp. 149–180).

Igo notes this same phenomenon, and argues that polls compounded the problems of democracy rather than alleviated them because the polls were deliberately modeled on its flaws (2007, pp. 138–139). For her, this is because the need to produce a majority led to the
polls being less representative, specifically for her in their exclusion of disenfranchised voters. Based on the analyses above, however, it is a reduction of the complexity of the capillaries of power in the real world to attribute this essentially and solely to the polls. We must agree with Daniel J. Robinson, a strong critic of the limitations and failures of public opinion polling, when he writes,

[T]here is nothing intrinsically wrong with or socially harmful about the use of sample surveys to solicit and measure the opinions, attitudes, or behavioural traits of citizens and consumers. The concern arises, rather, when assessing how survey practices and the subsequent use of polls measure of against polling’s purported democratizing mission. (1999, p. 9)

While Robinson considers the first decade of Gallup’s surveys to have been a failure to realize that mission, this is largely a condition of the polls mirroring the actual state of democracy and the public in America itself – a problem Gallup was in fact well aware of and concerned with.

However, outside of a capacity to condemn the polls universally as intrinsically harmful, one must turn to specifically contextualized critiques of this or that poll. This was particularly problematic because the public had a difficult time finding ways to debunk public opinion polls, even when they were actually inaccurate (Igo, 2007, p. 149). Despite problems with both inaccurate and inaccurately represented polls, the American public inevitably relented. They began to frame their words and deeds in terms of the national

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public, aligning themselves with majorities or consciously strategizing as a minority to become the majority. Local beliefs were displaced by national ones, as whole communities of people were made aware of their deviation from the statistical norm of the majority (Igo, 2007, pp. 180–185). Igo writes, “Opinion surveys were a genie out of the bottle. Having helped create the demand for instantaneous knowledge about majorities, polls had become the only means to satisfy it” (2007, p. 189). Even those that looked to criticize polling did not go so far as to argue it ought to be banned or restricted, but instead nearly always argued that pollsters needed “more respondents, more representation, more analysis to correct their instrument’s most visible flaws” (Igo, 2007, p. 190).

Igo’s goal is to understand social scientific representations such as those of the public opinion polls as indexes to political and epistemological power, rather than reflections of the body politic (2007, p. 22). As we’ve seen repeatedly, effective critique must recognize the affirmative dimensions of power. If we want to understand social scientific technologies as indexes of power/knowledge, then we need to acknowledge the presentational capacity of numerical mediation. Igo comes close, noting that “surveyors’ depictions of the population were at once the essential means by which individuals could perceive a mass society and the incontrovertible evidence for its existence” (2007, p. 6). For better clues we might look to Gallup himself, who describes polling technologies as akin to instruments like the thermometer and the seismograph. In this conception, through instrumentation vague impressions and intuitions are rendered precise against the whole background of tested knowledge implied in those images – and again, note the close similarities to Dewey’s thinking about instrumentation. It is through their being rendered precise that temperatures
and earthquakes become knowable, in terms of determining things like their places in the world, their intensity, and their causes, all of which lends itself to controlling their effects.

We must think of public opinion polling as a Latourian mediation, with 1936 marking the approximate point at which the national public was both discovered and invented, rendered available for precise knowledge, and projected backwards as having always-already existed. The feedback mechanism devised by the pollsters numerically mediated public opinion in such a way that national public opinion could be presented. And up until the twenty-first century, these sorts of feedback mechanisms based on statistical sampling to strike the appropriate balance between speed and accuracy would be a primary method for making inferences about big data in many contexts. The affirmative dimension of power here, then, is the presentation of a new entity or object for human knowledge that was immensely powerful. What numerical mediation and electric computational processing here present is an opinion totality in which all opinions upon being subjected to quantification are integrable and differentiable. This totality allows for the individuation of opinion into classes or different levels of genera. But most importantly, despite being a human science with mathematically indeterminable levels of error, it is largely reproducible. There is a correlational vector-map that can be made across the totality and all of its subdivisions, such that the same national public opinion can be found by different independent investigations, and also can be found enduring across time. This last bit is their real stroke of genius, as the feedback loop allows for the subdivisions of totality to rearrange themselves in accord with new data inputs increasingly quickly and accurately, tending towards a real-time feedback loop between computational presentation through numerical mediation and the associations...
and communications between people and things in the social world. Ever since, as William Connolly explains, “Thinking, culture, identity, and ethics are stratified processes involving relays and feedback loops between layers of being operating at different capacities and speeds” (2002, p. 141).

As Peters (2001) has described, in polls, people felt the deep loss of their individuality and communities, a movement away from, but one that also emphasized, their own finitude, and in its place they received information, valuable, yet distorted in its digitality, on a system that they could have no hope of experiencing in any other way. The acknowledgement of this presentational capacity of numerical mediation as an affirmative dimension of power is essential to locating the exact points of struggle in a network of capillary power. Critical analysis is more specific after this acknowledgement, as it allows us to see that there are two separate representational components in this feedback loop – the quantification of data and the interpretation of the statistical results. Let’s begin with the latter. This representation is necessitated by the fact that what is presented during data processing is a statistical entity or object. This statistical entity or object exists as a totalized and consistent field containing a vector map of correlations between data points, which can be used to individuate subsets of data and their correlations to one another or the totality. The problem here is that it is difficult to explain what any of this is or means outside of formal, mathematical language. All interpretations of the data that exceed the exact mathematical language are representational, and they often resort to old standards. At their sloppiest, they (re-)produce the image of the human inside the machine, but one that is digitally distorted and disturbing: they read a homunculus into the machine and decry its horrors.
As Igo notes, surveyors almost always felt compelled to offer more than simple summaries of their data, and in so doing “they encouraged new ways of seeing, perceiving, and imagining” (2007, p. 18). This to a large extent why Gallup took a page from Dewey, and advocated offering basic statistical education to the public so that they might critically analyze the numerical mediations they would encounter in their everyday lives with increasing frequency. It is also why Gallup took a page from Lippmann, and advocated for establishing an independent auditing institution that might review social statistics on the public’s behalf. This representational level entails all the traditional problems of representation that cannot be solved universally without committing to solely communicating with one another in formal mathematical languages. Barring that, there is no full escape from the public regarding the published poll results as a homunculus in the machine, and subjectivating themselves in relation to that distorted image they take for an it-self of the normal American. Injustices must be weeded out on a case-by-case basis, and a statistical education for the masses and a body of experts specifically tasked with auditing social statistics are both good starting points.

The second representational level is that of quantification. Here actual words and deeds need to become numerically mediated in order to enter the data set requisite for the presentation of the national public as a statistical entity or object. As numerical mediation determines what gets included and excluded, what is in being and what is nonbeing, it too has an element of exclusionary violence that cannot be done away with a priori. Gallup, to a remarkable extent, foresaw this when he wrote,
Whether the poll of the future is conducted by competing organizations, by the
government, or by a group of individuals as morally impeccable as Plato’s guardians,
the major problems will not arise from the pressure of “powerful interests.” They will
emerge in the day-to-day effort to refine the polling procedures and to eliminate the
detectable sources of bias. (Gallup & Rae, 1940, p. 280)

There are no grand villains to be found here. The power that operates in and through
governmentality is not only affirmative, but also banal. It is a *boring* power where atrocities
arise through the distributed effects of the systematic grammar behind data collection,
processing, storage, and transmission. In Gallup’s case, the lack of representational accuracy
in the data set was almost always the result of either unintentional bias or practical decisions
about sacrifices. Again here, public statistical knowledge and dedicated experts would both
be useful in weeding out unintentional bias, which would be welcomed by the affirmative
dimensions of power. Gallup specifically welcomes this type of criticism, noting that the
Gallup poll only emerged through such critiques and could only hope to further improve
through them as well (Gallup & Rae, 1940, p. 214). As Gallup writes, “To measure public
opinion is to imply that general trends and common tendencies can be pigeonholed. But
surveyors are continually trying to register the shades of difference between expressed
opinions” (Gallup & Rae, 1940, p. 240).

In the instances where the violence of exclusion is calculated as the sacrifice
necessary for the apparatus to function at scale, the task is trickier. There is, of course,
always the potential for revolution, however difficult, dangerous, or unlikely. There are also
cases where the exclusionary violence can be sufficiently mitigated simply by including new
data points into the numerical mediations of governmentality. Examples here include things like getting non-heterosexual life partners recognized as occupying the same genera as a spouse such that they might make medical decisions or become the legal guardian of children, or getting undocumented immigrants an inclusionary status that might allocate certain humane benefits to them or establish their identity such that they can be held accountable to the law in instances ranging from the mundane to murder. These examples extend into the domain of public opinion, as presenting the national public opinion on these issues can be a powerful tool in activism – be it conservative or liberal, Right or Left. Getting them adequately represented in the data collection process can lead to the presentation of a statistical entity that, as Igo (2007) noted, is an index of power/knowledge. Thus, for change internal to the apparatus – i.e., non-revolutionary change – one must work to rearticulate either the technological solution or the social problem of public opinion from within the ‘big data’ problematic.

Rearticulating the technological solution is a strategy that relies on making the violence as visible and impactful to the project of governmentality or the specific problem at hand, while simultaneously offering up a concrete plan for altering the technology to alleviate that violence that at the same times preserves the accuracy, speed, and cost-efficiency necessary to solve the social problem at scale. Rearticulating the social problem is a strategy that relies on mapping the play of forces constituting the ‘big data’ problematic itself, often by tracing out corollary problems and their solutions. It leverages this map to restructure the problem such that it is still posed in accord with the ‘big data’ problematic, and yet the balance of forces struck by the networked capillaries of power cordoned off in the
problem have shifted. This shift is such that the alleviation of the violence is implied by the problem into the solution in such a way that can counterbalance losses in accuracy, speed, or cost-efficiency. In reality, the distinction between these two strategies and the host of tactics each employs is non-existent. It is hard to imagine a non-revolutionary change being made at scale without both, if only because Capital has combined with the State to produce maximizations of accuracy, speed, and efficiency that deeply rationalize remaining but ongoing structural violence.
Code as a concept must also force us to think about the mundane processes of data differentiation online, specifically determining how a variable like X or Y can come to be defined, what X and Y actually mean and, most importantly, how users experience X and Y within the architecture that code creates. […]

Codes are cultural objects embedded and integrated within a social system whose logic, rules, and explicit functioning work to determine the new conditions of possibilities of user’s lives. How a variable like X comes to be defined, then, is not the result of objective fact but is rather a technologically-mediated and culturally-situated consequence of statistics and computer science.

CHAPTER 7. Graph Data and the $N$-Arization of Knowledge

To exist is to be indexed by a search engine.

Introna & Nissenbaum, 2000, p. 171

Figure 3. Knowledge Graphs for Stokely Carmichael. Screen captures from March, 2014 (Left) and September, 2015 (Right).

On May 16th, 2012, Google officially announced the launch of its Knowledge Graph. In the announcement, Google wrote that the Knowledge Graph was introduced to help users “discover new information quickly and easily” and thus satisfy “the basic human need to
learn and broaden your horizons” (Singhal, 2012). Google described the Knowledge Graph as able to understand “real-world entities and their relationships to one another,” noting that entities in the knowledge graph were no longer strings – i.e., arbitrary data values in table strings – but instead were things (Singhal, 2012). At its launch, the graph contained information on over 500 million real-world entities and over 3.5 billion facts about their relationships with one another, all extracted from public sources like Freebase, Wikipedia, and the CIA World Factbook. Further, the Knowledge Graph was able to understand which real-world objects your query pertained to – but instead of artificially, it could understand them “the way you do” – and to summarize the most important and relevant relationships that each entity had with other entities. Users could click on any of the related entities in their results and create a new graph of the entities most importantly and relevantly related to them, and thus facilitate discovery, or what is often referred to as ‘serendipitous search’. And finally, based on users’ interactions with either the Knowledge Graph itself or your normal search results, it was able to learn whether it had presented the right entity, and whether it had properly determined the importance and relevance of that entity’s relationships with other entities (Singhal, 2012).

