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Metabolizing Capital: Writing, Information, and the Biophysical World

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METABOLIZING CAPITAL: WRITING, INFORMATION, AND THE BIOPHYSICAL WORLD

A Dissertation Presented

by

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DEDICATION

To my parents, all five of you.

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ABSTRACT

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While the discipline of rhetoric and composition has looked at a variety of topics related to the *materiality* of writing, the majority of materialist approaches limit their scope to local, situated writing practices. However, with the spread of digital media and the establishment of a global, networked infrastructure for communication and inscription, the abundant textuality that has emerged in the early 21st century demands that we develop more rigorous materialist approaches to the study and teaching of writing.

This growing textual environment has been called, in popular and academic discourse, *Web 2.0*—a more "social Web" than its early form in the late 1990s, one that encourages more interaction and collaboration between users. The ethos of sharing that defines Web 2.0 has been celebrated by writing scholars as a qualitatively new public sphere where we are writing and participating more than ever. Yet,

underlying our exuberance of Web 2.0 is the problematic assumption that *more writing is an intrinsic good*. As more writing is produced, the logic goes, the richer the opportunities for human agency. In a world of infinite resources, such a productivist ethos makes sense; but in a world of *finite* resources, one whose health is intertwined with our global network of writing technologies, unrestrained textual production has become a threat to other human and nonhuman systems.

In this dissertation, I analyze current materialist approaches to writing to theorize how the *usefulness* of Web 2.0 technologies--and the writing labor they harness—have become necessary agents in the production of capitalist, consumer culture. Drawing on ecological models of writing and supplementing them with Marxian concepts of *value*, *metabolism*, and *capital circulation*, I explore the historical and dialectical relations that have given rise to a new phase of digital culture, one called *Web 3.0,* where the celebrated use value of Web 2.0 writing is eclipsed by the *ascendant exchange value* of Big Data--the massive substratum of consumer data that is produced as a by-product of our writing. Because the economic value of user data depends on two critical resources--the labor of our writing *and* the finite natural resources of the planet—our celebration of the productivity of Web 2.0 is in direct antagonism with other natural systems, including the organic system of the writing body. I conclude with a sequence of writing activities designed to help students foster critical, ecological literacies that will prepare them to grapple with the social and ecological problems emerging in Web 3.0.

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CHAPTER 1

INTRODUCTION: WRITING, ECOLOGY, AND MATERIALITY

> The resolution of theoretical oppositions is possible only in a practical way, and hence is by no means a task of knowledge but a task of actual life… (K. Marx, *The German Ideology*.)

Recently, while looking for books on the history of writing, I stumbled across a Time-Life publication titled "The Birth of Writing." It was written in 1974 as part of series called *The Emergence of Man*. "The Birth of Writing" is a fascinating and problematic book, compiled and written by historian Robert Claiborne. It is full of vibrant drawings of ancient scribes and their tools for writing. In a span of about two hundred pages, Claiborne walks a reader through the long history of writing, beginning with the mysterious bulls painted on cave walls in Lascoux France (15,000 BCE), to the rise of cuneiform in Ancient Mesopotamia (4000 BCE), Hammurabi's code (1700 BCE), on to the development of the Phoenician alphabet around 1000 BCE.

In chapter one, Claiborne introduces readers to a Mesopotamian merchant, Nanni. It is 1700 BCE, somewhere on the Euphrates River, present day Iraq. Nanni wants to talk to a business associate, Ea-nasir, who lives 200 miles north in the city of Ur. To do this he must send a letter, but he does not know how to write. So he hires a scribe to capture the sounds of his speech by *scratching*[1] them into moist clay with a slender, wedge shaped stick--a cuneus. The scribe is writing in cuneiform and transcribing a "tongue that no living man has ever heard" (9). The letter is vehement:

[1] *Scratch* (also *carve)* is the Indo-European root for the Greek word *graph*, which is known as our modern word "write".

> You did not do what you promised me...What do you take me for, that you treat somebody like me in such a fashion?…Take notice that from now on I will no longer accept any copper from you that is not of fine quality. I shall henceforth select the ingots individually in my own yard, and I shall exercise my right of rejection because you have treated me with contempt. (9)

This text was unearthed in an archeological dig in the 1920s. It is over 3500 years old, still legible, and fits in the palm of an adult human hand (24).

What is the significance of a text like this for us today? What does its unlikely existence tell us about the material and historical nature of writing and the *persistence* of textuality? What does the mundane, economic nature of the text (the most common type found in Mesopotamia) tell us about how writing developed, and what does the shape of those early literacy practices tell us about the shape of writing and rhetoric in the first half of the 21st century?

While the field of rhetoric and composition has looked at a variety of topics related to the history of writing, the broad, diachronic range of these questions is rarely broached by scholars in the field. And yet, in light of the radical changes currently underway in our experience of writing and literacy, such questions once again take on salience. With the maturation of digital media and the firm establishment of a global, networked infrastructure for inscription and communication, we find ourselves living through intense cultural shifts in the shape and quality of our semiotic environments. Such transformations have happened at different junctures in history, including the emergence of cuneiform in Ancient Mesopotamia. As history demonstrates, changes in writing and inscription technologies can lead to radical changes in all aspects of life and literacy. While

historical comparisons are not without their problems, I believe that in pursuing longer, diachronic analyses of the development of writing over centuries or even millennia, we can open up new opportunities for studying and theorizing writing as it relates to other historical, material, and technological aspects of lived experience. To put this more simply—Nanni's text has a lot to tell us about writing and literacy then, and it gives us important clues into our experience of writing today in a digital world.

One way to study and theorize large cultural and historical transformations is through analyzing the nature of the textual environment—that is, the *textuality* of a culture. Mundane texts like Nanni's, however insignificant they may seem, are precious artifacts from a culture radically transformed by writing and the subsequent textual culture that followed. Over the past century, archeologists have found troves of cuneiform texts. Today it is estimated that over a half a million tablets have been found (Gleick 45; CDLI).[2] Thus, in looking to the past to understand our present experience of writing, we aren't simply concerned with the "birth" of writing as a cultural and intellectual technology, but more precisely, both writing *and* the textuality it enables.

The content of Nanni's note confirms what archeologists now know, that economic trade networks had reached a level of complexity and geography in Nanni's time that ranged from Greece to Egypt to India. Writing arises in Mesopotamia, among other reasons, for managing the growing social and economic exchange relations that were then emerging. As a technology for *inscription*, writing thus became

[2] The Cuneiform Digital Library Initiative http://cdli.ucla.edu/index.html

an essential condition for more expanded trade relations, and, over time, as textuality began to take root in Mesopotamia, writing took on a central role in fostering the earliest forms of accumulation and profit making. The earliest textual genres we know of—ledgers, lists, inventories, statements of account, contracts, and titles of ownership—all speak to the developmental tie between writing and economic activity. When writing does emerge in Mesopotamia, it develops hand-in-hand with the earliest forms of capitalist exchange.

In addition to the economic roots of Nanni's text, as a 3000 year old document, its miraculous durability suggests something profound about the *materiality* of texts and the tools that create them, both in their existential persistence, but also in the ways they come to embody long histories of human use and development. Nanni's inscribed indignation lives on, long past himself. It is a simple example of what happens once writing enters the world and textuality is unleashed. The human need that initially prompts the development of writing in Mesopotamia, does, in turn, become subsumed by the structure of inscription and textuality that ensues with writing, giving rise to the modern world and history as we know it.

These three terms—*materiality*, *inscription*, and *economy*—and their dialectical relations form the general backdrop of the argument that follows. The tripart, historical relation between inscription technologies, the material social world, and economic activity creates the necessary conditions for the emergence of textuality in Ancient Mesopotamia

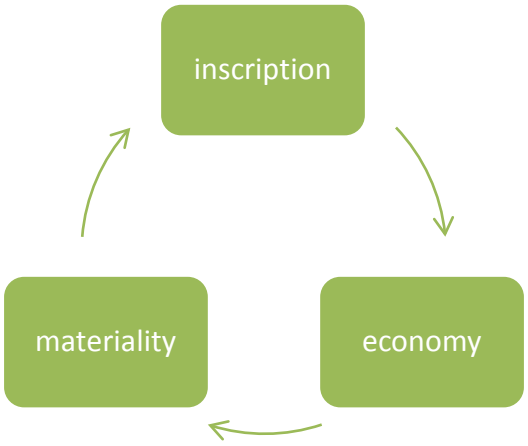

Figure 1.1: General tripart relation that forms the conditions for the emergence of textuality in Ancient Mesopotamia.

Figure 1.1 is a representation of my understanding of textuality in culture. I will be referring to these three elements throughout the chapters of this dissertation, and clarifying them more as my analysis evolves.

To establish the theoretical background for the rest of this dissertation, I want to use this introductory chapter to disentangle some of the confusion that surrounds our use of the term "materiality" to theorize and study writing. In fact, I argue that many of our misunderstandings about digital writing practices, and writing more generally, come out of our confusion about the spaciousness and ambiguity of the concept of *materiality* and its convoluted relations with writing and literacy. Thus, before we can fruitfully theorize the materiality of digital writing practices, we must first be clear about how we are defining materiality. Through a theoretical engagement with materiality and the way several scholars in field have theorized it, I intend to expand our current materialist approaches to writing and literacy and layout

a critical materialist framework for thinking and theorizing about changing textuality (as defined in Figure 1.1) in a electronic, wireless, and datafied age.

Of course, one can hardly talk about writing, even in the most simplistic ways, without touching on some facet of materiality. The trouble with invoking a term like "materiality," as Bruce Horner notes, is that "no representation of teaching or writing can exhaust the full range of their materiality…which demarcations of their materiality one emphasizes will inevitably place into the shadow other possible demarcations" (xix). Take Nanni's letter for instance—when we talk about the materiality of this writing situation, are we concerned with the tangibility of the text? The media of clay? The social relations between scribe and merchant? The use of writing for recording exchanges? All of these questions point to different ways of approaching the materiality of writing.

For Horner, the activity of writing is central to our experience of the material social world. He argues that we don't always grasp the significance of this, and, as a result, fail to capture the full breadth of writing as a "material social practice," where the work of writing "is the occasion for both reproducing and revising material social relations" (Horner 81, 82). Horner's materialism thus foregrounds the interface of writer and world, where human agents use literacy to produce and reproduce their material conditions of existence. Following his observation though, we might ask what aspects of his analysis are "place[ed] in the shadow" of other material facets of writing? While Horner, in *Terms of Work*, recognizes that the technologies of writing play an integral part of our material experience of literacy, his analysis brackets out

the writing space of the classroom from the larger social and technological forces that are inevitably influence this space. As digital networks and textuality continue to grow at an exponential rate, the need to extend our materialist analyses grows more pressing for the integral ways our writing technologies, and the textuality we create, get woven into the very existence and sustainability of other human and nonhuman systems. Digital, globalized computer networks now span the planet, from fiber-optic cables laid deep in the Atlantic Ocean to communications satellites orbiting the Earth. Such networks, and the inscription infrastructure that is now in place, raise serious material social concerns on a number of fronts, and in ways that challenge our assumptions about writing, literacy, textuality, and how to study these phenomena in the 21st century. Today we are faced with an intensified media environment, one that has managed to find its way, not simply into the home of every American (as the old fears of television claimed) but now with mobile computing, into the pockets of over 80% of the world's population (IBBP).

We must not forget that our classrooms are embedded in this new *informational environment*—one that reflects the historical transformation in the United States from an industrial economy to an informational one in the mid 20th century. Whereas the production of manufactured goods drove industrial capitalism, in informational capitalism, it is writing and literacy that serve as primary engines of capital production and circulation. What precisely is produced? How exactly does information production become a primary factor of capital circulation? Scholars vary on their answers, but for my purposes, I am thinking about information production as

dependent on both a diffuse infrastructure for inscription and a population of highly literate citizens with easy access to this new, digitized and *interactive* media environment. Traditionally speaking, information production includes professions such as the culture industries (entertainment, journalism), academic research, copyright and patent law, government and law making. Such institutions have long been in the business of producing and commodifying information. Writing and inscription technologies have always been central to these endeavors, but they take on new salience in our current technological and semiotic environment.

In today's globalized, networked, digital environment, information has become a central commodity—its production, collection, analysis, and purchase. This not only includes the extraordinary expansion of alphabetic textuality that has occurred online, but also the freakishly large substratum of binary, digital data on consumer behavior that gets produced whenever we go online and start clicking and writing. This industrial production of user and consumer data, and its subsequent commodification by information communication technology (ICT) companies, is one of the defining features of modern informational economies and now an essential condition for the production and circulation of capital today.

Thus, in our desire to theorize and understand the broader implications of networked, digital writing practices, we can begin by articulating a more diachronic and critical materialist analysis of digital textuality, one that foregrounds the historical and developmental relations between inscription technologies and the shape of social and economic life. Without pushing our material analyses, we risk obscuring some of

the more radical changes that are occurring in informational capitalism, not only in our writing practices, but in the way our use of writing technologies, and the abundance of digital textuality we have created, begins to endanger other social and environmental systems. I end this introduction with a materialist framework for accomplishing just this purpose.

Tracing Material Talk

Talk of writing's materiality began explicitly in the field of Rhetoric and Composition in the mid 1990's in response to three broad technological developments--the spread of personal computers, the development of the Web browser and hyper-linking, and the emergence of a global Internet. Christina Haas' *Writing Technology: Studies on the Materiality of Literacy* (1996), stands out, in my mind, as a touchstone here.[3] Haas emphasizes that "[t]echnology has always been implicated in writing…verbal behavior without technological tools is not, and cannot be writing" (xi). For Haas, any discussion about the materiality of writing begins with the tangible reality that writing technologies are products of human labor that *embody* a long history of use. That is, when we pick up a writing tool, we aren't just picking up a pen or touching a screen, we are, more fundamentally, interacting with a technological artifact whose function has been refined over time through the

[3] Another key materialist analysis from the 90s is Jay Bolter's *Writing Space* (1991). I have chosen Haas as my example here because her work is more in line with the tradition of historical materialism I am invoking in the present work.

laborious process of human trial and error. Haas goes on to critique the field for not recognizing the full implications of writing for the production of material social life:

> Despite the ubiquitousness of the tools and artifacts of literacy in contemporary culture and the rapid change in writing tools that the last decade has witnessed, surprisingly few theorists of writing have specifically addressed technological questions, and even fewer have attempted to deal with the broader issue of the material nature of writing. (36)

The materialist argument I am building here echoes the same concern that Haas pointed out almost twenty years ago—there is a persistent need in our theories of writing, due to the pace of technological change, to inquire not only into the alphabetic meaning of texts, but also into the deeper cultural and material changes that occur with the expansion of textuality. She calls this the Technology Question:[4]

> What is the nature of language made material, what is the nature of writing? And what, as a consequence of writing, happens to human thinking and human culture? (8)

Such questions resemble the ones I asked earlier in regards to Nanni's clay tablet. While they are broad, they reflect a historical materialist sensibility. Haas pursues these questions by invoking Lev Vygotsky's concept of *mediational means*:

> …mediation helps us to see tools, signs and technologies as spatially and culturally distributed systems that function to augment human psychological processing. In this way, technologies, literacy technologies in particular, are themselves complex systems that might fruitfully be studied genetically [that is, historically]… (17)

For Vygotsky, coming out of a Marxian framework, *mediation* is way to think both materially and *dialectically* about our use of symbolic technologies. That is to say, the

[4] Haas' use of the singular 'question' creates some confusion in the book. I think she would agree today that 'technology question[s]' is the more apt way to think about the multifaceted nature of our writing technologies.

process of mediation is predicated on a dynamic, fluid understanding of the world, an ever-changing, ever-emerging materiality that emerges from the fundamental relations between physical and technological forces and the human agents in the world. Our use of writing technologies must be understood as a process of mediation. This experience of using writing technologies is a bi-directional, reciprocal process of material and energetic exchange between user and technology. As we write and participate in the textual universe, we are simultaneously drawn into, beyond our control, an expanding world of textuality and inscription. Mediation is exceptionally useful in theorizing textuality because it emphasizes the interactive process that is central to lived experience.

Haas' recognition of mediation and the historically contingent nature of our writing technologies serve as a starting point for the materialist model I am proposing in this work, but we must expand these insights to develop a more rigorous, critical materialism for theorizing digital writing practices and their vital role as engines of value production in informational capitalism. How can we do this? By synthesizing the following theoretical frameworks:

- Ecological models of writing that have developed in the field of Rhetoric and Composition in the past 40 years.
- The historical and dialectical materialism of Karl Marx and Fredrick Engels, in particular, concepts of *value, metabolism* and *capital circulation*.

Ecology In Composition

One of the more promising materialist approaches to writing research and theory to emerge in the past forty years has been the development of ecological models of writing. Several writing scholars have invoked ecology to capture the dynamic relations between our use of literacy technologies and the various human and nonhuman systems we engage with via literacy. In its most pared down version, ecology is the scientific study of living organisms and their symbiotic relationship with the surrounding environment. Writing and rhetoric scholars who have invoked ecology find it to be a useful metaphor for thinking about human symbolic behavior and the role writing has in shaping human ecologies. We see a similar attempt to capture the fluid and emergent nature of writing in terms like semiosis, discourse, media, and dialectics—humanist and social science terms that correspond to the biology based ecology.

Ecology entered popular discourse in the United States with the gas shortages of the early 1970s and the birth of the modern environmental movement.[5] It is in this context that the term makes its first appearance in the field, Richard Coe's "Eco-logic in the Composition Classroom" (1975). In this prescient essay, Coe critiques "mode pedagogy"—the teaching of abstracted written forms (classification, definition, compare/contrast) a writer can apply across different writing situations. Coe argues that this approach, a vestige of the linear logic of the Enlightenment, is "...inadequate

[5] The modern environmental movement is often symbolically tied to the inauguration of the first international Earth Day, April 22, 1970 (earthday.org).

for discussing the more complex phenomena which are increasingly relevant to contemporary realities" (232). For Coe, "meaning is relative to context" (233), and understanding context in a changing world requires holistic thinking capable of making connections *between* contexts. Oddly though, Coe's eco-logic will not be pursued by other writing scholars, and *ecology* disappears from the field's discourse for the next decade.[6]

The term will appear again in the mid 1980s—a decade in which the field makes its "social turn" (Trimbur 109). In a world where personal computers are just making their presence felt,[7] the social turn in the field was, among other things, a response to the limitations of cognitive process models of writing. It is in this context that Marilyn Cooper publishes "The Ecology of Writing" (1986). Lester Faigley argued that Cooper's article, along with work by Patricia Bizzell, Kenneth Bruffee, and Shirley Brice Heath were representative of the field's move into social constructivism. And indeed, Cooper's use of "ecology" reflects a social constructivist's sensibility. The core premise of her ecological model of writing is that "writing is an activity through which a person is continually engaged in a variety of socially constituted systems" (367). She describes these systems as,

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[6] What happened? When we look at histories of the field (Berlin 1987, Faigley 1986, North 1987, Harris 2012), Coe's contextual model of writing was an oddity in a field that was focused on professionalizing the discipline and codifying a process model of composing through cognitive psychology and think-out-loud protocols (Emig 1971, Flowers and Hayes 1981).

[7] For an interesting history of computer's and writing in the 1980s, see Hawisher et al., *Computers and the Teaching of Writing in American Higher Education, 1979-1994: A History (New Directions in Computers and Composition Studies)*, 1995.

> …an infinitely extended group of people who interact through writing, who are connected by the various systems that constitute the activity of writing. For these "engaged writers" ideas are not so much fixed constructs to be transferred from one mind to the page and thence to another mind; instead, ideas are out there in the world, a landscape that is always being modified by ongoing human discourse. (372)

For Cooper, to think of writing as an ecological phenomenon means we must broaden our understanding of meaning making by taking it out of the head of individual writers and placing it "out there in the world, a landscape that is always being modified by ongoing discourse." Cooper's use of ecology, then, emphasizes the socially situated nature of writing over the more traditional understanding of meaning making as the product of individual minds.

Second Wave Ecologies of Writing

As promising as Cooper's work was, talk of ecology goes silent again in the field through the greater part of the 1990s. When it surfaces again in 1999, fourteen years later, the world has undergone radical changes—over 300 million computers have been purchased worldwide (United Nations); the Internet has been privatized and the WWW has emerged. Google has been launched from a garage in Menlo Park, CA, and the earliest forms of what we now call social media have begun to appear. This is a radically changed textual landscape that has been transformed by advancements in writing technology and the emergence of digital media. In response to such seismic changes, a second wave of ecology and writing scholarship has emerged.

Following in the tradition of Coe and Cooper, this second wave of ecological scholarship on writing tends to define ecology as the local "environment" of the composing situation--a classroom, a blog, a discussion board, the workplace. Outstanding examples in this second wave include Margaret Syverson's *The Wealth of Reality: An Ecology of Composition* (1998), Clay Spinuzzi's "Genre Ecologies" (2003), Sidney Dobrin and Christian Weisser's *Natural Discourse* (2002), Jenifer Edbauer's "Unframing Models of Public Distribution: From Rhetorical Situation to Rhetorical Ecologies" (2005) and Hawisher and Selfe's "Globalization and Agency" (2006). In each their own way, this second wave of scholarship moves beyond Coe and Cooper to develop more robust ecological models for describing digital, networked writing practices.

The most ambitious of these is Margaret Syverson's *The Wealth of Reality: An Ecology of Composition* (1999). Syverson argues that, like cognitive process models, social constructivist models of writing fail to grasp the complex materiality of writing in technological environments:

> [a]s contexts and technologies for writing continue to change at an ever accelerating pace, we cannot cling to our familiar, comfortable assumptions about writers, readers, and texts, or we will find ourselves increasingly irrelevant and even obstructive. We must not only develop new instruments and new tools for analysis; we must also develop entirely new disciplinary ways of seeing, thinking and sharing knowledge. (27)

For Syverson, current notions in the field such as *process* and *context* are limited—concepts from of a print world that are no longer adequate by themselves for understanding contemporary digital literacies. To make the shift into a more expansive paradigm, Syverson formulates an "ecology of composition" (7)--a

"comprehensive theory of composing as an ecological system of interrelated structures and processes that are at once physically or materially, socially, psychologically, temporally and spatially emerging in codependent activities."

Syverson applies this ecology of composition to study the complex social material interactions that take place to produce a single text. She uses the example of Jewish-American poet Charles Reznikoff. As Syverson demonstrates, the composition and publication of Reznikoff's memoir *Family Chronicle* (1969) only emerges as the final expression of years of relationships, travels, texts, arguments, agreements, and other activities that eventually coalesce into a final publication. Her important addition of both the physical and temporal aspects behind textual production extends the scope of Syverson's ecological model, giving materiality a more prominent place in theorization than previous models. Yet, oddly, Syverson argues that, if we hope to understand the "richness of data and the pace of interactions" present in contemporary writing situations "…case studies are the best means to accomplish this goal" (187). Despite the boldness of her ecological vision, Syverson's analysis remains at the level of the local writing situation, disconnected from many of the larger material and technological forces that she herself acknowledges in her ecology of composition. This limit in ecological vision is one aspect of current ecological models of writing that must be amended and broadened.

Jenny Edbauer's "Unframing Models of Public Distribution: From Rhetorical Situation to Rhetorical Ecologies" (2005) is another stellar example of this second wave ecological scholarship. In this study of public rhetorics, Edbauer argues that

Bitzerian models of the rhetorical situation "fall somewhat short when accounting for the amalgamations and transformations--the spread--of a given rhetoric within its wider ecology" (20). In contrast, she proposes we need instead a "…framework of *affective ecologies* that recontextualizes rhetorics in their temporal, historical and lived fluxes" (9).

To illustrate these "fluxes" in action, Edbauer tracks "a rhetoric" as it moves from one rhetorical situation to another in a local community. In this particular case, the rhetoric begins as a bumper sticker designed and sold by a local book store in opposition to the commercialization of downtown Austin, Texas--the "Keep Austin Weird" campaign. Starting from the counter of the book store, the slogan begins to circulate, appearing in other rhetorical situations—local newspapers, t-shirts, advertisements, graffiti. Edbauer concludes that "[t]his public scene forces us into a rather fluid framework of exchanges--a fluidity that bleeds the elements of rhetorical situation"(20). In this more fluid version of the rhetorical situation, audiences, speakers and texts are permeable and shifting. A rhetoric moves amongst these shifting triangles meme-like, carrying its original exigence as others affected by it propel the rhetoric onward. It is this sense of motion and *circulation* that Edbauer captures that is a vital theoretical component for articulating more materialist and ecological analyses of digital writing.

One final example to note is Cynthia Selfe and Gail Hawisher's model of the "literacy ecology." In "Globalization and Agency: Designing and Redesigning the Literacies of Cyberspace," (2006), Hawisher and Selfe use the literacy narratives of

two Asian graduate exchange students to explore how micro literacy events intersect with larger medial and macro ecologies. As they explain:

> The literacy narratives of Lu and Yi-Huey…demonstrate the multiple dimensions on which technology helps to shape the lived experiences of people within a cultural ecology…both women's literacy practices and values were influenced by their country's emphasis on building technological infrastructures, assembling a critical mass of skilled engineers and scientists, investing in education and educational technology, establishing political stability and formulating technology polices that made a difference in the lived experiences of its citizens. (628)

The great strength of Hawishwer and Selfe's ecological model is their understanding of ecology as the interaction of human and nonhuman systems at various scales, making connections between local writing situations and the larger politics of literacy and education. Their example of Lu and Yi-Huey's journey through literacy captures well how larger social and technological systems have become active determiners of the kinds of life and career opportunities one has access to.

Ecological models of writing give us a number of ways to think about the dynamic nature of literacy, and they provide a solid foundation for extending our current materialist approaches to writing and textuality. The following distilled list outlines the essential theoretical goals of current ecological models of writing:

- Moving from static to dynamic models of rhetorical situation
- Expanding process pedagogy beyond isolated, individual writers
- Problematizing linear forms of cause-and-effect logic
- Building a framework for writing research based on the interaction between multiple social, material, and discursive systems
- Approaching writing and discourse as generative, in-process, and circulatory

Such shifts in our study and theorization of writing are essential for theorizing the ways our experience of materiality is changed in our new textual and informational environment. At the same time, there is one vital question of method that must be addressed before our ecological models of writing are equipped to articulate a more rigorous, materialist framework for studying writing and textuality in modern informational capitalism, and that is the question of *dialectics*.

Dialectics, Metabolism, Composition

While all ecological models of writing are insightful for the ways they accentuate the circulatory movement of writing and texts, what they don't provide enough of is theorization on *how* this movement happens. That is to say, it is one thing to call a writing situation an "ecology of writing" and quite another to describe and theorize the actual forces and relations at play. Thus, when we begin to ask questions about the ecological connections between writing and economy, or how our use of writing technologies actually interacts, and can sometimes harm, other human and nonhuman systems. As it stands now, our current ecological models of writing aren't quite equipped theoretically to grapple with the full implications of difficult ecological questions like these. They lack one essential ingredient of ecological analysis--*dialectical thinking* and *logic*. As sociologist John Bellamy Foster notes about the origins of ecological thought that took shape in 19th century America and Europe:

> This [19th century] ecological conception of the world of life was itself in many ways reflexive and self-creating, arising out of materialist dialectics, and would give birth to many of the most powerful insights associated with the

> development of modern ecology. Moreover, it can now be argued more generally, extending Engel's early proposition with respect to nature, that "ecology is the proof of dialectics." No other form of thinking [dialectics] about nature and society has so conclusively shown the importance of irreversible change, contingency, coevolution and contradiction. (245).

In other words, modern ecological thinking is the latest form of materialist dialectics, and its emergence, according to Foster, owes a good deal to Marx and Engels historical and dialectical methods of analysis. Not only are materialist dialectics a precursor to modern ecological thought, more importantly, *materialist dialectics are a method and a process for engaging in ecological analysis* (see appendix for Bertell Ollman's diagram for doing a dialectical analysis). Marx and Engels never use the word ecology (coined in 1866 by naturalist Ernest Haeckel), but their materialist history of industrial capitalism was highly influenced by scientific work emerging in the natural sciences at the time, and in particular work by naturalist Charles Darwin and agricultural chemist Justus von Liebeg (Foster ix). In fact, one of Marx's most memorable metaphors for describing the material, dialectical processes of living culture, comes out of the then nascent field of biology--*metabolism*. Foster argues that, in understanding Marx's dialectical method, we must understand his use of metabolism and its significance for historical material analysis:

> In his definition of the labor process Marx made the concept of metabolism central to his entire system of analysis by rooting his understanding of the labor process upon it. Thus in his definition of the labor process in general (as opposed to its historically specific manifestations), Marx utilized the concept of metabolism to describe the human relation to nature through labor. (Foster 157)

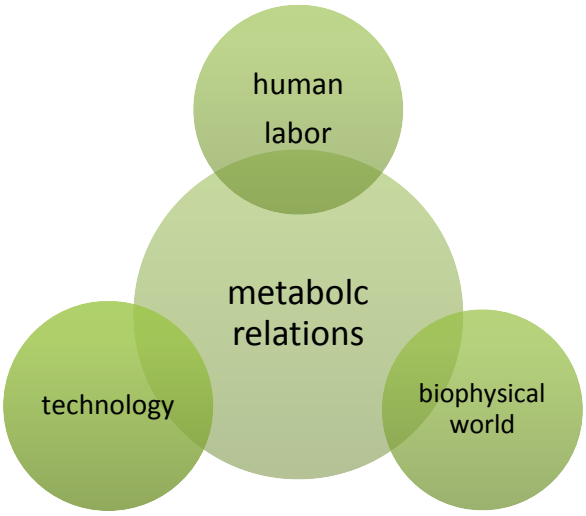

Figure 1.2: Diagram depicting Marx's historical, dialectical materialist framework for theorizing the active, metabolic exchange of energy between human labor, technologies, and the biophysical world.

Marx's use of metabolism is a clear expression of his imaginative effort to articulate a materialist, ecological analysis of industrial capitalism that wasn't simply a thought experiment in dialectics (which he attacked as "contemplative materialism"). Rather, Marx and Engels were both adamant about keeping their social and economic analyses *grounded in the biophysical world* that sustains all activity. As the opening quote to this chapter expresses, for Marx, resolving cultural tensions "is by no means a task of knowledge but a task of actual life." Metabolism, like ecology, foregrounds dynamism and relations, but it adds an important analytical component by emphasizing the *physicalness* of these relations and the kinds of *energetic, metabolic exchange* that takes place between human labor, our use of technology, and the organic systems of the biophysical world they interact with. That is to say, the interdependent relations between human labor, technology, and the biophysical world form the fundamental metabolic relations that give shape to our lived experience of the world.

As Foster notes, Marx's concept of metabolic relations, which sits at the foundation of historical materialism, has been consistently ignored in Marxian analysis. It's an unfortunate oversight because the concept undermines several standard critiques of Marxism—that it puts too much emphasis on technology or that it lacks an environmental component. On the contrary, Marx's theorization of metabolic relations places as *a priori* the interaction between cooperative human labor, technology, and the natural resources of the planet as central for sustaining and reproducing our daily lives (Foster 2000). As the *primary* metabolic relation, it's understood that there are repercussions for the system as a whole if any of the three relations begins to grow stronger in size or intensity:

> Just as this metabolic relation constituted the universal condition defining production, so the alienation of this metabolism was the most general expression of both human alienation and alienation from nature… (Foster et al. 278).

Marx explains that the industrial revolution that was then unfolding in 19th century England was enacting such an alienating process as the English peasantry was forced, over the span of a two centuries, to leave the agricultural commons for factory work in the cities. Marx and Engels argued that the closing of the English commons led to a "rift" between town and country--the severing of direct metabolic relations between human labor and the soil, and the appropriation of this labor by industrial capital.

Robert P. Yagelski raised a similar quandary fourteen years ago, but in the context of modern writing environments:

> Indeed, my concern – and fear – is that the primary effect of our uses of these computer technologies is to reify the Western sense of self as an autonomous, thinking being that exists fundamentally separate from

> the physical world; in this way, computer technologies…reinforce the disconnection between humans and their environment and thus contribute to the frightening environmental crises we face at this point in time. (2001)

Yagelski pinpoints precisely the kinds of contradictions and difficult metabolic truths that emerge in our contemporary hyper-mediated experience of literacy. As well, it raises difficult questions about the ways new media, Web 2.0 technologies have now firmly established themselves as standard technologies used at all levels of education in the United States. Many writing scholars and teachers have also embraced Web 2.0 writing technologies for the ways they encourage students to write more and the potential they have for more civic participation and collaboration. At the same time, in light of the environmental crises that Yagelski notes, crises that have become progressively worse (see chapter 4) in the past decade, some troubling questions surface:

- In what ways do new media writing pedagogies ignore the potential for disconnection from the natural world caused by living in a hyper-mediated writing environment?
- Is it possible that our new media pedagogies, in their embrace of Web 2.0 writing technologies and growing textual production, contribute to climate change and other environmental imbalances?

In answering such questions, we can begin to expand our material, ecological analyses of writing in ways that enable us to make better sense of the potential antagonisms that arise between a global, networked, electrified infrastructure for inscription and the organic systems of the planet.

Yagelski hints at the role of capital in this potential for disconnection, but he stays focused on the experience of the writing self. As I will demonstrate throughout

this work, understanding our experience of disconnection with the shrinking biophysical world cannot be understood only through the experience of the writing self—it also necessitates embedding the self in the hyper-mediated environment of informational capitalism and the central role our writing labor now plays in circulating capital.

Many in the field have found "circulation" to be a useful metaphor for thinking about the movement of texts through culture (Trimbur, 2000; Yancey, 2003; Edbauer, 2005; Eyman, 2007; Porter, 2011). In "Made Not Only in Words: Composition in a New Key" (2003) Kathleen Blake Yancey outlines three ways we think about circulation in the field: *textual circulation*, *genre circulation*, and *media circulation*.[8] These different types of circulation are helpful guides for understanding the circulation of texts in lived culture. However, placed within Marx's metabolic framework, "circulation" describes the large scale, incessant need for capital to continue circulating in culture, and marshalling any human and nonhuman resources towards this purpose. As Trimbur points out, "the question to begin with is not so much where the commodity goes as what it carries in its internal workings as it circulates" (Circulation, 209). When commodified writing circulates, not only does it carry rhetorical, semiotic meaning, it "also reproduces the prevailing and contradictory social and economic relations of capitalism" (Trimbur 208). From a Marxian perspective circulation is not simply about tracing written artifacts, or even

[8] *Textual circulation* is what we would associate with the intertextuality of quoting and paraphrase. *Genre circulation* centers on the textual forms that organize human relations (312). And *media circulation* refers to the ways old and new media converge to create new semiotic forms in new digital environments (312-315).

discourses as they move from writers to readers and back again. Rather, it's about understanding the production of writing and texts *in relation to the circulatory demands of capital* and how this process conditions our literacy practices. Understanding circulation in these terms deepens our material and ecological understandings of the writing we do online, and how this labor has become a necessity for capital to grow and circulate in the 21st century. In *Capital,* Vol. II, Marx outlines the industrial circulation of capital from a macro-economic perspective. It is composed of two spheres: the sphere of production and the sphere of circulation, also called the sphere of exchange. This is expressed in the following Figure 1.3: [9]

[9] Image reproduced based on an older image from *Marx's Capital* (2004) by Ben Fine and Alfredo Saad-Filho. Reproduced with permission from Pluto Press.

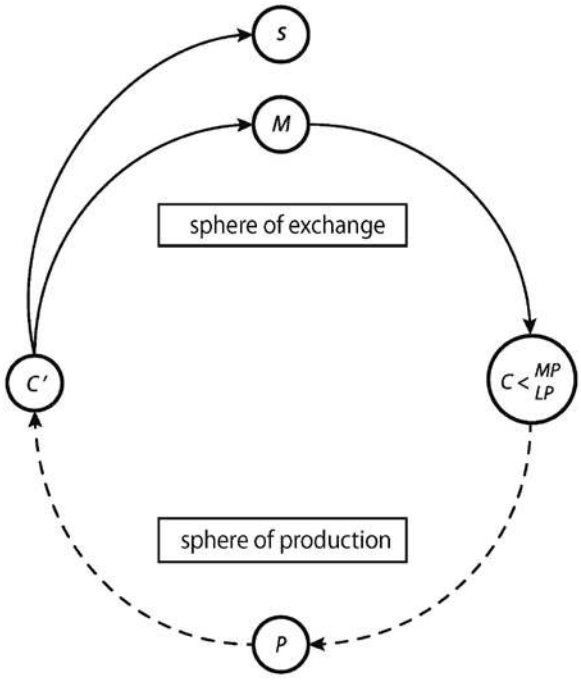

Figure 1.3: Diagram of Marx's industrial circuit of capital. The 's' emerging at the top represents the surplus value that is produced when capital completes the circuit.

