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## Introduction

### TOWARD A MATERIALIST ECOLOGICAL WRITING

*Since life evolved by natural selection, we might surmise that life is assembled from common elements that are easy and cheap to find. Indeed, life's chemical formula mimics in broad strokes the chemical proportions found in seawater and soil. (Kaspari 2012)*

We've all had this experience—we overpay for a lackluster dinner at a restaurant, or we buy a product, often electronic, that starts to slow down or stops working. We wonder why we don't cook at home more or why we didn't buy the two-year warranty. In a pre-Web world you might have filled out a customer-service card or called the company to complain. Today, however, we do what any disgruntled customer would do and post an online review.

For those of us who study writing and rhetoric, we might approach the writing situation of a mundane text like an online review by first considering its purpose. At first glance, this seems fairly straightforward: share your experience of a product or service in a way that readers find credible and informative. Upon further study, we could increase our scope and consider the rhetorical relationships between writer, audience, and topic. We could ask questions about the composing process, the time and place of the exchange, and the social relations involved in the transaction. And certainly, this kind of contextual, socially situated approach to studying writing has been a hallmark of writing studies as a discipline.<sup>1</sup>

However, when we start to consider the profuse *materiality*<sup>2</sup> in place for a text like an online review to exist, it's clear there is much more to consider in this writing situation beyond the

human symbolic activity that happens there. The sheer material abundance overwhelms the mind—the phones, computers, keyboards, screens, wires, cables, routers, telephone lines, cell towers, and data centers—to name a few. On a more micro level we might consider the hundreds of parts that make up the innards of our electronic devices—the microchips, circuits, transistors, and computer processors. Or, on a more macro level, we might consider the global labor force that mines the raw materials used to make electronics and the men, women, and children who assemble and break them down once they are, ostensibly, “obsolete.”

Then, of course, there is the stuff that flows through this materiality: the words, texts, information, and data we produce 24 hours a day, seven days a week. With the global online population surpassing four billion people (over half of the humans on the planet), it’s been estimated that every minute in the United States over 180 million emails are sent, 18 million texts are sent, 4 million Google searches are made, and 4 million videos are watched on YouTube (Internet Live Stats 2019; Domo 2019). Data management and analytics company Domo estimates that in 2020 “1.7MB of data will be created every second for every person on earth,” pushing global production of data by citizen-consumers<sup>3</sup> to 2.5 zettabytes a day (Domo 2018).<sup>4</sup>

Though we are all becoming more accustomed to such numbers, growing flows of texts and data greatly complicate our understanding of contemporary writing situations. Underneath the reviews, posts, texts, tweets, and comments we produce each day exists a vast system of interconnected platforms, networks, and inscription technologies that span the globe, from the bottom of every ocean, to the outer exosphere of the planet, all designed to collect, process, and commodify the streams of data churned out daily by human and nonhuman agents alike. While the information technology industries<sup>5</sup> refer to these flows of data and the material infrastructure necessary to make them flow as “the cloud,” we shouldn’t be fooled by the slick metaphor. A more fitting name for the modern internet and the material abundance that makes online texts possible is the *global networked infrastructure of inscription*. It’s a mouthful for sure, so



Figure 0.1. Submarine-cable map from data company TeleGeography, documenting all the active domestic and international fiber-optic internet cables that connect the Americas with Europe and Africa. (Image used with permission from TeleGeography Inc.)

I'll often abbreviate and refer to it as the *global archive*.<sup>6</sup> Despite its clumsiness, the phrase is meant to capture the copious materiality in place for online writing to occur more so than the specious metaphor of the “cloud.” The submarine-cable map of the internet released annually by the communications company TeleGeography provides a more realistic image of the internet and the more than 700,000 miles of underwater fiber-optic cable that make it a reality (figure 0.1).