The Knowledge Graph was implemented in accordance with one of Google’s foundational principles: “[I]nvariably, simple models and a lot of data trump more elaborate models based on less data” (Halevy, Norvig, & Pereira, 2009, p. 9). The driving idea was that the Web was a gigantic repository of knowledge reducible to expository statements of fact, and that all of this factual knowledge contained on the Web could be captured in the form of a particular $n$-ary tuple, the triple, which is essentially a subject-predicate-object statement.
This knowledge was, and still is, largely articulated in natural language. Google thus needed its system to be able to parse semantic content, extract the subjects, predicates, and objects of expository statements, and translate them into machine-readable triples for storage in its database. In order to extract this information at scale, they further had to develop machine learning techniques that began with simple models, applied them to large semantic ‘corpuses,’ automatically and iteratively complexified their models, and were eventually able to learn how to recognize and classify entities and the relations between them, as well as types of entities and types of relations between them.

This chapter argues that this process constitutes both the machinic totalization and machinic individuation of knowledge. It further argues that this process essentially constitutes a machinic rhetoric, in which increasingly autonomous machines are capable of producing their own discursive knowledge-formations, which have aesthetic, ethical, and political implications. In particular, the Knowledge Graph results in what I term the n-arization of thought, which delimits the space of invention and knowledge-production to that which can be made to fit the pattern of its data structure. Graph data is most often structured by what is termed a “triple.” A triple is a relation between two entities all stored in a database, and is most commonly understood as a subject-predicate-object statement. Here, the existence of entities and relations between them are quite literally dependent upon their indexability. The first part of this paper works to adapt rhetorical theory to the critique of new media, and, in particular, posits the existence of a machinic rhetoric. Parts two through five examine the technologies behind Google’s Knowledge graph, moving from the semantic web, to Pregel, to Information Extraction web crawlers, to Google’s TextRunner in
particular. The sixth and final part extends an initial critique of Google’s Knowledge graph and articulates some of its potential implications.

**Towards a Machinic Rhetoric**

Throughout the iterations of this chapter, I have engaged in repeated struggle with the simple question: why rhetoric? Peters has argued that mediation produces a situation in which communication is to be interpreted rather than responded to (1999, p. 150). To translate this into the language of the previous two chapters, the situation is now visual-intellectual such that communications are received by spectators, rather than social-political such that they considered a dialogue to be participated in by their receiver. While we resisted the assertion that public opinion polling was responsible in itself for producing a spectatorial public, we did so not by arguing that numerical mediation was a social-political or dialogic act. Numerical mediation, as we’ve seen, is the presentation of a statistical entity or object. This presentational process is often executed in and through electric computation, and as such is not dialogical while in process. We must remember though that polling mechanisms were to be thought of as instruments, and most often as stethoscopes that might measure the pulse of democracy.

The mediation of the stethoscope between doctor and patient is also not dialogical, but because it exists in a sociotechnical world populated by subjects and objects and the associations and communications between them, it does not preclude the doctor from utilizing other instruments or from relaying a diagnosis to the patient or his or her kin such that they might interpret the ailment, alter the patient’s everyday life, and potentially produce
a new result at the next sounding of the body. Similarly, we argued that public opinion polling must be contextualized as a single instrument in a sociotechnical world. While a given instance of it’s presentational process lends itself only to spectatorship, the representations on either end are open to intervention. First, and more simply, one can intervene in the representation of the result, as formal mathematical language must always be translated into natural or everyday discourse. Second, the underlying technical grammar of that process can be modified in the interstices between data processing operations, such that new variables are included, the weights between them altered, or axioms are rewritten, for instance. These variables, their weights, and the axioms for manipulating them are all *arguments* about the world that are necessary for numerical mediation to work. They are arguments about what gets included or excluded, is in being or nonbeing, in the apparatus. This is why Peters argues that the role of the human in mediation is at its sending and receiving ends, utilizing rhetoric to get the message across and hermeneutics to receive the message (1999, p. 151).

Put most simply, rhetorical criticism can establish the *argumentative* structure of any given statement, and thus illuminate the power of and knowledge within the numerical mediation from which that given statement arose. This is because the power/knowledge of any given discourse is itself created by and through its articulation, an idea now held by a significant number of rhetorical scholars (Bizzell, Herzberg, & Reynolds, 1991, p. 1). Rhetorical criticism has a long tradition of analyzing and classifying what Richard Lanham describes as “the patterns of speech or writing that provide patterns for thought” (2006, p. xiii). Here an articulation is always patterned, both by the selection of what is – and thus also
what is not – to be articulated and by the grammar of its particular medium and mode of expression. The pattern of this articulation subsequently provides the pattern for thought and action in relation to what was articulated, and as such, can be understood as persuading the thinker or actor to comport him or herself towards the articulated in accord with the articulation. We might thus think of a discourse as the grammar that provides patterns for articulating our thoughts and actions in a world. Such a discourse would also include articulations about articulation – or what we might term ‘meta-articulations’ – that exert a persuasive force over future articulations. These meta-articulations constitute a discourse’s grammar, and thus help delimit the range of potential articulations within that discourse, thus ensuring coherency and consistency, but at the expense of foreclosing articulations inconsistent or incoherent to the discourse. As such, the rhetorical component of these meta-articulations would be productive of an entire metaphysics: an aesthetic, an ethic, an epistemology, and an ontology. We can thus understand rhetoric to be an inventive force that is mobilized to produce, maintain, and continually update the way we think about and understand the world. In this case, rhetoric can highlight the argumentative force of n-arization, the way its foundational elements – n-ary tuples, and here, triples – make claims about the world and what we can know about it. This is the necessary basis upon which we can investigate how those claims can operate in aggregate to produce particular ontologies, schemas, epistemologies, aesthetics, and politics.

This understanding of discourse was best articulated by Michel Foucault, who writes, “Whenever we can describe, between a number of statements, such a system of dispersion, whenever, between objects, types of statement, concepts, or thematic choices, one can define
a regularity (an order, correlations, positions and functions, transformation), we will say, for the sake of convenience, that we are dealing with a discursive formation” (1972, p. 38). For Foucault, discursive formations are engendered by an ‘episteme,’ which he describes as “the strategic apparatus which permits of separating out from among all the statements which are possible those that will be acceptable within, I won’t say a scientific theory, but a field of scientificity, and, which it is possible to say are true or false” (Foucault, 1980a, p. 197). An episteme, then, is a ‘regime of truth,’ that literally determines what does and does not, what can and cannot, exist, and as such, is always also an ontology (Foucault, 2008, p. 19).

According to Gilles Deleuze, there are three ontological dimensions to Michel Foucault’s work which “are irreducible, yet constantly imply one another” (1988, p. 96). They are knowledge, power, and self. Knowledge continually produces formations that allow something new to be seen or said. Power assesses and establishes, reassesses and reestablishes, relations of force. And at the level of the self the production of new modes of subjectivation occurs (a point to which, by long detour, we will return) (Deleuze, 1988, p. 120). Rhetorical studies is well suited for analyzing these discursive formations, mapping their underlying epistemes, and critiquing their power/knowledge practices. As John Muckelbauer writes, “because of rhetoric’s traditional concern for persuasion [...] it has been intimately involved with questions of force rather than questions of signification or meaning” (Muckelbauer, 2008, p. 13).

This is a particularly useful tool for a critical code studies that, by its very object, must become speculative. The Knowledge Graph’s database and parsing API are intensely guarded secrets, only to be engaged through blackbox secretions: input data, output
information, and publications of code or module fragments scrubbed of internal modifications. Notably, these take the form of articulations and meta-articulations, precisely the objects of rhetorical criticism. Yet rhetoric’s traditional focus on spoken and written (natural human) language needs to be expanded in order to maintain its critical utility in the wake of new media like Google’s Knowledge Graph, a reimagining that many scholars have called for. Lev Manovich argues that rhetoric continually finds itself declining to the point of irrelevance in the wake of new media (2001, p. 77). While Manovich himself seems inclined to abandon rhetoric, and is often interpreted as explicitly encouraging said abandonment, he does note that any useful revitalization of rhetoric for the digital would likely “have less to do with arranging information in a particular order and more to do simply with selecting what is included and what is not included in the total corpus presented” (2001, p. 78). However, Manovich offers no such reimagining of rhetorical studies. A number of rhetorical scholars have disagreed with Manovich’s critique of rhetorical studies and/or attempted to reformulate rhetorical critique in light of the media technologies from which Manovich derives his criticism.  

In *Lingua Fracta*, Collin Gifford Brooke attempts a reimagining of the rhetorical canons for new media analysis. He writes, “with new media that traditional understanding of arrangement as sequence is more productively conceptualized as arrangement as pattern” (Brooke, 2009, p. 92). For Brooke, arrangement as pattern is the best way to articulate the interactions between discourse and space in new media, an event that occurs in the practices we employ to “make sense” of new media. This idea of pattern, which is much more flexible than that of sequence, allows for a better critical understanding of digital knowledge.

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It is common across new media scholarship to situate new media within the social need to create ever-faster and scalable technologies for navigating the exponentially increasing amount of data available to us. One of the primary ways of accommodating this need is the production of databases, which are essentially *structured collections of data* that, as Manovich explains, allow for quick access, sorting, and reorganizations at scale of a range of media types, with the capacity for multiple indexes, meta-data, and dynamic fields for the input of user-defined values (Manovich, 2001, p. 214). In contrast to the sequential logic of spoken and written language, Manovich argues that there is nothing in the logic of databases themselves that would foster the generation of a narrative (Manovich, 2001, p. 220, 228). He argues, “As a cultural form the database represents the world as a list of items, and it refuses to order this list,” and, as such, “narrative becomes just one method of accessing data among many” (Manovich, 2001, p. 225).

Reversing the previous narrative relationship of spoken and written words, databases make paradigmatic choices through the models by which they collect and store data, which are given material existence, whereas the potential syntagmatic choices by which those data may be articulated into a linear narrative is rendered virtual and held in reserve (Manovich, 2001, p. 231). Here the syntagmatic arrangement of data into human-knowable information is generated on the fly by a user-interface interaction, while the paradigmatic choices are preset to the extent that they are determined by the module that processes and stores data in the

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database initially. Thus data structures here present us with a mediated knowledge both of human experience and of complex interrelations between empirical entities that would otherwise be unknowable. This mediation is the result of any given system’s particular paradigmatic patterns of selecting, stressing, marking, effacing, and storing data, as well as the interfaces by which that data is translated into information that can be known, experienced, and interacted with by humans.\textsuperscript{108} As Victoria Vesna writes, “Data are the raw forms that are shaped and used to build architectures of knowledge” (2007a, p. xiii). I call this mediation $n$-arization, and understand its architecture of knowledge through my concept of the $n$-arization of thought. As we’ll see, here the entire systemic production of knowledge is $n$-arized in accord with the triple.

It is telling that Marius Pașca, a Senior Research Scientist in Google’s Research Group, explicitly employs terms for speech acts to describe our interactions with search algorithms and databases. Pașca understands web documents as ‘expository statements’ or ‘facts,’ search queries as ‘interrogations,’ and most importantly, relationships between entities as “‘hidden’ arguments,” with their own implicit typologies (Pașca, 2007, p. 109). It is important to note that a machine – and here I employ that term to refer to any individual piece or combination of hardware, software, or bulk synchronous processing mechanisms that span the two – understands all relationships to be facts, and all facts to be probabilistic. The triple is the basic structure by which the machine can $n$-arize these facts about entities’

\textsuperscript{108} It is important to distinguish between data, which maintains structure but in a format not suitable in itself to human knowing, requires translation via interfaces or APIs to become human-knowable information. See Paul, 2007, p. 96.
interrelations, and the ‘hidden’ arguments about the typologies of those relations. The probability of any fact’s truth, or its ‘confidence value,’ is calculated on the fly based on the particular perspective produced by the path being taken through the data. These perspectives can be produced based on a wide variety of protocols, ranging from input seeds and machine learning to pivots in relational databases to named graphs or entities in graph databases.

Thus, the machine here is no longer a true/false machine, a (0,1) machine. It employs fuzzy logic to assign confidence values between (0, ..., 1) to each relational fact based on perspective, and, upon query, for instance, the machine ranks potential answers’ suitability to the query based on these confidence values.