Despite the static depiction, the arrows illustrate the movement of capital as it makes its way through the sphere of production en route to accruing surplus value in the sphere of exchange (the market.) The M at the zenith of the circuit stands for money-in-motion, or, capital. Money is used to purchase C (commodity) in the form of MP (means of production) and LP (labor power). MP and LP then enter into the sphere of production, P, and emerge from this process changed as C'--a new, "altered" commodity that now embodies the labor and technologies that were used to produce it. C' enters into the sphere of circulation and will, ideally, complete the circuit by being sold on the market. Once sold, the labor power that is congealed in the

commodity is set free in the form of *s*—surplus value. In completing the circuit, capital has regenerated and *increased* in size.[10]

The speed in which capital makes this circuit has direct implications for our metabolic relations with each other and the environment. The goal for capital is to complete the circuit—a precarious process as we all know. The faster the circuit can be completed, the faster surplus value can be accrued. As I will be discussing shortly, as processes of capital circulation speed up, so too do our metabolic relations with the earth's finite resources.

Although Marx spends little time theorizing the role that writing and communications play in the circuit of capital, he considered them integral to the general process of acceleration that is a distinguishing feature of industrial capitalism. The truth of acceleration is even more evident in informational capitalism where our writing practices, and the data they create, take on primary roles as engines of capital circulation. Critical media theorists Vincent Manzerolle and Atle Kjosen frame it this way: "Media enable capital to move as an iterative process and is therefore the key component for capital's circulation; and it is media…that are the means by which capital communicates itself to itself in and through society" (216). The authors use the general term "media," but "writing" may be a better fit here. Media do indeed help circulate capital, but the specific medium of writing, as a human, symbolic activity, is critical for recording and organizing our day-to-day exchange relations with each other. It is the labor of our online writing, not simply media, that is a powerful

[10] Marx's shorthand version of this formula is M – C…P…C' – M'.

source of value production and essential for capital to circulate informational economies.

As history demonstrates in Ancient Mesopotamia, once writing and textuality were developed to a certain point of general use, they began to feedback into other social and technological systems. All communications media, from the earliest forms of writing, to print, radio, TV, and on to the binary code of today, could be considered inscription technologies that give rise to textuality by way of textual augmentation. Writing begets more writing. What does change, however, is how medial affordances, along with the general technological structure of a culture, get progressively *enhanced* and pulled into service to accelerate capital circulation. The acceleration of commodity exchange enabled by digital writing technologies, by collapsing time and the material spaces that capital must traverse before it can realize "itself in itself," plays a pivotal role in the ways our writing online gets leveraged for capital circulation and, in the process, pulling more and more of our online literacies into commodity relations.[11]

MEOW: Materialist Ecology of Writing as a Theoretical Framework

By supplementing our current ecological models with Marxian concepts of mediation, metabolism, and capital circulation, I believe we can build more insightful materialist methods for theorizing the broader material impacts of digital, networked

[11] Kjosen explains: "Hence, as capital extends itself in space, it also strives, as Marx famously noted, "to annihilate this space with time, i.e. to reduce to a minimum time spent in motion from one place to another" (1973:539). Marx calls this the *velocity of circulation*. David Harvey calls this "space-time compression" (1991).

inscription technologies and expanding textuality. The theoretical framework I am proposing here is intended to inform the research and teaching of digital writing as it manifests at multiple, interacting scales, including the biophysical world it is invariably dependent on. It is in this naturalist, materialist tradition that I locate my own developing *materialist ecology of writing (MEOW).* [12]

In articulating such a framework, I begin by theorizing the active role writing technologies play at various levels of interdependent, material *strata.* Michel Foucault uses the term to describe the historical layers of discourse that compose our textual, social worlds (*Archeology of Knowledge,* 1972). My use of the term borrows from Foucault's, but with a different theoretical emphasis for thinking about the production of textuality. MEOW is a stratified model of materiality where each stratum is in interdependent and dialectical relations with other strata, while also allowing for a more focused analysis of each particular layer.

[12] This ridiculous acronym finally dawned on me after two years of typing out "materialist ecology of writing." It has provided great comic relief for me while writing this dissertation, and it has helped me not to take myself too seriously. It also serves as homage to arguably the most significant phenomenon to emerge in digital culture—kitten videos.

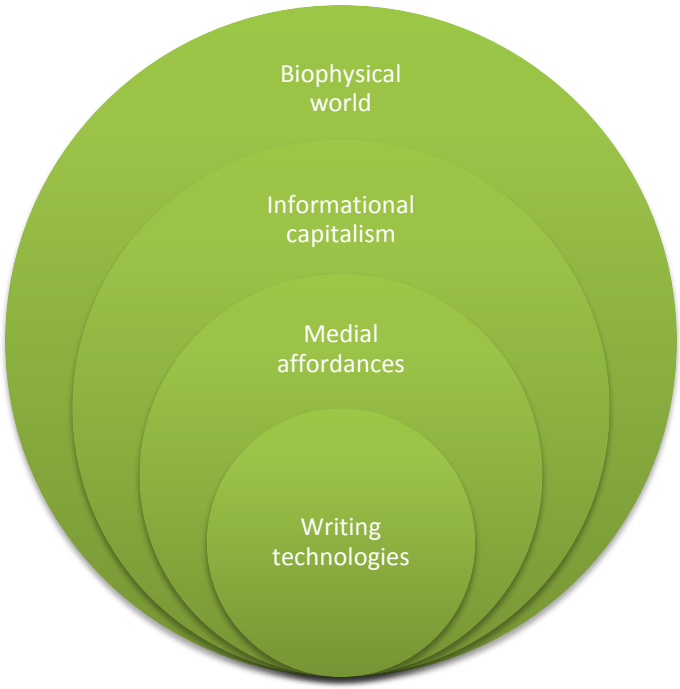

Figure 1.4: Diagram of layered simultaneity of the four material stratum that form the broader theoretical framework for a MEOW analysis.

Figure 1.4 illustrates my use of material "strata" as a framework for theorizing writing. Rather than running horizontal in relation (as geological strata), in the MEOW framework it's more useful to think about a nested structure, where strata grow progressively outward towards larger social and biophysical systems. The notion of layered simultaneity is meant to accentuate the nested structure of these dialectical relations.

The following four strata serve as the broader theoretical framework for MEOW and will guide my analysis throughout the work that follows. I will take up each stratum in different chapters:

Stratum I: Writing technologies as artifacts embodying a history of use

Stratum II: Medial affordances—the production of material textuality (informationalization) through *inscription* and *self-augmentation*

Stratum III: Writing, textuality, and capital circulation

Stratum IV: The biophysical world and the organic self

Current ecological models of writing provide a good base for developing more astute materialist approaches to the study of writing, but we must expand these models by grounding them in materialist, dialectical thought, one that recognizes the conditions of informational capitalism and the connection between the labor of our writing, the technologies we write with, and the dangerous metabolic acceleration of other social and physical systems that emerging in this context. Thus, I define the four strata structure of MEOW in the following terms:

> *The study of the metabolic relations between human semiotic activity and the surrounding biophysical environment located at the nexus of material strata, mediating writing technologies, and a finite, ailing planet.*

As Raymond Williams argues, "[f]ailure not only to acknowledge these [physical] conditions, but to continue to take them into active account, has indeed…led to shallow and limited kinds of Marxist and other political and social thought." (108). We see these limitations in current ecological models of writing in their failure to address writing's place as an engine of the information economy and its associated problems of expanding commodification, heightened consumption, ewaste, and other troublesome trends such as data-mining, surveillance, planned obsolescence, and the stresses of growing textuality on the somatic body. These problems have serious implications for our literacy practices, as well as the ecological health and

well-being of the planet. A materialist ecology of writing puts the biophysical world, and our semiotic practices at the center of capital circulation. By actively foregrounding the layered simultaneity of the four material strata, we can begin addressing challenging questions that have been traditionally beyond the field's purview. I argue we have a responsibility to address these concerns, one, because of our own scholarly and pedagogical stake in using and teaching digital literacies, and two, because the quality of our lives, and the lives of those that will come after us, vitally depends on how we approach and think about our growing use of media and inscription technologies.

CHAPTER 2

STRATUM I/STRATUM II: WRITING AND TEXTUALITY AS AGENTS OF CAPITAL CIRCULATION

Using the four strata framework I introduced in chapter one, in this chapter I foreground strata I and II--writing artifacts and their medial affordances. As a type of historical materialism, a materialist ecology of writing (MEOW) sees writing technologies as artifacts that embody a history of use. That is to say, though I'm typing on a keyboard and looking at a screen as I write, I am also using the Roman alphabet and printing on paper—technologies developed several millennia before the personal computer. Writing technologies and their history of use evolve over time to make up those technologies we call a book, a printer, or a computer.

As I discussed in chapter one, while current ecological models of writing hint at the ways local writing practices interact with larger cultural and technological systems, their preference for the local scene of writing (i.e. a classroom, a workplace, a neighborhood) limits their ecological scope of how these various scales of activity actually interact. In understanding the complexity of writing in digital environments there is a need to open the space of the local writing scene to these larger systems so we can more clearly theorize the ways writing, as a ubiquitous technology, profoundly affects our experience of literacy, and in the process, the limits and possibilities of human agency. In doing so, we create the opportunity to look at writing from new vantage points and radically rethink our assumptions about writerly agency and the ways this agency gets dispersed amongst a range human and non-human systems.

This task is even more pressing in the context of informational capitalism and ecological crisis, where our use of digital writing technologies, and the data and material waste they create, raise serious questions about the shape of our literacy practices and their vital role in the production and circulation of capital.

In this chapter, I begin laying out a materialist ecology of writing by historicizing the developmental relations between writing and economic life as it emerged in the world's first writing system, cuneiform. As mentioned in the introductory chapter, archaeologists have excavated over 500,000 cuneiform tablets dating from as early as the 4th millennium BCE to as late as 1st millennium BCE (Aubet, Roaf). Because of the durability of clay, a rich textual history has been preserved from the region, giving us a unique look into Mesopotamia's experience with writing and cultural development. The widespread textual culture that cuneiform helped produce over a span of three millennia is an interesting example of what I call a *proto-informational economy*—an economy where writing and textuality play a key part in the circulation of capital. While the texts that have been found in Mesopotamia vary in form and function, the vast majority of them are records of accounting and exchange—lists, receipts, orders, ledgers, and many more (Goody, Powell). This abundance of economic genres tells two important things about writing: one, the emergence of writing in a culture is also the emergence of textuality; that is, it's not simply writing, but also the accumulation of texts, that can account for the diffuse agency that writing, as a technology, can take on. And two, the large majority of these texts, economic in nature, are records of the quotidian, day-to-day exchange relations

between Ancient Mesopotamians and their experiences of the phenomenal world. Thus, the historical record we have of Mesopotamia strongly suggests that the technology of writing and textuality evolve in a dialectical relation with money and economic development.

Thus, I begin this chapter with the following question:

- What can we learn about writing and capital circulation by studying the cultural development of cuneiform, and how can this history inform our current theories of literacy and technology in digital environments?

To ask such a question is to assume that writing technologies can take on agency in culture. For many writing scholars, such a claim may feel dissonant. Agency is the reserve of human beings, not lifeless writing technologies, so the argument goes. But this assumption needs to be revised in light of the radical changes we are currently experiencing in the transition from an analogue, print world to a digital, layered one.

Historically, many of our current assumptions about writing, technology, and agency find their roots in the literacy debates that emerged in 1970s and 80s. I won't cover the entire history here, but a useful starting point is Jack Goody and Ian Watt's influential article "The Consequences of Literacy." Written in 1963, Goody (anthropologist) and Watt (literary critic) argued that the introduction of writing into Ancient Greece (circa 8th century BCE) brought with it the most radical of cultural and cognitive changes, leading to the emergence of democracy, abstract thinking, classification, and logic (332). This model of literacy and technology would come under attack as literacy and writing studies grew into the 80s and 90s (Street 1983, Walters 1990, Faigley 1999, Daniell 1999, Trimbur 2003, Lunsford and Prior 2007).

Critics argued that the Goody-Watt model was deemed too deterministic and was seen to mistakenly posit literacy as simply epiphenomena of technological change. Along with other scholars like Eric Havelock and Walter Ong, Goody and Watt's approach has been labeled the "great leap" model of literacy. The most trenchant of these critiques is Brian Street's *Literacy in Theory and Practice* (1983). Street argues that the development of literacy in any culture "must clearly be sought in the social structure" (51) and not in the supposed "intrinsic advantages" of any particular technology (51).

For many writing scholars, their most persistent critique of Goody and Watt is their problematic use of "consequences" to describe literacy's impact on culture. For Street and others, such deterministic language must be resisted because it obscures the richness of lived literacy practices and the potential for human agency. According to this critique, the true epistemological and ontological grounds for theorizing literacy rest in the diversity of situated local practices and literate human agents. While the critique is certainly warranted, it likewise ignored one critical advantage of Goody and Watt's work--the time and scale they were considering—a span of about 500 years. From this scale, literacy and the possibilities for individual human agency take on a much different dynamic. As Goody and Watt make clear throughout their article, the development of literacy can take centuries, if not millennia, to emerge. In calling this diachronic analysis a "leap," writing and literacy

scholars essentially dismissed the idea that writing and agency could be effectively studied at the juncture of both these different scales. [13]

In fact, Goody's later work would pursue this question regarding the relation between local practices and larger cultural systems in his later work. As he writes in *The Domestication of the Savage Mind* (1977):

> …there is a halfway house between the choice of a single cause and the complete rejection of causal implications, between the diffuseness of structural causality and of functional fit and the selection of a single material factor as the dominant or even determinant cause; there is the whole area of causal arcs, of feedback mechanisms, of the attempt to weight a plurality of causes. (10)

This is not a deterministic view of literacy and technology. Agency in this model does not reside in one thing—not the literate human or the writing technology, or even the local writing scene. Rather, a system of agency materializes at the "halfway house" where history, writing, technology, and human agents blend into a complex material ecology.

What's important to note about this particular literacy debate and the resiliency of the "consequences" critique is that, in the field's genuine effort to resist deterministic thinking, we developed an exaggerated sense of individual human agency in the process. While the reaction by literacy scholars may have been appropriate for those particular contexts, we have moved into a qualitatively new socio-technological phase with the emergence of digital textuality. Thus, while we must continue to value local literacy practices, we cannot be so naïve as to think those literacy practices are immune from the larger forces of capital circulation. In

[13] It is interesting to see these kinds of things happen to scholars, especially someone as prolific Goody (over 30 books, hundreds of articles) with an academic career spanning almost fifty years.

theorizing the materiality of digital writing and textuality, we have much to gain by revisiting Goody's later work on literacy and technology, and in particular, his diachronic analysis of writing and economy in ancient Mesopotamia.

Part 1: Historical Background and Definitions

Medial Affordances, Informationalization, and Capital Circulation

One way into a historical analysis of writing as a technological artifact (stratum I) is to focus on medial affordances (stratum II)—those basic functions encouraged by a writing technology. In this chapter I focus on what I see as the two primary affordances of writing (and all media in general)—*inscription* and *self-augmentation*.

- *Inscription* refers to our day-to-day use of writing to inscribe and materialize our social and phenomenal worlds.
- *Self-augmentation* refers to the cumulative effects of textuality and the organizational agency it exerts on our everyday social and economic exchanges.

What these affordances draw attention to is the idea that writing is not simply a technology for communication; it is, more basically, a technology for inscribing our phenomenal experience. It is the active creation of textuality, the great majority of these texts being those quotidian acts of writing we exchange each day—a printed receipt, an email, a text message, a contract, a paystub. This vast amount of day-to-day textuality we create is what I define here as *informational*--the industrial production of microtextuality that accumulates as we record and organize our exchange relations with each other. We too often take these kinds of texts, and their sheer abundance,

for granted; but, they nevertheless form the textual background of our lived experience. The affordances of inscription and self-augmentation are leveraged by human agents to create a cultural dynamic I call *informationalization.* I define informationalization in the following way:

> *The large-scale production of textuality for materializing and organizing our day-to-day social and economic exchanges.*

Every time we write, whether it be on paper or screen, we create real, tangible information. Writing allows us to actively materialize our thoughts, our promises, our relationships—that is, the daily record we create in our exchanges with each other and the phenomenal world. A good example of this can be seen in the experience of Nanni, the Mesopotamian merchant I introduced in chapter one. Nanni's complaint to another merchant is a process of informationalization—of materializing his indignation so it could be transported and exchanged. Recording exchanges is, and has always been, one of writing's most common uses. It is in the activity of human exchange that we witness how a diffuse system of writing and textuality can take on its own cultural imperative.

Informationalization is a particularly useful concept for estranging us from our alphabetic and print biases that may limit our ability to theorize writing in informational capitalism. To describe information simply as alphabetic content fails to capture the radical expansion of textuality that has emerged with binary computing and digital media. Informationalization is also intended to draw our attention to the productive aspects of a writing system and the ways labor of our day-to-day literacies get leveraged for the production of capital circulation.

The process of informationalization, and its dialectical relation with capital circulation, sits at the heart of a MEOW analysis (Figure 2.1).

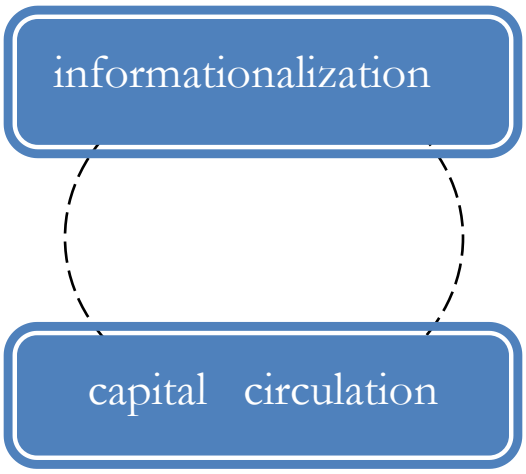

Figure 2.1: Diagram showing dialectical relation between informationalization and capital circulation that forms the starting point for a MEOW analysis of writing and economy.

Together, these processes form a "unity"—that is, in understanding one, it is necessary to understand the other. This unity forms the starting point for a MEOW analysis of writing and economy. My use of "circulation" (introduced in chap. 1) refers specifically to Marx's definition of capital circulation as "the social relations involved in the self-expansion of value" (Harvey, 2012). As Marx emphasizes throughout *Capital*, for capital circulation to emerge in culture, there needs to exist a standard commodity, like gold, that can serve as a universal measure of value for all commodities. Once an uber-commodity like gold emerges (and eventually standardized money), capital can now accumulate and, as a consequence, begin circulating—that is, create surplus value. While Marx was certainly on the right track, the textual record that has been unearthed since his death gives us a clearer picture of

the co-development of writing and economy in Mesopotamia. This history provides us with a unique counterpoint to Marx's theorization of capital circulation where , in the absence of standardized currency, writing, and the quotidian production of informational texts, plays a dominant role in the emergence of capital circulation. As I will demonstrate, the history of cuneiform and its developmental relation with economy and money present for us a provocative example of how writing and money develop dialectically as *co-agents of capital circulation*—a relation that is alive and well in the digital condition.

Marx's Concept of The Money Form and the Creation of Value

As I mentioned earlier, the history of cuneiform and the textual record the Mesopotamians created present us with a unique picture of a proto-informational economy—an economy where every-day textual exchanges play a dominant role in the production of capital circulation. To explore this history, I turn to recent work in archaeology and anthropology that looks at the historical and cultural impact of writing technologies in Ancient Mesopotamian economic life (circa 4000 BCE-1000 BCE)—modern day Turkey, Iraq, Iran, and Syria (Figure 2.2). I then integrate this history with Marx's theorization of money (*Capital*, Vol. 1) and Jack Goody's

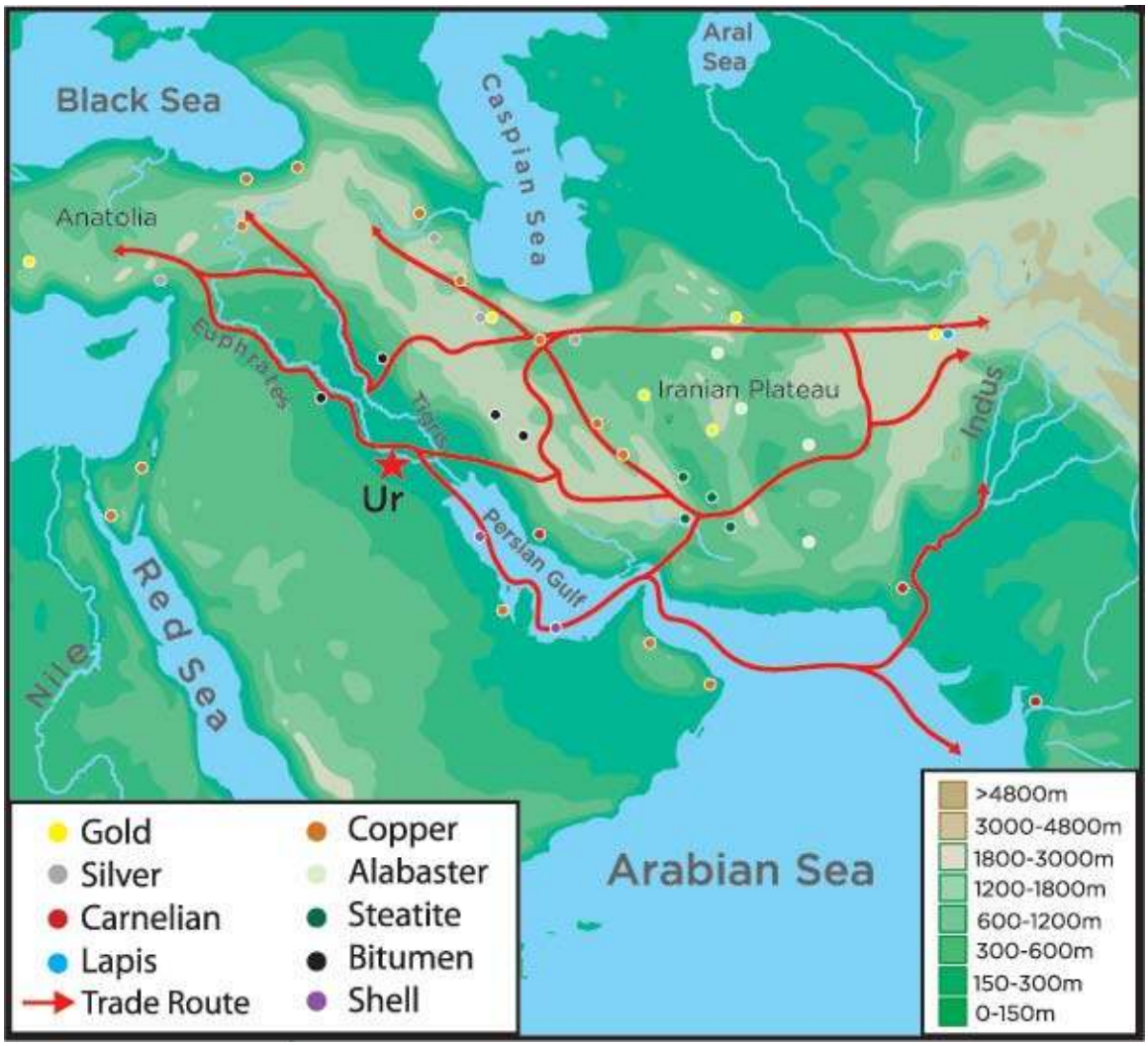

Figure 2.2: Map of Ancient Mesopotamia circa 4th millennium BCE showing early mining locations and trade routes. The city-state of Ur is marked in the middle of the map. where cuneiform writing first emerged as a full system of writing (Image courtesy of the Penn Museum).

materialist study of Mesopotamian literacy (*The Logic of Writing and the Organization of Society,* 1986). While Marx focuses on the importance of *money* as a pre-condition for capital circulation, Goody foregrounds writing, arguing that money *and* writing develop together as co-agents of capital circulation. As I will show, Goody's emphasis on textuality and the technology of writing as a cultural agent both compliments and problematizes Marx's theorization of money. The two perspectives

together offer a language and method for theorizing the developmental relations between writing and economy over long stretches of time. Through this process of historicizing information and informational economies, the experience of Mesopotamia offers us a different perspective and scale in which to understand how certain writing practices, especially the informational genres and texts I am focusing on here, get taken up in processes of capital circulation.

In invoking Marxian circulation, I am assuming that the culture under discussion has reached a certain level of social and technological development where there is *continuity* in the circulation of capital—that is, a culture that is now designed and equipped for the continuing expansion of surplus value creation. Marx argues that before this continuity can emerge, there needs to be a surplus of wealth in culture, what is commonly referred to as a "hoard." Hoards are a pre-condition for capital circulation because they are necessary to initiate and maintain it (Campbell 131). Along with early accumulation and surplus production, Marx theorizes that another essential technology emerges—*money*. Money arises out of the long evolution of labor and exchange relations between early human cultures and the first surpluses (he never gives an actual timeframe). Marx explains that, as social and economic trade relations grow in complexity, a commonly traded commodity begins to crystallize as a basic standard for *value*. As commodities like sheep and goats become more widespread, they take on the appearance of a "money form"—a commodity that can be used to represent the value of other commodities. Archaeologists have found evidence of shells, cattle, and gold all serving this function in various regions. Over

time, the *idea* of money begins to express itself in the first forms of standardized currency. Marx argues that the theoretical money form serves two key cultural functions: it is, simultaneously, a measure of value *and* a circulator of value (*Capital*, Vol. 1. 192—Figure 2.3). According to Marx, it is this dual nature of the money form that helps create the conditions for capital circulation.

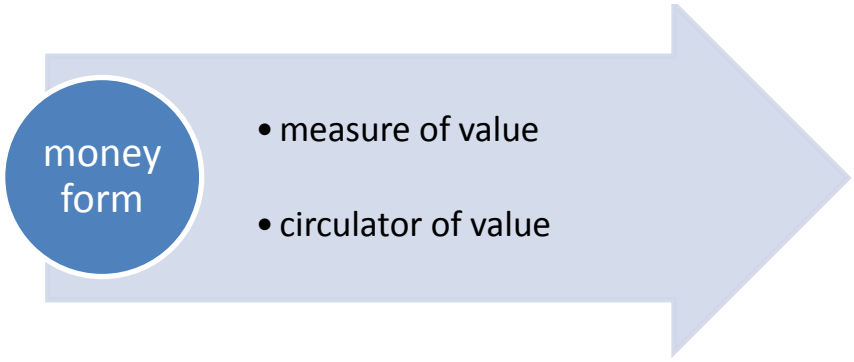

Figure 2.3: Marx theorized that a universal "money form" is composed of its dual function as a measure and circulator of value in culture.

In Marx's time, the standard money form was gold. The precious metal was used for centuries as a standard of measure, held in large supplies by nation states as a form of material backing to national currencies. A "universal equivalent" (Marx) like gold homogenizes the diversity of values in lived experience, making everything reducible to its price in gold.[14] He theorizes that, with the emergence of a universal commodity, hoarding of that commodity ensues, creating the conditions for capitalist social structures to develop. It is with the rising costs of the Vietnam War and the oil shortages of the early 1970s that gold is displaced as the universal equivalent in the U.S. and, as a consequence, the majority of the nations around the world. By

[14] Or, as we might say today, "Everything has a price."

removing the material backing of gold for their currencies, governments were free to print more money, injecting more money into circulation, essentially creating the conditions for the emergence of neoliberal economic policies and a global, capitalist economic system based on competing currencies, cheap labor, and tariff-free, global markets (Harvey, Lectures).

Marx also argues that, in such cultural conditions, the money form will simultaneously function as a *circulator of value*. With one tangible, universal measure of value in existence, exchange is simplified, standardized, and the circuit of capital accelerates in the process:

> As a means of circulation, money circulates commodities, which in and for themselves lack the power of movement, and transfers them from hands in which they are non-use-values into hands in which they are use-values; and this process always takes the opposite direction to the path of the commodities themselves. Money constantly removes commodities from the sphere of circulation, by constantly stepping into their place in circulation, and in this way continually moving away from its own starting point. (*Capital* Vol. 1, 212)

Once value is tangible and expressed in a tangible money form, it can now be accumulated and circulated in exchange. Capital, at this point, begins to emerge as a cultural agent by helping construct a culture of economic exchange intended to produce and reproduce capital accumulation. As Marx mysteriously notes of the money form, "By virtue of it being value, it has acquired the occult ability to add value to itself. It brings forth living offspring, or at least lays golden eggs" (Volume 1, 255).[15]

[15] "Marx is not claiming that gold is the actual form of money…In particular, he holds that [gold] is money's simplest form because, unlike credit money, it does not presuppose the banking system.

Marx's theorization of value and circulation deeply informs MEOW, but I often sense an omission, or hesitation, behind his vivid metaphors. Marx frequently describes capital in organic terms, vernal almost, invisibly growing and organizing and controlling. As elegant and persuasive as these metaphors are, they often signal a place where Marx was still trying to articulate the actual material conditions that promote the organic growth of capital. With the benefit of over a century's worth of archaeological and anthropological study on ancient cultures and writing systems, we are able to fill in aspects of his analysis. Archeologists now believe that a standardized currency never emerged in Mesopotamia (*Ancient Near East,* Van De Mieroop, Allen), despite clear evidence of capitalist practices of wealth accumulation and circulation. What this history suggests is that the experience of writing in Mesopotamia gives us a more nuanced history of capitalism, one where writing, and the emergence of a textual culture, became fundamental technologies for accumulating and circulating *value*. In fact, the history of cuneiform reveals an internal, dialectical relationship between money and writing that emerges early in the history capitalism, and one that continues to have an enormous influence on modern informational economies.

Writing and Money as Co-Agents of Capital Circulation

This developmental relation between writing and money offers us a glimpse into the cultural conditions that give rise to informational production. In "The

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Marx's methodological reasons for beginning with metal money follow from its being the simplest form" (Campbell 136).

Origins and Forms of Writing" Denise Schmandt-Besserat and Michael Erard argue that "the function of writing when it came about in 3200 BCE was exclusively economic," and grew out of a four thousand year old token system for counting and exchanging goods (8—see also Smart, "Materiality" Faigley). When we look at the emergence of the earliest city-states in Mesopotamia such as Uruk and Ur (4th millennia BCE), we see a confluence of several things—the emergence of agriculture and animal domestication, a greater division of labor, a growing population, and growing exchange relations. There is evidence that this change in cultural complexity was accompanied at each step by a series of advances in symbolic activity, leading eventually to a full writing system by the 4th millennium BCE (*Logic of Writing,* Goody, Robinson, Schmandt-Besserat).

As Mesopotamia grew in social and economic complexity, small clay tokens emerged as a form of symbolic exchange (Logan, Schmandt-Besserat). The earliest clay tokens begin to appear around 8000 BCE—4000 years before the emergence of cuneiform. Over time the tokens gradually became more sophisticated, imprinted with lines and other marks to distinguish between them (Figure

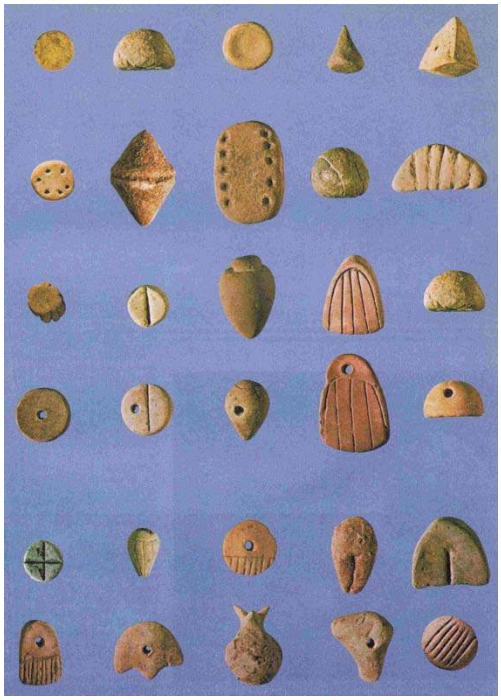

Figure 2.4: Clay tokens used for exchange in Mesopotamia (circa 8000-6000 BCE). Tokens represented basic goods for trade—sheep, wheat, textiles, etc, and are considered some of the earliest evidence of human symbolic behavior, predating both writing and coinage (Schmandt-Bessarat, "Precursor").

Archeologists believe these markings represent a material object, usually a commodity, that could be traded. For example, a token with a cross symbolized a 'sheep'; a cone shaped token symbolized 'bread'. Tokens were useful for simplifying more elaborate trade relations and transactions. Schamandt-Besserat argues that the tokens represent a pivotal stage in human symbolic activity--the first indications of abstract thinking in response to growing cultural complexity. She presents evidence that, as symbolic activity intensified in Mesopotamia, a technological bifurcation occurred, splintering the token system into two symbolic systems, dialectically attached—basic money currency and a system of writing (Figure 2.5)

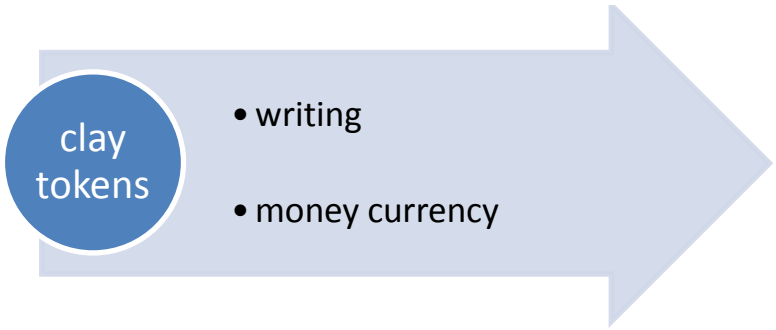

Figure 2.5: Bifurcation of clay tokens into dialectical relation between technologies of money and writing.

As I mentioned above, Marx argued that, for capital circulation to emerge, a universal money form had to exist. But archeologists have found little proof that standardized coinage—i.e. a universal money form--ever developed in Mesopotamia (Powell, Ofek, Allen, Van De Mieroop). The coins that have been found in archeological digs of ancient Babylon (2nd millennium BCE) originate from Greece, Phoenicia, and Persia (Powell 226). The Mesopotamians didn't use them as a standard currency; instead, they adapted them for their own needs. Historian of ancient economies Marvin A. Powell notes that, "The history of money in Mesopotamia is intimately bound up with weighing and measuring" (226). Mesopotamians still used coinage as a kind of currency, but it was based on their cultural preference for weight as a standard of value more so than the abstract value of the coin. For Mesopotamians, "money" was anything that people agreed upon as a standard of value. Common commodities that were highly traded like barley, tin, gold, and livestock could take the role of the money form if called upon to do so. Scholars believe that this diversity in money forms allowed for a great amount of flexibility in

Mesopotamian economic life (Powell), a diversity that is reflected in the most common types of texts found in Mesopotamia—lists, ledgers, tables, contracts, inventories, and receipts.

What's critical to point out is the way Mesopotamian history complicates Marx's theory of the money form as both a standard and circulator of value. In the absence of a standard money form, the technology of writing emerges in Mesopotamia as a *primary circulator of value*. Writing and money thus emerge together in a dialectical relationship in Mesopotamia—but it is a relation where writing takes a dominant role in circulating value. As Goody emphasizes, we cannot understand the roots of capitalist development without considering the "means of production in relation with the "means of communication":

> There is another, more basic level at which writing intervenes [in Mesopotamian economic life]…Most obvious is book-keeping of various kinds, but there is also the related question of the link between different systems of circulation, of money on the one hand and of the written word on the other. (46)

The economic genres that make up the greater portion of Mesopotamian textuality are notable not only for what they tell us about the origins of writing, but als0o for the informational function they serve in complex cultures for recording and organizing our day-to-day exchanges with others. Goody writes of the ancient Mesopotamian state of Ebla: "…book-keeping accounted for 70% of the texts in the archives, another 10% being historical and 20% literary…commercial and financial documents seem to have been kept…for several generations"(70). Such genres themselves are reflections of a growing bureaucracy needed to manage growing cities

and urban life, while at the same time allowing for more elaborate economic transactions, census taking, taxation, tribute, and money lending. Such a textual environment is not only a necessary framework for capital circulation to emerge, it also helps in its continuity by expanding textuality and feeding back into cultural development. Goody concludes that "we find an association between money-lending, banking, and literacy throughout human history" (175).