In light of this material abundance, it feels constraining to think about writing and rhetoric as simply the human symbolic communication that happens online. Though it's common to think about writing as a tool for rhetoric and communication, one of the great affordances of writing is its ability to record and inscribe the world, helping us quantify and materialize our lived experience. Despite the obviousness of this fact, our research and theories on writing tend to background the inscriptive aspects of writing for a greater focus on its symbolic and rhetorical aspects. And yet, the global archive that currently envelops us suggests that the inscriptive facets of writing technology can tell us a great deal about what writing is and how it changes in the twenty-first century.

I explore the concepts of inscription and the archive more in the next chapter, but a few thoughts here will help me introduce how I'll be thinking about these challenging concepts. I argue throughout this work that, in order to develop our new materialist theories of writing, we need to grapple more with the inscriptive affordances of writing. As writing studies scholar Jodie Nicotra points out, writing-as-human-communication is just one kind of writing and part of the more general use of writing as a recording technology. She describes the ubiquitous use of digital writing tools to record every kind of human and non-human activity as "listening inscription" (Nicotra 2017b). While the metaphor is an apt one, I'm thinking of writing-inscription more materially as a form of *datafication*, a term I borrow from Viktor Mayer-Schönberger and Kenneth Cukier, authors of the book *Big Data* (2013). As they define it, "to datafy a phenomenon is to put it in a quantified format so it can be tabulated and analyzed" (Mayer-Schönberger and Cukier 2014). Digital writing's enhanced capacity to inscribe all experiential phenomena (e.g. movement, growth, color, sound, speech, images, ideas, etc.) into computable binary code not only "listens" and records human activity, it radically changes every facet of our lived experience of materiality.

Inscription as datafication, as well as the material infrastructure of the global archive, both signal a qualitatively new informational environment, one that marks a transition from a Web 2.0 world that celebrated user-generated content and social media,<sup>7</sup> to a world that has been called Web 3.0 by many—a maturing digital environment of escalating data collection by corporations and governments and their relentless pursuit to capture, control, and commodify flows of information.<sup>8</sup> While Web 2.0 has generally been embraced by writing studies scholars, the movement into the more capital-driven Web 3.0 is presenting all kinds of conundrums for our materialist theories of writing. The intensification of inscription and data collection on citizen-consumers is raising troubling questions about labor and automation, surveillance and privacy, data security, the spread of misinformation, search-engine bias, and artificial

intelligence, as well as troubling ecological questions about the growing energy demand of the global archive and the growing stream of electronic waste that gets created as a byproduct of our disposable, digital culture. In the transition from Web 2.0 to Web 3.0, we are living through an accelerating process of ubiquitous inscription—a process of incessant datafication not only of our exchange relations with each other, but with the rise of the internet-of-things and the billions of nonhuman devices now connected to the internet, the datafication of any kind of activity that takes place in the phenomenal world. As will become clearer as this work unfolds, I define *data* as the building blocks of *information*. *Information* is the umbrella term and *data* is both a type of information in basic form *and* the building blocks for different kinds of information, both semantic and physical in nature.

The acceleration of data collection we are experiencing in Web 3.0 radically challenges our conventional assumptions about writing, inscription, information, and materiality in writing studies. Indeed, the rate at which digital writing and inscription technologies evolve and spread is greatly testing our abilities to theorize what writing and textuality become in the growing complexity of Web 3.0. Because these changes are so disruptive and potentially harmful to the natural and social systems they are a part of, there's an urgent need in writing studies to develop our critical, materialist, and ecological theories of writing to grapple more rigorously with the social and economic impacts of intensifying datafication and information production.

While new materialist theories of writing are starting to recognize the radical changes spurred by Web 3.0, the predatory nature of twenty-first-century informational capitalism demands a more direct engagement with the two primary agentive forces we consistently background in our materialist theories of writing: (1) the forces of capital circulation and (2) the basic biophysical laws of energy and matter. Without directly confronting these basic material agencies and how they entangle with writing and inscription, our materialist theories of writing will continue to

underestimate the virulent nature of neoliberal, informational capitalism and the ways writing and inscription get leveraged for capital circulation. This book is my attempt to fill this need and contribute to current new materialist work by starting to articulate a critical materialist framework designed to help us theorize the larger socioeconomic implications of writing and inscription in Web 3.0.