William Harpine has set out to bracket objectivity from rhetorical criticism, arguing that rhetoricians have long held that rhetoric establishes the probable – rather than necessary – truth of claims (Harpine, 2004, p. 347). This is precisely what such a machine does in responding to a query. When queried – especially in natural language – the machine chooses the relation that it has determined has the highest probability of matching the request, attempts to verify it, and then serves it up. In serving this particular relationship, the machine has made an argument. It argues not only that the relationship it serves up exists, but also that it is the best response to the particular query at hand. However, more interestingly, because these arguments have their own typologies, the machine has not only produced an argument about a single relationship and its query. The machine also makes an argument about all relationships, about argumentation and articulation itself: a meta-articulation. As we’ll see in the case of Google’s Knowledge Graph and in the semantic web more broadly, this is nowhere so true as in the case of extracted, iterative, and machine learned ontologies,
where – given a modest number of seed relations – the machine is able to learn how to extract patterns, construct relations between relations, typologies of relations, relations between typologies of relations, and thus finally, an ontology itself.

Here machines are iteratively learning to produce their own structured experiences of their world. The world which they have learned to experience is a ‘corpus’ of hundred of billions of Web documents. This machinic ontology already contains trillions of signs, billions of relations, and thus differentially probable facts, and tens of millions of entities that these machines have learned (in)to exist(ence). They have learned to produce their own aesthetic for signification, called a schema and identification, respectively, which employs things like values, types, and keys for nesting processes capable of producing classificatory typologies ranging from absolute specifics and human-knowable literals to the most abstract conceptual generalities. And they have learned to produce their own ethic, as their iteratively produced ontological axioms create a schematic axiology for the computation, attribution, and correlation of values. I take all of this to be evidence of the birth of a machinic rhetoric and the agency of increasingly autonomous rhetorical machines. And it is precisely their n-arized form of knowledge that is made available to us and is increasingly being positioned as the future of thought, specifically in terms of our practices of making sense of the digital.

**Typed Links, Metadata, and the Semantic Web**

As early as the first World Wide Web Conference in 1994, Tim Berners-Lee was arguing that semantics were the future of the web. In his plenary talk, Berners-Lee said, “Adding semantics to the web involves two things: allowing documents which have
information in machine-readable forms, and allowing links to be created with relationship values. Only when we have this extra level of semantics will we be able to use computer power to help us exploit the information to a greater extent than our own reading” (Berners-Lee, 1994). In a canonical article co-authored with James Hendler and Ora Lassila, Berners-Lee (2001) would go on to argue, “The Semantic Web will enable machines to comprehend semantic documents and data, not human speech and writings.” For Google Researchers, it is unfruitful to debate whether or not this vision of the semantic web meets different disciplinary interpretations of semantics. What is essential is that the semantic web operates by producing typed links and metadata (Guns, 2013, p. 2174–2175). Thus, Google’s vision of the semantic web is one in which machines learn to enumerate certain structures of the web such that they can be translated into machinic knowledge. This machinic knowledge is always an argument about what entities and relationships between them on the web are enumerable – in short, about what constitutes knowledge – and this argument is always structured by the link typology and metadata that the given machine is programmed to extract. Here the machine is enumerating an entire world – an ontology, epistemology, aesthetic, ethic, and politic – in large part by and for itself, and therefore, by and for machines in general. The feedback mechanism has in large part been exteriorized from human technicians ranging from the census’ enumerators to the pollsters’ interviewers into the computer.

The enumerative ontology it produces is a specification of what things or entities, and which relations, can exist; it is a pattern that determines what the graph database contains, what form search queries need to take in order for it to be parsed, and what the appropriate
knowledge is in relation to any particular query. And here we come full circle to our opening meditation on number, where we can see that existence, at least in terms of epistemological, if not phenomenal, availability is literally determined by enumerability. What exists for Google is strictly that which can be statistically extracted through machine learning algorithms, and that which can be abstracted from its context into the numerical form of a triple. In a state of ‘information explosion’ and constant dissemination of communications via digital media, what we are able to engage is strictly and necessarily limited to that which can be bounded and epistemologically differentiated, and it is precisely graph databases like Google’s that are at the forefront of performing that labor for us. The sheer volume of web documents on the Internet fills its channel, like an old dual tone multi frequency (DTMF) telephone whose buttons are all pressed simultaneously, and becomes sheer noise. We rely on data indexes and parsing algorithms to enumerate those documents once again for us – an impractical task for humans because of its scale – and it is only after that having occurred that we can once again engage with them on the level of human language and nomination.

At its most basic, typed links and metadata are the bedrock of n-arized thought in graph databases, and they serve as the a priori knowledge claims that found the enumerative

109 Ontology here is a rough analog to its philosophical equivalent. For computer science, as Thomas Gruber writes, “A body of formally represented knowledge is based on a conceptualization: the objects, concepts, and other entities that are presumed to exist in some area of interest and the relationships that hold them… An ontology is an explicit specification of a conceptualization… For knowledge-based systems, what ‘exists’ is exactly that which can be represented” (1993, p. 1).
form of the triple. At Google, the typology of links is the defining characteristic of the
semantic web. They describe the difference mathematically as follows: “A network can be
defined as a structure \( G = (V, E) \), consisting of a set of nodes (or vertices) \( V \) and a set of links
(or edges) \( E \subseteq V \times V \) that connect the nodes,” whereas “A semantic network [...] \( G_m = (V, E) \)
consists of a set of nodes \( V \) and a set of link sets \( E = \{E_1, \ldots, E_t\} \), where \( E_j \subseteq V \times V \) \((j=1, \ldots, t)\).

Each link set in \( E \) represents a relation of a different type or category. There are \( t \) link sets or
link types in the network” (Guns, 2013, p. 2178).\(^{110}\) Further, these edges are vectors, such
that \( \forall E = v_n (V_n, V_{n+1}) \). This is because edges represent relationships, and two interlinked
vertices might have different types of relationships with one another. The fact that edges in
the semantic web are directional creates a particular structure for all relationships. Having
roots in first-order predicate logic, this structure is essentially a subject-predicate-object
statement. The subject is the vertex from which the edge issues, the predicate is the particular
type of edge, and the object is the vertex at which the edge terminates. Take for example the
following triple: subject[Stokely Carmichael] predicate[WasBornInCity] object[Port of
Spain]. One can easily see here why an edge must be directed. If the same predicate (i.e.,
edge type) were preserved for the inverse, it would state: subject[Port of Spain]
predicate[WasBornInPlace] object[Stokely Carmichael]. This statement is nonsensical. What
it ought to state is something like: subject[Port of Spain] predicate[IsBirthPlaceOf]

\(^{110}\) N.b., for simplicity, the term vertex will be my default term for connoting node, entity, etc., and the term
edge will be my default term for connoting link, attribute, relation, etc. I will alternately employ subject,
predicate, and object when I need to preserve the directionality of an edge.
object[Stokely Carmichael].

The fundamental data structure here requires three pieces of data, two vertices and a (vector) edge, which serve as a subject-predicate-object statement. Databases store statements like these as $n$-ary tuples. In mathematics and computer science – as well as linguistics and analytic philosophy – a tuple is simply an ordered sequence or list of $n$ items, as opposed to a set, which is unordered. As the building blocks of the database, these tuples $n$-arize its knowledge production by their very form. A tuple enumerating three items is referred to as a ‘triple’. While triples may seem all too simplistic to capture the semantic activity on the Web, they actually can become quite complex in aggregate. Triples can form sets when they share common vertices, and these sets are referred to as ‘graphs’ (Halpin, 2013, pp. 59–60). In a graph, each vertex and each edge is assigned an identifier, such as a Uniform Resource Identifier (URI) or an International Resource Identifier (IRI), and it is these identifiers that actually stand in for the subject, type of predicate, and object in any given triple (W3C Working Group, 2014). The primary purpose of these identifiers is to make graphs machine-readable, and what the machine actually reads is a tuple of three of these identifiers. Thus, the most basic unit of the machinic epistemology here is essentially a constative claim, a subject-predicate-object statement. There is an implicit argument that these triples are the building blocks of all knowledge. Atop this argument, machinic rhetoric

111 As we’ll see in more detail below, predicates are systematically rendered into types based on a graph’s schema and ontology – as giving every link its own unique type and identifier would produce as much useful information as giving them none – and thus the identifier for an edge operates as a foreign key, itself linked to the edge type definition in the graph’s schema and ontology.
automatically produces billions of arguments wholes relations to one another combine. This combination produces the complex graphs that promise to produce the answers to any query.

One of the most important affordances of identifiers in graphs is the join function, which merges any two triples, or any two sets of triples, that have an identified vertex in common into a single graph. Through this join function multiple nodes can be linked by their edges forming complex paths, even isolating clusters and regions that form sub- or regional graphs. As we’ll see, this is possible because the machine automatically and iteratively produces its own ontology and schema. For now we might use our previous language and note that the machine here numerically mediates and presents a totality on its own, as the rhetorical process of data collection and input have been automated. Because this totality’s consistency is guaranteed by its numerical mediation, any constituent elements or subsets of elements that it contains can be integrated and differentiated at will. These operations allow for the performance of complex computations at an unimaginable speed and the production of knowledge that was never before available – at least in this form – to humans. In these large-scale processes of enumeration, the limits of human knowledge are transgressed and through hermeneutical processes, new things, relations, and aggregates of the two are made available for human knowing, if not sensation, by machine enumeration.

There are, however, two things that can be present in a graph without their own identifiers. The first is called a ‘literal,’ which is generally an unidentified alphanumeric string that makes more sense to humans – such as the characters in the name [Stokely Carmichael] or his date of birth [June 29, 1941] – which can only ever serve as a vertex in a triple. Literals are often marked up with a datatype to make them machine-readable, and
often serve as the more human friendly output of graphs upon being queried. The second is called a ‘blank node,’ and can serve as an intermediary between two triples, functioning at once as the object of the first triple and the subject of the second. The W3C Working Group writes, “Blank nodes are like simple variables in algebra; they represent some thing without saying what their value is” (2014). They also provide an example, reproduced in Figure 7.2.

Figure 4. W3C Working Group definition for ‘blank node’\(^{112}\)

These blank nodes drastically increase the flexibility of graphs to enumerate semantic

content in triples by producing a bridging vertex that connects two identified vertices by a two-edge path. Without literals and blank nodes, one might easily critique graph databases as being much too limited for producing elaborate statements and complex knowledge. Their reliance on reaching a critical mass of entities or relation types in order to produce genera that these singular entities and relations might be subsumed under and identified by would serve as a stumbling block to their ability to produce new knowledge. However, here we can see that when an unknown entity or relation impinges on the machine’s epistemic production, it can enumerate that entity or relation by bracketing the nomination of its identity, allowing it to serve, however temporarily, as a known unknown, or a not-yet-known. It is in this way that the machinic epistemology is dynamized and is afforded the capacity to continually expand the frontiers of its epistemology into the unknown as not-yet-known, which, as I’ll return to later on, is done with a peculiar and unsettling violence.

Semantic web metadata is precisely this assignation of identifiers to graphed vertices and edges. Jane Greenberg describes metadata as “structured data about an object that supports functions associated with the designated [vertex]” (2003, p. 1884). These functions can be radically diverse and specific to the life of whatever vertex they designate.\textsuperscript{113} As Miguel-Angel Sicilia notes, “Structure in metadata entails that information is organised systematically, and this is nowadays primarily achieved by the use of metadata schemas” (2014, p. 4). The systematicity behind structured metadata is produced and ensured by

\begin{footnotesize}\textsuperscript{113} Things like use, search, discovery, surfacing relations between disconnected vertices – as with blank nodes – or implicit relations, authentication, and administration are some of the more common functions of objects that metadata support.\end{footnotesize}
schemas and ontologies, which themselves are nothing but more metadata in the form of
metamodels or meta-metadata, if you will.