What this history tells us is that, not only does capital circulation arise much earlier than Marx had imagined (15th century Europe and the rise of the bourgeoisie), in Mesopotamia it, one, emerges without a standardized money form, and two, emerges in a dialectical relation with writing. That is to say, while Marx's focus on a universal money form works well for theorizing general exchange relations, the example of Mesopotamia demonstrates that, for a civilization to reach a stage of social and technological development where processes of capital are present and reproducing themselves, a full, mature symbolic system for inscribing and archiving these exchange relations is essential.

Thus, what we encounter in Mesopotamian textuality is the emergence of a dialectical relation between writing and money, where writing assumes the primary role as a circulator of value, while "money" retains its role as a measure of value.

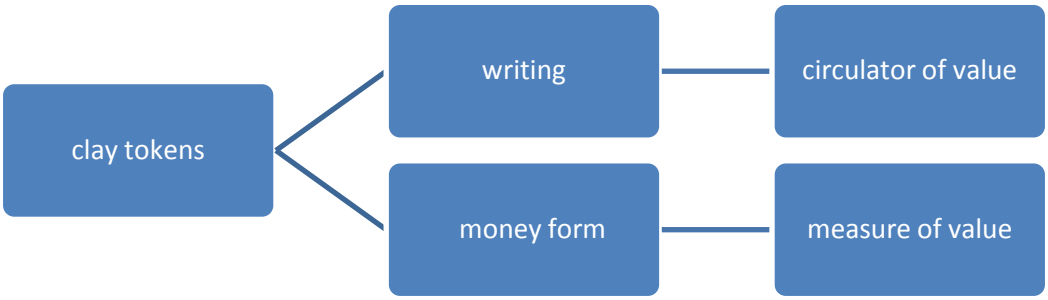

Figure 2.6: In the absence of a universal money form in Mesopotamia, the technology of writing (and the textuality it fosters) takes a dominant role as a circulator of value in culture.

Figure 2.6 illustrates the relation between writing and money as co-agents of capital circulation as they emerge from the historical development of the clay token exchange system. The outcome of this inversion manifests most clearly in the profusion of economic, bureaucratic, and accounting genres—ledgers, lists, forms of credit, contracts for shareholding, stocks, bonds, complicated investment schemes, property deeds, early banking and investing practices, as well as the rise of the first census and taxation practices (see Smart, *Handbook*, Bazerman, Powell, *Logic of Writing*, Goody). And all of this written production arose in an economy without a standardized currency. For capital circulation to occur, for it to "move" between hands and people, *writing* is the necessary material technology. The example of Mesopotamia illustrates the need for a sophisticated writing system and a wide range of economic genres to facilitate the movement of capital.

But the absence of a standardized currency in Mesopotamia begs the question--how exactly does writing become a circulator of value in Mesopotamia? The

following passage by Maria Aubet from *Commerce and Colonization in the Ancient Near East* describes the kinds of problems that had to be solved in order for exchange relations to expand and for capital circulation to occur in Mesopotamia:

> …in conditions where communication and transport are difficult, and when state institutions are unable to guarantee the physical and economic security of the merchants, long-distance trade, if it is to function well, *demands a series of solutions and measures to tackle basic technical problems* such as the regular exchange of information about conditions of supply and demand in the target country, safe and effective transport of merchandise--in particular perishable goods--the criterion and maintenance of relations of trust between traders and intermediaries, regularity in the setting up of credit facilities, an efficient arbitration system in disputes and the development and maintenance of a system of authority capable of guaranteeing order and respect for contractual norms and decisions. (103, my emphasis)

The "solutions" and "measures" for solving these practical challenges of exchange came in the form of a technology for inscription--writing. As Aubet's description makes clear, Mesopotamia was a complex society with a vast trade network of peoples, goods, languages, technologies, and ideas. For capital to accrue and take flight in a context of risk and insecurity, written contracts would become essential for minimizing this risk and for formalizing agreements. In addition to basic contracts, we also have to consider other genres such as stock options, promissory notes, loans—more sophisticated textual practices that become essential for organizing exchange relations for the purposes of accumulating wealth, as is especially visible in the two central institutions in Mesopotamia—government and religion. In Mesopotamia, the "palace" and "temple" (Goody) cultures maintained a strong monopoly on literacy and leveraged writing to expand control over large areas of trade. Both institutions used writing to record surpluses, keep more precise records,

secure land through written property agreements, lend wealth at interest, and consolidating more power in the process.

The diversity of the Mesopotamian economy, and its intricate trading networks (Figure 2.2) reveal a more autonomous market exchange than appeared in other early civilizations like Egypt or China (Goody, Aubet). Even as wealth centralized in the hands of Mesopotamian kings and priests, it nevertheless had to circulate through several agreements and exchanges before surplus value could reach the institutions of power. In a diverse trading economy like Mesopotamia, as capital passes from hand-to-hand to complete its circuit it "leaks at every pore" (Marx) creating other pockets of accumulation in its wake that spread wealth throughout the Mesopotamian region.

A good example of this process can be seen in clay tablet records from the Assyrian empire that dominated Mesopotamia from 1500 BCE to 700 BCE. These tablets reveal the emergence of a liberal market economy structured for capital circulation. Caches of tablets from the city of Assur, a major trading post in northern Mesopotamia, show evidence of the earliest corporation-like activity—the pulling of money amongst non-familial relations for the specific purpose of capital investment. In addition to controlling areas rich in alloys and precious metals, the Assyrians leveraged writing to organize trade relations with the Babylonians in the south and the Anatolians in the west (modern day Turkey)(Allen 463). Tablets show an Assyrian economy engaged in sophisticated exchange well beyond barter, one that included lending at interest and insurance policies intended to attract investment in trading

ventures. In addition to being essential for organizing exchange relations, the Assyrians used writing to develop a tight network of "family firms" (Goody) who used all kinds of written genres for the specific purpose of accumulating capital. This family system of organization also used titles-to-land to accrue property that could be passed on to children, thus accruing more wealth over time. As Goody notes of the texts found during Assyrian rule, there are an abundance of transport contracts, notifications, accounts, caravan expenses, and balance "sheets" determining profit and loss (76).

The development of writing and economy in Mesopotamia is an example where a universal money form is not a necessity for capital circulation to occur; and, more strikingly, it is an example where capital circulation on a large scale would simply be impossible without a system of writing and recording for organizing the social relations necessary for wide-scale economic exchange. In essence then, what we see with the emergence of cuneiform is a technology essential for complex human exchange. When we place this history within Marx's general framework for circulation—production, distribution, exchange, consumption (Grundrisse)—then writing, as a technology for exchange, plays an integral role in capital circulation in both Mesopotamia and today. Capital circulates in Mesopotamia in similar ways that it circulates today—via media technologies for inscribing exchange and the expansion of textuality for organizing social and economic relations. This process depends on our day-to-day production of texts to ensure the continuity of capital circulation. Digital data is the latest expression of this process of informationalization (chapter 3).

Part 2: Redistributing Agency: From Human Agents to Ensembles of Agency

Of the many things we could cull from the history of cuneiform and what it tells us about writing and economy today, there are two particular processes that stand out for a MEOW analysis—the affordances of *inscription* and *self-augmentation* (material stratum II). These basic functions of writing form their own dialectical unity that feeds into the process of informationalization and capital circulation (Figure 2.7).

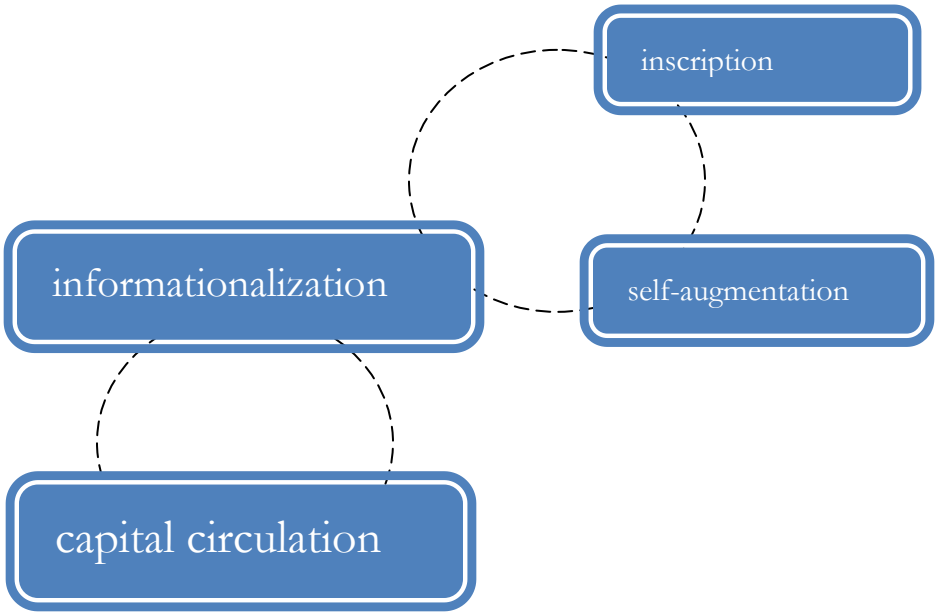

Figure 2.7: Second dialectical relation that emerges with the technology of writing and that becomes a necessary function in the continuity of informationalization and capital circulation.

Inscription, of course, is the fundamental affordance of writing. But inscription alone only tells half of how writing technologies emerge as agents of capital circulation. It is what happens after inscription that we can understand how writing, and the expansion of textuality, take on agency. Once unleashed in Mesopotamia, writing

spread through culture, and as it did, the textual corpus grew, with new genres emerging to handle the growing complexity in exchange relations. Out of this abundant production of everyday, informational texts emerges a self-augmenting process of textual production that begins to feedback into culture, turning writing and textuality into active agents of capital circulation.

It is the dialectical relation between inscription and self-augmentation that frames the second material stratum of my analysis. Together, they are central to my definition of an *informational economy*:

> An economy in which fully developed writing technologies for recording (inscription) and archiving (self-augmentation) our day-to-day social and economic exchanges take a primary role in the circulation of capital.

Again, I am not talking about writing in general, I am referring to a *specific facet of writing,* its informational aspects—writing to record exchanges, observations, patterns, in short, our exchange relations with each other and the phenomenal world. It is these everyday acts of writing that draw on the affordance of inscription, and the accumulation of textuality that ensues leads to self-augmentation. The relation between inscription and self-augmentation is a way to think about writing's role in the production of material culture and how our literacy practices get leveraged for capital circulation.

Inscription

The evolution of cuneiform in relation to developments in agriculture, husbandry, metallurgy, and science in Mesopotamia illustrate precisely how the affordances of inscription and self-augmentation manifest in Mesopotamia. Recalling

the Mesopotamian merchant Nanni again, it is estimated that his letter was written around 1700 BCE, 2000 years after the first cuneiform script appeared in ancient Sumeria (southern Mesopotamia) (Claiborne). Nanni is complaining about poor quality ingots he has purchased from a merchant 200 hundred miles away in Ur--one of the largest cites in Mesopotamia at the time (pop. 65,000, Aubet). Copper ingots tell us that Nanni was alive during what is commonly known as the Bronze Age by archeologists (3400 bce-1000 BCE). Copper, combined with a tin alloy, makes bronze—a harder, more durable metal than copper (CDA). It's possible that Nanni was some kind of metal smith; with copper and bronze he could cast his own products to sell at the market, cups and jewelry, and most likely weapons. During this time, most tin was mined in distant regions to the north of the agricultural city-states of southern Mesopotamia such as Uruk, Ur, and Babylon, so it had to be brokered through a network of other merchants and traders over hundreds of miles, from mines, to trading posts, to towns and cities (Claiborne, Weber, Aubet). Such a context requires advanced networks of exchange, a sophisticated organization of labor, and a full symbolic system for recording inventories, contracts, and accounts.

From the time of its emergence in the 4th millennia BCE to the last known cuneiform text (75 CE)—a span of about 3500 years—cuneiform went through several phases. Figure 2.8 shows the evolution of several common symbols as they move from the proto-cuneiform of the 4th millennium BCE to the refined cuneiform system of the Assyrians by 700 BCE. What begins primarily as a pictographic script

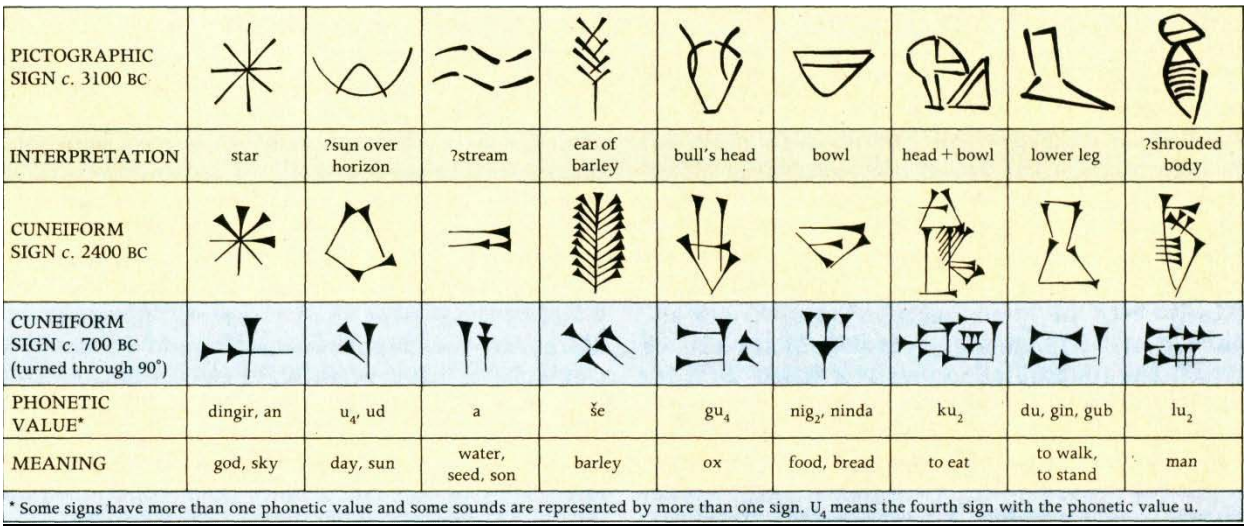

Figure 2.8: Evolution of common symbols in the development of cuneiform, moving through various stages of abstraction, evolving into a mature system of writing in concert with the growing complexity of Mesopotamian culture (Claiborne).

evolves over three millennia into a more abstract script, a syllabary with logographic[16] and phonetic elements. By the time Nanni is sending his letter, the cuneiform system has been pared down from over 2000 symbols to 800 (Claiborne 74). Clay, the media of tablets, is abundant and cheap, so there are few barriers to its widespread use. Figure 2.9 shows how both medium (tablet) and code (cuneiform) evolved over several millennia.

[16] A graphic sign that represents a complete word or morpheme but without providing separate phonetic representation of the individual phonemes or syllables composing the word or morpheme (as *&* represents *and*).

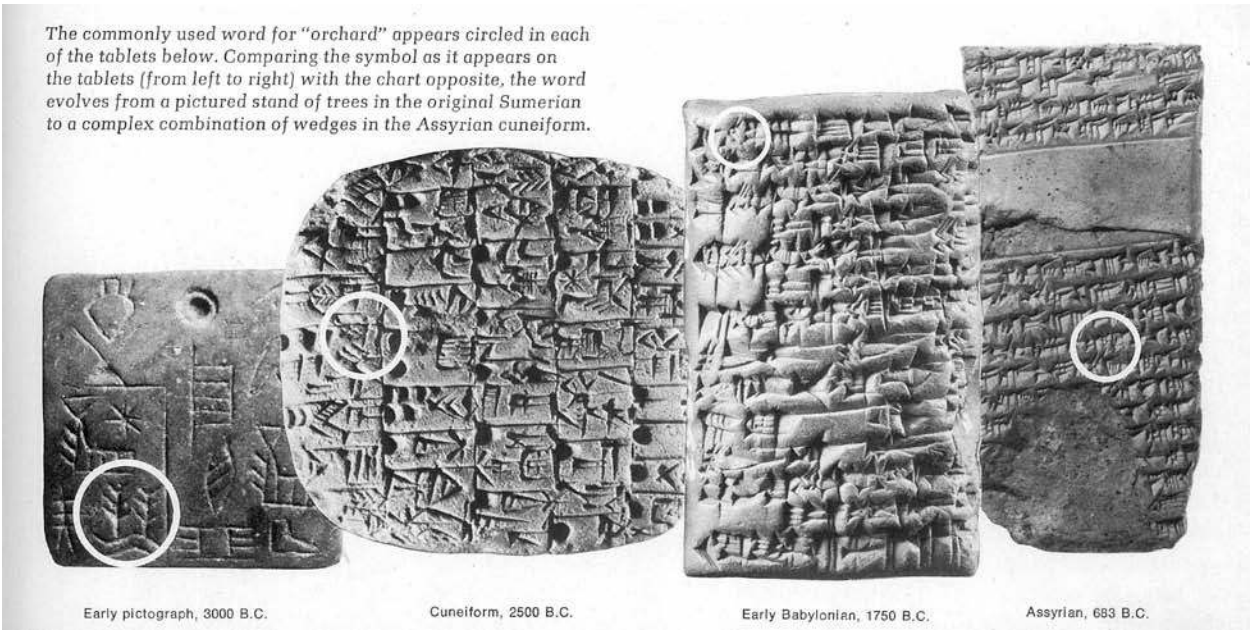

Figure 2.9: Change in size of clay tablet media, direction and standardization of writing, showing the word sign for "orchard" over a span of 2500 years (Claiborne).

Over this long span of time, we can see a process of refinement and standardization as cuneiform evolved to meet the social and exchange needs of the region. Tablets get larger and more organized; the direction of the writing becomes consistently left to right and more aligned; scribes move from *scratching* pictographs to *imprinting* abstract symbols into clay by pushing a more refined stylus; and schools for scribes are common by 2500 BCE (Claiborne).

What's most relevant about the evolution of cuneiform for my discussion here is the way these changes correspond to important economic changes occurring at the same time. As agricultural surpluses emerged, along with growing populations, and more sophisticated divisions of labor, so too did an ever-expanding network of trade that would eventually connect Ancient Greece to the Far East (*Logic of Writing,* Goody

Ancient Near East, Van De Mieroop). Throughout this development, cuneiform evolved in-step to handle the growing complexity that ensued in everyday exchange relations and, in the process, create the necessary textual conditions for capital production and circulation to expand. Clearly present in this history is the persistence of the dialectic between writing and money as co-agents of capital circulation. Smelting copper, trading it over long distances, contracting with others, expressing your frustration from two hundred miles away—these activities relate directly to the circulation of capital and can only take place in a world permeated with inscription and textuality.

Self-Augmentation

Bound-up with inscription is *self-augmentation*. Together, these affordances form a dialectical relation that feeds into processes of informationalization. In our process of informationalizing our social and economic relations, we are simultaneously constructing a structure of textuality. The same holds true in Mesopotamia. As writing and economic activity developed and texts began to accumulate, we see the mutual development of institutions and technologies for storing and organizing textuality—large bureaucracies, archives, public record keeping, census taking, taxation, and privatization of property (*Logic of Writing,* Goody). With inscription comes textual accumulation, and with textual accumulation we begin to see qualitative changes occur throughout Mesopotamia in every facet of cultural and technological development.

Writing and textuality, together, thus become what philosopher of technology Jacques Ellul calls "self-augmenting." For Ellul, self-augmentation occurs when the dominant ideology of a culture becomes the drive to technologize and textualize all aspects of lived experience. It isn't a particular technology that becomes self-augmenting, but rather the technical impulse itself as it emerges in the technological cultures in the West (Ellul 64-133). As he explains:

> A technical discovery has repercussions and entails progress in several branches of technique and not merely in one. Moreover, techniques combine with one another, and the more given techniques there are to be combined, the more combinations are possible. Thus, almost without deliberate will, by a simple combination of new data, incessant discoveries take place everywhere; and whole fields are opened up to technique because of the meeting of several currents. Material *techniques of communication*, psychological techniques, commercial techniques, techniques of authoritarian government, all combine to produce the important phenomenon of propaganda [discourse] which represents a new technique independent of all the rest and necessarily produced as a consequence of the preceding phenomena. (91, my emphasis)

Self-augmentation in Ellul's model is to be understood as a cultural *ethos* of continuity and production through technological development that becomes, over time, self-replicating. Technological advances in one area lead to technological advances in other domains of life, potentially leading to an "ensemble" (90) of technologies that co-develop over time, leading to more, and more advanced, technologies in the process. Ellul uses the phrase "techniques of communication" in the above passage, but they little part in his analysis and are considered one technology amongst many. Yet, as we've seen in Mesopotamia, for processes of self-augmentation to arise, for technological development to take on an ethos of continuity as it did in Mesopotamia, a full writing system was fundamental for these conditions to unfold.

Thus, I am using Ellul's term, but reframing it as an affordance of writing (and media in general). Self-augmentation, in dialectical relation with inscription, work together to create expanding textuality on a macro scale. As textuality grows, it shifts the balance of agency in the process, locating agency amongst an ensemble of human and non-human agents. The process of textual self-augmentation reminds us of the cumulative nature of writing, and the way it gets wven into the fabric of our lived experience. With the rise of agriculture and food surpluses in Mesopotamia came the need for better record keeping. With writing, palace and temple were able to establish greater control over their domains through textuality—records could be kept in perpetuity, land could be measured and recorded, then parceled out for tenant farming (*Logic of Writing,* Goody, Postgate, Weber, 76). Moreover, in addition to developing writing, Mesopotamian culture is also notable for inventing many of the earliest technologies of civilization: the heavy plow for large scale agriculture, advanced irrigation techniques, metal working, the wheel, astronomy, geometry, and law (Van De Mieroop). It is this ancient heritage, and many of the practices and technologies that emerged from there, that would eventually be inherited by the Persians, Greeks, and Romans who came after them. With writing serving as the catalyst, a process of technological self-augmentation emerged in Mesopotamia that has been extended through time and over space as others have borrowed, and improved upon, their technologies.

Physical Causality and The Abstracted Humanist Agent

It's easy to see why Ellul is often labeled a technological determinist. A theory of self-augmentation insists that writing technologies can take on a kind of agency and, as a consequence, exert some level of determination on individual human agents. Nevertheless, despite his occasional slip into deterministic language, Ellul would not say a technology *determines* a social practice; he would say it *conditions* it. The self-augmenting function of writing creates the textual conditions for a general technological self-augmentation in culture. The clay tablet ubiquity of Mesopotamia is an early example of how, over time, writing technologies eventually permeate all levels of culture. In light of this history, the evolution of writing in Mesopotamia provides a different historical backdrop for reassessing some of our assumptions about determinism, agency, writing, and technology in digital writing environments. Moreover, it is a necessary addition to our current ecological models of writing that lack a more rigorous dialectical and metabolic component in their analyses.

In theorizing the shifting nature of agency that is unfolding in digital culture we can begin by unpacking the concept of *causality* and what it means to say a technology "causes" something. In *New Media: A Critical Introduction*, Lister et al. point out that part of our confusion about agency comes from the distinct ways that humanist scholars think about causality:

> [the humanist argument] is that, instead of asking questions of cause and effect, that belong wholly to the physical sciences, the business of cultural science is to ask questions of agency. *Agency replaces cause* as an explanatory principle since the concept of agency involves not only the causing of an action but the desires, purposes and intentions behind it. (327, my emphasis)

It's a lucid insight. Traditional models of humanist agency, like the ones that inform many of our ecological and social models of writing, draw their understanding of agency from a physical model of cause-and-effect to create a humanist model of causality that prioritizes human action. In this way, the theory of humanist agency adopts a cause-and-effect logic to safeguard the sacrosanct belief that we, as humans, are in control of our own destiny. Technologies don't "cause" social change; human agents "cause" social change by using technology. Despite the readily grasped logic of humanist agency, such understandings are misleading because they "[are] cut off from the physical world" (Lister et al. 327) of cause-and-effect and appear to function without recourse to the physical forces (like gravity) that mediate our lived experience. Such a separation of physical cause and human agency becomes especially problematic in the contexts of electronic waste and Big Data and the ways digital media allow for greater automation, prediction, and faster processing speeds (chapter 3). As Lister et al. note,

> technology…causes events in accordance with its physical properties: there are mechanical causes at work in cultures that are predominantly structured by mechanical machines, and electronic causes at work in those primarily structured by electronic machines (336).

In terms of physical causality, human agents are just as prone to the effects of a technology as the natural environment is to it. That is to say, even human agents who can potentially leverage writing in powerful ways, are subject to the material, physical forces of textuality. Analogue media produces analogue textuality and digital media produces digital textuality. Can we really say that the emergence of digital technology

hasn't radically impacted our experience of textuality and literacy? Not definitively determining how and what we write, but surely influencing its shape?

Bruno Latour calls this confluence of humans, technologies, and physical forces an "actor network" where human agency is diffused amongst a matrix of social, physical, and technological activity. In actor network theory (ANT),

> agency is acquired by a thing being a component of a larger system…wherever we look, we see social action taking place not as a result of individually or collectively willed human actions but rather due to the relations between humans and the increasing quantity of non-human things that populate the cultural landscape. (Lister et al. 337)

In MEOW, ANT [17] and other distributive models of agency, there is a concern with the social *and* physical dynamics of lived experience—that is, a concern with the *metabolic* interchange between humans, technology, and the environment. *Causality* in these models is more accurately understood as an ecology of material social forces, systems, and agents. [18]

A useful example for capturing this kind of distributed agency can be seen in the reflexive nature of writing. With inscription and self-augmentation comes informationalization—the active materialization of our social and economic exchange with writing. Through the practice of inscription we are able to capture some aspect of the phenomenal world and can now study it, ponder it, rethink it. Goody calls this the "reflexive potentiality" of writing:

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[17] Heheh.

[18] This is what we might call "soft determinism" (Lister et al.) "Soft determinists are…concerned to highlight technological determinism as an effect of social forces, rather than as their cause. But the key issue they raise, regardless of identifying the causes of a deterministic situation, is that technological determinism now need not imply that it was always so."

> The emergence of what we call history was linked very closely with the advent of writing…[but]…it is not only the existence of archives or the formalization of information that makes history possible, but the kind of critical attention that one can devote to the original document and to the comments of others, particularly when one can examine different versions side by side. And finally, there is the combination of recording and reformulating that is involved in written composition itself. (149)

This reflexive function of writing is a combination of technology *and* practice where agency takes shape via the metabolic interchange between human agents, textuality, and the technology of literacy. In terms of the writing process, it's the activity of drafting and re-vision that good writing demands--the "reformulating" that occurs in the reflexive activity of writing. The affordance of reflexivity operationalizes inscription and initiates the process of textual self-augmentation.

Conclusion

What can we take from this cursory history of writing in Mesopotamia? First, it is a compelling example of how a writing system can radically change a culture as it permeates through all aspects of life; and second, it demonstrates the necessity of a full writing system for capital circulation to emerge, especially in the absence of a universal money form or currency. For capital to circulate in Mesopotamia it was necessary to informationalize economic trade via writing and the first written genres, which were predominantly economic. Not only do all of the economic genres I have mentioned in Mesopotamia still exist in Web 3.0, they continue to exert a powerful influence on the shape of our writing and current exchange relations.

While I don't want to overstate the relevance of this history, I find it useful for understanding the historical development of writing and textuality as agents of capital circulation. I am particularly concerned here with the industrial production of informational texts that inscribe our everyday exchange practices and literacies—text messages, search inquiries, user agreements, blog posts, reviews, comments, online purchases, sign in's, likes, tweets, etc—those quotidian acts of writing and exchange we now produce when we go online. These emerging practices and the textual substratum of data they create are the latest manifestation of the dialectical tension between writing and capital circulation that continues apace in Web 3.0. With the rise of massive online data collection and the emergence of what has been called *big data*, we are living through a new stage in informational production and the commodification of our literacy practices on a global scale.

CHAPTER 3

STRATUM III –THE CONTEXTS OF INFORMATIONAL CAPITALISM

"If the database knows what you want before you do, did you really want it?" (Andrejevic, 2013).

In this chapter I focus on the third material stratum—the larger contexts of 21st century informational capitalism--and look more broadly at how recent historical and technological developments, particularly in the United States, have given rise to modern informational economies, and with them, a radically changed writing and textual environment. One such development is the recent emergence of *Web 2.0*. While not without its problems as a concept, Web 2.0 was coined to describe the new information environment that has emerged in the past decade, what many have called the "social Web"—a Web built on technological platforms that encourage sharing, collaboration, connection, and *writing* between users. The sharing ethos of Web 2.0 and the global, networked infrastructure that makes it a reality have spurred tremendous growth in the amount of writing and rhetorical activity we now engage in our everyday lives. This new literacy environment has, in general, been cause for celebration in the field of Rhetoric and Composition and has signaled for many writing scholars a qualitatively new public sphere where we are writing, and thus participating, more than ever.

However, in our exuberance for Web 2.0 and its *valuable usefulness* for writers as a vehicle for social change and civic activism, we have likewise under-theorized other types of value that are produced in this emerging literacy environment, and in particular, the immense *economic value* that arises alongside our use of Web 2.0

technologies. Thus, while our social and pedagogical approaches to writing continue to evolve in response to a Web 2.0 world, other economic and materialist approaches to this new writing environment have not developed apace.

Ordinarily one could argue that this is simply a matter of perspective, and this is true to some extent. But in the contexts of 21st century informational capitalism and growing ecological challenges, the theoretical perspectives we choose become of critical importance. The emergence of a new writing public that defines Web 2.0 is not simply a social and textual phenomenon—it is also, more materially, a global, networked infrastructure for inscription and exchange that now permeates and influences every other human and nonhuman system on the planet. Thus, in furthering our ecological models of writing, one of my initial goals is to embed the fecundity of a Web 2.0 writing public in both the larger economic and ecological systems that it inevitably depends on. Without doing so, we may find ourselves unwitting accomplices to capitalist production and ecological degradation.

My purpose in this chapter will be to elucidate this blind-spot in our understanding of writing's *value* and theorize how the usefulness of Web 2.0 technologies--and the writing labor they engender--become primary productive forces in informational capitalism. To pursue this line of thought, I draw on Marxian notions of value and the industrial circuit of capital as laid out in Chapter I. I argue that we have moved into another phase of digital culture, one that has been

characterized as *Web 3.0*.[19] The shift from Web 2.0 to Web 3.0 doesn't signify a radical break from a 2.0 world; rather, it is a way to acknowledge the maturation of Web 2.0 technologies and the eclipse of the celebrated use value driven writing of Web 2.0 by what I call the *ascendant exchange value* of the user data that is produced as a by-product of our online writing.

In theorizing the third material stratum, I will be using Marx's metabolic framework (Chapter I) to guide my discussion.

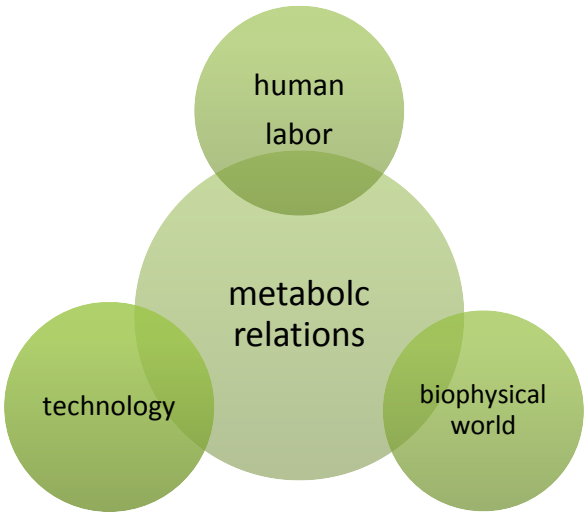

Figure 3.1: Diagram depicting Marx's historical, dialectical materialist framework (from chapter 1) for theorizing the active, metabolic exchange of energy between human labor, technologies, and the biophysical world.

[19] Reid Hoffman explains Web 3.0 in these terms: "Clearly what's happening is that there's going to this massive sub-structure of data…data is a platform…[and] it's not just one data set in Facebook, or one data set in LinkedIn, or one data set in Twitter, but it's actually these sets indexed by people, indexed by location, and across the multiple data sets on a kind of grass-roots basis that's going to create really amazing applications."

I trace the ascent of capital in the transition from Web 2.0 to Web 3.0 by looking at the dialectical relation between the labor of our online writing and the "massive sub-structure of data" (Hoffman) that is produced as a by-product of this labor. The information communication technology (ICT) industries [20] have labeled this deluge of data production "Big Data." As I will explore in this chapter, Big Data, as concept and ethos, represents the latest stage in the steady development of formalized, computerized, and ubiquitous data collection on consumers and citizens that starts to develop in the United States at the end of the 19th century. What this history reveals is the central role that the advertising and marketing industries have in shaping our contemporary writing environments and building an infrastructure for inscription and feedback for soliciting, gathering, analyzing, and selling data on consumer habits and preferences.

In theorizing this practice of consumer data collection and how it evolves in the transition from Web 2.0 to Web 3.0, I look at two particular phenomena--the rise of *networks of persuasion*, and the concomitant "*great acceleration"* of lived experience that is underway as advances in computer processing, data storage, and bandwidth continue to advance. I conclude the chapter by looking at the growing demand for electricity worldwide by data centers and how the rise in computer processing power and energy use poses serious concerns for the health and sustainability of other living

[20] I will be using the acronym ICT (information communication technology) throughout this chapter. It is clumsy, but I appreciate its breadth. When referred to as the ICT industries, I am thinking broadly about those companies involved in the production, collection, storage, and distribution, of consumer and user data.

systems, leading to my discussion of stratum IV in Chapter IV—the biophysical world.

Part 1: Web 2.0 Writing Theory

Arguably one of the most over-used terms in the digital age is *Web 2.0*. Although the term was originally coined in the late 1990s, it is open-source evangelist and publisher Tim O'Reilly's "What is Web 2.0?" (2005) that stands as one of the strongest explanations of the concept. O'Reilly invokes the term as a way to describe the state of the Web after the dot.com crash of the late 1990s. O'Reilly noticed that those companies that had survived--Google, Napster, Amazon, Yahoo--possessed certain traits that distinguished them from those that failed. These companies were built on a more flexible "web-as-platform" model that reversed the early print logic of the Web, those nascent textual genres that first emerged on the Web—the personal homepage, link indexes, news sites, retail stores. These early one-to-many textual forms were more germane to traditional broadcast media than to the more dynamic, data-driven sites that would become a defining trait of the next stage of the Web, Web 2.0. What emerges in 2.0 (circa 2005), according to O'Reilly, is a slicker Web, built on a more transparent and cooperative ethos, propelled by social practices of networking, collaboration, participation, and sharing. To distinguish between a 1.0 company and a 2.0 company, O'Reilly outlines seven key "competencies" that Web 2.0 companies possess:

- Services are delivered online rather than through packaged software, allowing for affordable scalability and growth

- Service has control over unique, hard-to-recreate data sources that get richer as more people use them
- Services that can be accessed by a broad range of devices
- Companies must trust users as co-developers
- Companies claim to be "harnessing collective intelligence" and the "wisdom of crowds" (Surowiecki)
- Companies, large and small, that can leverage "long tail" economics (Anderson)—a more accessible market for smaller players
- Lightweight and easily adaptable user interfaces, scalability in database and information design to accommodate all business sectors

I've amended O'Reilly's language to update some of the language ten years on. I note all seven competencies here to contextualize this chapter's argument. They are a useful touchstone for comparing how writing and rhetoric scholars have both embraced and ignored the different claims of Web 2.0. They also serve as a prescient articulation on the part of O'Reilly and the information communication technology (ICT) industries and the central importance of user data for making the Web a viable place for capital to circulate.