### EXPANDING NEW MATERIALIST AND OBJECT-ORIENTED THEORIES OF WRITING

In order to lay out the basic materialist framework for theorizing digital writing that sits at the heart of this book, I want to begin by unpacking some basic assumptions about materiality and agency that persist in writing studies and consider how new materialist theories of writing are rethinking these assumptions. Historically, whenever radical changes occur to our writing technologies and the quantity of texts produced, scholars in writing studies return to fundamental questions of materiality. Inevitably, questioning the nature of materiality leads us to revisit the concept of agency and who, or what, can enact it. The last wave of materialist theorizing about writing emerged in the early to mid-1990s with the cultural changes prompted by the spread of personal computing, word processing, and the World Wide Web (Bolter 1991, 2001; Haas 1996; Faigley 1999; Selfe 1999; Moran 1999a, 2005). Around the same time, other scholars were invoking the concept of *ecology* to think more materially about how networked, digital technologies changed the ways we produced and circulated texts (Cooper 1986; Syverson 1997; Edbauer 2005; Spinuzzi 2003). While these earlier waves of materialist thinking made important strides in our understanding of writing and its inherent technological and ecological qualities, they also made two key assumptions that continue to hinder our materialist theories today. Assumption one: only humans (and not nonhuman things like nature or technology) can enact agency. Assumption two: the primary site for studying and theorizing writing resides in socially situated, local contexts.

Though it may seem passé these days to claim that only humans can possess agency, it wasn't so long ago that to suggest a nonhuman writing technology could enact some form of agency was patently false—a type of technological determinism that obscured human agents and the diversity of situated writing practices. The critique of technological determinism has long been invoked by writing studies scholars to dismiss materialist analyses of writing that claim that writing technologies can have determining effects on the local scene of writing and human agency (Street 1984; Walters et al. 1990; Faigley 1999; Daniell 1999; Trimbur 2002; Lunsford and Prior 2008).<sup>9</sup> What may have seemed obvious in a pre-Web 2.0 world about who and what could possess agency, in the Web 3.0 world of the global archive, a qualitatively new informational and textual environment has emerged in which our tools for inscription take on greater agency.

In light of such changes, writing studies scholars have turned again to questions of materiality and agency. Work that draws on new materialist cultural theory (Barad 2007; Coole and Frost 2010; Bennett 2010) and Bruno Latour's object-oriented, actor network theory is significantly expanding our materialist theories of writing to better understand how algorithmic, automated, and ubiquitous inscription technologies thoroughly disrupt our lived, ontological experience of agency and writing (Lynch and Rivers 2015; Barnett and Boyle 2017; Dobrin and Jensen 2017; Gries and Brooke 2018). Broad in their sweep and depth, new materialist and object-oriented theories of writing argue that, due to the destabilizing effects of digital media and expanding flows of information, we need to reconfigure our basic assumptions about materiality, writing, rhetoric, and agency (Hess and Davidson 2018; Lynch and Rivers 2015; Barnett and Boyle 2017; Gries and Brooke 2018; Dobrin and Jensen 2017). Taken together, such work emphasizes four fundamental concepts for guiding our materialist theories of writing in the digital contexts of the twenty-first century: *distributed agency*, *embodiment*, *flow/circulation*, and *neoliberal capitalism*.



**Distributed agency:** In a world of automation, algorithmic computing, and ubiquitous inscription, we can no longer assume that agency resides only in human actors. Rather, with our writing environments greatly mediated by digital writing technologies and the profuse textuality it fosters, agency is not something to be possessed by either human or nonhuman, but something distributed across actor networks that include human and nonhuman actants (Gallagher 2017; Reyman 2018; Zappen 2018; Nicotra 2017a; Andrejevic 2013; Hess and Davidson 2018; Barnett and Boyle 2017; Lynch and Rivers 2015; Gries and Brooke 2018; Rickert 2013; Hirsu 2018).