A schema is what is used to write an ontology, and an ontology is what recursively
gives meaning to the schema that was used to write it. In the case of the semantic Web, a
schema is what ensures consistency in the form of representation. For example, in the case of
a single edge type, a schema ensures that its identifiers across all its instances in a graph are
uniform. An ontology, on the other hand, is what determines what can and is to be
represented, by which identifiers, what it means to be that particular represented thing or that
particular identifier, and how these identifiers can be used, and specifically combined. It
transforms formal consistency into conceptual consistency (Sicilia, 2014, p. 4). In the
previous example, an ontology is what determines which relationships constitute edges,
which edges ought to receive that uniform identifier, what it means to be an edge of that type,
and what vertices and paths that edge can interact with.\(^{114}\)

Thomas Gruber writes, “A body of formally represented knowledge is based on a
conceptualization: the objects, concepts, and other entities that are presumed to exist in some
area of interest and the relationships that hold them… An ontology is an explicit specification
of a conceptualization…. For knowledge-based systems, what ‘exists’ is exactly that which
can be represented” (1993, p. 199). In the case of database query, an ontology is the pattern
that determines which answers are presented, and to which a query must conform in order to

\(^{114}\) Ontologies draw on and appropriate from the world outside themselves to achieve this. Narrower ontologies
can be fully written by human coders. More robust and complex ontologies can be produced iteratively from an
initial set of human composed seeds, a machine learning algorithm, and verification procedures along the way.
elicit those answers. In order to function coherently and consistently, the entire system must either commit to a singular ontology, including its meta-arguments about what types of objects exist and how they can be related, or an intermediating system must be developed that can translate metadata between ontologies, this latter option being less desirable in its potential introduction of latency and/or error. However, commitment to a single ontology does not necessitate a data closure or completeness (Gruber, 1993, pp. 199–204). This is primarily for two reasons that will be demonstrated in the next two sections. First, implicit data can always be parsed and reorganized into new information, and graph databases are particularly good at this. Google’s graph database uses a variety of functions to query its data, modify, add or delete vertices and edges, locate paths through and regions of its graph, aggregate specific vertices and edges to collectively perform operations, and to mutate its graph topology to accommodate a desired perspective. These are the capacities of integration and differentiation we referred to earlier. Second, an ontology can be produced, maintained, and updated iteratively via machine learning techniques. Here you might think of an ontology as a ‘living document,’ whose vocabulary and schema can be continually reinterpreted, remodeled, expanded, etc. Google has developed a series of sophisticated Web crawlers to perform automated Information Extraction (IE), included in which are Named-Entity Recognition (NER) and Relation Extraction (RE). These algorithms are capable of maintaining an iterative database, schema, and ontology by continually crawling the Web and enumerating new entities and new types of relations between entities, as well as new abstracted typologies of entities and relations between them. This is the machinic rhetoric we’ve spoken of that automates the process of quantification that necessarily precedes the
numerical mediation of data processing through the graph.

Here we can see that the machinic epistemology is no longer quite so simple as assembling a gigantic index of singular facts that can be supplied when specifically queried. The centerpiece of a machinic epistemology is not the literals that are related, but instead is the genera that it is able to iteratively learn and extract – or, in our previous language, individuate – into an epistemic schema and ontology. The machine here produces an entire taxonomy, a *classificatory graph* differentiated by identifiers of entity and relationship types. It is important to note here that all of this is afforded only atop the statistical analysis of triples at Web scale, and thus the entire schema and ontology are *n* -arized in accordance with that form. What the graph gains by this practice is the possibility for analogical knowledge, whereby genera are leveraged to calculate similarities between any singular entities or relations. What it loses in exchange is knowledge of the singularity of each entity and relation in its absolute specificity. And further, each detected entity and relation between entities must either be classified according to the machine’s schema and ontology, or bracketed until such a time when the machine learns a new classification for the bracketed entity or relation and adjusts its schema and ontology such that it can extract and appropriate knowledge from the not-yet-known.

**Pregel, a Graph Database at Web Scale**

While Google has not yet confirmed public speculation, it is largely assumed that its
Knowledge Graph is powered by Pregel, Google’s graph database. Pregel is named after the river in the historical mathematical problem ‘The Seven Bridges of Königsberg,’ whose solution by Leonhard Euler led to the foundations of graph theory. As Google has publicly acknowledged, Pregel was inspired by Leslie Valiant’s proposal for a Bulk Synchronous Parallel (BSP) Model for abstract computation across distributed, and often heterogeneous, hardware (Czajkowski, 2009). In his proposal for the BSP model, Valiant described it as a “unifying bridging model for parallel computation,” existing as something between hardware and software, both connecting and insulating them, that allowed high-level programs’ processing tasks to occur simultaneously across distributed machines (1990, p. 104). The BSP Model consists of three primary attributes. First, a distributed set of components that engage in processing and/or memory functions. Second, a router whose sole function is to communicate messages between component pairs, and thus implements “storage access between distinct components” (Valiant, 1990, p. 105). And third, a synchronization mechanism that determines progression between ‘supersteps’. Valiant writes, “In each superstep, each component is allocated a task consisting of some combination of local computation steps, message transmissions and (implicitly) message arrivals from other components” (1990, p. 105). For Valiant, this synchronization mechanism is a user input periodicity of $L$ time units. After each period of $L$ elapses, the BSP computer checks if the superstep is completed, and either proceeds to the next superstep or initiates a new period in

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N.b., It is still unclear whether Pregel’s database maintains all of its own records internally and perpetually, or whether it uses foreign keys, or something akin to them, to call up its vertex and edge values from one of its pseudo-RDBMS’s, like BigTable or Spanner.
which to complete the superstep in process. Interestingly, Valiant also notes that an alternative synchronization mechanism could continuously check whether all the components had completed the superstep, and initiate the proceeding superstep when they had, which is exactly how Pregel was designed (1990, p. 105).

Pregel refers to Valiant’s ‘components’ as ‘vertices,’ and sometimes refers to ‘supersteps’ as ‘iterations’. As Pregel is a graph database, these vertices are connected by edges, along which messages can be routed. Google Researchers write, “Programs [in Pregel] are expressed as a sequence of iterations, in each of which a vertex can receive messages sent in the previous iteration, send messages to other vertices [which will be received in the proceeding iteration], and modify its own state and that of its outgoing edges or mutate graph topology” (Malewicz et al., 2010, p. 135). At each superstep in a Pregel algorithm, each vertex can vote to halt, and the algorithm proceeds to the next superstep when every vertex has done so. The algorithm will not reactivate halted vertices unless they receive an incoming message from the previous superstep. If there are no messages, and thus all vertices are halted without possibility of reactivation, the algorithm is completed. Figure 7.3, below, is an instructive example:
Figure 5. Google’s visualization of a maximum value algorithm. Malewicz et al., 2010, p. 136.

Here each circle is a vertex containing a numerical value, and shaded vertices have voted to halt. Solid vectors are edges, and dotted vectors are messages sent along edges to be received at the next superstep. In this particular algorithm, at Superstep 0 each vertex sends its value along its outgoing edges. At each subsequent Superstep, each vertex receives any incoming messages. If the value each vertex receives is lower than its own, it halts. If it is higher than its own, it changes to that value, sends its new value as a message along all of its outgoing
edges, and then halts. Halted vertices are reactivated upon receiving a message, but again, only send out messages upon receiving a value higher than their own. At Superstep 3 all vertices have halted without sending any new messages, and thus the algorithm is completed.

Pregel is a giant graph of these vertices, edges, and messages being sent between supersteps that can accept user input commands from a C++ implemented API. By 2010, it was already capable of graphing relationships between more than a billion vertices (Malewicz et al., 2010, p. 143). This allows Google to, for instance, present you with a famous actor’s most important relationships, such as biographical information (e.g., place and date of birth, education, parents, spouse, children, etc.) and films the actor is associated with. These filmic associations could be determined either by direct relationships (a single edge, connoting things like ‘Starred In,’ ‘Co-Starred In,’ ‘Appeared In,’ etc.) or, less likely, by indirect relationships (paths between actors and films that consist of a specified number of edges). Further, it can perform operations on this subsection of the graph, which in this simple example might be things like calculating the number of films the actor has starred in. The most fundamental aspect of this example though is that Pregel is able to determine that a particular thing is an actor, and thus that these types of relationships constitute the most important information to present.

What is most important in the case of Pregel is that, while the natural language terminology for the entities and relations remains stored in the database as literals, their surrounding context is discarded. The operations on the graph database occur outside of reference even to these literals, let alone their original context. As such, any new knowledge

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116 As it turns out, Pregel is great at calculating things like Erdős numbers or ‘degrees of Kevin Bacon’.
that is produced by manipulating the graph database is always-already limited by the particular constraints of its data structure (here vertex-edge type-vertex triples), and its schema and ontology (e.g., its taxonomy of genera). The critique of any such graph database thus always requires a critique of its inputs in addition to its outputs. However, before moving on to an examination of the preparation of data for Pregel input below, it ought to be pointed out that the limitations in terms of Pregel’s outputs specifically is near impossible to rigorously articulate, even speculatively. This is because, while one can read about the functions and operations that can be performed atop the Pregel database via extensions, there is no open sourced alternative NoSQL graph database that operates at Pregel’s scale, or that offers similar C++ implemented extensions instead of using SPARQL command prompts.

**Information Extraction on the Web**

In order to accurately determine what a particular thing is, what aspects of it are important, and thus which relationships to present, Pregel requires both a huge data set and a sophisticated query mechanism. While graph databases can operate accurately at small scales with very slim and well-defined schemas and ontologies, Pregel is designed for gigantic graphs of heterogeneous relations that constantly expand. To function accurately at that scale, Google needed to build a gigantic Pregel data set of vertices and edges. To do so, they developed a number of other applications that would allow them to crawl the Web and extract structured information that could be translated into vertices and edges. This required a series of experiments with machine learning and verification procedures to produce accurate, structured data ready for importation. And further, because the data set was meant to be
heterogeneous, Google needed to extend this machine learning to the production of an iterative schema and ontology.

Since its inception, Google has worked to develop an automatic enumeration system. They articulate this goal as developing technologies for machine learned ‘Information Extraction’ (IE) techniques that can be applied to unstructured Web documents. Even before the publication of the PageRank algorithm, Google cofounder Sergey Brin was working on the unsupervised extraction of binary relations (Brin, 1998). Google understands the Web as a gigantic collection of textual documents, and argues “the human knowledge encoded within the documents can be seen as a hidden, implicit Web of classes of objects (e.g., named entities), interconnected by relations applying to those objects (e.g., facts)” (Paşca, 2007, p. 101). For more than a decade, Google has been intensively researching methods for IE, first by ‘Named Entity Recognition’ (NER) and its capacity for classifying objects, and second by ‘Relation Extraction’ (RE) and its capacity for discovering and proliferating connections between those objects. Their immediate concern is improving Web search, but, as they argue, this process of IE “also fits into the far-reaching goal of automatically constructing knowledge bases from unstructured text” (Paşca, 2007, p. 101). As we’ve seen, for Google the Web is a gigantic repository of expository statements about the world that users wish to interrogate, and it is their goal to have machines build their own n-arized graphs of that world in order to numerically mediate new totalities and/or individuated subsets.

However, there is a price that any information extraction algorithm must pay in order to produce data sets given to complex natural language queries. The goal is to produce a data set that can respond to queries analogically, such that users don’t need to already know the
specific answer that they are seeking in order to input their query. Instead, the database needs to simulate serendipitous discovery, which means comparing possible answers and determining which ones are similar enough to the structure of the question and its implied answer. This detection of similarity is achieved by \(n\)-arization, the machinic construction of vast schemas and ontologies for the generalization of entities and relations into conceptual taxonomies, and the establishment of probabilistic analogies between different genera in that taxonomy. While this process affords great flexibility to query and renders statistical analogies that otherwise might be unavailable to human knowledge, it also necessitates a flattening of entities and relations in their singularity and absolute specificity that becomes most apparent at the level of generic triples. The individuality of a person’s birth into a particular place and world is flattened into the generic triple of [Person][WasBornIn][Place], despite the absolute singularity of a person’s being born in a particular place and world. A graph database attempts to account for this loss within an \(n\)-ary stream of thought by supplementing the triple with yet more triples, by forming paths, regions, and entire graphs. It attempts to flesh out and perfect its representation of a real life by connecting all sorts of other constative claims, like where that person went to school, what texts they may have produced, who their family members and friends might have been, ad inf. Yet, the individuality of a life is not reducible to the constellation of facts, or as rhetorical scholars might term it, the situation, from which it emerged.