From the outset, defining Web 2.0 was a concerted marketing effort on the part of the ICT industries to re-imagine the Web and its potential as a means for generating surplus value. As writing scholar Bradley Dilger notes, the concept of Web 2.0, was, from its inception, a marketing buzzword, "a new label for the same old irrational exuberance of the dot-com boom, the same corporations selling the same commodities at the behest of the same advertisers" (15). And certainly, O'Reilly's

article is bubbling with a rhetoric of business and innovation—a vision of the Web as the perfect balance of neoliberal ideology and communitarian responsibility.

Yet, despite our widespread awareness of the explicit economic and marketing motives at the core of Web 2.0, other socio-technical aspects of Web 2.0 have been embraced by several writing and rhetoric scholars. Two cultural aspects in particular that writing scholars have focused on in relation to writing and Web 2.0 are concepts like "the wisdom of crowds" and "harnessing collective intelligence" (Porter, "Digital Economy," Clark, Dilger, Wolff). Such perspectives on the potential of networked writing spaces fit well with the field's social and ecological approaches to writing. It's long been understood that writing is inherently a social activity, essential in the way it helps us organize society and our daily lives. Writing allows human beings to pass down knowledge and wisdom generation after generation. One could easily argue that the written record we have inherited is the manifestation of "harnessing collective intelligence" over the long stretch of recorded history. In any case, for writing scholars that invoke Web 2.0, it is often with the tacit assumption that writing plays a vital role not just in building shared wisdom and collective intelligence, but more critically as an essential technology for a vibrant, healthy democracy, an accessible public sphere, and individual human liberation and agency.

A good example of this positive assumption about textual production is vividly captured in research in the Stanford Study of Writing (2001-2006). Andrea Lunsford and colleagues analyzed over 14,000 pieces of student writing, written in and out of class, over a five year period. In referring to the study's results in a 2009

interview with *Wired* magazine, Lunsford refutes the popular myth that digital technologies and practices like texting are ruining students' abilities to write thoughtful, academic prose. In fact, she argues, "we're in the midst of a literacy revolution the likes of which we haven't seen since Greek civilization" (Thompson). As Lunsford emphasizes, Web 2.0 writing technologies aren't "killing our ability to write"; rather, they're "reviving it—and pushing our literacy in bold new directions" (Thompson; see also Haven).

Others have voiced similar excitement at this expansion of textuality and the usefulness it has for writers. J. Elizabeth Clark argues we are entering "a new era of digital rhetoric where, more than ever before, people are becoming authors every day, constructing digital profiles, public commentary, and using publicly available resources to research and inform their opinions"(27). James Porter takes a similar view in "Rhetoric in (as) Digital Economy" arguing that the Web 2.0 companies and services that thrive are the ones that help writers build "productive and pragmatic knowledge about how to create information products that will matter to people--that is, be usable and useful…" (Porter 174). Drawing on the principle of the "wisdom of crowds," Porter's discussion of writing and digital rhetoric in Web 2.0 emphasizes the great benefits we receive through our *use* of Web 2.0 writing technologies. This new ability to collect, organize, produce, and share texts and knowledge of all kinds is, according to the wisdom-of-crowds logic, an *intrinsic benefit* to both individuals and a society at large, benefits that come in the shape of a more cooperative, transparent, and accessible space for knowledge production and knowledge sharing via a

computing and inscription infrastructure that allows for easy, global, instantaneous communication and textual exchange 24 hours a day.

But I think Kathleen Blake Yancey's work best captures the excitement that Web 2.0 textual productivity inspires in writing scholars. In her report for the National Council of Teachers of English entitled "Writing in the 21st Century," Yancey argues that Web 2.0 is a qualitatively different public sphere than the print-driven 20th century; a more democratic, participatory space where people actively engage in "self-sponsored writing" (Brandt) that falls beyond the purview of formal schooling. As Yancey notes in an earlier article:

> Today, we are witnessing a parallel creation, that of a *writing* public made plural, and as in the case of the development of a reading public, it's taking place largely outside of school…Whatever the exchange value may be for these writers…it's certainly not grades. Rather, the writing seems to operate in an economy driven by use value. (301)

Like Lunsford and Porter, Yancey emphasizes the growth, or *productivity* of the writing public in Web 2.0 and the valuable use that writers receive through sharing, collaborating, working, and communicating via Web 2.0 technologies.

Hence, the pattern I am isolating here, what I call *Web 2.0 writing theory*, is based on several shared assumptions about the shape of writing and textuality in the 21st century and the different types of *value* that are produced from the labor of our online writing. As Porter stresses, it's vital we realize that,

> Writing--all writing, I would say--resides in economic systems of value, exchange, and capital. Not necessarily monetary or commercial systems…The kind of economics I am talking about has to do with value more broadly defined. It might well involve the exchange of money, but the motivation could just as easily be based on desire, participation, sharing, emotional connectedness. This is the secret of the Web 2.0 dynamic. (176).

Porter insists that we cannot understand Web 2.0 writing practices from a purely economic model of monetary exchange. Instead, we need to imagine Web 2.0 as more like a "gift-sharing economy" (188) where writers engage in social, literate activity in exchange for a multitude of values including connection, expression, and collaboration--values beyond the exchange of money and profit. (Dilger makes a similar argument.)

I too embrace Porter's argument that it is necessary to avoid simplistic, economistic arguments about Web 2.0 writing. Indeed, many of the cultural changes we have watched emerge in Web 2.0 are cause for celebration and Web 2.0 writing theory rightly emphasizes the democratic and civic potential of these technologies. At the same time, as comforting and necessary as it is on occasion to bracket our experience of writing and textuality from the larger economic systems of capitalism, some of the economic and environmental questions that are emerging in Web 2.0 necessitate that we keep our analysis of Web 3.0 embedded in the third and fourth material strata, informational capitalism and the biophysical world.

Consequently, two problematic assumptions emerge in Web 2.0 writing theory:

1. It is a productivist model of writing
2. It over-emphasizes use value

I borrow the concept "productivism" from critical sociologist Anthony Giddens work *Beyond Left and Right* (1994). Giddens defines the concept of productivism

> as an ethos where work is autonomous and where mechanisms of economic development substitute for personal growth, for the goal of living a happy life in harmony with others. (247)

For my argument here I would just slightly amend the end of the quote to say, productivism describes a social system in which

> mechanisms of economic development *become the primary way in which problems of human happiness and emancipation are solved.*

This change is necessary to ground the assumptions behind productivism as it relates to the textual production of Web 2.0. That is to say, a productivist model of culture is, obviously, predicated on production, but it is production as *intrinsically positive*—that is, the phenomenon of *growth itself* is the standard in which one measures the health and dynamism of any kind of system, be it human or nonhuman. For productivists, "growth without limits" is the ideal state for any system. The usual critique of productivism is leveled against economic models that prioritize production over other phases in the circulation of capital (distribution, exchange, and consumption). For example, many have argued that orthodox Marxism is a productivist model--the economic base determines the cultural super structure that sprouts from it. Web 2.0 writing theory turns this notion of productivism on its head. It too is a productivist model of rhetorical production, but rather than stressing the profit motive as the intrinsic force that expands textuality, Web 2.0 writing theory emphasizes the social and personal benefits that writers receive from their use of Web 2.0 technologies.

The second contradiction that arises in Web 2.0 writing theory becomes clear only after acknowledging these productivist assumptions, and that is the exaggerated emphasis on the *use value* that writers received when using online writing technologies. As I argued last chapter in my discussion of writing in Ancient Mesopotamia, the clay tablet record archaeologists have uncovered presents a compelling case for a historical and developmental relation between writing and economy. From a MEOW perspective, Web 2.0 writing theory's heavy focus on the use value that writers' receive from using online writing technologies has, at the same time, neglected the relational exchange value that comes with all commodities in capitalism. As Marx theorizes in *Capital* Vol. 1, the defining feature of all commodities is the tension between two types of socially produced value—the value of a useful thing and its value on the market in exchange. [21]

Writing, and the data it produces in Web 2.0, are one such commodity. All commodities carry the use/exchange tension, but its shape will vary in each commodity. An example of this relation can be seen in the transition from Web 2.0 to Web 3.0, where use-value, as the intrinsic *worth* of a commodity for fulfilling a human need, often must *precede* the expression of exchange value. O'Reilly emphasizes this dynamic in "What is Web 2.0." The Web 2.0 companies that made it through the Web 1.0 bubble had done so because they *prioritized use* and *functionality* (Dilger) in their platform designs. The goal of attracting an audience was the same,

[21] Another shorthand aid from remembering the distinction between Marxian use and exchange value--use represents "production for human needs" and exchange represents "production for profit" (Trimbur 2000).

but by prioritizing use and functionality (Dilger), Web 2.0 companies could build a critical mass of users that could, hypothetically at least, be appropriated by capital circulation. But in 2005, when Web 2.0 was taking a foothold in American culture, how these companies were going to monetize the data they were collecting was still hazy. What wasn't hazy was the potential for profit that investors saw in data. In Facebook's Initial Public Offering (IPO) in 2012, the company was valued at 104 billion dollars--the largest IPO for a technology company to date. On paper though, Facebook only owned 15 billion dollars in assets. The other 89 billion dollars was based on the *speculation* that Facebook's unprecedented collection of user and consumer data would eventually reap huge profits (Cukier and Mayer-Schonberger, Chap. 6). Exchange value, then, in the transition from Web 2.0 to Web 3.0, often is not simply the antithesis of use—it is also *the ongoing project of monetizing this use and the consumer data it produces*.

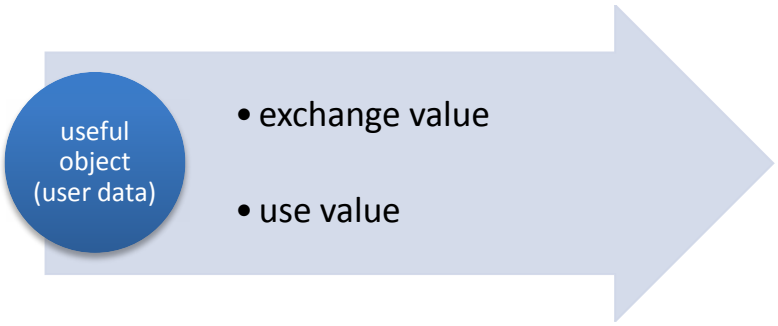

Figure 3.2: Diagram showing the commodification process of consumer/user data in the transition from Web 2.0 to Web 3.0 in which the exchange value begins to grow as fast, or faster, than the celebrated use value of Web 2.0.

With the success of Web 2.0 platforms, and the successful integration of the Internet throughout the globe in the past 20 years, we have celebrated the use value of digital,

networked technologies, ignored how this growth in user generated content contributed to creating new streams of exchange value.

One of the key reasons Web 2.0 writing theory has under theorized the exchange value of online writing is that it has not adequately recognized the extraordinary growth in the value of the user data that is produced as a by-product of this writing. It makes sense that Web 2.0 writing theory would focus on the collaborative, social, and civic potentials of digital writing environments. Such perspectives have been a hallmark of the field. However, behind the interfaces and networks, the interactive design and social Web, sits a vast, material and technological infrastructure for inscription--databases, servers, routers, switches, and fiber-optic cable. While it is clear that this textual infrastructure creates a multitude of values, we must also recognize how these values emerge in relation to capital circulation. If it is the online platforms that have brought consumers great use value in all aspects of cultural life, it is the data that can be collected and mined by ICT companies that has become a productive source of exchange value.

In fact, if we revisit O'Reilly's seven principles of Web 2.0, amidst the "wisdom of crowds" and "collective intelligence" is an essential principle that propels the other six:

- Control over unique, hard-to-recreate data sources that get richer as more people use them

Harnessing collective intelligence, aggregating the wisdom of crowds, delivering information services online—all of these vitally depend on the collection of "hard-to-recreate" data on consumers' online activities. As O'Reilly had predicted, those

companies that could design a useful, functional online tool for communication and information management would be able to attract a population of dedicated users. This user base would then become a central hub on the Internet for the production of user data--data that could be turned into value through one, hosting and storing user data via cloud services, and two, gathering unprecedented insight into consumer desire through an intensification of online data collection. Thus, exchange value is not just present in Web 2.0, it is a driving force—a force that fundamentally depends on the labor of our online writing and the massive collection of user data that gets produced in this process. O'Reilly is quite clear about this:

> One of the key lessons of the Web 2.0 era is this: *Users add value*…The key to competitive advantage in internet applications is the extent to which users add their own data to that which you provide…Therefore, Web 2.0 companies *set inclusive defaults for aggregating user data and building value as a side-effect of ordinary use of the application*. (9)

Thus, the "secret of the web 2.0 dynamic" (Porter) isn't simply a thriving use value driven economy of writing. Part and parcel of this economy, embedded as it is in informational capitalism, has always been *the explicit intention* to extract exchange value "as a side-effect of ordinary use" of the application by enticing a user base with "free" services. While Web 2.0 certainly seems to have started predominantly as driven primarily by use value, exchange value was always part of Web 2.0, even if it remained dormant only in the form of *the promise of future streams of surplus value* as a consistent, critical base of users is build up over time, expanding as more users use the application, and more content and data is created. The change in the value of user data exemplifies the process of ascendant exchange value—the moment when

exchange value is 'in the air,' heightening the single-minded effort on the part of capital to create vibrant spaces of use value and exploit its relational potential for exchange value and profit. This is precisely what has occurred in the transition to Web 3.0.

The Data Mine and Big Data—Inscribing the Labor of Our Writing

In the first chapter I introduced Marx's theorization of the industrial circuit of capital. I include the graphic here again for easy reference. In theorizing the circulation of value in Web 3.0, it must be placed in dialectical relation with the *sphere*

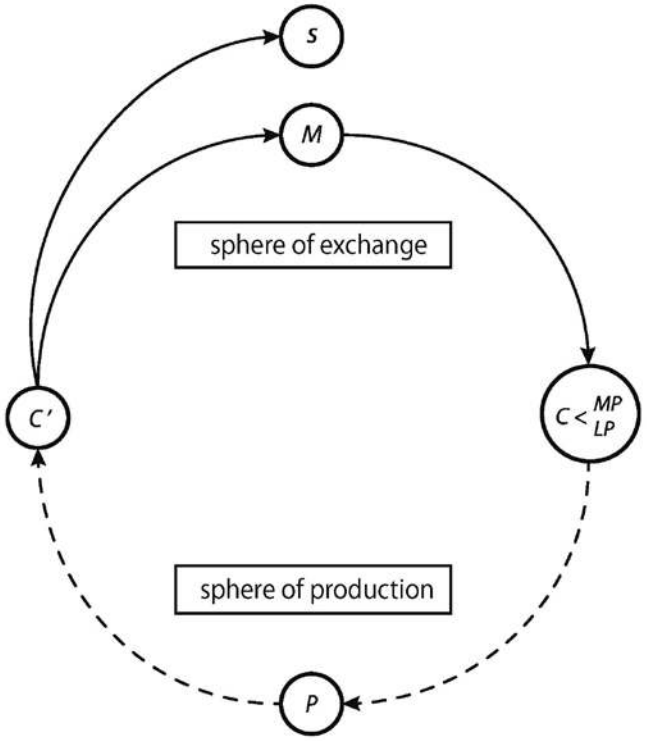

Figure 3.3: Diagram of Marx's industrial circuit of capital (introduced in chapter 1). In this section, the focus is on the sphere of production and the process of turning data into value.

of production. As a dialectical relation, it is understood that for capital to circulate, there must be *some thing* to circulate. For a thing to circulate there must be production, which means there must be *labor* occurring. In an industrial economy, it is manual labor and large scale machinery that manufacture the tangible commodities necessary for capital to circulate. In an informational one like Web 3.0, a newly emerging, powerful stream of value creation is produced by the labor of our online writing and the substratum of consumer data it generates. According to IBM, the world generates 2.5 exabytes of data everyday—the equivalent of 2.5 billion gigabytes. By 2020, they estimate the world will be producing 35 zetabytes of data annually.[22] The ICT industries have labeled this data deluge "Big Data" [23] and it has become the raw material of 21st century informational capitalism. The phrase Big Data is meant to invoke associations with other corporate monoliths like Big Oil and Big Tobacco but without the more negative connotations of excess and power that have been attached to these industries. In Big Data, "Big" is used to describe the explosive growth of data production that has emerged with digital networks and the potential it is already showing as a fertile source of value in today's informational economies. Big Data is of such a type and quantity of data that human perception alone is unable to make sense of it. It requires the combined power of networked servers and algorithmic programming to sift through it looking for the telltale signs of human patterns and social trends (see also Dumbill, Cukier and Mayer-Schonberger, Rudder).

[22] The numbers I've cited vary and the only available data come from corporate research by companies like IBM and the IDC (International Data Corporation).

[23] I chose to focus on the corporate use of data vs. governmental use to contain the argument. In truth, both corporations and governments are pushing Big Data and buying into its promises.

Although O'Reilly had made his own predictions regarding the importance of user data in Web 2.0, Big Data rhetoric is more aggressive in tone and style. While large scale data collection and analysis sits at the heart of the Web 2.0 business model, in Web 3.0, intensive data collection and analytics have become standard protocol for companies and governments around the world for monitoring and tracking consumer-citizens. The ICT industries routinely describe Big Data as a combination of three characteristics: *volume*, *variety*, and *velocity*. Coined back in 2001, the 3Vs of data are conventional wisdom for ICT corporations when it comes to the Big Data phenomenon. To talk about data in terms of the 3Vs puts emphasis on *the production and movement of consumer data. Volume* describes the explosion of digital data created in the past decade around the world, in particular the new streams of data being created by our growing time writing and communicating online, creating more abundant sources of value via the labor of our writing through the increase in the content we are creating (reviews, blog posts, tweets, surveys, sign-ups, etc) and the concomitant production of user data that is produced along with evolving data base and networking technologies for storing, sorting, and analyzing this data. The expanding infrastructure for inscription and the global, digital Internet that serves as its backbone, is facilitating the exponential growth in the amount of data we are creating every day. This data now comes from a vast array of sources, greatly facilitated by an expanding infrastructure for inscription--and is growing exponentially. Information scientist Martin Hilbert has estimated that in 1986, "just 1% of the world's capacity to store information was in digital format" (9). By 2007, digital data reached 93% of all

stored data in the world; the other 7% being analogue media—vinyl, paper, tape (9). Hilbert notes that trying to save this much data in analogue form would be the equivalent of covering the planet's landmass with two layers of books (2010).

Variety describes the different kinds of digitized data that can now be collected and triangulated using large scale data sets. One change in the transition from Web 2.0 to Web 3.0 is the growth in the diversity of data sets that are now being collected and the potential for finding unique insights about consumers. The idea of a variety of data sets relates directly to the concept of informationalization I discussed last chapter. That is, variety is another way to emphasize the continual human desire to materialize the phenomenal world by using inscription technologies to make the world more quantifiable and measurable. As Kenneth Cukier and Victor Mayer-Schonberger note about this process in their book *Big Data: A Revolution* (2013), "Once we datafy things, we can transform their purpose and turn the information into new forms of value" (35). The authors argue that with a growing variety of data sets, faster computer processing, and plenty of storage capacity, Big Data fundamentally changes how we might pursue knowledge, shifting our obsession with *causation* that comes from an information scarce world and to a focus on *correlation* and unstructured streams of data that can be analyzed in real time (46).

These real time capabilities for analysis lead to the final of the 3Vs, *velocity*. The velocity of data describes the speed and *acceleration* in the way data is now collected and analyzed. That is, one of the emerging capabilities of Web 3.0 data-base technologies like Hadoop and other Big Data platforms, as well as the growing

sophistication of algorithmic programming, is the ability to analyze cultural activity while it is happening in real-time. This is what makes Twitter both a Web 2.0 company as defined by O'Reilly, as well as a quintessential Big Data company—by first establishing itself as a useful platform for writers and attracting a critical mass of users, Twitter has become an important, real time source of data and information that is enabling journalists, government, and the public in general to tap into and understand the "sentiment" and thinking of various global publics, any second of the day. Twitter boasts over 288 million active users that send on average 500 million tweets a day (Twitter, 2015).

Big Data and the growing frenzy to capture user data by ICT corporations presents several challenges for how we theorize modern writing practices. Jessica Reyman points out in "User Data on the Social Web: Authorship, Agency, and Appropriation" (2013) that, in theorizing writing on the "social and participatory Web," writing and rhetoric scholars need to be aware of the ways ICT companies distinguish between user-generated content and user-created data (523). Reyman argues that our highest priority concerning data collection is "fundamentally, about the terms of control over user-generated information" (522). She is raising important questions here about the two layers of information created by our online writing—the front-end, alphabetic content created by users and the sub-layer of user data that gets generated in the process. She points out that Facebook's data collection policies explicitly state that users have ownership of the content they create, but Facebook, as the owner of the social network, retains exclusive rights to the user data that is

generated as a by-product of the writing we do when we are there. As Reyman clarifies,

> The data itself isn't viewed as the result of human creativity or effort. Technology companies and data brokers, in this sense, are taking something that has little or no value as separate, individual data points and creating something of commercial value through aggregation and interpretation. Such appropriation is based on the assumptions that data as property is separable and unique from individual users' creative activities on the social and participatory Web and, further, that data is a technology-generated by-product. (523)

What's helpful about Reyman's analysis here is her perceptive observation of how Web 3.0 companies actively transform essentially worthless individual user data into exchange value through *combining and aggregating* millions of users' data. It's also an observation that resonates with the idea of ascendant exchange value.

In trying to make sense of use data's use and exchange value in Web 3.0, it's helpful to get a sense of how user data is technically captured. A useful tool for visualizing how much user data is being collected online, and by who, is Firefox's free browser add-on "Lightbeam." With Lightbeam, users can "track the trackers"—that is, visibly track which companies are placing cookies and other tracking devices on their computer or mobile phone. When you visit a site online, Lightbeam records the number of tracking devices that are installed and renders this information as a network graph (Figure 3.3).

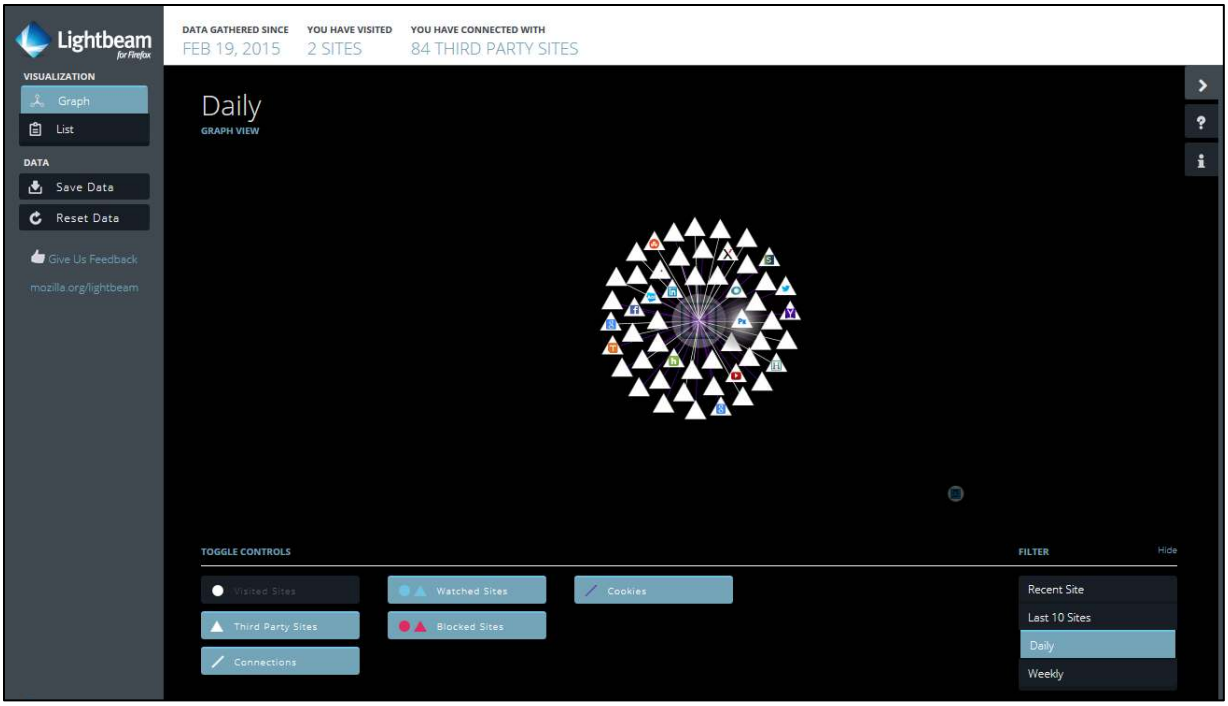

Figure 3.4: Visual representation from Firefox add-on "Lightbeam" showing the various companies that install tracking devices such as cookies and beacons onto users' computers.

Above is a network diagram showing what happens when you visit Huffington Post online. One visit to Huffington Post and your computer or phone is assailed by over 60 different tracking technologies--cookies, bugs, beacons--designed to track your behavior online. As Internet regulation stands now, for many sites, just by visiting we agree to the collection of any data we create while there. At the same time, not only must we agree with Huffington Post's data collection policies, we must also agree with any agreement Huffington Post has with third parties allowing them to set their own cookies for user data collection. These third party companies can range from marketing and advertising firms to data aggregation firms that package and resell the consumer insights they can glean from the data.

Huffington Post isn't unique in this case. According to the Wall Street Journal's series "What They Know," "[t]he largest U.S. websites are installing new

and intrusive consumer-tracking technologies on the computers of people visiting their sites—in some cases, more than 100 tracking tools at a time…" (wsj.com). Such pervasive use of tracking devices are common across the Web as they are essential for creating streams of valuable data on user and consumer behavior. The data amassed forms an aggregate profile of each user based on what they do online, a profile that is continually updated and growing in data. These profiles, based on the IP address of an electronic device, can contain our name, email, weight, age, religion, where we've been online, what we purchased, what we've written, etc. The data is then analyzed and used to categorize us into marketing demographics. These profiles, which are said to be "anonymized" by ICT companies (Andrejvic 2013), are sold on one of the many data exchange networks, depending on the socio-economic category a user falls in. Companies that mine consumer data can grab a higher price for information on those consumers searching the Web for diamonds and yachts versus those combing Craigslist for a used car (Turow 158-60). Research from the Interactive Advertising Bureau (IAB) shows that revenue from online advertising has grown no less than 10% a year since 2000, with some years reaching 20-30 percent growth. In 2015, ad revenue will surpass $50 billion.[24]

One could easily argue here that such data collection is nothing new. As Americans, haven't we come to accept the necessary evil of advertising in exchange

[24] "The IAB sponsors the IAB Internet Advertising Revenue Report, which is conducted independently by the New Media Group of PwC. The results are considered the most accurate measurement of interactive advertising revenues because the data is compiled directly from information supplied by companies selling advertising on the internet. The survey includes data concerning online advertising revenues from web sites, commercial online services, free e-mail providers, and all other companies selling online advertising."

for a service or good content? But in theorizing writing and economy in Web 3.0, understanding the online media and marketing industry is only the first step in understanding the phenomenon of Big Data and it's relation to contemporary rhetoric and writing practices. In theorizing Big Data, we must also make sense of the radical epistemological questions that arise in an environment of information abundance.

Part 2: Web 3.0 as Infrastructure for Inscription

If the labor of our online writing and the Big Data it produces are essential to capital circulation in Web 3.0, what are the factors that not only keep this labor churning, but that also accelerate it? Big Data is a contemporary expression of informationalization and the medial affordances of inscription and self-augmentation put to use for capital circulation. Understanding the value chain created by online advertising is, while opaque, possible to make sense of with empirical data. Moreover, we must place these practices within other social and biophysical systems to gauge the broader ecological effects they are having on these systems. Reyman's final conclusion about user generated data is, generally speaking, accurate—data collection is a question of property and ownership. However, from a MEOW perspective, the property question is one amongst many that fall within the larger framework of the metabolic relations between a global, networked infrastructure for inscription, writing labor, and the biophysical world.

The infrastructure for inscription and textuality that has emerged with Big Data, far beyond the annoyance of advertisements, is already making a large impact on our world, in the health and food industries, in government and the private sector, in law enforcement and academia. At the same time, this infrastructure is raising problematic questions about privacy, surveillance, fraud, power, and knowledge itself. In short, the emergence of a Big Data textual environment is already disrupting our epistemological and ontological assumptions we have inherited from an analogue, information scarce, print world. In teasing some of these ideas out, I turn to two cultural, historical, and ecological developments that have emerged in the wake of industrialization:

1. Networks of persuasion
2. The Great Acceleration

I return to Marx's tripartite framework of metabolic relations (Figure 3.4). Using this model as my guide, I argued in Chapter 1 that, in this tripart dialectical relation of metabolism, change in one element will always affect change in the other two. What we are seeing in Web 3.0 is the development of a technological infrastructure that has grown in agency over the past century, radically impacting the shape of our writing labor and the health of our planet. In the persistent drive to

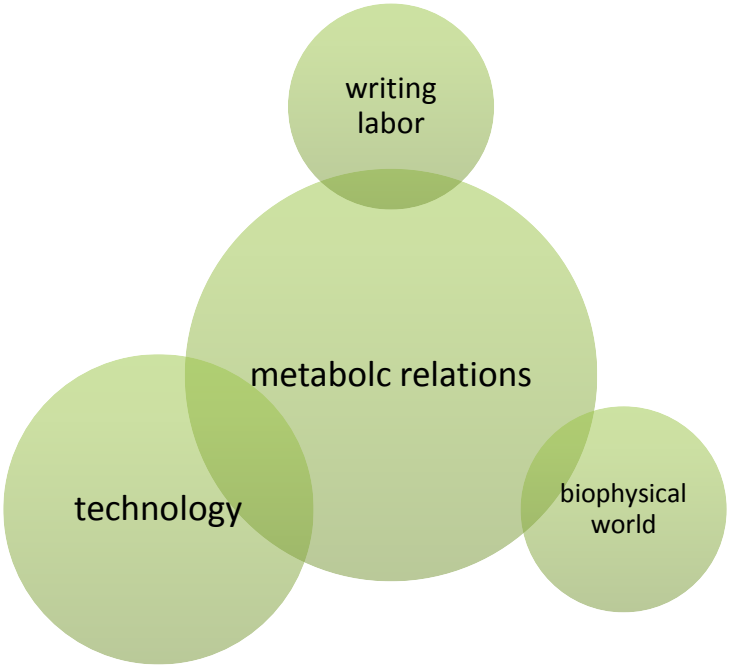

Figure 3.5: Diagram showing Marx's basic tripart dialectical, metabolic framework in Web 3.0 where the technological element begins to take on a dominant position to human writing labor and the biophysical world.

expand capital circulation, in Web 3.0 we find ourselves ensconced in a system of capital circulation that depends a *networks of persuasion* to constantly stimulate consumer desire and keep users online freely providing their posts, tweets, comments, and ratings—the writing labor that produces the data that will be spun into value. Such networks of persuasion, since their earliest origins in the late 19th century, have become a central condition for maintaining and accelerating capital circulation. Such ensembles of networks, over time, have evolved into a global system spurring consumption onto new levels and, in the process, jeopardizing the health and sustainability other human and nonhuman systems.

Networks of Persuasion

Despite the hype that surrounds Big Data today, using large data sets to make sense of larger cultural systems is not new. Governments have long sought data about populations in the form of the census and have developed bureaucratic institutions to manage the collection of information on the state and its citizens. The U.S. government since the 1880 census has used large scale, automated computing to make census taking feasible in a rapidly growing country. The development of Herman Hollerith's first large, electric analogue tabulator for counting the 1880 census represents a watershed moment in modern information processing. James Beniger explores this history of computing in *The Control Revolution* (1986), arguing that the roots of modern informational economies date back to the huge influx of commodity production that came on the cusp of industrialization in the U.S. during the mid-19th century. Beniger explains that this explosive growth in commodity production created a "crisis of control." [25] With new forms of steam power and electricity, the production of commodities outstripped demand, creating an oversupply of commodities without consumers to buy them. In such a novel environment of excess, corporations and governments scrambled to understand how to move this surplus product. What emerges, alongside developments in telephony, printing, and the railroad, are the first glimmers of mass culture and the earliest forms of mass media, marketing and advertising to *control demand and consumption* (18). For Beniger, this response by American culture to industrialization (1880-1940) marks a

[25] Beniger defines "control" as any "purposive influence on behavior" (8).

time of transition as the United States evolves from an industrial based economy into an informational one.

It is during this transition into mass culture that American capital begins to develop advertising and marketing techniques appropriate for production on a mass scale. In an environment of commodity oversupply there is not enough demand to propel commodities through the circuit of capital. Thus, capital gives commodities a push by giving them a voice—a catch phrase or a logo--a way to distinguish themselves from other commodities—a marketing practice that would eventually come to be called "branding" (Beniger 265). The practice of commercial branding arises at the same time as mass consumer culture does in the U.S., and it gives rise to advertising and marketing industries to help sell the brand. This is a critical point for my argument. The emergence of the advertising and marketing industries is, at its base, the professionalization of rhetoric on a mass scale, training humans in the use of language, graphics, argument, persuasion, and, as I'll show, the ability to collect more data about consumers to keep commodities and capital moving.

As all good rhetors know, the more you know about your audience, the more you are able to communicate the appropriate message. This is precisely what advertisers are paid to do—to persuade and stimulate consumption. Products can only realize value by finding their way into the hands of consumers *consistently*. To come to know their audience in an age of mass culture, advertising and marketing agencies developed new ways to learn about audiences by creating soft, textual

technologies for collecting feedback on customer habits, preferences, and behaviors. Beniger describes this process in detail:

> Simultaneously with the development of mass communication by the turn of the century came what might be called *mass feedback* technologies: market research…including questionnaire surveys of magazine readership, the Audit Bureau of Circulation (1914), house-to-house interviewing (1916), attitudinal and opinion surveys (a U.S. bibliography lists nearly three thousand by 1928), a Census of Distribution (1929), large-scale statistical sampling theory (1930), indices of retail sales (1933), A. C. Nielsen's audimeter monitoring of broadcast audiences (1935), and statistical-sample surveys like the Gallup Poll (1936), to mention just a few of the many new technologies for monitoring consumer behavior (Beniger 20).

Set in the context of new printing technologies, expanding railways, and telephony, these soft technologies helped create what we could consider the first networked structures of mass culture in the United States. New textual genres were developed to communicate more directly with potential buyers of products—by soliciting feedback from consumers, the nascent publishing, advertising and marketing industries created new inroads into citizens' lives, turning consumer feedback into actionable data to develop more persuasive advertising for the expanding mass markets of early 20th century. It is their ability to know audiences through feedback from consumer data that makes advertising and marketing a primary rhetorical force in mass culture. Thus, what arises in the U.S. in the late 19th century is a dialectical relation between networked systems, capital circulation, marketing and advertising rhetoric, and feedback data from consumers. In Web 3.0, consumer data collection has reached a new stage of intensity and it develops in tandem with the growing intensity of the writing we are doing online, typing, tapping, and texting our way through global networks of communication.

Networked systems [26] serve a multitude of purposes in the functioning of complex cultures and they are useful conceptually for ecological thinking. A networked structure also has advantages for capital circulation. For example, the Internet, like the railroads and telegraph before it, extends the reach and density of our social and economic exchanges with each other, while also putting in place an infrastructure for inscribing and archiving these exchanges. Such networks have become essential feedback structures for controlling and stimulating consumer desire.

Web 3.0 and Big Data are the next stage of mass feedback technologies, a squeezing of the invisible hand of the market through the use of pervasive inscription technologies that record, ever finely, our social and economic exchanges with each other. Expanding Big Data practices are particularly virulent for the potential ways they turn Web 3.0 writers into "double objects of commodification" (Fuchs 57)—where our writing, and the digital detritus we leave, is collected, sold, then doubled back upon us through an "intensified exposure to commodity logic" (Fuchs 57) through persistent and targeted marketing (IAB, Turow).[27] As Fuch's notes about this process, our modern infrastructure for inscription has put in place a networked,

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[26] There is a large corpus of literature on the concept of networks and writing that I don't have the space here to explore fully. I invoke the term mainly for its relevance to the material and ecological systems that first emerged in industrialization and have greatly expanded in informationalization. For specific work on writing and networks, see Hawk, Rice, Foster, Spinuzzi, Castells).