**Embodiment:** In the hypercirculatory contexts of Web 3.0, where writing technologies take on greater agency, the relationship between our physical bodies and growing digital textuality is radically changing our felt experience of writing and reading. To understand these changes, we must learn to tap the full sensorium of our bodies to become more attuned to affect, corporeality, and mutual accommodation with those human and nonhuman agents we are entangled with (Cooper 2017; Nicotra 2017b; Pflugfelder 2015; Zappen 2018).

**Flow/circulation:** The material contexts of digital writing are inherently dynamic and thus demand a more posthuman and ecological orientation toward writing and textuality that foregrounds physical matter, intra-relational activity, flow, circulation, complexity, self-organization, contingency, and emergence (Barnett and Boyle 2017; Gries and Brooke 2018; Dobrin and Jensen 2017).

**Neoliberal capitalism:** With the rise of digital networks and the global archive, neoliberal, informational capitalism is intensifying. As transnational corporations continue to expand and solidify a global economy, they also continue their assault on citizen-consumers and the natural environment by tearing down government regulations, avoiding taxes, and further privatizing more aspects of US socioeconomic life. New materialist theories of writing argue that in theorizing writing today we must grapple with the neoliberal motivations driving the development of digital networks and wide-scale data collection (Chaput 2010; Nicotra 2017b; Trimbur 2000; Dingo 2018).

These four fundamental concepts lie at the heart of new materialist and object-oriented theories of writing. The focus on flow and embodiment reminds us that, as permeable, living organisms, we inevitably assimilate the effects of persistent, ubiquitous

inscription, both in the ways we use digital tools to inscribe the world and how those same tools are used to inscribe and datify our lives.

To be sure, scholarship on writing that draws on new materialist and object-oriented theories is astute, and it is building new and creative frameworks for theorizing the radical changes unfolding in Web 3.0. At the same time, however, we see a familiar pattern emerging in this work that continues to undermine the clarity and explanatory power of new materialist thinking—the stubborn tendency to background the two basic agentive forces that influence all actor networks and the writing that takes place there: the persistent demands of capital circulation and the causal, natural laws of the biophysical environment.

Pulling such forces into the foreground of our materialist theories of writing is, undoubtedly, a difficult endeavor. But we don't have to venture far theoretically to begin this process. For starters, we should acknowledge that many of the basic assumptions of "new" materialism aren't really new. They grow out of the long tradition of materialist thinking known as *organicist materialism*. Organicist materialism conceives of materiality as dynamic, intra-active, self-organizing, and ceaselessly in motion. Its development can be traced through time from pre-Socratic atomists like Democritus and Heraclitus, to Aristotle, Epicurus, and Renaissance thinkers like Spinoza and Leibniz, on to the work of materialists like Karl Marx and Friedrich Engels. I note this history as a reminder to all of us who invoke new materialism that, when we do so, we are invoking a long tradition of materialist thought that conceives of the natural world and physical laws as the ontological fiber of our existence. This tradition vitally includes the historical and dialectical materialism of Marx and Engels and their critical analysis of industrialization and the ways capital circulation exploits both social and natural processes to speed up profit. While current new materialist theories of writing acknowledge the impact of neoliberal capitalism on the shape of writing in Web 3.0, they rarely mention, let alone grapple with, Marx's foundational critique of capital that sits at the heart of new materialist thinking.

By better acknowledging and exploring the fundamental influence of organicist materialism and Marxism on new materialism, we can open up new ways to think about the materiality of digital writing and ubiquitous inscription, and how such forces inevitably intertwine with capital circulation and the natural environment.

#### INTEGRATING THE BIOPHYSICAL ENVIRONMENT INTO OUR THEORIES OF WRITING

Writing studies has long endeavored to integrate the natural sciences into our social and materialist theories of writing. To capture a more systemic, organic understanding of writing over the decades, we've invoked terms like *ecology*, *kinesis*, *emergence*, *saturation*, *flows*, and *circulation* to describe writing. Despite our best efforts though, we tend to use these terms more metaphorically and continually pull up just shy of actually integrating the discourses and methods of the natural sciences into our study of writing.