Almost immediately after its proposal, (Riloff & Jones, 1999) the use of machine learning for IE was applied to constructing machine-readable semantic lexicons (Thelen & Riloff, 2002), NER (Collins & Singer, 1999), binary relation extraction (Agichtein &
Gravano, 2000; Brin, 1998), and mobilizing that data for Question Answering based query
The biggest limitations of these experiments were their reliance on ‘clean text collections’ –
and especially news corpora – rather than ‘noisy Web documents,’ their expense, and their
closed, and thus limited, schemas and ontologies to which data were made to fit or
disregarded (Pasça et al., 2006, p. 1401). For Google, the massive amounts of errors and
non-standard language usages on the Web capture divergent aspects of human behavior that
are not only important for capturing the diverse knowledge contained in the Web, but also for
more practical purposes, such as providing accurate search results to queries containing
errors and non-standard language usage. Google’s solution: big data. Google Researchers
write, “[A]ll the experimental evidence from the last decade suggests that throwing away rare
events is almost always a bad idea, because much Web data consists of individually rare but
collectively frequent events” (Halevy, Norvig & Pereira, 2009, p. 9). Once your corpora
enters a scale of billions of examples, you obtain an approximate set of all human distinctions
between entities without need to start from generative rules (Halevy, Norvig & Pereira, 2009,
p. 9). For Google, the limitations of n-arization always disappear at greater scales, and thus
the solution for any quirk in the graph is always more data. As we’ve repeatedly seen, this is
the tenet of governmentality and the ‘big data’ problematic that most frequently manifests
itself. The limits of numerical mediation are to be met with more numerical mediation, made
possible by the development of computational technologies for data collection, processing,

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117 For examples of studies limited by ‘clean text collections’ like news corpora, see Agichtein & Gravano,
storage, and transmission.

Here Google Research follows a trend in IE called ‘Statistical Relational Learning’ that leverages large corpora for statistical machine learning of patterns and construction of models, the outcome of which is the ability to probabilistically represent relations between entities – even so-called ‘deep’ relations – based on first-order predicate logic (Halevy, Norvig & Pereira, 2009, p. 9). In “The Unreasonable Effectiveness of Data,” Google Researchers argue that the “first lesson of Web-scale learning is to use available large-scale data rather than hoping for annotated data that isn’t available,” and close with a call to action: “So, follow the data… [G]o gather some data, and see what it can do” (Halevy, Norvig & Pereira, 2009, p. 9, 12). This is precisely the path that Google has taken. Google employs machine learning and Web crawlers for performing NER and RE on unstructured Web documents (TextRunner), formatted tables (WebTables), query logs, and the deep Web, continually modified, verified, and shored up by Click Through Rate (CTR) tracking on all of their search traffic. While each of these crawlers is programmed differently, they basically perform the same function on different sets of data that is either unstructured or not structured in accordance with Pregel’s schema and ontology. This function is the extraction

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118 For more on this trend, see Getoor & Taskar, 2007; Schoenmackers, Etzioni & Weld, 2008; Taskar et al., 2004.

119 For more on Google’s attempts to perform NER and RE on formatted web tables see Cafarella et al., 2008; Cafarella, Madhaven & Halevy, 2009. On Google’s attempts to perform NER and RE on query logs, see Paşca, 2007. And lastly, for more on Google’s attempts to perform NER and RE on the deep Web, see Cafarella, Madhaven & Halevy, 2009.
of triples suitable for input as Pregel vertices and edges. As such, I examine TextRunner as a representative example.

However, before moving on it is worth pointing out that while statistical relational learning is certainly a promising form of machine learning and epistemic production at web-scale, there is again a necessary loss implied by \( n \)-arization that offsets this promise. No matter how complex the machinic structure becomes, if it is laid atop the foundation of statistical relational learning through \( n \)-ary tuples, this loss is not ever fully recoupable. The loss I am referring to is again the absolute specificity of a singular entity or a singular relation between entities. Statistical relational learning is predicated on the production of taxonomies of genera for entities and relations. While machine learning allows for the introduction of new genera to the schema and ontology, this introduction only occurs once the machine has reached a critical mass of mined entities and relations that match the new genera. These limits vary by machine, but by definition, taxonomical generalization never maintains a one-to-one correspondence between singular entities/relations and their genera. Despite Google’s drive to surpass the limits of \( n \)-arization by ever-increasing amounts of data, like the maps of Jorge Luis Borges or Lewis Carroll, the endpoint of that (impossible) trajectory is a graph that is simply the world-in-itself.

At this point for the graph, the life of a person is not even a constellation of facts, but instead is a (probabilistic) constellation of genera, itself relative (probabilistically) to the type of entity that person is identified as (e.g., the life of an actor will be understood as being constituted by a different constellation of genera than that of a political activist). Thus, the machine is making an argument not only about what sorts of facts are knowable and
important, but also about what constellation of genera constitutes the identity of a particular entity. In short, the machine is determining which types of relations are important in regards to certain types of entities, and in so doing, setting up an entire $n$-ary representational logic for analogical thought. It is as if the machine here is engaging in the millennia old task of producing, updating, and maintaining Aristotelian distinctions between things by way of species and genera automatically, at a frenetic pace, and with all empirical things, be they material or immaterial, in its purview. Through this process of machinic enumeration, the machine itself draws the line for us between the effable and the ineffable, between the known, the unknown, and the unknowable.

**TextRunner and Unstructured Web Documents**

Despite the frustrating lack of access to accurate materials on the actual graph operations being processed behind the Knowledge Graph, a clearer picture of the functioning of $n$-arization can be had by examining the inputs to the graph. By way of a detour through the history of Google’s research into TextRunner, we can see the foundation of the $n$-arization of knowledge, the formation of the basic building blocks of the graph – triples – that necessarily delimit the entire field of the knowledge *a priori* for the blackboxed, though presumably very advanced, graph functions and operations being processed in Pregel. As we’ll see, the experiments begin with an assumption that knowledge is distributed on the Web in the form of metadata and typed links that can be formalized as triples. Rapid success was quickly achieved by $n$-arizing language itself to facilitate the extraction of vertices and edges from Web documents containing natural language. But the call for speed and accuracy,
and thus for smaller storage spaces and faster parsing algorithms, quickly lead to a shedding of all contextualization and specificity, even of the individual facts themselves.

In 2006 Google Researchers entered a set of 10 randomized seed facts, \( n \)-arized into triples of the type Person-BornIn-Year, into a machine-learning algorithm set to crawl 100 million Web documents, and was able to grow them into 1 million facts of the same type.\(^{120}\) The algorithm was set to learn sentence level basic contextual extraction patterns, which in essence are triples that allow for NER. These pattern triples come in the form of (Prefix, Infix, Postfix), which are each a sequence of a fixed number of terms that surround the subject and object of an expository statement. In English sentences, the prefix almost always comes just before the subject, and the postfix just after the object.\(^{121}\) Take, for example, the sentence “The famous Civil Rights Activist Stokely Carmichael was born in 1941, in Port of Spain, Trinidad and Tobago.” This sentence produces the prefix \{…Civil Rights Activist\}, the infix \{…was born in\}, and the postfix \{in Port of Spain…\}, which isolate the subject

\(^{120}\) N.b., The starting documents were in English, cleaned of HTML, tokenized, split into sentences, and were part-of-speech tagged using the TnT tagger. See Pašca et al., 2006, p. 1402.

\(^{121}\) It is important to note that Google’s extraction method is specifically designed for languages that read from left to right and in which subjects precede their objects. As Google Researcher Andrew Hogue notes, Google has trouble with “Yoda speak,” where objects precede subjects. It is unclear at this point if and how Google modifies TextRunner to perform information extraction on languages that differ from this standard. An alternative may be attaching entity names from other languages to their English synrings and identifiers, and thus providing search results based upon data extracted from English language web documents. As the Knowledge Graph was recently implemented for Japanese Google users, it would be useful to extend this line of inquiry to the Japanese language Knowledge Graph. See Hogue, 2011.
{Stokely Carmichael} and the object {1941}.

In the first part of the process, the documents were crawled in parallel, sentence by sentence, for sentences that contained both entities from any of the 10 seed facts. The algorithm then took the (Prefix, Infix, Postfix) triple from any of the sentences that it had located, which constituted the specific patterns in which the seed facts had occurred, and aggregated prefixes, infixes, and postfixes into broader classes based on their distributional similarity. 122 Once distributionally similar prefixes, infixes, and postfixes had been grouped into classes, the algorithm yielded a smaller set of general pattern triples – i.e., (PrefixClass, InfixClass, PostfixClass). There were obviously fewer general patterns than basic patterns, but their coverage of sentences containing the targeted relation between entities was significantly increased. In the second part of this process, these general pattern triples were matched to sentences to extract new candidate facts – i.e., people and their birth years not included in the seed facts. In the third part of this process, candidate facts were validated based on statistical scores produced by their word-to-word similarity to candidate facts, the similarity of the infixes of the sentences from which they were extracted, and the probability that both entities in a candidate fact were complete (e.g., Stokely or S. Carmichael vs. Stokely Carmichael), all three of which were calculated via distributional similarity. Those candidate entities that met a certain score threshold were then retained. This entire three-part process is referred to as an ‘acquisition iteration’. In this experiment, Google was able to produce its 1 million facts over a series of only two acquisition iterations, and found their results to have

122 N.b., This is a somewhat expedient explanation, as the extraction of (Prefix, Infix, Postfix) triples from sentences containing seed facts makes use of a modified trie designed by Google Researchers.
an 88.38% precision rate. At the time of the study, this extracted fact set was several orders of magnitude larger than any other extracted fact set in history (Paşca et al., 2006).

As you can see, this revolutionary IE process rested on Google’s capacity to calculate distributional similarities at almost every step. At the time of the study, Google had already spent three years indexing the distributional similarity of words occurring in a corpus of approximately 50 million news articles (Paşca et al., 2006, p. 1401). A database of distributional similarities of words is an $n$-arization of language, and serves as the foundation of the statistical language models leveraged for large scale IE processes. Such a database is produced through what is called ‘$n$-gram analysis’ performed on large data sets. An $n$-gram is a sequence of $n$ successive grams, where each gram is one instance of the linguistic unit being analyzed and $n$ is the number of units included in the sequence. Single gram sequences are referred to as ‘unigrams,’ followed by ‘bigrams,’ ‘trigrams,’ ‘four-grams,’ ‘five-grams,’ and so on. In this case, $n$-gram analysis is a calculation of the probability that particular words will occur in a particular order – here you might think of $n$-grams as phrases. In the same year that Google Researchers published the experiment outlined above, Google made public a database of a trillion words and $n$-gram analyses of the frequencies of all sequences of these trillion words up to five words in length (Halevy, Norvig & Pereira, 2009, p. 8). What this meant was that given any sequence’s first word, Google could calculate the most likely second, third, fourth, and fifth words of that sequence, with decreasing accuracy. And further, the more words of a given five-gram sequence that were given, the more accurately

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123 These databases are also essential for speech recognition and algorithms that translate phrases between languages. See Halevy, Norvig & Pereira, 2009.
Google could calculate the following word. An expedient example of an application of n-gram analyses is the increasing accuracy of Google’s top 10 autocomplete suggestions for your search query as you type each word of your query.

This example is expedient because it overlooks some of the more impressive pieces of information contained in n-gram frequencies. For any sequence of words greater than five, the frequencies of potential unigrams, bigrams, trigrams, four-grams, and five-grams can be used to calculate the probable shifts between n-grams in the sequence. For example, given five words, if there is a high frequency of co-occurrence between the first three words and the last two words, but the fourth word rather infrequently follows the third word, it will be more likely that those five words are a trigram followed by a bigram, rather than a five-gram. In essence, this allows parts of speech to be separated. But further, statistical analysis of how often and in what order n-grams occur together in a sentence produces much more robust applications. In essence, this second level of analysis allows the determination of ‘semantic similarity’ between n-grams – be they single words or phrases – which includes synonymy, meronymy, hyponymy, antonymy, as well as words or phrases that are simply related to one another (Bollegala, Matsuo & Ishizuka, 2007). This determination of semantic similarity allows n-grams to be classified into types, which can then be rather easily affiliated with things like parts of speech to extract (Prefix, Infix, Postfix), and thus (Subject, Predicate, Object) triples.

Once this level of statistical data has been achieved, distributional analysis becomes so powerful that named entities can be continually identified without need of prefixes and postfixes. Here distributional similarity can be measured accurately enough to identify an
entity by its internal distribution and its border with its infix alone. Eliminating prefix and postfix patterns improves recall, and can be shored up by a variety of verification mechanisms (Paşca et al., 2006, p. 1401). These mechanisms include things like the validation procedure described above, which can compare candidates to one another, to a seed, and to a type, correlating extracted candidates to datasets extracted from other sources on the Web, and tracking search users’ interactions with structured data presented as answers to their queries. The end result of this system is TextRunner, which crawls the Web, performs IE in batch mode to generate an iterative schema and ontology and a detailed index for future queries (Cafarella, Madhavan & Halevy, 2009, p. 56). Notably, entities and relations that do not meet established validation standards are discarded, and thus do not contribute to the iterative development of the schema and ontology, nor do they appear in the index.