[27] Manuel Castells elaborates on the point: "Thus, while the informational, global economy is distinct from the industrial economy, it does not oppose its logic. It subsumes it through technological deepening, embodying knowledge and information in all processes of material production and distribution on the basis of a gigantic leap forward in the reach and scope of the circulation sphere" (Castells 99).

electrified, and global technological system to encourage cultural exchange of all kinds, via wide scale literacy, capital circulation, and, most critically, the labor of those quotidian acts of writing we spend much of our day performing. As such, the "intensified exposure to commodity logic" we experience in Web 3.0 is not simply the creepy advertisements that follow us around the Web; it is also, more problematically, the harnessing of the writing we do online, in emails and texts, comments and reviews, into a prolific, somewhat amorphous, but flexible source of labor value. This is just the point where Reyman's analysis ends. She's correct about data as property, but recognizing this is only part of the larger task of understanding the role that writing plays in value production in Web 3.0. Dealing with Big Data as a problem of individual ownership over one's data misses the radical, large scale implications of Big Data. It isn't the individual's data that is valuable--what's valuable is consumer data in the aggregate and the new insights it can yield about consumer behavior. Individual ownership of data emphasizes the extraction and ownership of small quantities of data, when we should be thinking more about the *acceleration* of value production that occurs systemically as a result of Big Data inscription technologies and a hyper literate population who are, for the most part, willing to trade our little dossier of data for the convenience of the Web.

Moreover, we need to keep in mind that the writing we do online produces content *and* user data—two sources of value. User data from both sources—the same kind of terra and petabyte production that is now produced daily in data centers worldwide—is used to glean new insights about consumers and thus better organize

and target advertising campaigns. In the productivist ethos of Big Data, as well as O'Reilly's seven principles, and Web 2.0 writing theory, there can never be a limit to the amount of data we can collect or writing we can do. Consumer data, the kind that is collected online, is what is known as a "non-rivalrous good"—that is, its value isn't expended once it is consumed, unlike, say, when we burn gasoline or eat at a restaurant. Digital data is a resource that can continue to provide value in the future, and often becomes *more valuable* as more and more consumer data is collected, giving marketers, businesses, and governments new understandings both on the granular level of individuals and on the broader level of society (Cukier and Schonberger 102). The key point to take away here is, again, the novel ways that consumer data is producing value in informational capitalism, and its dialectical relation to the productive labor of our online writing *to keep capital circulating*.

Another way to understand the ascendant exchange value of consumer data in Web 3.0 is to understand its value as "actionable information" (Andrejevic 662-63). That is, the ways our writing, and the data it creates, can be leveraged over and over by companies and organizations to craft more measured, rhetorical actions to stimulate consumer desire, and in the process, continue to expand the infrastructure for inscription necessary for capturing data's value. In his book *Predictive Analytics*, data scientist Eric Siegel writes that the value in Big Data rests in its worth as a feedback mechanisms for predicting consumer behavior on an unprecedented scale. A good example of this is Amazon's much heralded recommendation engine that suggests other books consumers might like based on previous purchases. The system

now generates 1/3 of Amazons total sales (6) and has become a standard, interactive function on other retail and media sites.

Siegel argues the term "predictive analytics" is preferable to "Big Data" or "data mining" because it better describes how businesses and governments put computing and data collection to work through "predictive modeling":

> Predictive modeling generates the entire model from scratch. All the model's math or weights or rules are created automatically by the computer. The machine learning process is designed to accomplish this task, to mechanically develop new capabilities from data. This automation is the means by which PA builds its predictive power. (27)

Siegel shifts the emphasis from data production to machine learning here to emphasize the critical role that automation and algorithmic programming play in turning data into value (Figure 3.4). The value in predictions, as Siegel notes, comes in the ways it helps governments and corporations run more efficiently, make fewer mistakes, be more accessible. When it comes to valorizing our online writing labor and the consumer feedback it creates, Siegel argues explicitly that the value of consumer data lies in its ability to create the "persuasion effect."

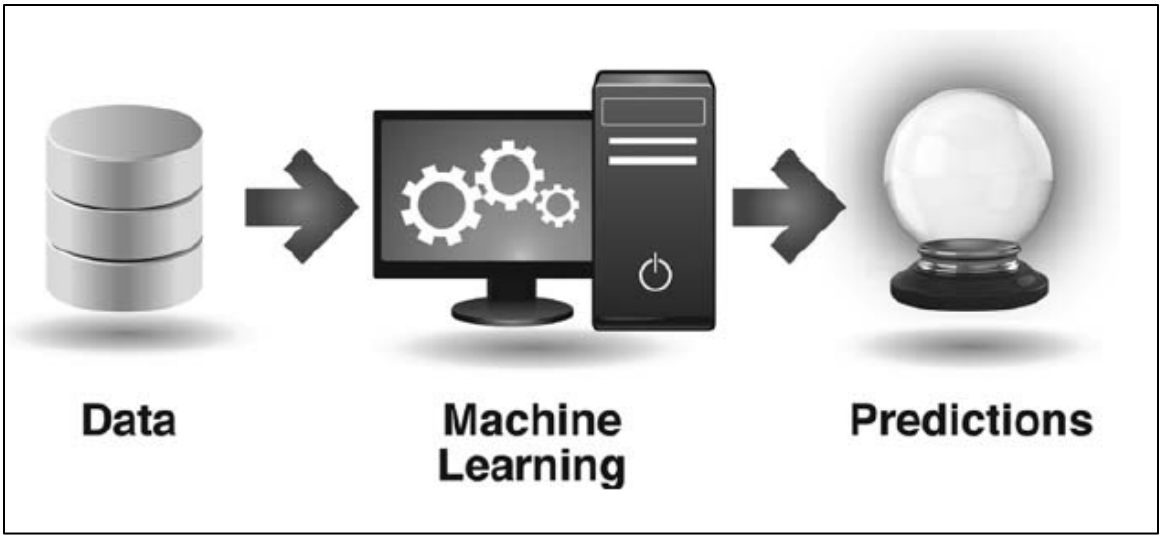

Figure 3.6: Diagram from Eric Siegel's Predictive Analytics (2013) illustrating how large amounts of data (Big Data), along with machine learning (algorithmic programming), enables new insights into predictive pattern in both human and nonhuman systems (27).

> The Persuasion Effect: Although imperceivable, the persuasion of an individual can be predicted by uplift modeling, predictively modeling across two distinct training data sets that record, respectively, the outcomes of two competing treatments. (208)

Uplift modeling is a way to put consumer data to work by comparing large data sets from across a range of metrics, then leverage exponentially growing computer processing speeds to analyze the data, using statistical regression techniques and algorithmic programming to help find correlations between data sets, and thus better predict how a certain percentage of people will, under certain circumstances, act. While not an exact measure, there is value in knowing even a rough percentage of a particular activity or consumption pattern, and as the phenomenon of Big Data reminds us, as more data is collected and analyzed, such modeling on consumer behavior grows in breadth and accuracy.

In Web 3.0 we find ourselves ensconced in a networked and automated textual environment where non-human ICT systems take on more agential force than individual human agents. What matters less is the data of individual consumers and more the data of millions of consumers that can be aggregated, sorted, triangulated, compared, and mixed in novel ways. But to maintain knowledge production at this kind of scale, it is imperative for the ICT industries that consumer data continue to flow, and flow fast. For this to happen, consumers need to be online, living and working online, clicking and writing, signing up and buying things online a good portion of our day. And this is indeed what has happened in Web 3.0. Results from a 2014 report by independent communications regulator Ofcom in the UK, showed that adult Britons, on average, spend more time on media devices during a normal day than actually sleeping (bbc.com). Studies from the U.S. and Australia reflect similar trends (medibank.com; Pew).

In the context of Beniger's history and Seigel's discussion of machine learning then, it is apparent that the celebrated use value of Web 2.0 writing, as vibrant and alive as ever, has also become a vital source of labor value for the circulation of capital in Web 3.0. Take as an example Figure 3.4, an infographic created by the

Interactive Advertising Bureau (IAB), a leading professional organization for online advertisers and marketers. The playfulness of the model belies its subtle rhetoric. The "Engagement Continuum Metrics" graphic comes from the IABs annual public report (2014). The report brings together professionals and stakeholders interested in

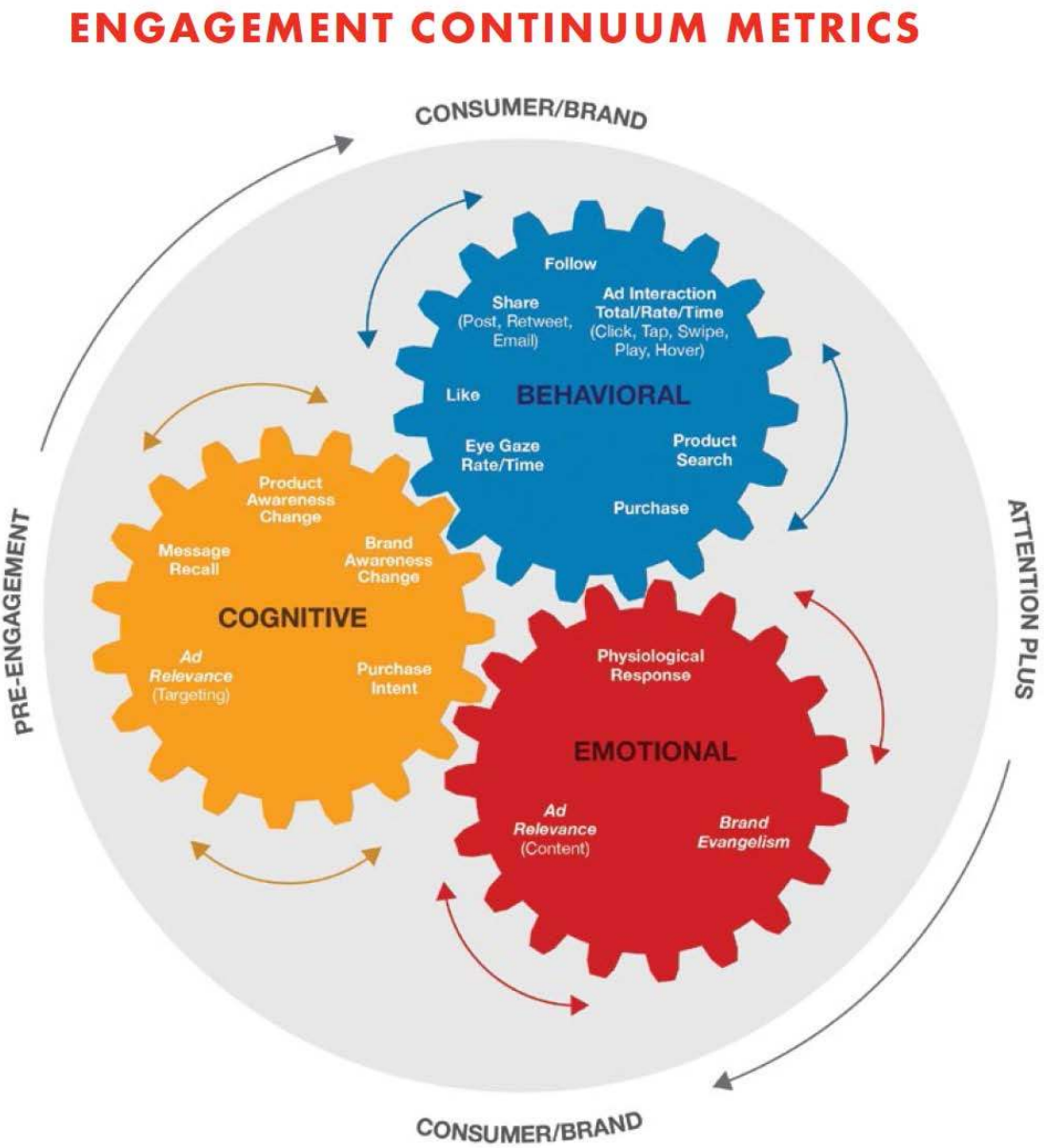

Figure 3.7: Graphic from the Interactive Advertising Bureau's annual report on how best to stimulate "Engagement" with consumers to maintain the necessary feedback system from consumer activities.

developing industry standards on data collection and online advertising. The explicit goal of the group is to articulate a broad consensus on the meaning of "Engagement" (used with a capital E) in the industry, and work out a core set of thirty metrics to measure consumer Engagement that could then be standardized throughout the online analytics, publishing, and marketing industries.

On the outer rim of Figure 3.4, the movement of circulation goes through phases of *pre-engagement* to *consumer/brand*, and *attention plus* to *consumer/brand*. What these cryptic terms describe is the persistent process of reminding consumers about a particular product they may be interested in. The three cogs in the middle—cognitive, behavioral, and emotional—describe the rhetorical "targets" that Internet advertisers and marketers are aiming for in their persistent drive to engage consumer attention. This is a strategy of persuasion that goes beyond enticing users with ads—it is a more systematized, rationalized, and psychologized strategy that consists of both a well-developed, global infrastructure for inscription and an industry of professional marketers and popular rhetoricians bent on tapping deeper into the personal and emotional lives of consumers in their persistent desire to stimulate the user engagement and feedback that creates the streams of data value that flow through Web 3.0.

There is an interesting tension in the graphic though. If we think of these three categories as appeals modern marketing rhetors use today and compare them to the classical appeals, an odd disconnect arises:

- cognitive---logos
- emotional—pathos

- behavioral---ethos [?]

Granted, this is a loose example, but it reveals something interesting about the way value gets created in Web 3.0. The connections between cognitive/logos and emotional/pathos come fairly easy (I'll be exploring this intersection in the next chapter when I look at digital literacy and the writing body.) But the last one, behavioral/ethos is an oddity. The implication, it seems, is that the appeal to character that was central in Ancient Athens is substituted for the hard, empirical data on consumer behavior. If we look at some of the behavioral metrics, we get a sense of the granularity and specificity of user data collection, analyzing how long we stare at something on the screen, who we share with, where we click, tap, or type, and how fast we do it.

Two concerns arise in this substitution. The first, of course, is the absence of ethos. This is poignantly reflected in the report's seven guiding questions for developing Engagement with consumers. None of them explicitly address ethical questions (5).[28] The absence of ethical concerns from a report published by the online advertising industry is troubling, even more so now with the public's growing

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[28]

1. Is there a single definition of Engagement? Or should the definition be different based on type of ad, device, campaign goal, or advertising category?
2. Do all digital metrics need to be consistent, or at the very least comparable to other media?
3. Do we need benchmarks of comparison?
4. How should creative execution be factored in?
5. Does Engagement demand (or even assume) a two-way communication, and, if so, would that mean that print and broadcast advertising can by definition never be engaging?
6. "The legacy of the click:" Since clicks have existed as a surrogate, will it be challenging or impossible to move the focus away from the purely physical/behavioral?
7. How does Social Media get factored in, given the uniquely intimate possibilities of the communication? (IAB 5).

awareness of data collection and problems surrounding consumer privacy and surveillance. As Heidi McKee notes of the unsettled state of Internet regulation and the lack of oversight on data collection practices, the public must keep these concerns in the foreground as we begin to shape legislation on data collection in the next decade (2011).[29]

In addition to the absence of ethos, what we also see in Figure 3.4 are traces of the first mass marketing techniques to emerge in the early 20th century (Beniger) in capital's effort to stimulate consumer desire and alleviate the commodity glut brought on by industrialization. Of particular note here are the propaganda techniques pioneered by Edward Bernays before, during, and after WW I. Bernay's, the nephew of Sigmund Freud, drew extensively on his uncle's ideas about desire and compulsion to effectively psychologize mass advertising. He is often referred to as the "father of public relations." He is most famous for helping President Woodrow Wilson successfully win public opinion to enter WW I and his "Torches of Freedom" advertising campaign that helped break down the prohibition of smoking by women in 1929 in the U.S., empowering women and opening up the tobacco market at the same time (Curtis, 2002). I mention Bernays in particular to foreground how mass networked communication technologies, and a hyper-literate culture that embraces them, become a necessary condition in manufacturing the consumer desire necessary to circulate and grow capital. The "Engagement Continuum Metrics" graphic extends

[29] On February 26, 2015, the Federal Communication Committee reclassified the Internet service under Title 2 of the Telecommunications Act (usatoday.com), requiring internet service providers (ISPs) to maintain equal access to all content on the Internet (fcc.gov).

the Bernaysian tradition into the 21st century drawing on cognitive psychology and neuroscience. In this diagram, the IAB and colleagues present their ideal media environment, one intended to stimulate and reinforce audience Engagement and desire across platforms and devices in the exhaustive search to understand more about consumers.

In understanding and theorizing these networks of inscription and persuasion what emerges is the accelerated production of self-augmenting textuality, and an inscription infrastructure for manufacturing consumer desire in Web 3.0. Figure 3.7 illustrates this process. Value is created by engaging the labor of our online writing, gathering and analyzing the streams of data this writing creates, then feeding these insights back into the cultural work of textuality and, naturally, capital circulation.

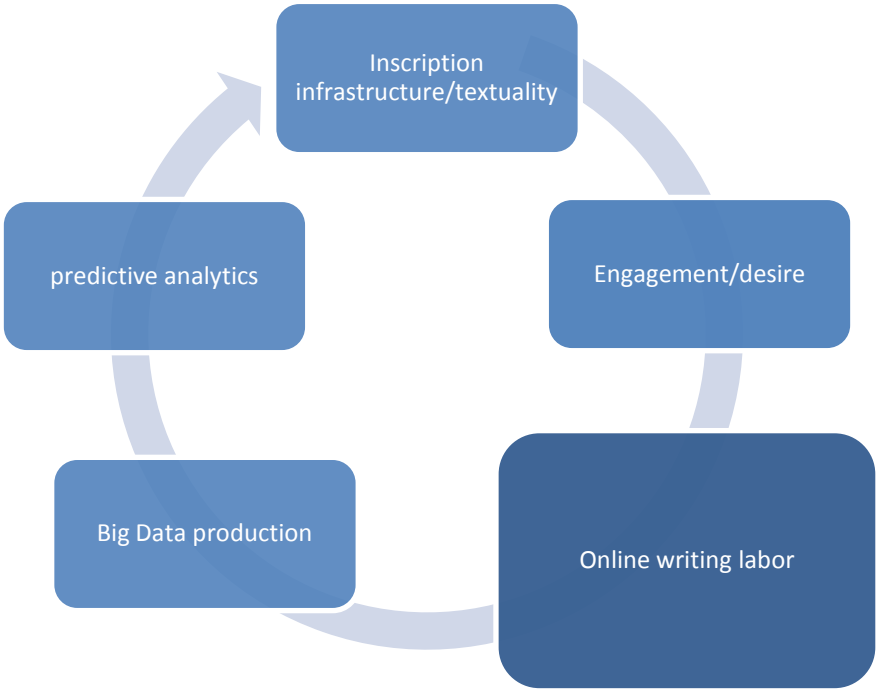

Figure 3.8: Self-augmenting textuality and manufacturing desire in Web 3.0. With a mature infrastructure for inscription and archiving in place, value is created in Web 3.0 the moment we go online and engage the global Internet. It is the labor of our online writing, and the textuality we actively create that feeds back into the infrastructure of textuality.

Writing, as is evident in this model, becomes an essential, and very abundant source for value creation in Web 3.0. This is the process of "harnessing" (harvesting?) the collective intelligence of our writing labor via a planetary, networked infrastructure for inscription.

With this process in mind, I want to bring my point back to where I began this section, and merge the growing labor power of our online writing as illustrated in Figure 3.6 with Marx's general framework of metabolic relations.

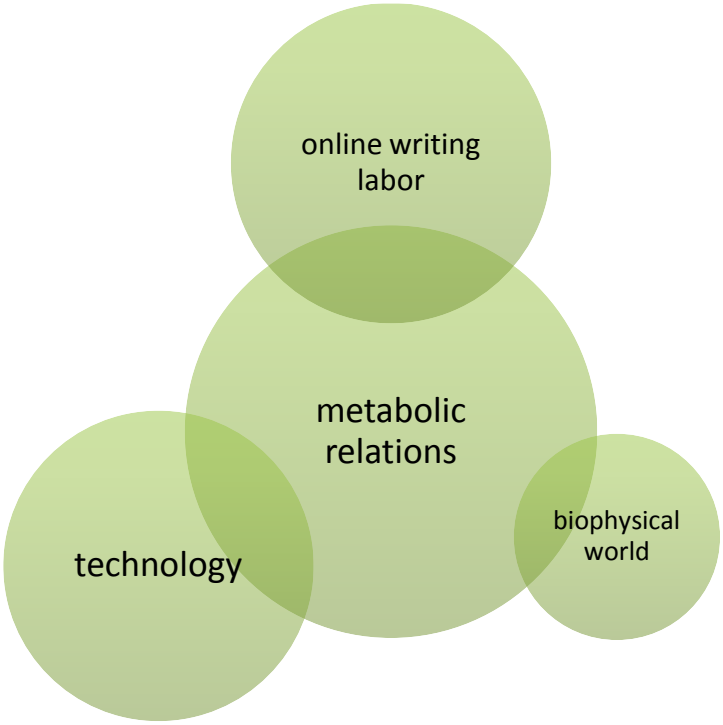

Figure 3.9: Basic metabolic relations between inscription technologies, writing labor, and the biophysical world in Web 3.0.

The breadth and depth of Web 3.0 technologies now serve as a global communications spinal cord reaching into all aspects of cultural and planetary life. What has emerged in this development is a material, metabolic system where an oversized technological infrastructure combines with the boundless labor power of our online writing to produce a dangerous imbalance with other human and nonhuman systems in the biophysical world. One of the effects of this imbalance is the phenomenon of *acceleration* and socio-technological systems that begin to process human informational and material needs faster than the Earth's resources naturally regenerate, creating a dangerous antagonism between a growing public sphere, a power-hungry, technological infrastructure, and a finite, ailing planet.

The Great Acceleration

Several contemporary scholars have noted the phenomena of acceleration (Castells, Harvey, Virilio). Beniger lists over one hundred different phrases that have been coined to describe the lived experience of acceleration in the past century. Writing in 1986, he voiced a similar concern we hear today--

> If social change has seemed to accelerate in recent years…this has been due in large part to a spate of new information-processing, communication, and control technologies like the computer, most notably the microprocessors that have proliferated since the early 1970s. (6)

Big Data and Web 3.0 are the current culmination of this process that began in the the mid-19th century—a steady process of acceleration brought on by the parallel and progressive development of more diffuse communication and inscription technologies, faster computer processing speeds, more bandwidth, and endless storage capacity. Work by information theorist Martin Hilbert confirms this felt sense of acceleration. He argues in his research on the world's capacity to save information (data):

> Humankind's technological capacity to compute information has grown even faster than the world's storage and telecommunication capacity– by 60–85% annually. That is more than 10 times faster than our economic capacities. (9, 2012)

The pace of life feels faster in Web 3.0 because our technological capabilities to process both informational and material flows continues to advance exponentially (as expressed in Moore's Law).[30] Hilbert stresses that in the move from analogue

[30] Moore's Law is named after Gordon E. Moore, co-founder of microchip pioneer Intel Corporation. Moore estimated in 1975 that the processing power of semi-conductors—microchips—doubled every two years. The law has since been applied to other aspects of computer development

technologies (print, tape, vinyl) to networked, digital technologies (binary code, dvds, carbon), audio and visual data storage decreased significantly while *text* production and storage *increased* by 20%. As Hilbert observes, "The multimedia age actually turns out to be an alphanumeric text age, which is good news if you want to make life easy for search engines" (9). Hilbert reminds us that, in addition to the accelerated production of video, music, images, and other semiotic forms, in a Web 3.0 data environment, it is the labor of our online writing and the industrial production of alphanumeric textuality that grows most prodigiously. This is the same textual production that Web 2.0 writing theory celebrates as inherently beneficial in the way it expands opportunities for rhetorical, civic participation in the public sphere.

As I've been arguing throughout this chapter, the same writing labor that Web 2.0 writing theory celebrates for the use value it provides to writers, is also the productive force that propels capital circulation in Web 3.0. And, as a consequence of the metabolic relation between online writing labor, inscription technologies, and the biophysical world (Figure 3.7), what has manifested in Web 3.0 are deepening ecological antagonisms between human textual production and other social and biophysical systems. As our capabilities to process both informational and material flows accelerate, we are invariably impacting other social and natural systems in problematic and unsustainable ways.[31]

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such as memory capacity, screen resolution, and video and sound card development (amended from Wikipedia entry on "Moore's Law"—accessed March, 2015).

[31] My use of the terms "material and informational flows" comes out of Castells' and Beniger's work.

This is precisely what research shows. In 2000, the International Geosphere-Biosphere Programme (IGBP)[32] offered compelling evidence that human activities in the past 250 years, beginning with the Industrial Revolution in Europe (circa 1750 CE), have altered the Earth's eco-system so definitively that humans have initiated a new geological phase, the *Anthropocene* (Steffen et al. 2). In 2004 the IGBP published their results in a report containing 24 graphs, one for each of the 24 indicators they were measuring—12 social systems and 12 ecological systems (2). The report garnered wide spread attention and led to the coining of the phrase "The Great Acceleration." It is "great" because the IGBPs research shows, quite compellingly, the process of acceleration occurring evenly and radically across a range of social and natural systems. In 2015, the IGBP published updated versions of all 24 graphs, with data as recent as 2010. Figure 3.8 shows six of the indicators. The trends you see here are consistent across all 24 indices. The IGBP notes that each system makes a surge around 1950—the same era that the U.S. begins to shift from an industrial to an informational economy (Beniger, Drucker, Hayles).

[32] IGBP is a non-governmental organization composed of scientists from all disciplines and nationalities.

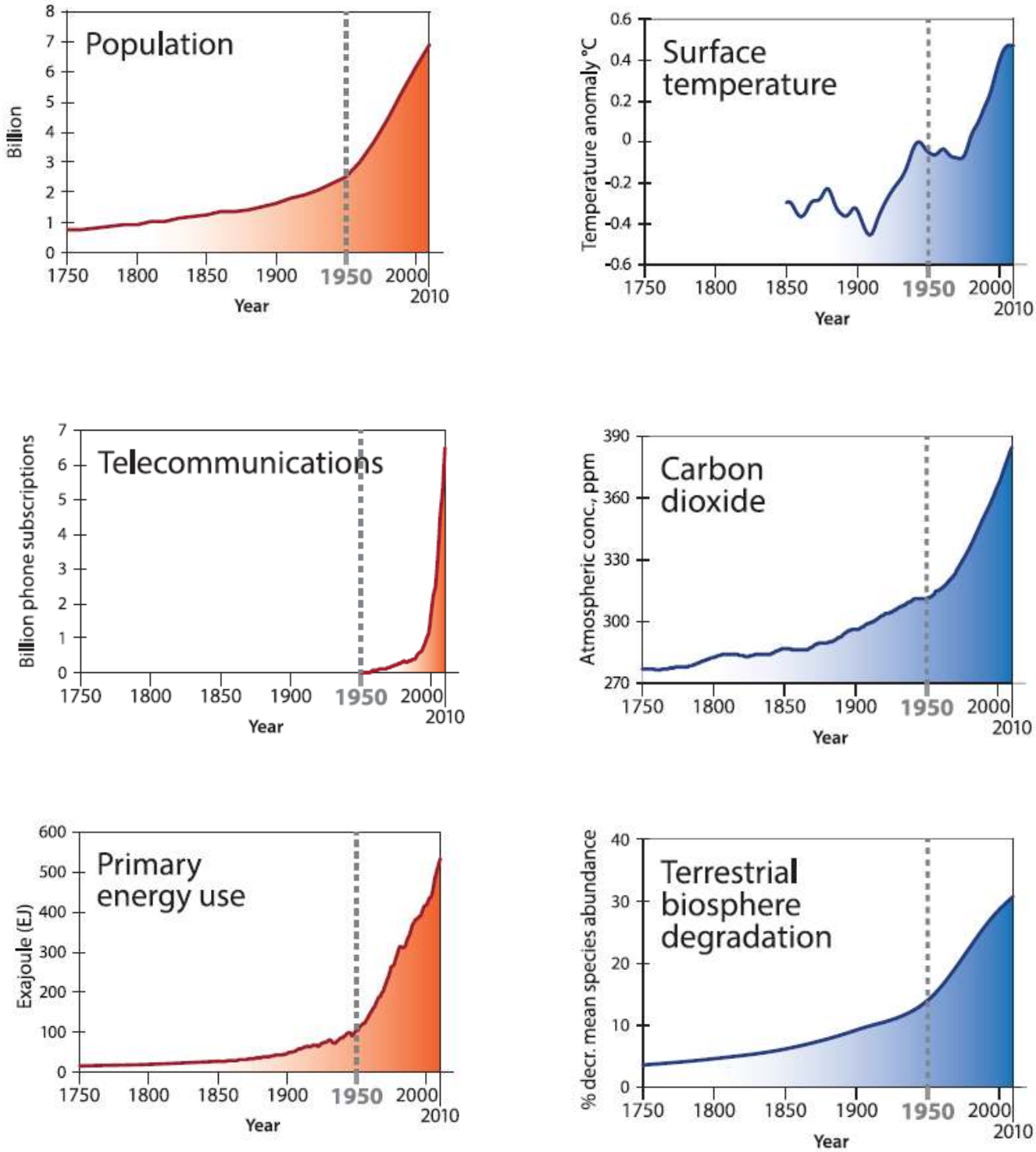

Figure 3.10: Six sample metrics taken from the IGBPs report on the impact of human activity on social and biophysical systems.

The graph for Telecommunications supports a similar claim that Beniger made thirty prior—the development of informational technologies will always lag behind

developments in commodity production. The Telecommunications chart, which measures the percentage of people globally who own mobile phones, is practically silent until 1950, but shoots exponentially upward starting around 1990, reaching over 80% of the world's population in 2010. The IGBPs research draws a clear metabolic relation between the rise of informational economies driven by data collection and the acceleration of other natural and social systems.

A concrete example of this relationship between information processing and the biophysical world is the growing demand for energy needed to power the data centers around the world that make up the ever expanding "cloud." Energy use by data centers is growing faster than any other industry. According to Greenpeace, the total consumption of energy used to power the growing number of data centers worldwide is somewhere in the range of 40GW annually—a number predicted to grow by at least 81% by 2020 (Greenpeace, "Clicking Clean," 11). In 2013, the global cloud consumed the equivalent output of 40 nuclear power plants (Greenpeace, Glantz)—more energy than France, Germany, Brazil, and Canada combined (Greenpeace). While use of renewable energies are on the rise by companies like Google and Facebook, other companies like Twitter and Amazon continue to lag behind in adopting clean energy to power their operations (Carli, Greenpeace, Glantz).

Energy studies have also shown that data centers are exceedingly wasteful in their use of energy. Because of the need to operate 24/7, data centers must build in redundant energy measures to ensure servers never go down. A study by the NY

Times in 2013 found that "data centers can waste 90 percent or more of the electricity they pull off the grid" (Glantz). An average size data center drawing 5 million gigawatts (Facebook draws 60 million annually) will also need back-up servers, back-up batteries, and back-up generators, as well high powered air conditioning and ventilation to remove the heat produced by the servers. At the end of the day, it is estimated that about 12% of the energy needed to run a data center is used by actual servers.

Greenpeace has led the way in raising public awareness about the growing energy of the cloud. Since 2008 they have released report cards for all major tech companies and great improvements have been made by many ICT companies in energy efficiency and investment in renewable energies. Google has set the example here with 35% of their energy use currently provided by solar and wind power (google.com). Unfortunately, the industry in general has not followed Google's lead, and there continues to be a culture of secrecy around how much energy is actually being used by data centers around the world, and what other potential environmental concerns might emerge as a byproduct of building and powering these data centers.

Conclusion

In this chapter I've explored the third material stratum in the MEOW framework, the contexts of informational capitalism and the various kinds of value that are produced by the labor of our online writing. I've argued there is an opportunity, in the shift from a Web 2.0. to a Web 3.0 environment, to expand our

material and ecological analyses of contemporary writing practices and begin a deeper engagement with the sub-strata of data gets produced as a by-product of the time and labor we put in when we go online.

In the next chapter, I move from the burnished, sterile environment of the data center to another side of Web 3.0—the opaque, toxic world of electronic waste factories (ewaste). Developing countries in the northern hemisphere have for decades reaped the benefits of cutting edge computing while off-loading the responsibility of electronic disposal on developing countries in the southern hemisphere. While disposing of electronics in another country certainly eliminates the challenges of recycling electronics, no cultures are immune to the toxins that are released into water and soil systems when ewaste isn't recycled appropriately or dumped in landfill. I address this issue in the next chapter, as well as another system that has come into conflict with Web 3.0, the organic system of the writing body.

CHAPTER 4

STRATUM IV: LITERACY AND THE BIOPHYSICAL WORLD

> "It is not clear how these [online literacy] habits will now begin to change with the spread of hypertextual materials; but there is nothing about the form of such materials that insures more perspicuous readings…" (Burbules).
>
> "The Internet is still ours to shape. Our minds are in the balance" (Dokoupil).

In the preceding chapters I've outlined three different vantage points in which to theorize a materialist ecological approach to writing in Web 3.0—what I've been calling *material strata*. In this final chapter I integrate more fully the IV material strata--the biophysical world. By "biophysical world" I mean the physical and organic systems that sustain life and their interdependent relations with the writing body. In exploring writing's relationship to the 4th strata, I am looking for ways in which our current digital literacy practices, and the hyper-mediated textual environment of Web 3.0, intersect and possibly harm both the natural environment and the permeable space of the writing body.

In Web 3.0 we find the 4th stratum in crisis—over-population, growing demand for natural resources, climate change, water shortages, and losses in biodiversity. These are global concerns that impact us all. Due to the scope of ecological problems, solving them will require concerted effort at all levels of culture and all disciplines, including education. As environmental scientist and educator David W. Orr argues, "the ecological crisis is in every way a crisis of education" (xi, 2012). With literacy and writing instruction at the center of education around the world, the field of rhetoric and composition can play key role in ameliorating

environmental problems by helping students cultivate critical, ecological awareness in our writing courses.

In this final chapter, I explore two prominent concerns emerging in the 4th stratum that directly connect to our digital literacy practices--the dangerously toxic problem of electronic waste (ewaste) and the ascendance of two problematic literacies--*media-multitasking* and *skanning*. Both ewaste and these nascent screen literacies raise serious questions about environmental justice and the ways digital writing environments may be in conflict with the health of other social and biological systems, including our bodies.

Drawing on work from Kristie Fleckenstein, Robert Yagelski, and Max Van Manen, as well as work in education, ecoliteracy, cognitive psychology, neurobiology and environmental science, I demonstrate how the inclusion of the 4th stratum (body and natural environment) in our theorization of digital literacy radically changes our understanding of literacy in Web 3.0. In so doing, it opens up new ways for us to develop more critical, sustainable, and ecological literacies that will better prepare students for the social and environmental problems we are facing today. I close the chapter with five broad learning outcomes and a sequence of writing activities intended to help guide faculty and administrators in integrating critical, ecological literacies at all levels of program and course curricula.

Part 1: Web 3.0 and the Challenge of Sustainability: Setting the Context

Strong Sustainability

The criterion of sustainability is vital for the discussion that follows, and it provides the ethical grounding for writing pedagogy from a MEOW (materialist ecology of writing) perspective. As ecological in nature, our literacy practices play a central role in building healthy lives that are sustainable both socially and environmentally. By "sustainable" I am referring to the "strong" version of sustainability that includes the *intergenerational requirement*—the idea that humanity has a responsibility to use earth's natural resources in ways that "meet the needs of the present without compromising the ability of future generations to meet their own needs" (Owens 22, United Nations). Like ecology, sustainability is often co-opted by corporations and governments as a way to talk about economic growth and development. This is the "weak" version of sustainability (Nobbs 144)--an anthro-centric model that gauges sustainability by how well human socio-economic systems (businesses, corporations, cities, nation states) can maintain perpetual economic growth in the short-term. It is weak because it erroneously separates human socio-economic systems from the natural systems they are embedded in.