Unsurprisingly, writing studies is not alone in this. As critical sociologist John Bellamy Foster argues about the social sciences,

Social science today is crippled not only by its growing failure to confront the historical specificity (and thus the hegemonic structures) of present-day society, but also by its repeated refusal to engage critically with the reality of the natural world. Thus the social sciences and the humanities . . . are all characterized to varying degrees by their radical separation from nature—from the concerns that preoccupy natural science, and more particularly from notions of natural history or evolution. (Foster et al. 2011)

It's a strong indictment, and something I think we are starting to address as more colleges and universities develop interdisciplinary programs in environmental and sustainability studies. One of the main reasons for this ongoing separation between the social sciences/humanities and the natural sciences has to do with the extensive practical challenges of doing such crossover work—deep differences in methods, assumptions, discourse, terminology, and what counts as knowledge are all substantial

barriers to doing interdisciplinary work. Nevertheless, new materialist theories of writing are certainly moving in this direction, and Foster's critique is a healthy reminder that there is still a lot of theoretical work to do in bridging the gap between writing studies and the natural sciences, in particular ecology, biology, and physics. In light of the environmental and economic problems we are facing in Web 3.0, we cannot miss the opportunity in our recent turn to new materialism to undo this habit of backgrounding capital and the basic laws of the biophysical environment in our critical theories of writing.

We can begin this process by addressing some of the basic assumptions of new materialist theories of writing and key theoretical concepts like *matter*, *information*, and *circulation*.

### *Matter*

How we define and understand the concept of matter will inevitably determine how we might theorize about writing and rhetoric. As Gries emphasizes, new materialist and object-oriented rhetorics wholeheartedly embrace an organic definition of matter as a "productive, dynamic, and resilient force" (Gries 2015, 7). Scott Barnett and Casey Boyle echo a similar idea when they write that, "things are rhetorical . . . vibrant actors, enacting effects that exceed (and are sometimes in direct conflict with) human agency and intentionality" (Barnett and Boyle 2017, 1). To theorize the vibrant agency of material, nonhuman things, new materialists argue that human and nonhuman agents don't just interact, they *intra-act*. As Karan Barad explains in *Meeting the Universe Halfway*:

The neologism "intra-action" signifies the mutual constitution of entangled agencies. That is, in contrast to the usual "interaction," which assumes that there are separate individual agencies that precede their interaction, the notion of intra-action recognizes that distinct agencies do not precede, but rather emerge through, their intra-action. (Barad 2007, 33)

Intra-action is a useful concept for explaining how nonhuman agents, both living things (like animals) and nonliving things

(like writing technologies), come to enact agency by the sheer fact of their existence as living matter and energy. A simple example can be seen when we pick up a hot cup of coffee. Agency emerges in the intra-action between the human who picks up the cup and the transfer of heat as it moves to the hands, then the mouth, of the person who drinks the coffee.

While intra-action is widely invoked in new materialist theories of writing, the focus on how agentic, nonhuman things come into contact with human agency is often interpreted more like *interaction* rather than intra-action. That is to say, though new materialist theories of writing argue that nonhuman things are agentic and rhetorical, such things are generally seen as discrete and separate entities from human agents rather than as “mutually constitut[ed]” of the same substance and beholden to the same physical laws that humans are. Thus, though a new focus on rhetorical “things” has been critical for denaturalizing our preference for humanist agency, intra-activity suggests there aren’t individual agencies or things that interact in an actor network but, rather, the basic *modus operandi* of all things, as composed of matter and energy, is fluid, dynamic exchange as energy and matter circulate *through* agents and actor networks. When it comes to understanding intra-action then, and theorizing the agency of a nonhuman thing like a writing technology, we must also consider how all human and nonhuman things are manifestations of how matter and energy circulate, and how they intra-act with another vital circulatory flow, the flow of *information*.