With TextRunner, we can again see that the constraints of storage space and parsing speed lead to the discarding of the context in which the extracted information originally occurred. While the same critiques outlined above certainly continue to apply here, we find a new problem here in statistical relational learning, which only admits new entities and relation types when they occur in a frequent and distributed enough fashion to meet its given learning threshold. This problem is twofold: (1) the extracted information will be the norms of the most frequent and distributed content producers on the Web, which leads to all sorts of implicit imbalances in terms of socio-economic class, nationality, ethnicity, race, gender, etc., and (2) the extracted information will be that which is stable enough to be recognized as ‘truth,’ and thus more singular instances of poetic language use will either be passed over, discarded, and excluded from machine learning and machinic epistemologies, or they will be
flattened into their most analogically similar genera and forfeit their poetic force. What cannot be $n$-arized cannot be thought: it is nonsense. The protocols for machine learning and extraction always function by way of selection, and thus by both inclusion and exclusion, remembering and forgetting, storing and discarding, as well as arrangement, a process which inflects all of the information it extracts. Extraction is always a reduction and an abstraction that, while functional, demands continuous and constant critical awareness of its stakes and implications.

**The N-Arization of Knowledge**

A number of rhetorical scholars have argued that the self is not a transhistorical phenomenon with some sort of universal or transcendental substance. Instead, the self is concretely historical, situated, and constituted or brought into being by rhetorical invention (Biesecker, 1989; Charland, 1987; Greene, 1998; Miller & Shepherd, 2004). The self and its knowledge of the world are both inflected by the particular pattern through which they were constituted, stabilized, and maintained. For Ronald Greene, “The critic locates his/her ethical-political judgment in how a constitutive outside (or other) becomes the source of possibility for the stabilization of a subject” (1998, para. 19) Here the post-structural critical project is an illumination of these patterns, a Nietzschean reminder that truth is a poetic and rhetorical construct that has forgotten itself, which might set the self free to determine its own constitutions, stabilizations, maintenance, and iterative modifications. But even more so, it is this freeing up of *collective* selves, to make these determinations in common. It is a demonstration to any group of selves who are in a world together that they might constitute,
stabilize, maintain, and iteratively update their common world. What is at stake here is the very futurity, and through it, the agency in the present moment, of any given me, we, or world.

As we’ve seen in Part 1, rhetorical criticism helps highlight the $n$-arization of knowledge at work in Google’s Knowledge Graph. In Part 2 we saw that the machinic $n$-arization of thought in the Knowledge Graph took the form of Google’s only holy trinity, the triple. Google understands the world as a vast sea of expository utterances to be enumerated for machinic knowledge. It understands knowledge to be a triadic movement between vertices, and thus thought is this forging of paths between discrete points. As we saw in Part 3, these paths can produce sequences, outline regions, and navigate between abstract generality and absolute specificity, even human-knowable literals. They can be traversed by messages or architecturally maintained as edges. What this means in terms of an inter-machinic metaphysics is outside the purview of this chapter, and perhaps impossible to know barring public access to Google’s proprietary algorithms and server farms. As we saw in Part 4, what we do have some access to is the inputs and outputs to Pregel, the graph database (likely) powering the Knowledge Graph. These outputs are the automatically populated content boxes that sometimes appear alongside users’ search results. The inputs are the result of IE techniques that Google has been honing for nearly two decades, all in accord with the company credo of simple models and billions of data. Google maintains this stance despite the limitations of TextRunner, as we saw in Part 5, which $n$-arized a corpus of trillions of words in order to facilitate the abstraction of things and relations between them into vertices and generic edges between them for inputs to the Knowledge Graph. What this means for
humans, then, is that all human-knowable information derived from the graph is nothing but strings of \( n \)-ary tuples abstracted from their context and specificity, nothing but paths, paths, paths.

Provided that it is understood as a way of thinking and understanding open to collective and continued influence, rather than solidified into a regime of truth, a graph database like the Knowledge Graph is an extremely impressive experiment in numerical mediation and the automation of rhetoric. These contributions range from the concrete demonstration that machines can perform rhetorical acts to the ease with which anyone can draw on a large collective’s triadic knowledge formations quickly, mobilely, and accurately. It certainly does achieve what it purports to, at least to the best of its current ability, which is the facilitation of (limited) discovery. It allows users to make simple graph queries in natural language – which is no small feat if given the complexity of coding SPARQL queries – that can mutate graph topologies, and present them with a perspective of the graph, a carousel for interfacing with the probabilistically related items from that perspective. The user can move from vertex to vertex, mutating graph topology on the fly with a single click, discovering entities that are sequentially related, but may be collectively disparate. In so doing, users can start from any vertex of the graph and create paths of relation that highlight sequences, outline regions, or move vertically between abstraction and specificity.

There are numerous potential criticisms, many of which are of utmost importance, but at the same time, not criticisms per se of the immanent logic of the machinic rhetoric itself. I see two primary dangers that are internal to graphical knowledge production itself. The first, and perhaps more obvious, is the danger of the resultant knowledge being taken as universal
truth, and its rhetorical production as the universal standard. There is a danger in that shift from producing one way of knowing to producing the one way of knowing. Google publicizes the graph as an exercise in discovery, or what is often termed ‘serendipitous search.’ It is meant to be a journey into the unknown. But that journey is n-arized into a staggered, sequential, triadic path, moving in fits and starts, and at each resting vertex along the path, the next steps open for the journey are those probabilistically determined to be most suitable. While it would be useful to empirically examine the number of vertices an average Knowledge Graph user moves through and the graphical and/or relational distance and displacement they achieve, it should be expected that the ‘unknown’ that user discovers would be rather ordinary and easily appropriated, not so far off his or her beaten path, so to speak. If n-arized knowledge is one knowledge among many, then this constitutes a relatively small problem, as in that case it would be a rhetorical multiplication of ways to know and knowledge itself. Rhetorical criticism demonstrates that it is inherent to its protocol – its process of selecting, marking, arranging, storing, discarding, etc. – that this knowledge will always be perspectival, reductive in its generalizations, a failed representation that loses the specificity of singularity in its movement towards analogy. The limitations of n-arization are the price of admission for graph knowledge, but, while they might be unavoidable in general, they can be accounted and adjusted for on an ad hoc or case-by-case basis. However, if this becomes the mode of knowing and discovering, that false universalism will inhibit the ongoing struggle to rectify the inevitable incidents of violence that will result from the necessary process of exclusion intrinsic to numerical mediation via n-arization. And further, in this instance, it is likely that our n-arized journeys will be confined to relatively small
regions with only minor discoveries of rather easily appropriated unknowns.

It is likely the case that the Knowledge Graph and its successors become powerful enough to make a bid at becoming the one way of knowing. Google continually dominates global Web traffic, navigating knowledge on behalf of a large portion of the world, and reaping huge financial benefits as well. With Google’s resources, there is little doubt that the Knowledge Graph project will continue to be developed and more deeply embedded into everyday life, to the point that, at least for some, it will be their episteme. Yet, Google Researchers are well aware of the Knowledge Graph’s current limitations, which are, precisely, the absolute specificity of a singular thing. As we’ve seen, a number of Google Researchers passionately believe that simple models for statistical analysis at Web scale (or larger) are the way to examine the unique, the aberrant, and the unclassified, because at such scales there is the largest possibility of subduing them to a quantitative logic by way of n-arization. But this is an indefinite – if not infinite – task of adjusting strings to better match things, and often gets articulated as a reinvigoration of the millennia old impulse to pursue perfect simulacra. Again, we find a homunculus in the machine by convincing ourselves of the potential equivalence of strings and things, of the human and the machine. And it is precisely the belief in this equivalence that forecloses the inventive force of graphical knowledge being one new way of knowing among many others, a way of exploring the differentiations across human and machinic worldings.

While here we have focused on the rhetorical aspects of automated data collection and input, there is the corollary problem of hermeneutics. It is inevitable that the presentation of a statistical entity or object by the machine will be anthropomorphized, but we must
develop ways to facilitate an *ad hoc* or case-by-case hermeneutical corrective. A first step we have taken here is to redefine the process. Whereas before it was taken as a single representation of the real world, we can now see that there are two phases of representation separated by a phase of presentation. The apparatus begins with the (rhetorical) representation of the world during data collection and input through quantification methods. It proceeds to numerical mediation – assisted by computer – and the presentation of a statistical entity or object. And this is followed by a second (hermeneutical) representation, in which the formal mathematical language of the statistical entity or object is translated into natural language: in short, what was enumerated gets nominated.

The second and most frightening danger of *n*-arized knowledge to me, though, is at work in the blank node. In general, the graph’s response to what is unknowable to it, given its schema, ontology, and extraction procedures, is to simply *not experience it*, to discard it between steps. In these instances the graph is surely selectively exclusive and inclusive, discriminating against inventive practices that do not (yet) operate at a statistically probable scale to meet the threshold for machine learning and extraction. However, in the case of the blank node, the machine has found some *thing* that it cannot know, and yet that remains essential to its ability to further its purpose of forging paths of triadic connections between entities. Here its knowledge-production practices are confronted by something that is unidentifiable, but no longer outside its experience. It experiences the intense negativity of an otherness, of a void, that it can infer, almost sense, but does not know. And its response to this presence of non-presentation – this negativity of the unknown other – is to *tether* it, to move through it by circumscribing it and allotting it a blank or null identifier.
Conclusion

By the middle of the twentieth century governmentality had crystallized in the United States and the ‘big data’ problematic had inflected most, if not all, of the social world. The play of power would press forward towards the infinite collection, processing, storage and transmission of data. Now that the world was seen as the host of complex and interwoven vital processes with unique rhythms and durations, these processes needed continuous and precise management. Their management required the amassing of an incalculable amount of data to afford a qualitative shift: the emergence of the capacity to trace correlational networks between ongoing processes. The end result was the perpetual quantification of the milieu. Birth, death, marriage, and crime rates, agriculture, manufacturing, transport of freight, risk of death, disease, and disability, loss of everything from sea vessels to homes to employment, psychography from public opinion to propaganda, marketing and public relations, and even sexuality had all been numerically mediated and presented for human knowing and governance. Each became totalized and consistent, such that any process or element could be integrated into it or differentiated from it, as well as aggregated into subdivisions within the milieu. With the catalysis of continual research and development of computational techniques and technologies for data collection, processing, storage, and transmission, the fluid mobility of governance along the entire axis that runs between discipline and bio-power/security was finally realized.

As Adrian Mackenzie and Theo Vurdubakis (2011) note, this new fluid mobility afforded by numerical mediation and computation the ability to transform the objects they were enumerating by continually establishing new categories of being and engaging in new
modes of world-making. Numerical mediation can here bee seen as a constructive engagement of chance whose iterations “support functions for convergence on existing norms and divergence into new norms,” for here “predictability itself has changed in important ways” (Mackenzie & Vurdubakis, 2011, p. 12). At the collective level of the social world, numerical mediation and computation operate conservatively by working to produce a future that is integrable into their current totalization. The final goal of security is to continuously foster and sustain the norms that it discovers-invents-constructs through numerical mediation. To do so, it needs to anticipate, prepare for, and manage future crises that might threaten the continuance of those norms. As Matthew May and I (2016) have demonstrated elsewhere, speculation collapses full potentiality into a spectrum of possibility and works to realize those projected futures that best suit the interests of the present. The future is thus constructed and anticipated within the ‘big data’ problematic as well, such that the future is delimited to what can be inferred from the present and its current archive of the past (Chun, 2011b, p. 188). As Uncertain Commons explain,

> Whether the lasso thrown across time is thought or money, speculation always constitutes an attempt to draw the future fully into the present. Both registers index an attempt to represent and calculate a future that is unpredictable, unrepresentable, and incalculable by definition; both registers index an attempt to fix and capture a potential future in and as the actual present. Such, then, is speculation: a modern technology for the absolute actualization of potentiality without remainder, a modern apparatus for erasing the future by realizing it as eternal present. (2013, p. 9)
This is the bedrock of contemporary governance: an ability to extend itself into the future by operating on the spectrum of possibilities from which it might arise. It is the root of affirmative aspects of power, including everything from the prevention of epidemics to the mundane routines of inspecting and certifying elevators.