The "strong" version of sustainability displaces the focus on economic growth with a more holistic, long-range understanding of sustainable development. A healthy ecosystem, whether it be a pond, a cell, or a city, must produce the energy for life to exist (photosynthesis, food, oxygen) and be able to manage the waste produced by the system. Such "waste management" becomes the building blocks of the system

and its capacity to flourish and regenerate itself (Nobbs 144). Weak versions of sustainability ignore the intrinsic waste produced by all systems, as well as the finite limits of the planet's raw materials. Consideration of future generations injects a social justice component into the concept of sustainability, and sets the ethical foundation for developing literacy practices that will sustain both economic and environmental health for generations to come. Thus, when I use the term sustainability throughout this chapter, I am referring to the strong version.

Electronic Waste and the 4th Stratum

One of the more problematic environmental concerns that has emerged in informational capitalism in regards to our literacy practices is the growing production of electronic waste, or *ewaste* (introduced in chap. 1). Categories of ewaste include computers, monitors, keyboards, televisions, mobile phones, faxes, and printers. According to the United Nations (UN), close to 50 million tons of electronics are discarded worldwide each year (StEP)[33]. The U.S. alone disposed of 258 million individual devices in 2010—the most of any nation. Discarded electronics are now the fastest growing part of the waste stream in many countries. The UN predicts that by 2017 the world will be producing over 70 million tons of ewaste a year —33% more than current rates (see Appendix A and B).

Unlike simpler waste products such as paper or glass, electronic waste is more complex, containing hundreds of individual components. The manufacture of computers and electronics is resource intensive using large amounts of water,

[33] These are metric tons, which weigh approx. 2, 200 pounds.

chemicals, and energy. For monitors, circuit-boards, and batteries to function, they need lead and mercury—heavy metals known to effect human development and cause reproductive problems in marine life when released into the environment. Moreover, the need for gold, silver, and copper in computerized devices requires extractive open-pit mining that produces enormous amounts of hazardous waste while leaving large scars in the landscape that destroys local habitat and can pollute local water systems for decades (Grossman, 2006).

Recycling such complicated and hazardous materials is expensive, requiring trained labor and the proper tools and machinery to do it safely. Currently, there is no way to mass recycle ewaste. Wires, circuit boards, monitors, and plastics must be broken down manually. When ewaste recycling is done correctly, no toxins are released at the end of a products life, and much of the precious metals used in electronics can be recovered for resale. Because of the high costs associated with proper ewaste disposal, many recyclers in the global North (U.S., European Union) cut costs by shipping the waste to developing counties in the global South. Research from the Basal Action Network (BAN) estimates that in the U.S, 15% of the ewaste produced is properly recycled by licensed recyclers. The rest is stockpiled by consumers, dumped in landfill (both legally and illegally) or sent to developing countries for recycling. It is estimated that the U.S, the largest producer and exporter of ewaste, has exported an average of 1 million tons of ewaste annually to developing countries since 2000 (BAN, Bradford, 2011).

Such numbers exhibit the enduring practice of *externalization*, where wealthier

countries "contract out" the more laborious and dangerous aspects of commodity production and disposal to poorer countries with large, cheap labor markets. Today, electronics exemplify this practice:

> The developed nations of the global north consume 75% of all electronics produced globally, then export anywhere from 15 to 30% of these products to developing nations in the south. It is a perfect case of "externalization"—where developed countries are currently dumping their hazardous waste products on developing countries where U.S. and European recycling companies can find cheap labor and skirt regulations (Khetriwal and Luepschen 6--see Appendix C).

Externalization is a hegemonic practice that allows wealthier nations to enjoy the benefits of new media while passing the burden of disposal and recycling on to developing nations. This, undoubtedly, is a form of *fetishization*—the systemic practice of concealment, of obscuring the relations between the electronic commodity and the network of human labor and natural resources necessary for their production and disposal. The city of Guiyu, China is a case in point. Guiyu is considered the largest ewaste processing center in the world (BAN). It is one of hundreds of ewaste locations in China—an industry that employs over 400,000 people at an average of 1.50 USD dollars a day (StEP). From 2000 to 2010, 75 percent (1.25 million tons) of the ewaste received at Guiyu came from North America (BAN). The Chinese government banned all importation of electronic waste in 2000, but ewaste continues to flow into China from the West while its growing domestic production of electronics is beginning to contribute significantly to the ewaste stream.

Several studies on Guiyu have exposed the environmental costs of ewaste and the dangerous conditions it creates. The facilities there, like others around the world,

use open air flames and chemical baths to break down the circuit boards of old electronics, melt plastic, and retrieve any metals they can. The population of the city has been found to have higher rates of "digestive, neurological, repository, and bone problems" (StEP) than cities of comparable size. A 2007 study found that 80% of children between ages of 1-6 had high levels of lead in their blood (Huo et al.). Other studies done in Nigeria (Olubanjo et al.) and India (Inagaki) have shown similar results--Guiyu is just one of thousands of such processing plants around the world.

Figures 4.1: Images of ewaste processing in Guiyu, China (Greenpeace).

In 1989, in response to the growing export of hazardous waste occurring from the global north to the global south, the United Nations adopted The Basel Convention—a treaty designed to halt the illegal transport of hazardous waste across national lines. As of today, all the countries in the E.U. have ratified the treaty and use it to guide national regulations on electronic waste. Despite being one of the first countries to sign onto the treaty in 1990, the United States, the largest generator of ewaste in the world, has failed to ratify the treaty in Congress. It is still legal in the United States to export old electronics for recycling (eStewards).[34]

[34] Growing awareness of ewaste has helped stem the flow of electronics into China. The crackdown on exports has created problems in the flow of domestic ewaste with recycling companies often transporting ewaste across state lines. ("California's Ewaste Creating Toxic Mountain in Arizona").

There's a really interesting relation at work in the problem of ewaste between the challenge of waste disposal and capital circulation. Anything that slows capital down, causing deflation, historically has manifested in crises. Any disruption or barrier to capital circulation results in crisis—a stock market crash, an oil shortage, a bad investment. Ewaste, and the cost to properly dispose of it is one such disruption. To solve it capital skirts regulations, avoids international treaties (Kyoto, BAN), finds cheaper labor, and poisons the environment. In a very real way then, the discordant juxtaposition of data centers (Chap. 3) and ewaste dump is a fitting trope for the asymmetrical relations that persist between the global North and South. Because the benefits and risks of electronic production and waste are unevenly shared, it makes the issue one of environmental and social justice. [35]

But ewaste is only one aspect of the waste created by electronics manufacture. From the ecological perspective of the 4th stratum, we must also consider the waste created in the manufacture of our writing technologies, especially something as resource-intensive as semiconductor production—more commonly known as "microchips." Elizabeth Grossman lucidly illustrates this complicated process in *High Tech Trash*: "Turning simple silica into the platform for nearly all high-tech electronics is anything but simple. It requires enormous amounts of other materials, highly complex machinery, energy, and water, and creates large amounts of waste" (44). In fact, as Grossman argues, "one individual semiconductor fabrication plant may use as

[35] United Nations definition of environmental justice: "The fair treatment and meaningful involvement of all people regardless of race, color, national origin or income in the development, implementation and enforcement of environmental laws, regulations and policies" (Khetriwal and Luepschen 6).

many as five hundred to a thousand different chemicals," (45) most of which are hazardous and require extreme measures to ensure they are not released into the environment post-manufacture. Many of the chemicals used in semiconductor manufacture must be stored in underground tanks engineered to never leak. Despite such regulations though, there are over twenty documented cases of leaky tanks contaminating local drinking water (New York, Oklahoma, North Carolina). In Silicon Valley, the birthplace of microchip technology, there are currently seven toxic waste sites from microchip manufacturing that are listed on the federal governments Superfund [36] program (Grossman 3).

Thus, with a problem like ewaste we can see just how difficult it is to contain waste production on a global scale and avoid polluting human and non-human ecosystems. While neoliberal policies like NAFTA and GATT succeeded in opening up international markets through tariff-free trading and accelerating global capital flows, they have also created global flows of waste that inevitably circulate back and begin to poison those countries who have been externalizing it. From an ecological point of view, externalizing waste only conceals it. The environmental impacts of electronic manufacture and ewaste don't end in Guiyu or Silicon Valley. The toxins produced by electronic manufacture and disposal have wended their way, via air, water, and soil, into other ecosystems around the globe. Grossman captures this metabolic movement in the following passage:

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[36] Established in 1980, the EPA's Superfund program was created to help identify and clean up significant cases of hazardous waste sites throughout the country.

> A polar bear settles down to sleep in a den carved out of Arctic ice. A whale cruises the depths of the North Sea and…a bottlenose dolphin leaps above the waves. A seagoing tern lays an egg. A mother in Sweden nurses her baby, as does a mother in Oakland, California. Tissue samples taken from these animals and from these women's breasts contain synthetic chemicals used to make the plastics used in computers, televisions, cell phones, and other electronics [to] resist fire. Americans have the highest levels of these compounds in their blood of any people yet tested, and the same chemicals have been found in food purchased in grocery stores throughout the United States. (2)

This is what it means to be in a metabolic relationship with a multitude of human and non-human systems (see Appendix C). That is to say, to understand the cultural and material realities of literacy in Web 3.0, we must consider the environmental hazards created by the growing production and consumption of electronics. By including the 4th stratum in our theorization of digital literacy, we open up new ways to think about the broader environmental consequences of our digital literacies and the ways they interact with other ecological systems, including the organic, permeable space of the writing body. Understanding this experience of the body in informational capitalism is an essential part of understanding the 4th stratum, and for articulating our felt experience of the digital condition.

Part 2: Literacy, the Somatic Mind, and the 4th Strata

But what exactly does it mean to talk about the body in relation to literacy? What are we hoping to understand about writing? And how can we study such a thing in a field more inclined towards social and qualitative approaches rather than the biophysical experience of the writing body? Generally speaking, when we think about literacy we tend to focus on the *activities* of literacy--reading, writing, speaking.

But if we shift from this human-centric model to an ecological one, literacy becomes more than just an activity, it becomes an *experience*, something that permeates through and affects the living body. The idea of mediation, stratum 2, speaks directly to this process. Mediation is the fundamental experience of literacy--the physical, metabolic exchange that occurs between the writing body and physical environment when we "pick-up" a writing tool to intervene in the world. Kristie Fleckenstein describes the exchange in this way:

> The physical demarcations constituting who we are (and what we are) at any moment must enclose, not cut, the relevant pathways that create a specific context thereby blurring the boundaries of what constitutes flesh and technology, flesh and culture, flesh and other. (287)

Rather than use "mediation" to describe this merging of flesh and technology, Fleckenstein uses the term "somatic mind"[37] to emphasize the embodied experience of literacy. Though it may appear from the perspective of the human agent that we use writing tools to write the world, from an ecological perspective, those same tools very much write the somatic minds of writers in the act of literacy.

To clarify this point further, although our visual field tells us that our bodies are physically separate from other objects in the phenomenal world, the concept of the mediated somatic mind assumes a more fluid, metabolic experience between textuality, technology, and the body. As I type on my keyboard right now, my fingertips, laced with thousands of sensitive nerves, send neuronal signals back to my

[37] "Using the work of cultural anthropologist Greg Bateson, I define the somatic mind as a "being-in-a-material-place" whose fluid and permeable boundaries are (re)constituted through the mutual play of discursive and corporeal coding" (Fleckenstein 282).

brain telling me I'm touching, and using, an electronic writing tool. The little Braille bumps on the F and J keys tell me my hands are in the correct position. I rarely look down when I type after three decades on the qwerty keyboard, although I still have trouble reaching the Z. Thus, though it may appear from the perspective of the human agent that we use writing tools to write the world, from an ecological perspective, those same tools very much write our bodies in the act of literacy. Acknowledging this embodied experience of textuality is vital to our understanding of literacy in Web 3.0. As Fleckenstein argues, "Without bodies…no resistance or systemic transformation can be effected…" and "it is only *through* the body that competing (con)textualities materialize…" (284). Without considering our body's experience of semiosis, not only do we obscure human agency, we do so by ignoring the wealth of knowledge the full sensorium of our body provides.

Our lived experience of literacy only intensifies in the datafied space of Web 3.0. In this radically new literacy environment, we are just awakening to the subtle changes our minds and bodies are undergoing. Such changes are reflected in two of the more noticeable and problematic literacies to emerge from Web 3.0: *media-multitasking* and *skanning*. While you could argue these are hardly literacies, their prevalence in Web 3.0 as common modes for engaging digital semiosis demands we take notice. I borrow the term media-multitasking from Reynol Junco. Media-multitasking, as I understand it, specifically refers to using several electronic media simultaneously—listening to music, watching a video, doing homework, and texting, while doing homework. Skanning is my own foolish phrase, but I wanted to draw a

distinction from the common practice of scanning when we read. Skanning refers specifically to how our reading practices are changing in Web 3.0 as we move from the static printed page to hyper-media space of our screen "reading."

Research into both practices has emerged from a variety of fields including human computer interaction (Junco, Adler et al.) cognitive psychology (Wolf, Levitin, Sana et al., Aagaard) and education (Lee and Wu 2012, Hewitt et al., Mangen et al.). Such work is raising questions about the growth of these new literacies and the potential ways they can *distract* writers from the sustained attention necessary for more advanced writing and for developing more standard school literacies like close reading, critical thinking, and reflective thought. Life online, where so much of our digital literacies unfold, seems to encourage a different skill set than the one traditionally associated with direct literacy instruction, one more designed for the frenetic textualism of Web 3.0.

Because these practices bear directly on questions of attention and distraction, they also, inevitably, bear directly on questions of literacy and writing. Nowhere is this clash of old and new literacies playing out more vividly than in the language arts/composition classroom at all levels of education. Understanding media-multitasking and skanning, their benefits and potential for disrupting the sustained attention and focus necessary for becoming skilled readers and writers, are pressing questions that teachers and scholars will have to grapple with as we move deeper into Web 3.0. As the commercialization and datafication of Web 3.0 encroaches further into our lives, we must revamp our writing pedagogies to help students develop the

critical and ecological literacies they will need to survive in a world of technological control and environmental crisis.

Three Kinds of Digital Literacy

To get a sense of what a critical, ecological literacy looks like, it's useful to take a quick inventory of the field's scholarship on digital literacies. To be sure, these are broad strokes—my goal is to give a general picture of some of the more common approaches to digital literacies in the field:

- New media, multi-modal composing (Yang, Wysocki, Kress, Sorapure, Selfe, Jewitt, Rice, Ulmer). This approach to digital literacies emphasizes textual *design* and the use of new modes of composing (image, video, sound) now available on a broader scale to professional and amateur alike. I would also place more instrumental approaches to digital literacies (Hicks and Turner, Clark) in this category.

- New (digital) literacies (Roswell, Street, Boyd, Black, Urbanski, Ito, Lankshear and Knobel). This social constructionist approach to digital literacies focuses on the local and situated literacy practices of discourse communities. I would also place classroom studies of digital literacies in this approach (Maranto and Barton, Yang)

- Web 2.0 writing theory, public rhetorics online (Sheridan et al., Grabill, Porter, Chaput, Helmers, Lunsford, Dobrin). This approach tends to focus on the changes in the public sphere brought on by a globalized Internet, especially the rise of user-created content and social media. It also tends towards a celebratory understanding of Web 2.0 where students are writing more and more outside of formalized schooling.

Admittedly, this is a condensed taxonomy and there is overlap between approaches; but it captures the general shape of how many scholars are thinking about literacy in Web 3.0. Conspicuously absent from this list is the 4th stratum—the biophysical world of the writing body. Web 3.0 challenges many of the basic assumptions about

literacy present in these models. We enter a new stage of semiosis where the public space of writing has become an expanding global network of computers, servers, platforms, applications, transmission lines, and satellites. Problematic phenomena like ewaste and Big Data are manifestations of these cultural and technological changes.

Writing Instruction in Web 3.0

An interesting lens for exploring the potential effects of media-multitasking and skanning can be seen in a recent study by the Pew Research Internet Project, "The Impact of Digital Tools on Student Writing and How Writing is Taught in Schools." Researchers surveyed over 2,400 Advanced Placement (AP) and National Writing Project (NWP) teachers from around the country to better understand their perceptions of literacy and student writing in digital environments, and how new writing tools are changing their teaching. The overall tenor of the study is one of optimism and technological progress:

> …teachers see the internet and digital technologies such as social networking sites, cell phones and texting, generally facilitating teens' personal expression and creativity, broadening the audience for their written material, and encouraging teens to write more often in more formats than may have been the case in prior generations. (Purcell et al.)

Such sentiments and trends clearly reflect the influence of Web 2.0 writing theory (chap 3) and its assumptions about the value and purpose of literacy. The tacit assumption here is that *more writing production is better*--the more opportunities and audiences we have to write to, the more creative and expressive students, and ourselves, will become. And the Pew study data speak to these beliefs:

- 96% of teachers agree that digital technologies "allow students to share their work with a wider and more varied audience."
- 79% of teachers agree that these tools "encourage greater collaboration among students."
- 78% agree that digital technologies "encourage student creativity and personal expression."

In these impressive numbers, the study seems to confirm what Web 2.0 writing theory has been telling us all along—digital writing technologies allow for a richer rhetorical experience for students and for writing instruction in general. And yet, as I argued in Chapter III, when this explosion of writing is embedded in informational capitalism, what we see in Web 2.0 writing theory is a *production view of writing* where more writing, with more audiences, inevitably translates into stronger, more rhetorically aware writers. To celebrate the abundance of writing in Web 2.0 as inherently positive, we are, in a very real sense, celebrating and confirming informational capitalism's standard mode of operation.

On closer inspection, this tension between writing production and emerging Web 3.0 literacies like media-multitasking and skanning begins to bubble-up in the Pew study. First, when contrasting the benefits of digital writing tools with their more "undesirable effects," the survey data revealed a surprisingly superficial list of concerns:

- The use of informal language in formal writing assignments.
- "Truncated forms of expression," like text-speak.
- A sense of digital tools as "toys" they learned as children.
- Disparate access to digital tools amongst their students.

While I think all of us can sympathize with these sentiments, I can't help but notice their traditionalist bent. Besides the access question, the other three are rather trite in the larger cultural politics of literacy education. These highlighted "undesirable effects" tell us little about the true impact of digital tools on student writing, but they do provide us with two key insights about contemporary writing instruction as articulated by professional teachers:

1. The "beneficial impacts" to writing in Web 2.0 assume a productivist model of writing. That is to say, Web 2.0 writing theory is a social-constructionist approach to writing that focuses on the *social production* of writing and its communal practices of personal expression and sharing. The more opportunities for these kinds of literacy activities, the richer, and more genuine the experience of writing. Thus, there is a strong bias towards social explanations of literacy (rather than say cognitive or ecological as I've been using it here).

2. The "undesirable effects" are based on the assumptions of more traditional writing pedagogy—belief in a tamed and standardized tongue, the poverty of abbreviated forms of expression, the principle that writing is "serious" business, not child's play.

I find the juxtaposition fascinating—the conflicting desire on the part of writing teachers to embrace the wildness of Web 2.0 textuality while trying to contain its influence on the writing that takes place in the classroom. These two traditions, social-constructionism and current-traditionalism alike, have been absorbed into our understanding of literacy today. They are useful and important ways to think about writing, but alone they are not sufficient for theorizing literacy in the datafied age of Web 3.0. An excessive focus on "the social" or "the mechanical" aspects of writing effectively obscures our sense of literacy as a fully social, ecological, and *embodied* experience.

As would be expected then, nothing in the study points to the 4th strata—either the biophysical environment or the writing body, at least not explicitly. If one looks carefully at the less emphasized statistics, some very interesting patterns begin to appear.

- 68% of teachers say that digital writing tools encourage students to "take shortcuts" and "not put effort into their writing."
- 46% noted that digital writing tools encourage students to "write too fast and be careless."

These are telling figures, and they tell us a different story than the highlighted 'pros and cons' that frame the study. These are not surface level questions about grammar or whether or not students are writing more—these are concerns about the writing process, the careful, thoughtful work of composition, and a critical break-down of this embodied process.

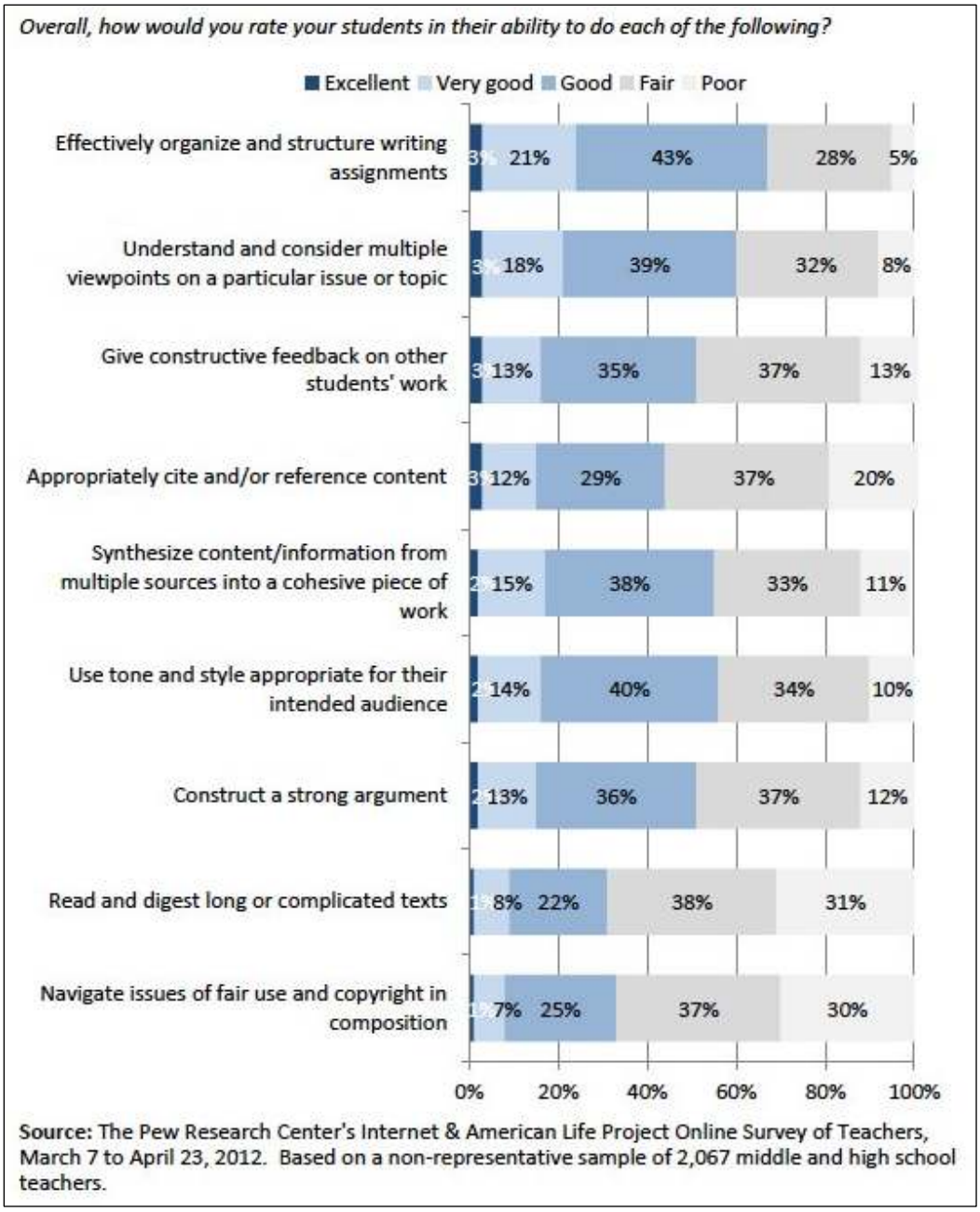


Figure 4.2: Graph showing teacher ratings of students' writing abilities (Pew Research Center).

Other troubling numbers arise in the teachers' rating of students' core writing abilities (figure 4.5):

- No more than 3% of students were rated as "excellent" on any of the core writing abilities.

- 69% of students were rated as "fair" or "poor" at "reading and digesting long or complicated texts."

- 67% of students were rated as "fair" or "poor" in "navigating issues of fair use and copyright.

Again, issues of copyright and fair use are significant in Web 3.0 and rightly recognized by teachers in the survey. But the other two figures give us reason to pause. How is it possible, after decades of research on writing pedagogy that no more than 3% of students rated "excellent" on any of the writing competencies? It could be that survey respondents were drawn from lower income school districts with fewer resources—that might explain the 3% ceiling. Unfortunately, this isn't the case. The majority of respondents were "leading edge" AP instructors teaching high-achieving students in resource-rich school districts. Maybe writing teachers are getting more stringent in their assessment of writing, or maybe our most privileged students are getting complacent. Whatever the reasons are, the particular statistics I'm highlighting here tell us something more radical is happening to our literacy practices in the hyper-mediated environment of Web 3.0.

My purpose here is not to cynically dismiss the undeniable conveniences that digital writing tools have brought us and the ways they have improved the teaching of writing. But concerns over short-cut taking, careless writing, and poor reading comprehension are profoundly concerns about learning and intellectual development, and how this process changes in digital environments. What we are recognizing in these behaviors are young, beleaguered somatic minds interfacing with the datafied space of Web 3.0 and struggling. In these conditions literacies like media-multitasking

and skanning emerge as people adapt to a new information and media environment. And in the process, while students develop a skill set for managing this new information and media environment, there is growing evidence for a simultaneous erosion of their abilities to focus and sustain attention, habits of mind necessary for thinking and writing well.

Part 3: Reintegrating Cognitive Research With Web 2.0 Writing Theory

Somatic mind is an immensely useful framework for theorizing the permeability of our bodies interfacing with writing technologies. By foregrounding the somatic mind as the nexus of corporeal and discursive codes, Fleckenstein essentially argues that we can understand the deeper implications of Web 3.0 by looking at the material social relations between literacy and cognition. The problems the writing teachers cited in the Pew study are problems associated with thinking. Some writing scholars may find my inclusion of cognition troubling—we are all aware of the tradition of "cognitivism" that was eclipsed by the field's "social turn" (Trimbur) in the early 1980s. But, as I will argue, developing critical, embodied ecological literacies in Web 3.0 will require we reintegrate contemporary cognitive studies of writing with Web 2.0 writing theory.

Some revisionist work will help me here. James Berlin's definitive taxonomy of writing "ideologies" in *Rhetoric and Reality* firmly framed the cognitive tradition, as represented by the work of Sondra Perl, Janet Emig, Nancy Sommers, and Linda Flower and John Hayes, as a branch of writing study no longer relevant in the social

turn of the field.[38] Berlin argued that "cognitive rhetoric might be considered the heir apparent of current-traditional rhetoric…" (121), a kind of transition phase into the more robust and critical approaches of "social-epistemic" models emerging in the social-turn. As he notes of Flower and Hayes' use of out-loud protocols to study the writing process:

> Nowhere, for example, do Flower and Hayes question the worth of the goals pursued by the manager, scientist, or writer. The business of cognitive psychology is to enable us to learn to think in a way that will realize goals, not deliberate about their value. (124)

Berlin's main critique of the cognitivists is here, in their lack of engagement with the ideological and cultural aspects of writing. For Berlin, "the rhetoric of cognitive psychology refuses the ideological question altogether, claiming for itself the transcendent neutrality of science." Thus, because cognitive models cannot provide us access to ideology, they are limited in what they can tell us about the inherent socialness of literacy.

Berlin goes on to make several important critiques of the early cognitive models:

- Their research methodologies inappropriately decontextualized the act of writing.
- Their framing of "poor" and "expert" writers was problematic for the ways it generalized and valorized a specific kind of writing process (academic, essayistic) with a particular class-based, bourgeois understanding of literacy.
- They wrongly assumed that we can extrapolate from controlled studies of academic writing more generalizable claims about the "writing process."

[38] In Berlin's earlier publication of "Contemporary Composition: The Major Pedagogical Theories," he doesn't list a cognitivist category. This is added in the 1987 version.

- A naive understanding of language as a transparent system of rational signs compatible with the mind and the external world—Berlin's poststructuralist argument.

Berlin's critique is the quintessential expression of the field's social-turn and marks the arrival of poststructuralist theory into rhetoric and composition. In a poststructuralist world, the labs and controlled experiments used in cognitive studies of writing were too isolated from the ideological power of discourse in late capitalism. As Berlin argued, if we really want to understand writing in culture we need to critically engage with questions of power and inequality if we hope to understand writing as a social, cultural production.

The critique has stuck and in the process helped create a schism in the field. As the majority of writing scholars were making the "social turn" in the 1980s (situated literacies, ethnography, critical and cultural studies) the cognitive researchers broke away and created their own branch of writing research within the cloisters of cognitive psychology and education.[39] Berlin's critique has been unfortunate for the field in two other ways. The first was his simplified reduction of the field of cognitive psychology—turning a large and interdisciplinary field, influenced by Marxist psychologists like Lev Vygotsky and A.R. Luria, and reduced it to a bland, positivist field without a heart or critical lens. And secondly, Berlin's social-epistemic model erased the body as a source of meaning-making (Fleckenstein 286). While there was clearly theoretical limitations with early cognitivist models of writing, their focus on

[39] It's interesting to remember that Flower and Hayes "A Cognitivist Process Theory of Writing) was published in CCC. A cursory look through the titles of CCC since 1981 reveals only a handful of articles pursuing cognitive approaches to writing research.

the working mind of the writer was an acknowledgement of the body as having a role in our experience of literacy. Or to put it another way, the cognitivists had recognized the importance of the somatic mind as a material site for understanding literacy several decades ago.

I find it useful in this discussion to revisit the seminal, and much maligned, "A Cognitive Process Theory of Writing" (1981). It's important to keep its publication in context. Flower and Hayes were responding to the extremely limited "stage model" of the writing process—the basic prewrite-write-revise model that was then popular in writing textbooks. Their response was to develop a more empirical and rigorous study of the writing process of both novice and advanced writers.[40] Berlin critiqued Flower and Hayes for the asocial nature of their research, but the value in Flower and Hayes research lies more in their effort to define a 'generalizable' writing process that could be applied across a variety of writing situations and could be taught through direct instruction. Nothing more, nothing less. Some of our most lucid descriptions of the "writing process," the one we all teach in our classrooms, are found in this essay:

> A [writing] process that is hierarchical and admits many embedded sub-processes is powerful because it is flexible: it lets a writer do a great deal with only a few relatively simple processes--the basic ones being plan, translate, and review. This means, for instance, that we do not need to define "revision" as a unique stage in composing, but as a thinking process that can occur at any time a writer chooses to evaluate or revise his text or his plans. As an important part of writing, it constantly leads to new planning or a "re-vision" of what one wanted to say. (285)

[40] The standard research method used was out-loud protocols that record writers talking out-loud about what they are consciously thinking about when writing—how they are planning, organizing, synthesizing, etc.

Their use of "hierarchical" here describes the basic structure of the writing process--steps in the process move fluidly through a hierarchical structure that is an ever-changing dialectical process *between* writing processes. Berlin interprets this "hierarchy" as a rigid framework, but, as Flower and Hayes continually stress, a hierarchical system does not necessitate that the hierarchy stays the same.

Flower and Hayes layout three major elements in the act of writing (Figure 4.5):

1. The task environment—the rhetorical situation; broader cultural context; the evolving text.
2. The writing process: planning, translating [the mechanics of writing it down], and reviewing.
3. The writer's long-term memory: stored knowledge of topic, audience and writing plans.

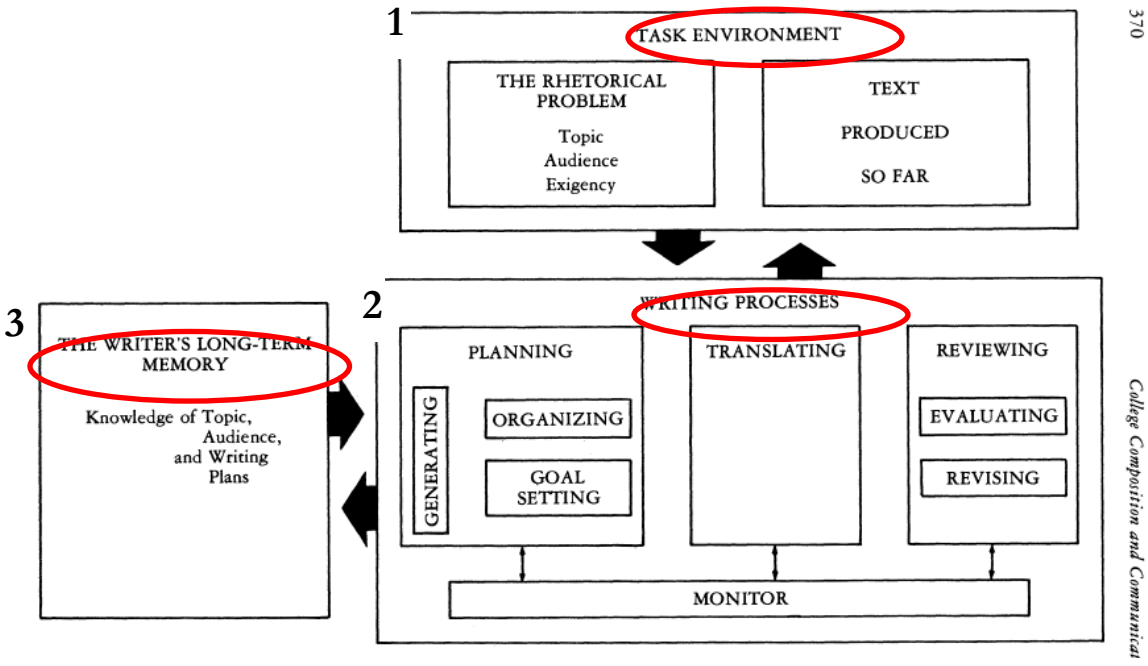


Figure 4.3: Diagram of Flower and Hayes cognitive writing process with three major components circled ("Cognitive Process Theory").

I still find this diagram an instructive, albeit limited, representation of the writing process. It essentially captures the basic pedagogical framework of first-year composition. What's particularly relevant for my discussion of the body and the 4th strata is the third element in this process, the writer's long-term memory. Memory, as one of the rhetorical canons of ancient Greek rhetoric, had once been a skill on par with the other four canons. But with the rise of writing and print, memory receded into the background behind other canons such as invention, arrangement and style—canons apparently more germane to literacy. Writing scholars such as Janet Rider (1996), Kathleen Blake Yancey (2003), and Colin Brooke (2009) have argued that with the emergence of digital textuality, the canon of memory takes on new salience.

For cognitivist approaches to writing, memory has always been at the center of literacy. In fact, to understand how we are able to write at all depends on the central role memory plays in the acquisition of basic writing skills and the development of more advanced literacy practices (Flower and Hayes 276). While Berlin had felt it necessary to dichotomize the "cognitive" and the "social," the cognitivists would never make this claim. And later work by Hayes and Flower (1994, 1996) struck a better balance between the mind and the social by adding the concept of "domain knowledge" [genre] to their cognitive process model of writing. As Ronald T. Kellogg and Alison P. Whiteford argue "… in cognitive science today it is taken as axiomatic that both general strategies and domain-specific knowledge are required for expertise [in writing]" (3766-67). Along with new advances in neuroscience and a growing understanding of the role memory plays in writing,

contemporary cognitive models of writing offer a necessary compliment to our social-constructionist/social epistemicist models of writing. By reintegrating recent research on writing and cognition into our social models of writing, what begins to take shape is a fuller, more dynamic ecological model of writing that considers the somatic mind of the writer amidst the layered material social contexts of Web 3.0. [41]

Memory as System

Neuropsychologist Jonathon K. Foster notes that our current models of human memory have been greatly influenced by the rise of information technologies and computers in the second half of the 20th century (604-07). In fact, modern information theory emerges from the need for Allied code-breaking in WW 2. With the end of the war, mathematician engineers like Claude Shannon applied their expertise towards domestic needs for communication and information processing. Coincidentally, what emerges in cognitive psychology post-WW 2 is a three-stage structure for a "memory system"—a basic framework for understanding memory, in computer and human alike, that is still accepted today (figure 4.7).

[41] An interesting outlier in the social/cognitive split is Richard Young and Patricia Williams' article "Why Write? A Reconsideration" (1984). Written contemporaneous with much of the cognitivists work, "Why Write" is arguably a more nuanced discussion of memory and writing than Flower and Hayes'. Young and Williams make the simple argument that, because writing depends on the limited capacity of a writer's short-term memory, the more taxed it becomes the more difficult it becomes to write. Therefore, writers can learn specific writing strategies [the writing process] to extend the capacity of short-term memory.