### *Information*

In unpacking our assumptions about matter and how a writing technology enacts agency, we need to revisit our assumptions about *information*—what it is and how it entangles and circulates with energy and matter. I say more about the concept of information and its history in writing studies in the next chapter, but here I briefly introduce how I will be thinking about the term throughout this work.

The term is just starting to appear again in writing studies after a hiatus of about a decade, though our understanding of the concept remains general and vague. I believe the concept has a lot to offer our materialist theories of writing and our understanding of the broader material social effects of ubiquitous inscription. Because of its dialectical relations with energy and matter, information as concept and thing provides a critical interdisciplinary bridge to the natural sciences that will help us further develop of our materialist theories of writing.

New materialist theories of writing generally tend to think of information as the symbolic, meaningful stuff we exchange with each other (the semantic kind), but this is only a partial understanding of a term whose meanings range widely across fields as diverse as biology, ecology, computer science, and mathematics. In these other fields, information is something inherent in all living systems and a basic component of life, along with energy and matter. For natural scientists and mathematicians alike, information is the basic signaling, communicative force that all life and matter exchange in, from the organic sequencing of DNA, to the process of photosynthesis, to the flow of binary and semantic information circulating through the internet. Information then, at its most basic level, is the intrinsic signaling and communication abilities of all matter and biological life, which includes the semantic information we produce via our writing *and* the layers of data and metadata this writing produces.

In a way, it's arguable that *information* is a more useful term than *agency* at this point for theorizing writing. Distributed, intra-active agency means that agency is a given. Human and nonhuman things alike, by the pure fact of their existence as matter and energy, are intrinsically agentive. If we can agree that all things, human and nonhuman, are agentive and networked, then, from a theoretical standpoint, we're ready to make distinctions between different kinds of agency. That is to say, *rhetorical agency* should always be distinguished from a more general, *informational agency*. To use the wonderful example of the dragonfly from Marilyn Cooper's article "Listening

to Strange Strangers, Modifying Dreams” (Cooper 2017), a dragonfly is not, unto itself, a rhetorical agent. It’s certainly deserving of our respect and acknowledgment, but it isn’t rhetorical. It is, however, *informational*. To be rhetorical is to deliberately use (and misuse) complex, symbolic, and semantic information, something a dragonfly doesn’t do.<sup>10</sup> Thus, a dragonfly is not a rhetorical agent, though it still communicates with us. Likewise, water is not, intrinsically, a rhetorical agent, but it is always informational, constantly signaling to us through our vital connection with it. Once we put water into a plastic bottle and try to sell it, then it becomes rhetorical. While any human made thing could be considered rhetorical, when we “attune” to living, nonhuman actors and organisms (and they to us) we don’t do so through rhetoric, but through the innate communication and informational capabilities of all living matter.

Thinking about information beyond its more obvious semantic and human aspects is essential for integrating the natural sciences into our study of writing and inscription. In doing so, we can develop our new materialist theories of writing in ways that will help us articulate the dynamic relations among writing, information, energy, matter, and capital. I pursue this idea more in the next chapter, when I dive deeper into the various kinds of information produced in Web 3.0.

### *Circulation*

In revisiting information and its intra-relations with writing, matter, energy, and capital, we invariably must revisit another key concept in new materialist and object-oriented theories of writing—*circulation*. Historically, scholars have used circulation to theorize how texts, genres, and media move through culture (Trimbur 2000; Yancey 2004; Edbauer 2005; Eyman 2007; Porter 2010). But the concept takes on new salience in Web 3.0 with the rise of the global archive and networked, algorithmic computing. More recently, Laurie Gries and Colin Brooke have argued that the theoretical robustness of circulation makes it

a *threshold concept* for writing studies. They define circulation studies, “in the most general and simplest sense, as the study of writing and rhetoric in motion,” with a focus “on how bodies, artifacts, words, pictures, and other things flow within and across cultures to affect meaningful change” (Gries and Brooke 2018, 201). The authors argue that, because writing is at the heart of how all things, human and nonhuman, circulate in culture, understanding how writing circulates will help us understand other kinds of circulating phenomena.