As Alexander Galloway and Eugene Thacker argue, this new computational environment has a dual interest in maintaining the status quo and discover-inventing-conditioning disturbances to that status quo (2007, p. 78). As they note, these new technologies of power operative in governmentality encourage experimentation, creative participation, and production, but only in such a way that strengthens their operative capacities (2007, p. 41). The ‘big data’ problematic inflects all of its technical solutions such that they are perpetually hungry for more and more data; as we’ve seen, there are no means for determining in advance the quantitative threshold at which the qualitative dimension of sufficient ‘bigness’ will be reached to afford new predictive capacities. Governmentality needs to collect data from as many acts of resistance and failed revolutions as it can reasonably be predicted to sustain if it is to prevent, or better, manage and appropriate those acts of resistance that might produce a true revolution. The price of admission here is that experimentation is canalized by the ‘big data’ problematic, such that as much as possible, the eruption of the new, with all the potential for genesis and risk of chaos that entails, can itself be modulated.

Take, for example, the introduction of the blockchain technology that powered Bitcoin. Essentially, this blockchain technology operated as a globally distributed database that was capable of reliably and securely moving virtual currency without the intervention of
any authority – banks, technology companies, governments, etc. In avoiding the intervention of authority, the blockchain had essentially anonymized currency and deprived governmentality of access to ‘big data’ about the movement of currency. This data was the bedrock of financial governance, as it made money produced by illegal activities ranging from theft to drug sales to Ponzi schemes all traceable, and also helped with the prediction of currency fluctuations and speculative bubbles. As such, Bitcoin had an arguably large revolutionary potential, including both advantageous and dangerous valences. Its release prompted rampant discourse in the United States. The FBI released a report on Bitcoin’s dangerous facilitation of illicit activity (Federal Bureau of Investigation, 2012). Jennifer Shasky Calvery (2013), the director of the Federal Crimes Enforcement Network (FinCEN) of the U.S. Department of the Treasury, issues a similar statement to the U.S. Senate Subcommittee on Economic Policy meant to define virtual currencies and the dangers they posed to governance. These stances were soon mirrored by many government agencies including the Department of Homeland Security (DHS), which worked to shut down Bitcoin exchanges, and the Securities and Exchange Commission (SEC), which began prosecuting Bitcoin-based financial crimes like Ponzi schemes in highly publicized court cases.

Now, only a few years after it was positioned as a crisis, the SEC has approved a plan for Wall Street to issue stock via a variation of the blockchain called Hyperledger that was developed in open source but with collaboration from IBM, JP Morgan, Wells Fargo, and the London Stock Exchange (Metz, 2015, 2016a, 2016b). As Cade Metz (2016a) notes, “The project aims to build blockchain-like software that can more efficiently, reliably, and openly track the exchange of financial assets, including stocks, bonds, futures, houses, and car...
titles.” Essentially, we can see here the modulation of the revolutionary capacity of blockchain technology such that it can be incorporated into the logic of the ‘big data’ problematic. Instead of secrecy, privacy, and anonymity, we get the securing of property and the production of traces, registries, censuses, and databases that can be used for governance. Similarly, *Harvard Business Review* has touted the results of Don and Alex Tapscotts’ two-year study detailing the future uses of the blockchain for moving anything of value, including “money, titles, deeds, music, art, scientific discoveries, intellectual property, and even votes” (Tapscott & Tapscott, 2016a). Not only can blockchain be used to bolster the protection of property ownership, but it can also be used to secure the identities of individual people within data sets, such that those data sets can be made transparent and open for regulation without compromising individual identities (Tapscott & Tapscott, 2016a, 2016b). I take this to be a concrete example of the ways in which the potentiality for genesis is constrained by and filtered through the spectrum of possibilities produced by the ‘big data’ problematic. While the real world is constantly being modulated and (de-)(re-)constructed, the logic of ‘big data’ is conserved. In short, the price of consistency is change without revolution.

Yet, because computation affords us the capacity to numerically mediate complex systems like the global economy and the global climate, for instance, it also discovers-invents-constructs crises. In fact, as Wendy Hui Kyong Chun argues, computation proliferates crises. While calling on us to have faith in our capacity to project and mitigate crises, we are also called to perpetually prepare for the events that in the long run will eventually elude them (Chun, 2011a, p. 92). As Chun writes,
Crises cut through the constant stream of information, differentiating the temporally valuable from the mundane, offering users a taste of real time responsibility and empowerment. They also threaten to undermine this experience, however, by catching and exhausting us in an endlessly repeating series of responses. (2011a, p. 92)

This empowerment is partly a ruse, though, as in constructing the problem for us our computations also delimit the spectrum of possible responses to them. As numerical mediation is what gives us access to both the thing and the crisis confronting it, there is little opportunity to alternate perspective. For Chun, this collapses executive, legislative, and juridical powers into the *logos* of numerical mediation. Here computation legislates possible actions, judges which are most preferable, and is also the means for executing those actions. Chun describes computer code as “automatically enabling and disabling certain actions and functioning at the level of everyday practice. Code as law is code as police” (2011a, p. 101).

This sovereign exception in which computation is legislator, judge, and executive lends itself to new modes of power. One such mode of power is preemption, which Brian Massumi (2010) has described as the utilization of a threat that has no actual referent or object. He writes,

The security that preemption is explicitly meant to produce is predicated on its tacitly producing what it is meant to avoid: preemptive security is predicated on a production of insecurity to which it itself contributes. Preemption thus positively contributes to producing the conditions for its own exercise. It does this by capturing for its own
operation the self-causative power native to the threat potential that it takes as its object. (2010, p. 58)

A public that is exhausted by the continuous anticipation of crises is prone to this operation of preemptive power. As Mark Andrejevic (2013) argues, this condition is exacerbated by the information bomb that has overloaded the public’s critical and analytical attention. He writes, “An era of information overload coincides […] with the reflexive recognition of the constructed and partial nature of representation” (2013, p. 3). This applies equally well to both the ruses of preemption and their critiques. For both Andrejevic and Massumi, this power of preemption is demonstrated *par excellence* by Colin Powell’s announcement to the United Nations that the Bush administration had proof of weapons of mass destruction being produced and used in Iraq. While his proposed solution differs slightly from ours, Bruno Latour (2004, 2005) has looked at this same example to demonstrate that we can no longer be satisfied with a critique of rhetorical representations of the truth, but instead must look sociotechnical production of an entire regime of truth.

Truth is the historically contingent product of particular conjunctions of power, knowledge, and self. Foucault tells us,

Each society has its regime of truth, its ‘general politics’ of truth: that is, the types of discourse which it accepts and makes function as true; the mechanisms and instances which enable one to distinguish true and false statements, the means by which each is sanctioned; the techniques and procedures accorded value in the acquisition of truth; the status of those who are charged with saying what counts as true (1980c, p. 131).
As we’ve seen throughout this project, this articulation doesn’t go quite far enough. It ought also to include numerical mediation. It is only by enumeration that the social world can be totalized, and that we find integrated entities and objects that are differentiated from one another and their milieu. It is also by enumeration that what is in being is differentiated from nonbeing, the included is differentiated from the excluded. As Theodore Porter (1996) has shown, the objectivity of enumeration is always the result of a grammar that operates as the form of standardization by which things are to be enumerated. As such, enumeration is as much a matter of social and technological power as it is a discovery of the thing-in-itself. The objective truths that result from numerical mediation are thus always discoveries-inventions-constructions. It is precisely this contingent aspect of objectivity that makes numerical mediation so dangerous. As Porter (2012) notes, numerical mediation requires ‘thin numbers’ to operate at scale, in the sense that it must abstract from social context and generalize in order to simplify data enough to render them homogeneous as well as to make numerical mediations fast and accurate. The contingency of objectivity is something that leads good scientists to approach results with skepticism, fully knowing the ‘thinness’ of their descriptive capacity. Yet, the results of numerical mediation are continually thickened as they enter public discourse. In essence, this results in a double loss of specificity, as it evacuates the formal specificity of the numerical mediation, which was only achieved in the first place by an evacuation of the material specificity of the world. The traditional method for responding to the ‘thickening’ of numbers for the purposes of manipulation has been a critical apparatus that deconstructs this double loss of specificity of any given truth claim. Importantly, in tracing discursive constructions back through their numerical mediation to
their real contexts in the social world, this critical apparatus leverages a capacity to comprehend any given process of numerical mediation as well as their real world context in the social world.

Andrejevic is right when he argues, “There is, in Foucault, the evidence-based argumentation of the happy positivist – the conserved understanding that it is possible, with enough evidence, to intervene in the functioning of established truths and the power that promulgates them” (2013, p. 134). Governmentality inflected by the ‘big data’ problematic is a different case. Here, truth has become probabilistic, a correlational network that emerges on the fly during computationally facilitated numerical mediations. These numerical mediations demand ever increasing stockpiles of data in the hunt for new correlations; as Andrejevic notes, “the future is, in a sense, always now: the collection of the next bit of data might itself reveal a previously undetected pattern” (2013, p. 38). This leads to what he calls the paradox of ‘total documentation,’ in which humans generate data at such a rate that they cannot even locate a perspective on it, let alone comprehend it (2013, p. 35). Here we find a critical impasse, as the processes of numerical mediation are often blackboxed from public view, and the real contexts in the social world they are enumerating data from are too complex, heterogeneous, and distributed for humans to gain a perspective on. Andrejevic seems torn on the possibility for reviving critique, but ends his text with a directive to “find a way of reinscribing (suppressed) forms of knowledge back upon the new ways of knowing associated with the database/algorithm assemblage” (2013, pp. 164–165).

As we saw in chapter seven, the future of big data processing is firmly grounded in artificial intelligence (AI), machine learning, and deep neural nets. While companies like
Google have made groundbreaking innovations in terms of their databases, the robust application that these databases promise are lagging behind. Think here of the line of personal assistants that are quickly becoming future flagship products of companies like Google (Okay Google/Google Now), Apple (Siri), Amazon (Alexa/Echo), Facebook (Facebook M), Microsoft (Cortana), and Tesla (Summon). While they have all certainly demonstrated promise, they are also comically inept at a large number of everyday tasks they will soon be or already are expected to perform. The current limitations and future value of more robust artificial intelligence has driven a host of companies to open source their AI and machine learning software in the hopes of quickly gathering more feedback data as they are set to work on heterogeneous tasks by independent researchers and hobbyists. Since the time Andrejevic was writing, both Google and Microsoft open sourced their machine learning frameworks – called TensorFlow and CNTK respective. Similarly, Facebook AI Research (FAIR) shared its framework (Facebook M) that had been developed on Torch – the open source development environment for machine learning and deep neural nets also utilized by Google/DeepMind, NVIDIA, and Intel, among others. This trend is also showing up in terms of hardware, as competition for future business to their cloud computing platforms has pressured companies like Facebook and Google to open source server and data center designs.¹²⁴

With open source on the upswing, these major companies have never been more interested in the participation of the public and the development of heterogeneous new forms

¹²⁴ This in contrast to 2012, when Google was reported as keeping its server cages in complete darkness and providing its engineers with mining helmets to use when working on servers (Metz, 2012).
of (numerically mediated) knowledge. Let’s not kid ourselves. Open source software
development is not different enough from traditional software engineering to serve as the
panacea for our troubles with Silicon Valley (Frabetti, 2015). The feedback mechanism here
is constrained either by technical ability (you must be or go through a person who can
manage these computations and has access to sufficient data sets) or by the grammar of the
forms the company uses (ranging from forum posts and emails to automated packet
deliveries). That said, we are clearly at the precipice of the ‘big data’ problematic’s
rearticulation of problem-solution pairs, a strategically advantageous time for intervention.
One primary possibility is fostering technical awareness, if not technical capacity, in those
that would otherwise be disenfranchised. There is an element of John Dewey’s notion that
‘those who wear the shoe know best where it pinches’ here. If the general user did not have
important insight into the outcomes of these computations, there would be no point in
soliciting their participation in the first place. Where the user might not be able to speak to
the means, s/he can certainly speak to the ends. This is a form of feedback that we ought to
foster, by the sponsorship of programs through non-profit organizations, universities, and
private collectives that might facilitate user interaction with AI and machine learning, as well
as the communication of their thoughts and ideas. And this needn’t be a face-to-face process,
as we might take a cue from the public response to Google’s release of the DeepDream
neural network. The development of simple API’s for modulating its image-processing
techniques, even sites dedicated to automating the process for users, created a public craze as
people set about experimenting with machine vision.
It is these aspects of participation and experimentation that are well positioned to capitalize on the current swing towards open source development of AI. Fostering public participation and experimentation will go a long way towards dispelling the capacity to thicken numbers. The bizarre results and continuous bugs ought to provide healthy doses of skepticism. That said, these gains would be the affirmative dimension of new powers. Companies like Google and Facebook not only need to open source their development of AI, they can open source it because they are well positioned to appropriate and capitalize on any innovations made by the public. A much more impactful struggle can be located in strengthening the public’s role and relation to future iterations of software they contributed towards developing. Establishing a diverse set of independent governmental organizations, non-profits, academic research centers, and/or think tanks that were responsible to the public for representing their interests in the ends of AI research might go a long way towards producing new forms of (numerically mediated) knowledge that would be safeguarded and maintained by these entities.