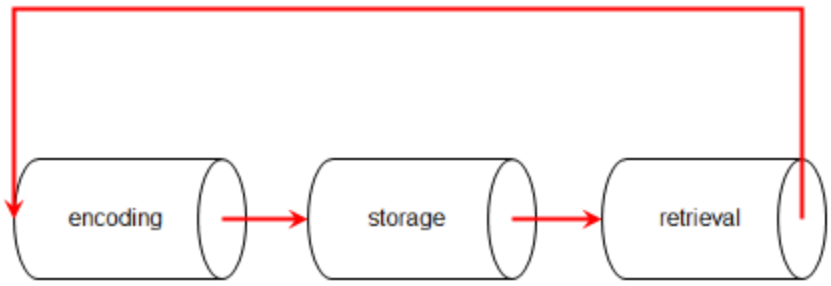


Figure 4.4: Basic components of a memory system.

Foster calls this the "fundamental logic of memory" (589-603). All memory systems must be able to perform these stages adequately well to function as a *working* memory system. The use in the model is as a heuristic for exploring the vital role memory plays in our abilities to write.

In addition to these basic processes of memory, it is now well understood from decades of cognitive research on healthy individuals and from studying people with brain injuries that the process of memory consists of two general components—short-term and long-term memory. Short-term memory are the thoughts we hold in conscious attention and long-term memory holds memories over time, many of them becoming automatic (walking, driving) (Foster 684-88). Today,[42] the concept of short-term memory has been updated with the more active "working-memory" model (see appendix for evolution of memory models) developed by Alan Baddeley and G. J. Hitch (1974). In their research on learning and memory, Baddeley and

[42] Baddeley explains that the original distinction between short-term memory and long-term memory came out of work by pioneering neuropsychologist Donald Hebb (1949). Hebb proposed a distinction between STM (temporary electrical activation held in conscious awareness) and LTM (physical growth of neurons through "rehearsal") (830).

Hitch noticed that, when given two learning tasks at the same time, a primary and secondary one (e.g. remember a set of words *while* listening to a lecture), performance on the primary task always decreased (Baddeley 830). This signaled to Baddeley and Hitch that short-term memory is finite—it is only capable of holding in conscious attention a limited amount of incoming information.

But "short" was too static a term for this organic process and Baddeley and Hitch turned short-term memory into a "working memory" with three components (figure 4.8): the visuospatial sketchpad (VSSP), the phonological loop (PL) and a central executive (CE) The VSSP and PL are temporary storage systems that encode our immediate experience. The phonological loop encodes sound and language while the visuospatial sketchpad encodes visual and spatial experience (830). Managing and making sense of this streaming information is the "central executive"—the attentional center of our conscious awareness in the active process of comprehending the world via incoming stimuli (see Baddeley, Foster, Kellogg, McCutchen. Image from Baddeley).

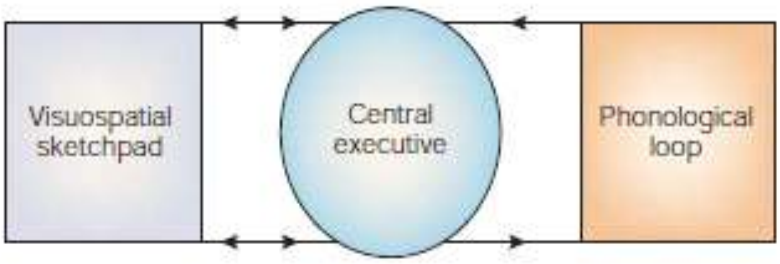


Figure 4.5: Baddeley and Hitch's working memory model from 1974 (Baddeley).

While both the visuospatial sketchpad and phonological loop work together in the writing process, the phonological loop takes a more primary role in learning and growing as a writer.

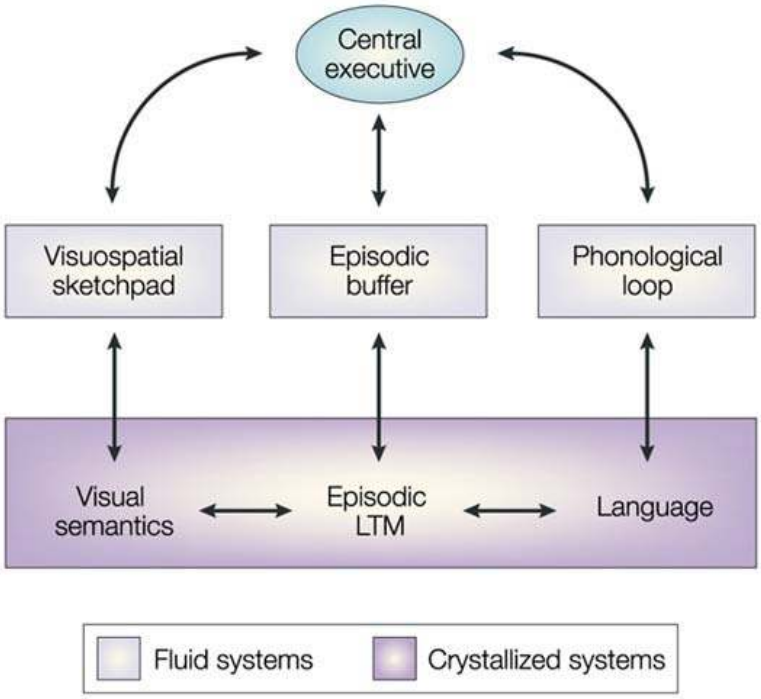


Figure 4.6: Current model of working and long-term memory.

Figure 4.9 is the most recent model of memory (Baddeley). In this recent iteration of memory we see a model that has slowly developed over time. The basic three component model is now embedded in a more fine-grained structure of a complex memory system. Long term memory (LTM) is described as a "crystallized system" that interacts with the components of working memory (fluid systems). The "episodic buffer" is a nexus of sorts—the point in consciousness when our process of memory is actively reconstructing our experience of the world by integrating

temporal experience with the more stable linguistic and visually based "episodic LTM" (long term memory), see Baddeley, 2003. Directing in the background is the "central executive"—the component of memory that prioritizes and directs our conscious attention to, ideally, that which needs our attention (i.e. trying to drive and text at the same time).

I provide this overview for two reasons. First, this refined model of working memory has helped cognitive research on writing articulate more sophisticated understandings of the writing process and the vital role memory plays in our writing. And secondly, it gives us a discursive bridge, however imperfect, to theorize the metabolic relations between somatic mind, memory, and our digital literacies. As the Pew study suggests, we find ourselves living through a radical transition in literacy and textuality and we are just beginning to comprehend the effects of this media environment on our somatic minds. We will need interdisciplinary approaches, creative combinations of discourses, theories, and methodologies to articulate a critical, ecological understanding of our experience of literacy in Web 3.0.

Working Memory and Writing

With this more developed understanding of working memory, cognitive research on writing has considerably revised Flower and Hayes early discussion of memory and writing. Work through the 90s and into the millennium has drawn on this model to explore memory's critical role in our ability to write, and the kinds of problems that arise when we are unable to sustain the focused attention necessary for

the development of more advanced writing skills. I should point out that cognitive research on writing has long been interested in the differences between novice and skilled writers--the assumption being that the literacy practices expert writers draw on when writing longer, more elaborate texts, can inform our teaching of novice writers. While we could bicker about the finer details of this assumption, I think we can agree it is one most writing teachers make every day.

More recent cognitive studies on writing have demonstrated that working memory is an integral component of literacy. The longer, more involved a composition is, the more involved working memory is in the process (McCutchen et al., Kellogg and Whiteford, Galbraith et al.). For writing to even begin, we must be able to hold a mix of knowledge in our conscious attention long enough to compose a word, a sentence, an idea, etc. Once the writing process begins, working memory kicks into gear and tries to coordinate the writer's awareness of the rhetorical situation with understandings retrieved from long-term memory--everything from semantic meaning to discourse competence to orthographic and lexical knowledge. This is a process of meaning-making, one that requires the conscious *attention* of the writer to unfold (Olive, Nickerson et al., Kellogg, see also Rider on "reconstructing" memory).

Research tells us is that more experienced writers, experienced in terms of key literacy skills like semantic understanding and genre knowledge--exhibit a working memory that can handle longer, more sophisticated writing tasks than novice writers (McCutchen et al., Kellogg and Whiteford, Galbraith et al.). This fact has nothing to

do with inherent differences in the brains of experienced writers versus that of novices. Rather, it has to do with the intensity of time and experience a writer spends with a discourse. Experienced writers consistently draw on standard writing strategies for extending their working memory—pre-writing, outlining, revising, note-taking—to manage the cognitive demands of writing longer texts (McCutchen, Young and Williams, Lea and Levy). At the simplest level, more experienced somatic minds have spent more time *encoding* from working memory to long-term memory the ways and values of a particular discourse. Not only have they built a richer storehouse in long-term memory, they have also learned strategies to manage information effectively and free up space in working memory and extend the writing process further (Kellogg and Whiteford). More familiarity with a discourse, as well as mastery of the techniques for advanced composition, helps writers become more conversant in a discourse and to encode, store, and retrieve these understandings from long-term memory with more facility. (McCutchen et al. 462). The same holds true in the inverse. A novice simply means a somatic mind that is just beginning to build the "cognitive architecture" (McCutchen) of a working memory conversant in a discourse. The teaching of writing, of discourse, is the procedure we use in helping students build this cognitive architecture of memory.

The implications for writing pedagogy seem clear. As writers build up stores of discursive knowledge, they are at the same time conditioning the long-term working memory to handle progressively more sophisticated and expansive writing projects (Bereiter and Scardamalia, 1987; Foster, 2009). When we write we often

intuit this—we know writing longer texts challenges students, and we know the kind of intellectual growth that occurs in this process—associative thinking, perspective taking, abstract and critical thinking, reflective thought. These are the kinds of literacies that emerge when students have the opportunity to write progressively longer, more challenging texts. Writing teachers also intimately know the struggles and joys of mastering a discourse—the time and patience it takes, the need to engage with it in diverse ways. If the literacy practices of experienced writers tell us anything, they tell us that engaging in academic or research oriented writing is critical for the development of working memory and advanced literacy skills.

Critical to this endeavor is having the time and space to develop the habits of mind and sustained attention necessary for becoming an advanced writer (Kellogg and Whitemore (3872-78), Hendler). Without sustained attention, working-memory cannot transfer meaning into long-term memory—a process called "memory consolidation" (Kandel). In order for us to remember (and hence learn) worldly information that we discern as important must go through a "delicate" consolidation process into long-term memory where "any disruption, whether a jab to the head or a simple distraction, can sweep the nascent memories from the mind" (Carr 184). What the teachers in the Pew study are noticing is their students lived experience of distraction in the digital environment of Web 3.0.

Research on media-multitasking and skanning confirms their intuitions. Skanning is the less understood of the two. The most recent research on our online reading practices suggests that reading on screen "is characterized by more time spent

browsing and scanning, keyword spotting, one-time reading…and reading more selectively, while less time is spent on in-depth reading…" (Liu, Wolf) Other research by Andrew Dillon has shown a steady change in our reading habits as reading online has proliferated (2004). And new work coming out on e-readers is finding that users have more troubling remembering what they read when using an e-reader versus a traditional book (Mangen et al.). The general consensus amongst these researchers is that the online, networked, hyperlinked environment of Web 3.0 encourages, even demands, a more frenetic kind of reading in response to the abundance of information and textuality (Wolf 2013, Mangen et al.).[43]

Media-multitasking, in comparison to skanning, has been studied extensively. In the popular mind, "multitasking" is often seen as something we do "naturally" as a matter of course as we juggle our lives. But multitasking online is different in the sense that we are asking our limited working memories, with their two limited storage systems (phonological loop and visuospatial sketchpad) to handle the hyper-mediated space of Web 3.0. One of the most misleading beliefs in Web 3.0 has been the categorization of contemporary students as "digital natives" or "millennials." We often assume that, because these digital natives (born after 1980) came of age in the Internet era they have developed the capacity to media-multitask and skan faster and more efficiently than the print generations that preceded them. The problem with this stereotype is that it isn't true. As psychologist Jesper Aagaard candidly puts it, "we

[43] This movement from book to screen has long been recognized in the field (Kress, Wysocki, George, Selfe) but it's usually framed in terms of writing more so than literacy as a whole practice of reading and writing.

simply do not have any evidence of young people's superior technological abilities and multitasking skills (Bennett et al.)" (Aagaard 2). In truth, cognitive psychology and other brain fields have known for decades that the human mind does not "parallel-process" very well—that is, engage in conscious activity with two or more simultaneous tasks (Wood et al., Junco, Koch et al.). Again, the culprit here is distraction and the effects of rapidly shifting focus amongst tasks:

> Although switch costs may be relatively small, sometimes just a few tenths of a second per switch, they can add up to large amounts when people switch repeatedly back and forth between tasks. Thus, multitasking may seem efficient on the surface but may actually take more time in the end and involve more error. (American Psychological Association)

This becomes even truer for an activity like writing longer compositions which demands the full capacity of the working memory. Because writing uses both the phonological loop and the visuospatial sketchpad in working memory, *any* concurrent verbal, visual, or spatial task has been shown to adversely affect a writing task (Ransdell et al. Marek and Levy; Kellogg, Olive) by slowing the writing process down, eliciting more grammatical errors, and producing less sophisticated syntax. Skilled writers build a global understanding of their writing through sustained time and attention in a discourse. They are able to do this because they keep going back to long term memory and retrieving meaning—building a rich discursive source to draw from. They also commonly draw on practical writing strategies to free up working memory necessary for progressing through a long text. In the case of the students in the Pew study, students are having difficulty at a critical stage not only of learning to write well, but of the whole endeavor of learning itself—the introductory and

planning phases of writing. Encoding and learning a discourse requires we spend time with texts, to grapple with them, ponder them. Emerging literacies like media-multitasking and skanning are designed for other kinds of semiotic engagement and can greatly disrupt this patient process of learning to write proficiently in a discourse.

Part 4 - Web 3.0 and Manufacturing Distraction

Thus, the rise of both media-multitasking and skanning literacies in Web 3.0 are expressions of an intensifying textuality with more images, words, sounds, and automation. The once disconnected space of the writer before the Web, whether it was pen and paper, or even word processing, is now ensconced in a global, commercialized network of servers, databases, and websites. In this new socio-economic environment, capital circulation depends on the *continual manufacture of distraction*. Without our constant stream of clicks, posts, tweets, and online purchases, Web 3.0 cannot function. The more we are distracted online, the more we glide through the Internet, the more data we create, the more capital thrives in Web 3.0.

The process has unfolded over the last seventy years with the rise of informational capitalism and neoliberal economics (chap. 2 and 3). Creating a global communications network was only the first step. But the Internet alone cannot fully account for the ascendant exchange value of user-created data in Web 3.0. Also essential for these conditions is more direct access to "consumers" through the development of personal, mobile computing and the "internet of things" where any commodity with a microchip can be connected to the Internet (home alarm systems,

toasters, cars) thus creating ever more data about our social, phenomenal worlds. For students and ourselves, Web 3.0 is a more aggressive semiotic environment than print, and it encourages literacy practices that potentially run counter to the habits of mind (creative, critical and reflective thinking) we are trying to develop in our classrooms.

As I discussed in chapter 1, our current ecological models of writing need to be supplemented with other frameworks for helping students develop critical, ecological literacies. Both threads, ecology-of-place and ecology-of-scale, while extending our understanding of writing as an ecological phenomena, do not engage deeply with the ways our literacy practices intersect with the 4th material stratum. This is understandable—ecology works well as a metaphor for describing the interactive social systems that writing helps organize. But how can we ground the metaphor more solidly and integrate the biophysical world into our understanding of literacy in Web 3.0? Cognitive psychologist Edward Huthchins frames the question this way: "[H]ow will the elements of the ecology that are outside the skull ever come to have relevance to the neural processes that take place inside the skull?" (712, 2010). The answer, as I've been arguing, is to be found in our embodied experience of literacy. But building the kind of working memory needed for critical, ecological thinking requires focus; it requires concentration and attention. Frequent distraction or overloading working memory with too much stimuli impedes this development and thus the development of more advanced writing skills. That is why new literacies like media-multitasking and skanning are troubling and why writing teachers and scholars

must recognize their effects on somatic minds and adjust our pedagogies accordingly. The social and environmental challenges we are facing in Web 3.0 will require digital writing pedagogies that stress an embodied, ecological imperative before the technological one. One way to do this is by reintegrating social constructionist/epistemic and cognitive approaches to writing, and define "novice" and "advanced" writers based on the ongoing capacity for critical, ecological thinking. In light of ewaste and Big Data, and the resultant manufacture of distraction, we must stay vigilant of the powerful fetishizing effects of informational capitalism, especially in this time of environmental crisis. While the literacies that are emerging online are essential skills today, we need to be aware of how they can conceal our vital relations with the 4th strata and weaken those literacy skills necessary for critical, ecological awareness.

Defetishizing Literacies

What I'm aiming for here is a theoretical and pedagogical framework that extends current ecological models of writing. By acknowledging writings integral relationship with 4th stratum we open-up the possibility of learning from the lived experience of the datafied writing body and use this experience to reconnect to the 4th stratum. Of course, this isn't really a novel idea. Ecological and environmental literacy movements have been around since the 1970s, emerging from fields as diverse as neuroscience, psychology, sociology, and education (Puk, Puk and Ritterson; Bowers, Matthews, Foster, Goleman). In rhetoric and composition,

notable scholars that do work in this area are Derek Owens, Jimmie M. Killingsworth, Amy Patrick, and Robert P. Yagelski. Their goal has been to integrate more systematically ecological literacy at all levels of schooling. Early iterations of ecological literacy programs focused mainly on learning key concepts and developing environmental awareness (Disinger and Roth, Orr, Bowers). However, after 40 years of such initiatives, the U.S. has been unable to curtail many of its most pressing environmental problems, especially our immense contribution of greenhouse gases and their effects on climate change.[44]

Later theorists have added a more critical bent to ecological literacy (Puk, Yavetz et al.). Puk defines ecological literacy as "the capacity to make informed decisions about the future of life based on a comprehensive understanding of the reciprocal relationships between natural systems and human systems" (115)—a definition that aligns well with the strong version of sustainability that is a prerequisite for any viable ecological model of literacy. Puk and Stibbards argue that, of all the reasons for ecological literacy programs to fail (and environmental movements in general), the most damaging is the atomistic structure of institutionalized education, a system that steadily moves students from kinetic, embodied learning to a more regimented focus on cognitive development via lecture and reading (Puk 4). The problem with this, they argue, is that we essentially "teach" children out of learning through their bodies and close off the development of

[44] It is well known that the U.S. has been the largest producer of green house gases during the past 40 years, with a population of about 5% of the world's population. The U.S. has also failed to fully ratify the Kyoto Protocol—the only international agreement in place for slowing climate change.

ecological thinking in adolescence (356. See also Louv). Research from the National Environmental Education and Training Foundation's (NEETF) [45] report on environmental literacy in the U.S. (2005) found that,

> while it may be true that overall environmental consciousness has risen over time, a lack of sound and detailed environmental knowledge [in students] is the stark reality. This lack of detailed knowledge parallels other school-taught subjects such as the physical or life sciences. (Coyle 3)

Coyle goes on to write that the report did not find an "appreciable difference in knowledge levels between people who finished high school prior to 1970 and those who graduated after 1990 when [environmental education] was more commonplace in schools. If anything, the former are more knowledgeable about the environment" (3).

To fix these shortcomings, environmental educators (Puk, Goleman, Louv, Kahn, Bowers, Matthews) have offered several pedagogies—more time spent in natural habitats, more experiential learning, more team-based learning, more critical analysis of consumer society. While surely these approaches have enhanced our environmental awareness, they overlook one crucial learning activity: the role writing plays in developing critical, ecological literacies. They are, after all, invoking the term "literacy" to describe the process of learning to think ecologically. This omission of writing is all the more strange considering what we know about it as a technology for nurturing the working memory of writers while also building the cognitive architecture for ecological thinking. To develop the kinds of literacies I am imagining

[45] A report designed to gather data on citizens' current ecological awareness and use that information to guide ecological education programs around the world (5).

here, we must synthesize ecological awareness approaches with critical writing pedagogy. By doing so, we can create a writing pedagogy that fosters critical, ecological understanding of the interdependent relations between human and non-human systems *through* the development of advanced writing skills. In Marxist terms, we might call this a critical process of *defetishization*. I borrow the term from Chris Wyatt (*The Defetishized Society*). Wyatt explains that "there are two indispensable features to the defetishized society--transparency in the social relations of production and demystified commodities" (14). Both transparency and demystification can be generated through focused writing instruction designed to help students better understand the complexities of Web 3.0 and the kinds of cultural forces at play. Grappling with ewaste and Big Data are just two issues among many to help students begin to make critical sense of Web 3.0.

Developing Curriculum for Critical, Ecological Literacy

As Puk emphasizes, we won't be able to realize a more "wholistic" (4) curriculum without exposing students to ecological thinking and practice at all stages of schooling. With more environmental challenges on the horizon, there is a need to prioritize critical ecological literacies across all facets of the curriculum (Goleman and Senge 2014). Towards this end, I have pulled together a broad framework for critical ecological literacies based on Robert Diamond's widely used model for curriculum development (Figure 4.10). In this model, particular emphasis is put on articulating learning outcomes as the first step in curricular development. These goals should be broad, and will gradually become more specific for each course in the program:

> In every institution, the final determinant of the quality of the academic program is the performance of its graduates. The degree of success will depend on how well the curriculum is delivered through its courses and other learning experiences provided to students. Carefully articulated learning outcomes must be the basis on which competency must be measured. (91)

Diamond notes that this is an ongoing process of practice, data collection (student work, assignments, syllabi), and reflection on the kinds of competencies programs want students to develop. He emphasizes that, not only should the curriculum teach the core competencies of a program, it should also take into account the basic survival competencies students will need to live meaningful lives in the future. He notes that "there is far more agreement about basic competencies than one might first expect [across disciplines]." Typical competencies include categories like *communication skills*, *interpersonal skills*, *problem solving skills*, *participatory citizenship* (87). Ecological or environmental concerns are not present.

If we are interested in having students learn the basic skills to survive in Web 3.0, they will need to be equipped with the critical acumen to understand (and ameliorate) the socio-ecological problems we are facing in Web 3.0. That is to say, the basic skills to survive in a time of ecological crisis *must* include critical, ecological literacy. Tackling global, systemic concerns like ewaste and big data will require the integration of critical, ecological literacy instruction at all levels of education.

Towards this end, I present here five broad learning outcomes for grounding a critical, ecological model of literacy that could be integrated across various levels of schooling. Generally, such learning outcomes would emerge organically from a school or department. The outcomes I present here are a synthesis of my own

thinking with work in cognitive psychology, neurobiology, ecoliteracy (Orr, Goleman), ecopedagogy (Kahn, Bowers), composition (Owens, Yagelski, Patrick), rhetoric (Killingsworth) and phenomenology (Van Manen). I'll end with a writing unit on defetishization where students engage in phenomenological and critical inquiries via focused and sequenced writing assignments designed to foster ecological literacies that prepare them for envisioning and enacting a more sustainable world.

Five Learning Outcomes for Critical, Ecological Literacies in Web 3.0

1. Students will learn to cultivate life-long critical, ecological literacies.

The first learning outcome is a guiding heuristic. Students will develop literacies that foster ecological intelligence, including a basic understanding of the interdependent and metabolic relations between literacy, technology, the biophysical world, and the receptive space of the somatic mind. The Center for Ecoliteracy (CEL) emphasizes that the core of ecological literacy is understanding that "nature sustains life by creating and nurturing communities" (2004). Students will understand this basic process, the organic framework which facilitates it, and their own place in this metabolic process of regeneration. Core attributes of all natural systems and ecological processes include:

- networks
- nested systems
- interdependence
- diversity
- cycles
- flows [energy transfer, feedback loops]
- development

- dynamic balance (Capra). [46]

The ultimate goal with this outcome is to help students refine their abilities to think and to learn *systemically*. That is to say, the idea of interdependence tells us that, while humans as a species have come to dominate the planet, we cannot survive, let alone live well, without acknowledging metabolic interdependence with the biophysical systems that sustain life. Moreover, as CEL emphasizes, we have much to learn from non-human systems how to live sustainably in the world. Capra puts it succinctly: "economics emphasizes competition, expansion, and domination; ecology emphasizes cooperation, conservation, and partnership" (Capra 301). In this way, critical, ecological literacies can act as a counter-balance to Web 3.0, data, and distraction and foster the kinds of critical, reflective thinking necessary for living more sustainably in the world.

Both ewaste and big data are useful starting points. When seen through the attributes of living systems, a problem like ewaste quickly expands well beyond the individual user throwing away an old desktop. When embedded in interdependent networks and nested systems, the desktop computer becomes the living embodiment of these systems--global chains of natural resources, labor, energy, data, and markets. Students can begin the process of demystification through writing and articulating the metabolic relations between the production, use, and disposal of electronic commodities and the bio-social world of Web 3.0. What we are trying to seed with this outcome is a greater sensitivity to our embodied experience of literacy in Web 3.0

[46] This is very similar to Goleman and Senge's framework for "ecological intelligence."

and the potential for emerging digital literacies (i.e. media-multitasking, skanning) to be in tension with the development of critical, ecological literacies.

2. Students will develop a deep understanding of the socio-techno history of communications technologies.

This learning outcome foregrounds strata 1: writing technologies as cultural artifacts that carry a congealed history of use within them. Understanding this history is vital for historicizing and understanding literacy in Web 3.0. Students will learn the historical conditions that have given rise to informational capitalism, and sharpen their embodied sense of the technological imperative at the heart of neoliberal capitalism and the potential for ecological harm this poses. Such understandings can be fostered through historians of technology like Leo Marx, Lewis Mumford, Jacques Ellul, Michel Foucault, Katherine Hayles, Donna Haraway, among others. In writing and rhetoric classes in particular, Jay Bolter, Christina Haas, Dennis Baron, Jack Goody, and Walter Ong all offer accessible texts into the specific history of writing technologies.

In terms of writing pedagogy, one assignment I introduce in the upcoming unit is the genre of the *life-cycle assessment* (LCA). LCAs are used in government and business to help organizations assess the environmental costs of a product as it goes from production to consumption to its "end-of-life" and the process of decomposition back into the natural environment (more to come). Like the first outcome, LCAs are a useful way to engage students in the literate act of demystifying a commodity. The intent of an LCA is to reveal the various material social systems

involved in one commodity's production.

3. Students will learn to draw on their somatic mind as an embodied meaning-maker.

Students will develop techniques and strategies for listening to their body's experience of the world beyond simply that which we consciously understand. They will learn to draw from both logical and emotional meanings, and they will also learn to think of their experience in the world as an organic, metabolic exchange between our somatic minds and the living a bio-social sphere.

This is an embodied literacy—one that is greatly enhanced in the act of writing. Yagelski writes that, "In the act of writing, our consciousness and the world…become one; thus, our experience of our self as a being-in-the-world is intensified as we make meaning through the act of writing (115). "Intensified" is the key word here. As Yagelski asserts, the *intensity* of writing makes it qualitatively different from other forms of human activity (watching a movie, playing a game, listening to music) for the way it pushes our subjectivity to the edge of meaning and back. This intensity has also been observed in cognitive studies on writing that show differences between novice and advanced writing processes. The working memory of advanced writers has clearly undergone a more intense engagement with a particular discourse. Literacies are always much more than textual production and consumption, but we often don't see them this way. One framework I have found useful for developing this learning outcome is Daniel Goleman's "five practices of emotionally and socially engaged ecoliteracy" (*Ecological Intelligence*)

- Cultivating empathy for all forms of life
- Embracing sustainability as a community practice
- Making the invisible visible
- Anticipating unintended consequences [of our practices]
- Understanding how nature sustains life [overlap with the first outcome]

4. Students will learn to cultivate literacy practices that meet the ethical criteria of strong sustainability, both socially and environmentally.

Students will come to understand a literacy "practice" as a material social activity that occurs over long stretches of time (months, years), and that can have adverse effects on the health of bio-social systems when human practices get out-of-balance with other human and non-human systems. Teachers should actively promote those literacies that will help students live more sustainable, healthy lives for generations to come. Thus, teaching writing and rhetoric in Web 3.0 cannot simply be about reading and writing, or even sharing this reading and writing, but also about learning to speak and work with others in sustainable ways. As Capra notes, "the tendency to associate, establish links, live inside one another, and cooperate--is one of the hallmarks of life" (301). Sustainable literacies include practices like involved listening, invitational rhetorics, perspective taking, empathy, and collaboration—that is, "rhetoric as a practice of collaborative truth-seeking" (Couture). Developing sustainable literacies will take place side-by-side with other sustainable ways of living.

5. Students will learn to cultivate imaginative and utopian thinking.

Among other things, this outcome is about averting the poison of cynicism. Although dystopian films are big at the box office these days, solving environmental

problems requires one, a belief that the global community can work together to solve these problems; and two, a vision of a future that can be better, more humane, more patient, more utopian. "Imagination" and "utopian thinking," come out of my synthesis between the work of compositionist Anne Berthoff and philosopher Ernst Bloch. Berthoff's *Reclaiming the Imagination* (1984) gives an impassioned defense of the imagination and its centrality in making meaning. It integrates well with Ernst Bloch's three volume opus *The Principle of Hope* (1953-1959). In a well cited passage, Bloch writes that,

> [e]xpectation, hope and intention, directed towards the possibility which has not yet arrived, constitute not only a fundamental property of the human consciousness but also, provided they are rectified and grasped in their concrete aspect, a fundamental determination at the heart of objective reality itself. (quoted from Zarka).

Bloch's massive treatise was in response to the horrific amount of killing that occurred in WWII and a steadfast defense of the necessity of utopian thinking and the nurturing of hope. As he notes, when we grasp the concrete aspects of hope historically and the significant role it has played from generation to generation, it compels us to continually seek ways to foster hope as a force for good. Developing imaginative, utopian thinking is central to MEOW because it is a way for students to put their ecological intelligence into practice to begin building a more sustainable, just, and ecological world.

Unit on Defetishization

Using these broad outcomes as my guide, in this final section I present a sequence of writing activities designed to foster critical, ecological literacies in Web

3.0. Using a combination of phenomenological inquiry, textual analysis, and genre analysis, I present a unit on defetishization, a sequence of writing and reading activities intended to develop embodied literacy practices that sharpen the senses of the somatic mind in metabolic relations with the bio-social world. We can think of defetishization as the critical practice of *reconnection*—of verbalizing the metabolic relations between literacy, writing technologies, and the biophysical world. This process fundamentally depends on how we conceptualize and teach the activity of writing. Yagelski argues that, to begin this process of reconnection,

> we will need to understand writing in ontological terms; we will need to understand the experience of writing and of learning to write in order to understand the implications of that experience on students' sense of self. We will need, that is, a theory of writing as a way of being (12).

Understanding writing as a way of being means shifting our pedagogical focus from the production of a commodified text (both "process" and "product") to the *phenomenological experience* of writing and it's potential for radical transformation of the self.

As the study of lived experience, phenomenology assumes that the "truth" of human experience is best understood through direct, preverbal contact with the phenomenal world. [47] Phenomenologists seek to capture [48] this experience of being *drawn into relation* with objects and people before ideology and convention can

[47] Our most immediate experience of things…is necessarily an experience of reciprocal encounter--of tension, communication and commingling. From within the depths of this encounter, we know the thing or phenomenon only as our interlocutor--as a dynamic presence that confronts us and draws us into relation… (Abram 56)

[48] The irony of trying to capture preverbal experience through the verbal activity of writing didn't seem to deter phenomenologists like Maurice Merleau Ponty and Martin Heidegger from writing profusely.

adulterate the encounter (Abram 56). The idea is that through practiced phenomenological inquiry, of writing as a way of being, we can learn to tap deeper into our lived experience of the world, and thus discover more meaningful ways to live in it. It is through this *written* process of encounter that we are "attempting to recover and express the ways we experience our life as we live it--and ultimately to be able to act practically in our lives with greater thoughtfulness and tact" (Van Manen 1779). The following unit isn't groundbreaking. What I've tried to do is take standard writing pedagogies (journaling and genre analysis) and adapt them to specifically target critical, ecological literacies in the context of Web 3.0.

Activity 1: Writing Phenomenologically [49]

The goal in this kind of mental gymnastics is to try and *suspend* our knee-jerk interpretations of the world--the ideologies, judgments, and biases--and try to grasp "that raw moment…of existence that we lift up and bring into focus with language" (Van Manen). Writing lies at the heart of this process. Phenomenological questions tend to eschew analytical practices like generalization, theory formation, opinions, and moral judgments (Van Manen 7380-87). A phenomenologist might ask, "how do we experience sickness?" or, "how do we experience time," or "what is my experience with x [object, person]." Writing teachers will notice the resemblance these questions have to more personal, journal-like writing. In phenomenological writing the explicit goal is conscious, directed attention on the thoughts and

[49] Adapted from Max Van Manen's *Phenomenology of Practice*, 2014.

sensations of any particular lived experience *before* the constricts of discourse and culture intervene to make sense of it on their terms.

As Van Menen notes, while we will never be able to completely understand some raw, unmediated experience of the world, we can certainly learn and teach the kinds of literacies that will help students clarify their lived experience of Web 3.0 and act in better accordance with the planet, the body, and the people they come into contact with. Thus, writing phenomenologically is a *practice* of writing that is intentionally exploratory, experiential, and generative—a practice of writing that is more than a means of communication or educational assessment, but a somatic practice intended to help students act in "a more reflective, self-aware, and…altruistic way" (Yagelski 159).

Here's an example of phenomenological inquiry by J.H. Van Den Berg on his lived experience of time:

> Compared with the toad, the frog is fast, even when it doesn't stir and, on the basis of its particular speed, the frog leaps, while the toad crawls by virtue of the time that is its own. Even people have a time of their own; each one, I suspect, has one for himself. The botanist is marked by a different time than the geologist. The zoologist who specializes in dipteral is by virtue of his time, his tempo and duration, a different man than his colleague who prefers to limit himself to bumble bees. Compare the gracefully and rapidly alighting dragonfly with the busy, ungainly, searching bumbling bee: they represent two tempos, two forms of time, and the zoologist has to make a choice if he wishes to have the specific interest which he professes to have. (123)

In addition to the journal-like qualities of the passage, we also notice a certain contemplative tone with vivid details, concrete images, attention to pattern, metaphor. These are the impressions phenomenological inquiry is trying to capture

via writing—listening to our experience of living, noting relations, movement, abstraction, and concrete details as they vibrate and metabolize through the permeable boundary of the body. We are essentially withholding judgment of our experience so we can clear the way for novel understandings of this experience.

But what are we hoping to achieve with such experiential writing? First, to begin cultivating critical, ecological literacies, writing phenomenologically is an intentional literacy practice for exploring the dynamic reciprocity between our bodies and other human and nonhuman systems. We can hardly expect students to develop critical, ecological literacies in Web 3.0 without writing activities that practice this kind of "intensive meaning-making" (Yagelski 115). A second goal is to shift our ultimate emphasis from the finished, polished text to the transformative power of writing where "the text serves the purpose of writing, rather than writing having only the purpose of producing a certain kind of text" (Yagelski 147). In this way, phenomenological inquiry is intended to temper the over-determining effects of Web 3.0 and help students cultivate a greater sensitivity of their bodies as makers-of-meaning.

The Phenomenological Journal

There are many ways to approach phenomenological inquiry but it is essential that teachers are giving phenomenologically appropriate writing assignments. The topic or theme students will examine must be "experientially recognizable and experientially accessible," giving students a fertile space for tapping into their embodied experience (Van Manen 9498-9507).