I find Gries and Brooke’s call for circulation studies compelling and I agree that *circulation* should be considered a threshold concept in the field. At the same time, as promising as circulation studies is for expanding our new materialist theories of digital writing, we see, again, in Gries and Brooke’s edited collection *Circulation, Writing, and Rhetoric* (2018) the same tendency to background capital circulation and the biophysical laws of matter and energy.<sup>11</sup> This can be seen in the afterward where Gries proposes several research questions for future work in circulation studies:

- How does circulation help us further understand the ontological dimensions of rhetoric and the rhetorical nature of nonhuman things?
- How does circulation studies help us understand how public life assembles and reassembles?
- How does circulation shape identity?
- How do we integrate circulation into our classrooms? (Gries and Brooke 2018, 326)

These are all excellent questions that hold great promise for developing new materialist theories of writing. But it’s hard not to notice the same pattern of omission I’ve been tracing in this introduction. Neither capital circulation or the physical flows of energy, matter, and information are mentioned.<sup>12</sup> I don’t mean to single out any particular work here, and I commend Gries and Brooke’s push to develop our use of circulation—something I hope this book contributes to. However, in the contexts of Web 3.0, informational capitalism, and environmental crisis, there is a dire need in our new



materialist theories of writing to foreground and articulate how circulatory writing gets conditioned by the forces of capital circulation and intertwines with the causal laws of the biophysical environment. From a critical, Marxian perspective such as new materialism, circulation is never simply about tracing written artifacts, rhetorics, or other material flows as they circulate through actor networks. Rather, it's about understanding the circulation of texts and information *in dialectical relation with the circulatory demands of capital* and how this process inevitably conditions *all* other circulatory processes.

#### FROM CIRCULATION TO METABOLISM

From an ecological perspective, when we background circulating flows of capital, energy, and matter in our materialist theories of writing, we are essentially abstracting our understanding of writing from both the material realities of our socioeconomic lives and the fundamental laws of the natural world. Doing so doesn't mean we can't theorize effectively about writing in culture, but it does significantly limit what it tells us about its materiality. Of the many ways this kind of abstraction limits how we study writing, perhaps the most troubling is how it conceals our understanding of how material things circulate and flow. The basic laws of matter and energy tell us that there is always a material cost for things to move. Circulating writing is no different—there is a material cost for it to circulate that comes in the form of energy used, energy lost, and the inevitable production of waste. This dialectical relation between writing and circulating flows of energy means that we can't fully understand how texts and nonhuman things circulate outside of basic physical and biological laws.

Moreover, we should remember that energy, matter, and information not only *flow and circulate* through all living systems, they also pool and create *stocks*—material spaces where energy, matter, or information slow down and accumulate within the ecosystems they are a part of. A stock of energy can be seen in the oil reserves of a country; a stock of matter can

be seen in a lake where water has pooled at the lowest point of a valley. Stocks of information include things like libraries and databases. Exponentially accelerating computer processing, data compression, and networked computing have led to the cheap and bottomless data storage that makes ubiquitous inscription feasible and stocks of data valuable. But both bottomless data storage and ubiquitous inscription pose a serious threat to the finite flows and stocks of energy and matter they intra-act with. Thus, whether we are talking about the energy necessary to circulate information or how to deal with the waste created by information production (CO<sub>2</sub> emissions, electronic waste), there is always a material cost for storing and circulating writing.

To reiterate, my goal in this introduction is to offer a fair critique of new materialist theories of writing so we can more clearly articulate writing's dialectical relation to the natural world and capital circulation. What I see in new materialist theories of writing that invoke words like *ontology*, *thingness*, *circulation*, *flow*, *ecology*, *ambience*, *kinesis*, *intra-action*, and *agency* is an effort on the part of scholars to find new, interdisciplinary ways to conceptualize digital writing in culture, ways that are more organic, more ecological, more *material*. While the concept of circulation certainly moves us in this direction, what is needed is a complementary term, one that not only recognizes the inherent motion of texts and writing, but one that also foregrounds the intra-active exchange and transformation of energy, matter, information, and capital as they entangle and circulate through *all* ecosystems. I believe that concept is *metabolism*.