In the end, I can offer no true imperatives as there is no predefined sequence of events that ought to take place. The best I can hope for is that we foster experimentation by a participatory public and try to establish some safeguards for the results of their experiments to protect their continued interests in them. As Wendy Chun notes, the digital is not a stable object, but instead an event or series of events in process (2011a, pp. 105–106). As we have seen, there are inescapable acts of exclusionary violence in its grammar that are the cost of admission for numerical mediation. They can only be the continual and mobile objects of an ad hoc critique. In the end, there is no escape from the contingency of numerical mediation.
Our only option is to engage the contingent numerical mediations of computation while at the same time acknowledging the impossibility of establishing their truth in advance (Chun, 2011a, pp. 106–107).

Foucault tells us that “liberty is a practice,” and that there is now way to establish it automatically such that it is guaranteed universally, “so there may, in fact, always be a certain number of projects whose aim is to modify some constraints, to loosen, or even to break them” (2000b, p. 354–355). Because “there are no machines of freedom, by definition,” we must instead resolve ourselves to the grueling and perpetual task of working to align the intentions of our policy-makers and designers, our institutions, our techniques and technologies, all with the real practice of people in the exercise of their freedom if they are to produce positive effects (Foucault, 2000b, pp. 355–356). We have thus exhausted the first approach to the ‘big data’ problematic, which involves macro-intervention into the process and results of numerical mediation, and now must turn to the other pole of governmentality and examine the relation between discipline, individual subjects, and enumeration in the ‘big data’ problematic.

In a state of constant crisis and the continually restructuring of the categories of being and social norms, what Ian Hacking (1986) calls ‘the space of possibilities for personhood’ was being continually modulated. Already by the mid-twentieth century people were inclined towards what Sarah Igo describes as a ‘confessional mode’ and a ‘voyeuristic stance,’ as their belief in the importance of big data and their curiosity about their neighbors led them one-by-one to confess even their most secret information in exchange for the opportunity to “filter their experiences through tables and percentages, to fit themselves into social scientific
categories, and to identify with strangers” (2007, p. 20). As Raymond Williams argues, “[T]here are in fact no masses, but only ways of seeing people as masses” (2002, p. 98). This capacity to continually generate new categories of being and social norms that would subsequently serve as an indefinite series of *it*-selves left the people in a constant state of individuation and disindividuation, subjectivation and desubjectivation. Take, for example, the continued attempts to build solidarity amongst the working class that occurred in the first half of the twentieth century. Many scholars have looked at the way in which whatever political agency the working class had built in the nineteenth century was disrupted in the twentieth century as the proletariats were continually morphed into anonymous members of a cascade of new classless social groups. As Stuart Hall notes, “The break-up of a ‘whole way of life’ into a series of life-styles […] means that life is now a series of fragmented patterns for living for many working class people. One cannot organize militantly to keep up with the Joneses” (1958, p. 31). From this point on, class struggle was largely rearticulated as a process of coalition-building across continually metamorphosing and increasingly atomized social groups (Haraway, 1990; Hardt & Negri, 2004; Laclau & Mouffe, 1985; Williams, 1958, pp. 295–338).

Gilles Deleuze (1995) has argued that this capacity to fragment and recompose the categories of being and social norms has since extended to individuals and thus has transformed discipline into a new technology of power that he calls ‘control’. For Deleuze, “Control is short-term and rapidly shifting, but at the same time continuous and unbounded” (1995, p. 181). It uses digital codes to splinter and disperse the individual – now termed the ‘dividual’ – into a multiplicity of constituent elements. Each of these elements is now open to
what he terms modulation, a “self-transmuting modeling continually changing from one moment to the next, or life a sieve whose mesh varies from one point to another” (1995, pp. 178–179). The ‘dividual’ is thus the individual rendered as both a milieu and a population: a totalized and consistent space for the integration and differentiation of elements and subsets of elements. Discipline needs to determine a norm in advance as the end of training and punishment, but individuals no longer have indivisible consciousness and consciences that need be appealed to. Instead, technologies of control are able to establish and modulate the normalities of dividual elements, each in their own rhythm and duration. Here the individual is now subject to the same methods of demography, psychography, and similar applied statistics and predictive analytics that operate on the population.¹²⁵ Galloway and Thacker explain, “in control societies, bodies are consonant with more distributed modes of individuation that enable their infinite variation (informatics records, databases, consumer profiles, genetic codes, identity shopping, workplace biometrics)” (2007, pp. 40–41). However, like Foucault, Deleuze does not see new technologies of power as excluding the operation of their predecessors. In societies of control, the technologies of bio-power/security, discipline, and juridical sovereignty are appropriated, modified, and redeployed to facilitate the new logic of modulation. Deleuze closes this sort piece by pleading for critical attention to be directed towards the establishment of “the basic sociotechnological principles of control mechanisms as their age dawns,” and towards describing “in these terms

¹²⁵ All of this is achieved through numerical mediation. However, Deleuze (1995) uses the term ‘numerical language’, which many critics have subsequently replaced simply with the term ‘code’ (see Mackenzie & Vurdubakis, 2011, pp. 8–9).
what is already taking the place of the disciplinary sites of confinement that everyone says are breaking down” (1995, p. 182).

It is precisely these sociotechnological principles that our analysis of numerical mediation helps to highlight, as the emergence of control is not without precedent in the American context. In fact, it is more aptly understood as the emergence of a new order of complexity in the already firmly established technologies of power for integrating and differentiating elements and subsets of elements within a consistent and totalized field. For example, the principle of control already exists in the move towards the numerical method of actuarial calculations initiated by Prudential in the first decades of the twentieth century. In that case, a system of consistent and integrable quantifications of risk classes allowed for the near automatic individualization of insurance rates. The difference there is that once integrated, these calculations established the bandwidth of deviation from the ideal norm and charged them according to that – in short, there was a certain flattening of rates into brackets afterwards. Here the individual was already being broken down into various risk elements, which were only secondarily integrated and flattened into a collective category (standard, sub-standard, etc.). And additionally, it was a system meant to extend insurance to more people who would otherwise have been excluded. This was certainly done because doing so was an affirmative aspect of power, a ‘good deed,’ but also because it extended the data set and helped produce the mechanism for capturing untapped markets. It is a small conceptual step from there to complete ‘personalization,’ where fee structures and rewards are completely and continually tailored to each dividual’s constellation of constituent elements.
Granted, this small conceptual step was a large technical step, as it would require much ‘bigger’ data and the computational power to numerically mediate it.

Andrejevic locates the roots of surveillance here, as a redoubling of the affirmative aspects of power. He writes, “We might describe this self-fueling cycle of monitoring-based rationalization: transactions and interactions are rendered more efficient by automated forms of information processing, which, in turn, generates data that can be used to further rationalize the process” (2013, p. 33). The difference here is that once data collection and feedback become automated, two very important things become possible. First, data collection can be rendered largely invisible and a mandatory condition of partaking of the affirmative benefits of power. Think here of the invisible agreement to have your data collected when you use a search engine to navigate the internet. The only escape is to opt-out of search, which effectively precludes you from locating materials on the web you do not have the URL for. The second consequence is that data processing can increasingly occur in ‘real time’, modulating the spectrum of possible futures open at increasingly nuanced and continuous levels.126 It is this speed, accuracy, efficiency, and robustness of computation that affords control its modulatory capacities.

John Cheney-Lippold (2011) offers a very relevant example here in his discussion of the construction of gender by technologies of control. He describes the way in which

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126 It is worth pointing out here that, as Chun notes, “[R]eal time refers to the time of computer processing, not to the user’s time. Real time is never real time – it is deferred and mediated” (2011a, pp. 98). Instead we might more safely think of it as a window within which automation is unnoticeable. However, as companies like Google release tools for parsing petabytes of data per second, the distinction is more theoretical than practical.
extraction algorithms continually capture divergent fragments as they flow across networks and sort them into rigid databases. These databases allow API’s to determine a user’s gender as female in ‘real time’, and use that classification to inflect her web navigation, showing her items determined by the correlational network by which the machine understands an abstract category that we might call femininity. In a long passage worth quoting at length, Cheney-Lippold writes,

Gender as a category still holds the capacity for discipline – of serving targeted advertisements and targeted content according to the inferred digital identity of a user – but it also is embodied by a new and flexible cybernetic categorization system. Instead of standards of maleness defining and disciplining bodies according to an ideal type of maleness, standards of maleness can be suggested to users based on one’s presumed digital identity, from which the success of identification can be measured according to ad click-through rates, page views, and other assorted feedback mechanisms. The regulation of gender as a category then becomes wholly embedded within the logic of consumption, where categorical behaviors are statistically defined through a cybernetics of purchasing and research that marketers have deemed valuable for identification and categorization. (2011 p. 175)

We can see by this description of its concrete operation, that there are very few, if any, strategies of resistance today that do not depend on opting out. For example, Galloway and Thacker argue, “[W]e should become devoid of representable identity. Anything measurable might be fatal. These strategies could consist of nonexistent action (nondoing);
unmeasureable or not-yet-measureable human traits; or the promotion of measurable data of negligible importance” (2007, pp. 136–137)

At this point, it becomes very important that we take seriously how deeply rooted the apparatuses of governmentality are. We must resign ourselves to existence inflected by the ‘big data’ problematic, and likely to its longevity exceeding our own as individuals. Without this, our analyses, critiques, and actions are bound to be naïve. For slow changes, look to reconstitute the problematic itself by pushing the boundaries of as many of its most important constituent parts as far as possible and hope for mutations, eruptions of genesis, and with the aid of a vast collective spanning generations, wield the cutting edge of knowledge to produce a disjuncture. For fast changes that might manifest quickly enough to be seen in a single lifetime, operate within the problematic to rearticulate problems with subtle variations that might imply useful or just alterations in their implied technological solutions once those have been adapted to the rearticulated problem. What I mean by this is that your analysis must appreciate the affirmative dimensions of power, and look for ways to alleviate some of the violent and exclusionary tendencies in the apparatus that at least preserve – but better increase – the effectiveness of power in its affirmative dimension.

Analyses of power must be nuanced, for power is capillary and banal, distributed across a wide host of subjects, objects, techniques, technologies, strategies, tactics, institutions, signs, numbers, discourses, etc. In the case of governmentality and its subsidiary technologies of bio-power/security and discipline, this often means that analyses must be highly specific when it comes to technical and technological dimensions. As we’ve seen, governmentality is embedded in a ‘big data’ problematic that necessarily implies numerical
mediation and its catalysis through electromechanical, and later electronic, computation. Thus, many of the sites for intervention into the everyday practices of governmentality that will be effective in the shorter term are going to be banal aspects of data collection, processing, storage, and transmission. These sites will be points where it can be demonstrated within the ‘big data’ problematic and the overarching logic of governmentality that the violence committed by a specific technique or technology of data collection, processing, storage, and transmission is not outweighed by the gains in speed and accuracy that these techniques or technologies offer to the essential processes that constitute and ground the apparatus. This is the dilemma of governmentality: we must all consent to fine-tune its instruments ad hoc, or dare to imagine an outside whose uncertainty yields the promise for something better, but without a doubt, also yields the promise of much greater risk of danger.
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