A text I've used in class and one that works well for opening up phenomenological inquiry is to ask students to participate in Jake Reilly's "The Amish Project." [50] As an undergraduate at the Chicago Portfolio School, Reilly began to notice how his life online was dominating his life offline: "It was pretty bad. I was reading every single tweet and I follow 250 people. Then, I would waste a good hour and a half on Facebook. I was sending more than 1,500 texts a month." He also noticed how it was changing his relationships, and how he and his friends talked more online than actually face-to face. In response, Jake decided to take a break from social media for three months. He deactivated his Facebook and Twitter accounts and put away his smart phone (and installed a land-line). As Jake told in an interview after the experiment, while difficult at first, he discovered he had a lot more free time on his hands, and that he learned to be more present when hanging out with his friends in person (rather than looking at a screen). Jake's experiment echoes many of the same feelings and sentiments other young people have expressed in similar studies conducted on college campuses. The University of Maryland's "Unplugged" study (2012) surveyed close to 1000 students from around the world after asking them to go "24 hours without media."[51] Researchers concluded that "going without media made students dramatically more cognizant of their own media" (Moeller et al. 45). Students self reported that they felt addicted to social media, and struggled without it. They also expressed how essential it was in helping them manage their relationships and work lives (46). As the researchers note, "a clear majority in every

[51] This included no cell phones and email.

country admitted outright failure of their efforts to go unplugged" (48).

Both Jake's experience and the "Unplugged" study exemplify the experiential and metabolic relations we carry on with our digital media. While we can't ask students to abstain from social media for 90 days, we can ask them to try a day, or a week, and to keep a phenomenological journal of the experience. The Jake experiment works well as an initial phenomenological inquiry because of the potential for strong visceral responses that can denaturalize students' relations with their writing technologies. Other activities could ask students to observe their time online—how they feel after a long stint online, what they remember, what they read or watched. Another assignment could have students writing about a special place, or perhaps an awkward situation; or sitting in a park; or by a lake. A final entry in this sequence could have students write about a place where technology clashes with the environment (see Owens superb chapter on writing about place). Both technology and the biophysical world offer an infinite number of opportunities to practice phenomenological inquiry, and unplugging can be the first step in helping students do that.

Using the Existentials

To help students pursue their experience of unplugging teachers can draw on what Van Manen calls "experiential" or "universal themes of life" (7487-92):

- relationality--lived relations
- corporeality--lived body
- spatiality--lived space
- temporality--lived time

- materiality--lived things

The existentials are conceptual tools found across several works on phenomenology (Heidegger, Sarte, Merleau Ponty). For phenomenologists, "we all experience our world and our reality through these existentials" (Van Manen, 7487-92). Such a framework provides the kind of cognitive architecture I mentioned earlier—mental heuristics designed to develop the capacity for critical, ecological literacy. To help guide students in their phenomenological inquiry of unplugging, the framework can help them pursue the kinds of questions that lead to more embodied understandings. Their separation is only for creating ways into phenomenological inquiry:

Relationality (lived relations): The shape and experience of our lived relations, especially with our closest intimates, comes sharply to life when we do not have access to easy communication. As Jake noted in his three month experiment, those relations that were the strongest continued (and grew) with more face-to-face interaction, and those that were more media based tended to fade away easier. Exploring the relational qualities of unplugging, students might asks questions like,

- What role does social media play in my relationships?
- How does it affect my relations both online and off?
- How much time do I actually spend in physical contact with friends?
- What is the quality of my interaction online vs. offline? Consider actions like touching, smiling, winking, banter, dialogue, innuendo, etc.

- What *is* my relationship with my technology? Can I articulate it?

One of the most vital things we are trying develop in thinking relationally is *empathic thinking*—helping students grow their innate abilities to take on others' perspectives, to show compassion and concern (Goleman and Senge 215-222). As Goleman and Senge emphasize though, empathic intelligence will only emerge when given the right conditions to do so (450-455). This is something the phenomenological journal is intended to do.

Corporeality (lived body): This is a focus embodiment—the sensual experience of the somatic mind in the act of making-meaning. Van Manen asks the quintessential question for pursuing this existential: "How is the phenomena we study perceived, sensed, touched by the body?" (7521-37). How do our somatic minds experience screen life and datafication? What kind of impulses do I experience online? What kind of emotional world do I experience online? Does it cause anxiety? What is the experience of bodies interfacing with media—our hands, our backs, our eyes? How do I feel about wearable technology? Having students write through this existential is to help them tap into the lived experience of the body in Web 3.0.

Spatiality (lived space): As I noted in the previous chapters, one of the defining features of informational capitalism is how it radically changes our experience of time and space by dematerializing (digitization) commodities and accelerating capital circulation. By unplugging, students create a space to step back from their hyper-mediated lives and reflect on how social and mental spaces when we leave our mobile

phones at home. We can ask them to explore the experience of having to find their way around an unfamiliar area without a gps, the sense of disorientation they might feel, or a sense of physical liberation like Jake is eventually able to express. Exploring spatial questions inevitably intersects with relationality and can tell us a lot about how and why our online relations might contrast with those offline.[52]

Temporality (lived time): In thinking about the temporality of unplugging, we are asking students to reflect on how their experience of time changes. Jake notes several times in his experiment how much "free-time" he seemed to have once he unplugged. When asked if this free time translated into being a better student, Jake responded:

> Yeah, a hundred times over. Like I said, there wasn't really much to do at the house, so I stayed at school most nights until 10 when everyone else leaves around 6, without a doubt. I think what's so hard for people and so distracting for people is that where they work, there are social media distractions on the same machine that they are supposed to be using to do their work…when you can't distract yourself, all you can do is work.

Anyone who has played a multiplayer online game has had the experience of compressed time where 12 hours of game play are experienced unconsciously by the gamer as less than five minutes. Having students inquire into their sense of time when unplugged is ideal because of the cognitive dissonance that can be generated. If students express anxiety, or feel disoriented, or, like Jake, experience the sensation of

[52] This may sound a little too binary—clearly in Web 3.0 our online and offline worlds are completely intertwined. I use the distinction here only to explore the different embodied experiences of chatting on the phone, sending a text, or sitting across the table with a friend.

creating time, students are tapping into their lived experience of temporality in Web 3.0.

Materiality (lived things): Asking questions about the phenomenology of materiality directly connects to our experience of material strata 1 and 2—the historical artifact of the writing tool and the continual enhancement of medial affordances. When students explore the materiality of digital tools, they are looking specifically at how digital technologies help create and manage materiality itself. What are the material implications of the data our online literacy practices create? What kinds of cultural forms and social structures emerge from the ubiquity of digital technology?

Again, this is just one way to approach a phenomenological journal with students. The idea is to create enough strangeness in students' lived experience to initiate embodied learning through exploratory, generative journal writing. As Van Manen emphasizes, phenomenological writing "does not just aim for the clarification of meaning, it aims for meaning to become experienced as meaningful. Meaningfulness happens when meaning speaks to our existence in such a way that it makes "contact" and touches us" (9118-20). The basic idea then in phenomenological writing is to heighten student awareness of their metabolic relations with the world in ways that bring them more in-touch with the innate wisdom of the sensing body.

The phenomenological journal begins the unit because it helps ground students in the *practice* of phenomenological inquiry—a way to develop a rich, ecological understanding of our lived experience. Stepping away from the screen and

doing this kind of contemplative writing gives students a creative space removed from the distractions of online textuality, a space to to give full *attention* to an experience through writing. As Goleman and Senge note of developing this phenomenological state-of-mind in students:

> Self-awareness— turning our attention to our inner world of thoughts and feelings— opens the path to managing ourselves well. An inner focus lets us understand and handle our inner world, even when rocked by disturbing feelings. One of the core abilities for doing this is how we deploy our attention. We can turn our awareness inside, and we can monitor where we put our focus. These are life skills that keep us all on track throughout the years, and help children be better learners. (88-91)

This is precisely the kind of introspective, nimble kind of thinking the phenomenological journal is attempting to build in students for a lifetime of conscientious, thoughtful activity.

Activity 2: Slavery Footprint

With the phenomenological journal at the heart of the unit, instructors have great flexibility in how they pursue other reading and writing activities in the unit. A text I have found to be immensely useful for helping students defetishize Web 3.0. is slaveryfootprint.org (SFP-figure 4.12). SFP was developed by the non-profit organization Made In A Free World (MIFW) to help raise awareness about the pervasive use of slave labor in globalized chains of production. MIFW estimates that there are over 29 million slaves worldwide—men, women, and children forced into labor through coercion and violence. Roughly 10% of this population will be sold into the illegal sex trade, while the rest work, in one way or another, within the global flows of state and corporate capital. Like ewaste, slave labor is another example of

how neoliberal capitalism externalizes the environmental and human costs of maintaining capital circulation, shifting the most dangerous, tedious, and monotonous work to developing countries while accumulating immense profit margins in American and European markets.

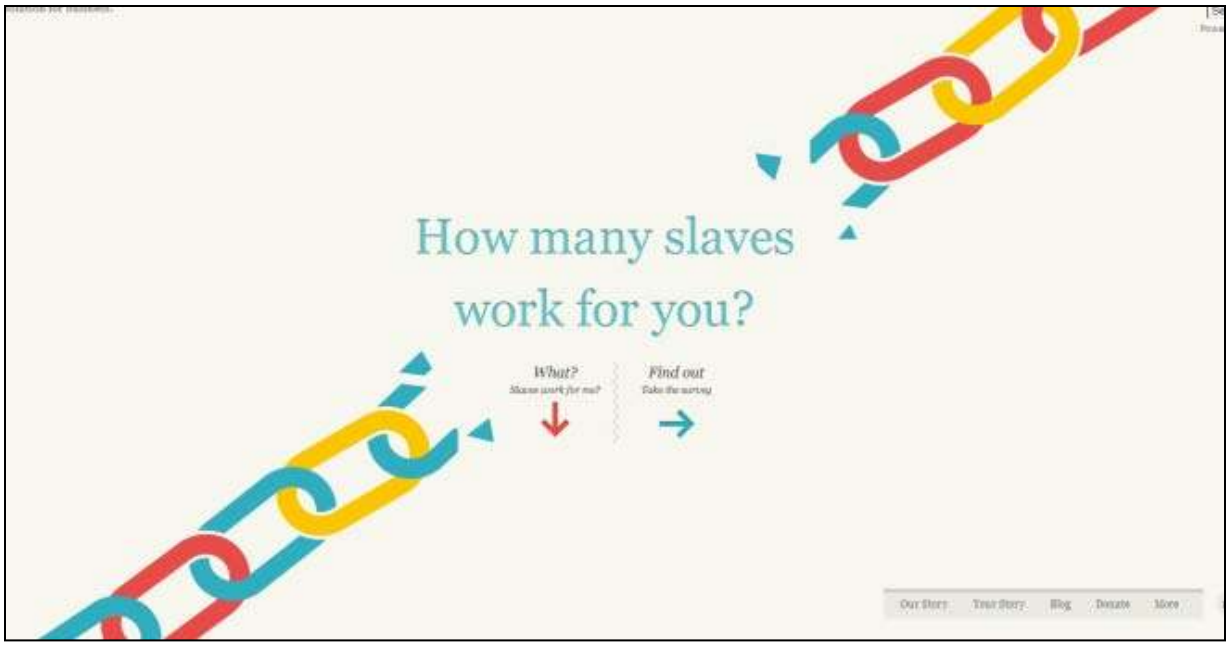


Figure 4.7: Entry page for slaveryfootprint.org.

SFP is an interactive online survey that collects user data about our day-day-consumption practices--how many times a week do you eat meat? Do you rent or own? How often do you wash clothes? How much make-up do you buy? The survey takes about 15 minutes to complete. Through a very simple, user-friendly interface, slaveryfootprint turns our consumption practices into a game composed of colorful, visual imagery that playfully represents the kinds of commodities that define our

consumption practices. Figures 4.13-4.17 show how SFP uses a rhetoric of play to cajole users into providing honest information about the extent of their consumption:

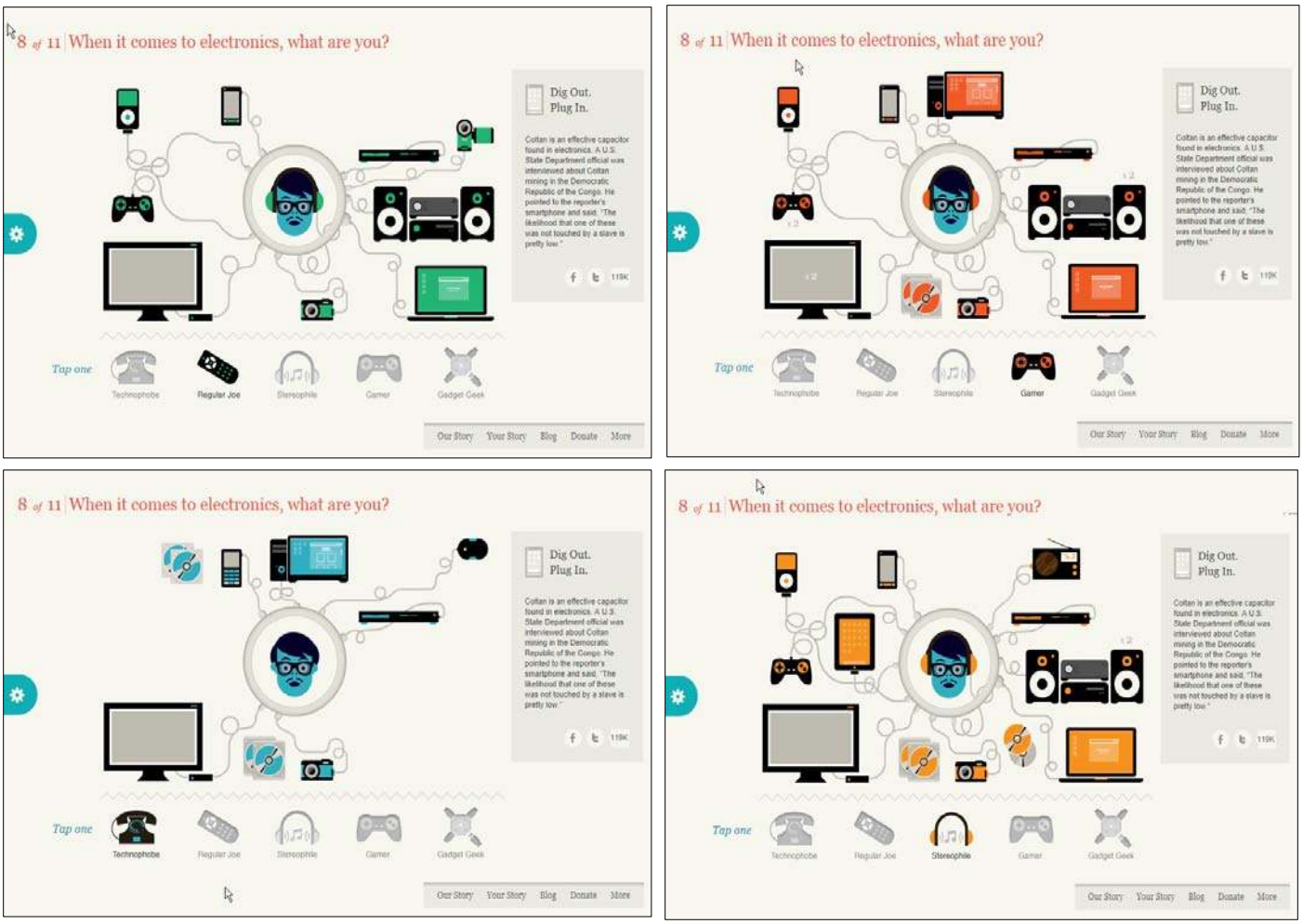


Figure 4.8: Different levels of electronics consumption at slaveryfootprint.org.

In the example of electronics, users can choose from five categories: Technophobe, Regular Joe, Stereophile, Gamer, and Gadget Geek. With each step in identity comes more electronics. Even the technophobe, according to SFP, owns a minimum of five electronic devices. As you move up the chain, the Gamer comes in owning at least 11 devices including two televisions, a desk top and lap top. The interface is clear,

lighthearted, even fun. To keep survey respondents grounded in reality, SFP includes a sobering figure about the global slave trade in coltan—a metallic ore used to make the capacitors used in electronic circuits. The Democratic of Congo is home to one to large coltan mines. Western demand for it has fueled internal strife in Congo and helped create inequitable labor relations (much of it slave labor) and dangerous working conditions.

SFP is a counter-example to the more commodified practices of Big Data. Rather than annex semiotic activity for capital accumulation (the standard business model of Web 3.0), SFP uses data to connect consumers to the class and labor relations that make informational capitalism possible. In this way, SFP performs two defetishizing moves. First, it is a model of digital data collection that is more communitarian, helping Westerners understand the cumulative impacts of our consumption and the ripple effects it causes across the globe. The second kind of defetishizing that occurs with SFP relates directly to Marx's classic understanding of commodity fetishism as our inability to see the commodity form for what it really is—"a material form of a fundamental social relation" (Marx). SFP uses modern writing technologies to demystify the global chain of power relations that buoys Western levels of consumption.

I find the site to be quite useful in the classroom for several reasons. One, it's a good example of the layered nature of Web 3.0 texts—the server and database layer; the algorithmic, programming layer; the coding, design, and rhetorical layer of the interface. This kind of textual richness serves well as a model for a range of writing

and new media activities--writing for the web, visual rhetorics, web design, programming, and database design. As a critical text, it helps writers imagine a different paradigm for new media writing, one that actively undercuts the data-as-currency model that dominates Web 3.0. By actively revealing the social relations behind commodities and the complex networks of labor that make them possible, SFP effectively models how to think ecologically.

Activity 3: LCA as Critical Research

Cultivating critical, ecological literacies is a gradual process of helping students demystify Web 3.0 and develop the critical faculties for complex, systems thinking. In the hyper-mediated environment of Web 3.0, one of the vital skills we must help students develop is a practice of research as one of defetishization, the nuanced, deliberate process of understanding the social and ecological systems that make a commodity possible. An ideal genre for fostering this kind of thinking is known as a *life-cycle assessment*, or LCA. LCAs came out of the environmentalism of the 1960s as a method for studying the effects of energy use (CSS). Now an established genre, LCAs are a systems approach to quantifying the total amount of energy and emissions produced in the manufacture, use, and disposal of a product (epa.gov). Figure 4.18 diagrams some of the basic stages that make up an LCA. LCAs can be long and technical documents, written by a team of scientists or researchers.[53] They can also be shorter documents, looking at a particular part of a larger process. They are used by

[53] An LCA completed by the EPA on desk-top monitors is over one hundred pages (2001).

government and corporations to assess both energy and disposal needs associated with manufacturing and releasing a product for public consumption.

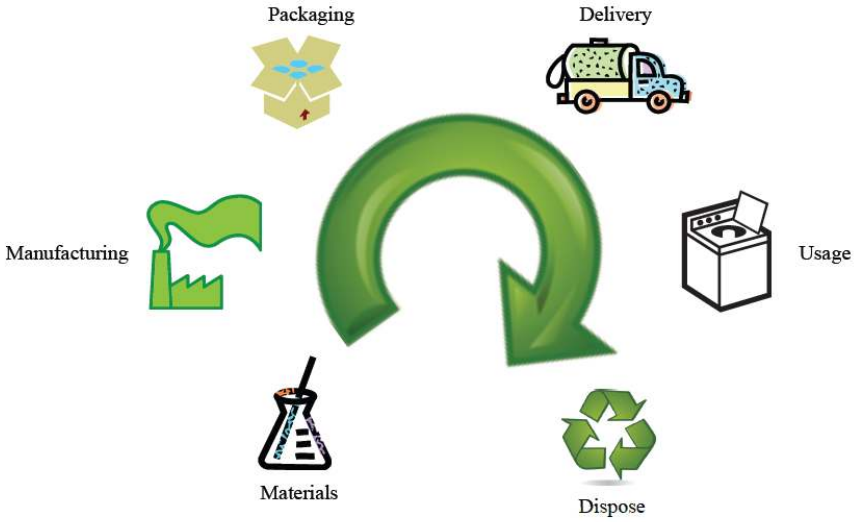


Figure 4.9: Simplified diagram of the stages of the life-cycle of a product (SUCCEED initiative).

Students new to the genre could begin by tracing the circulation of a simple commodity using the six stages of product development (above). This object may have been something they discovered in their phenomenological inquiries. Take the example of headphones—students could research what (and how much) actually goes into the manufacture of headphones—the plastic, rubber, and wire—the kinds of labor that go into the product, and where they go when they no longer work.[54] Depending on the teacher's goals, the LCA might take a more narrative, phenomenological tone that explores other social and cultural aspects of commodity circulation. For example, students could research where their food comes from, how a fresh tomato ends up in New England in mid-January, and the human ecosystems

[54] Many of the LCA activities here were adapted from the excellent Carnegie Melon's Center for Climate and Energy Decision Making.

that emerge in this process. And because LCAs are primarily concerned with processes and relationships, they are well suited for visual presentation (see Figure 4.19 in appendix), thus making them also useful for courses on visual rhetorics and design. Because LCAs tend to be longer, research texts, they present the kinds of writing challenges that help students cultivate their working memory and grow as critical, ecological thinkers.

Conclusion

The efficacy of the unit can be assessed by how well it succeeds in teaching the five learning outcomes for critical ecological literacies. Because literacy instruction sits at the heart of the educational system, we need to be teaching the kinds of literacies that will prepare students to build a more just and sustainable world. It will take our concerted effort to continually displace the productivist tendencies of informational capitalism and develop sustainable writing practices that bring the writing body into closer alignment with the rhythms of the biophysical world. As we learn more about the effects of Web 3.0 and emerging practices like media-multitasking and skanning on the somatic mind of writers, we must be wary of how these practices change our experience of literacy, and how they can erode our abilities to focus, to think critically and reflectively, and to grow as writers. It's not simply that our minds are in the balance, as one of the epigraphs says at the beginning of the chapter. Rather, our minds, and the ecosystems they depend on, both hang in the balance as we figure out how face the literacy challenges of Web 3.0.

APPENDIX A

TRACKING THE WORLD'S E-WASTE

Image from United Nations StEP Initiative diagramming the largest producers of ewaste in 2012.

APPENDIX B

AMOUNT OF USED ELECTRONICS PRODUCED IN U.S. 2010

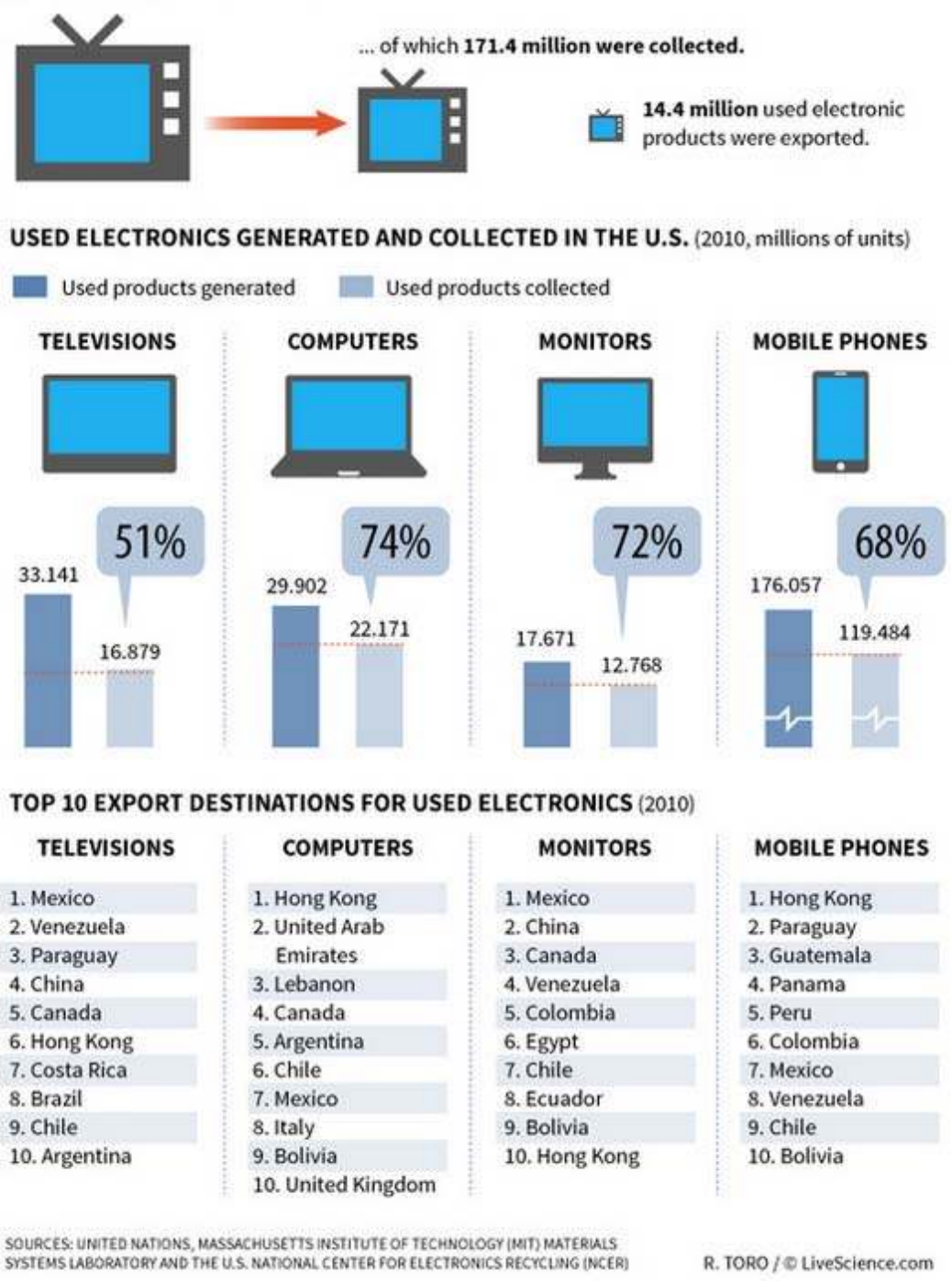
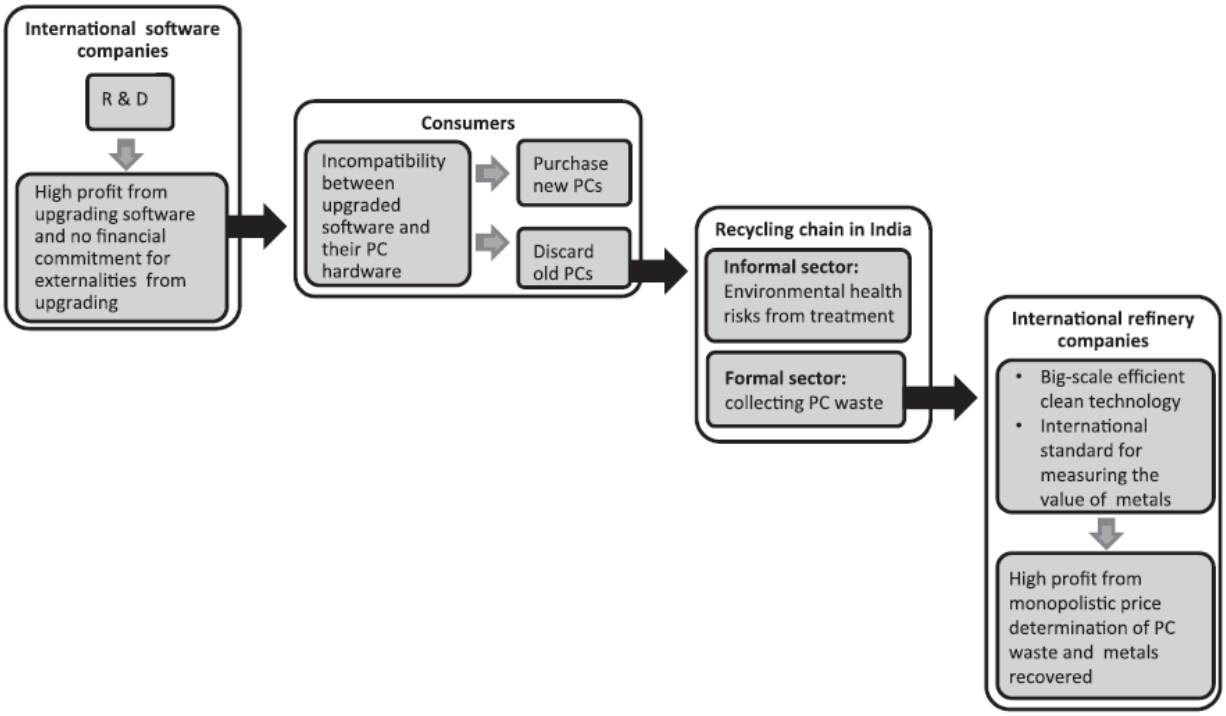


Image courtesy of United Nations StEP Initiative diagramming types of ewaste by country in 2010.

APPENDIX C

TRICKLE DOWN E-WASTE STREAM



(Image from Inagaki, 2013).

APPENDIX D

POTENTIAL HEALTH EFFECTS OF E-WASTE

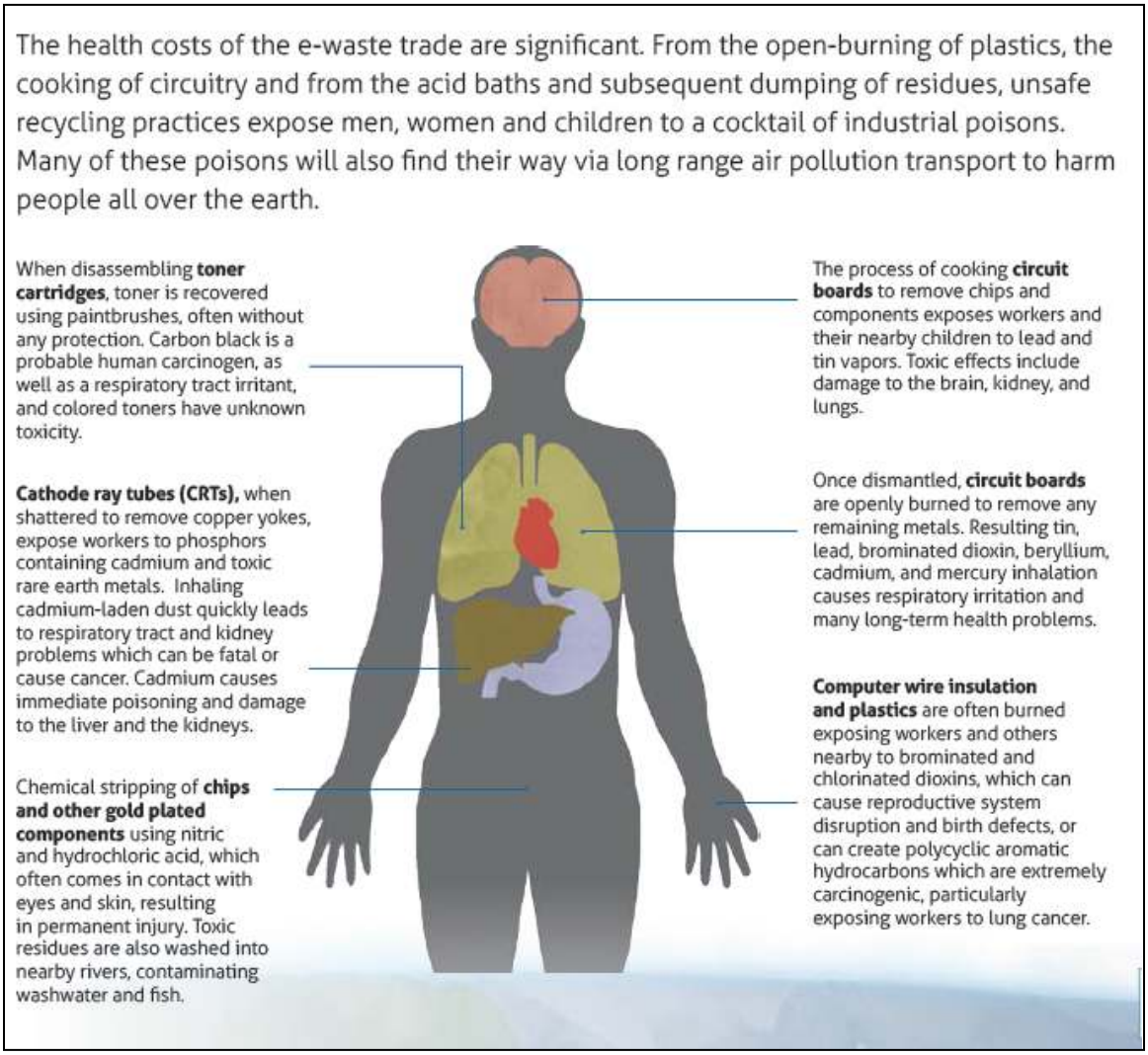
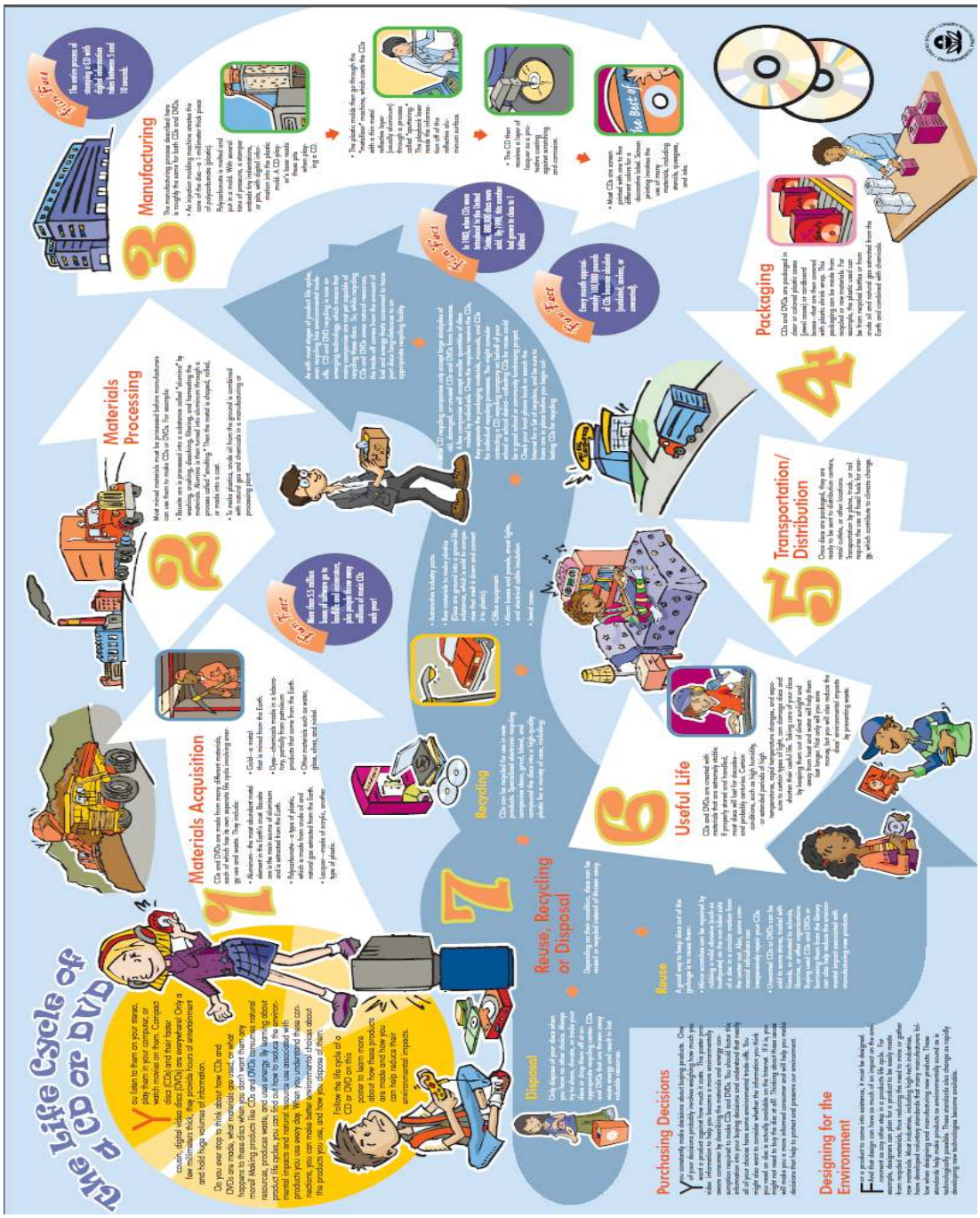


Image from StEP Initiative, United Nations.

APPENDIX E

LIFE CYCLE ANALYSIS OF A CD



Infographic of life cycle analysis of a compact disk. (EPA).

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