I say more about metabolism in the next chapter, but an introduction to the term and how I'll be using it will help introduce the critical, materialist framework for theorizing writing that forms the basic argument of this book. Etymologically, metabolism comes from the Latin word *metabole*, meaning to "change" or "transform." In the popular imagination, metabolism is usually associated with eating and how efficiently our bodies burn calories. However, this is just one aspect of the vital, universal process that all biological systems must

undergo in their ongoing need to turn food into energy and process the waste that occurs during this process. As ecologists Jim Brown, Richard Sibly, and Astrid Kodric-Brown explain about the universal process of metabolism that continually flows through every ecology:

Interactions between organisms and their environments involve exchanges of energy, materials, and information. These fluxes are all part of metabolism in the broad sense. They are all dependent on metabolic rate, because energy powers and controls the exchanges. So, for example, the primary [energy] production of an ecosystem is the sum of the carbon fixation of all the autotrophic organisms [e.g., plants, algae]; the growth rate of a population is the rate of incorporation of energy and materials into new individuals; and the information conveyed by birdsong is generated by the singer transforming metabolic energy into sound waves. (Brown et al. 2012, 3)

The authors go on to emphasize the inherent scaling properties of metabolism and that “all interaction between organisms and their environments involve the fluxes, transformations, and storage of these three basic currencies [energy, matter, and information]” (Brown et al. 2012, 5). *Metabolism*,<sup>13</sup> then, as I use it throughout this work, is the basic, ceaseless circulation of energy, matter, and information that all life depends on at every scale, from DNA, to bacteria, to mammals, to human ecosystems, to the planet’s biosphere and beyond (Brown et al. 2012; West 2018).

*Metabolism* works well alongside concepts like *circulation*, *flow*, and *network*, but it’s even more fundamental. There can be no circulation of anything without the tireless process of metabolism that drives all ecological systems. Moreover, metabolism provides a way for theorists to scale outwards in our materialist analyses to understand how the metabolism of individual human writers metabolizes with the larger ecosystems we are a part of. This ability to scale is one of metabolism’s greatest theoretical attributes. When combined with terms like *circulation* and *flow*, we have a potent framework for theorizing how flows of writing and information affect how energy and matter circulate through all biological systems.<sup>14</sup>

My use of *metabolism* is similar to how Thomas Rickert defines *context* in his article “The Whole of the Moon: Latour, Context, and Holism.” Rickert argues that, in understanding how context affects an actor network, we need to think of context as “the undergirding logos from which things and language emerge in their meaning and bearing” (Rickert 2015, 141). For Rickert, context is more than a static backdrop for actor networks. He uses the example of a human agent drinking wine (a nonhuman agent) to make his point. Wine takes on agency within an intra-active context that creates the “hybrid coachievement” of wine-human. When framed metabolically, we can take this observation one step further. The undergirding logos of any context is the basic physical laws of metabolism—the transformation of energy, matter, and information as they circulate through our bodies when we drink wine. The “subtle rhetoric” of wine goes beyond human word and deed—it is the physical experience of our bodies processing alcohol and feeling its powerful effects. It’s a simple tweak that, in essence, biologizes Rickert’s holistic idea of context. By couching these vital agencies in more humanistic, metaphorical terms, we miss an opportunity to integrate concepts from the natural sciences like *metabolism* and *information* that can help us develop more interdisciplinary, materialist theories of writing. Making such theoretical adjustments is all the more important for the ecological challenges we are facing as a planetary community, both environmentally as we struggle with climate change and waste management, and socially and economically as a globalized, neoliberal capitalism continues to widen wealth disparities across the globe.

Towards this purpose, I introduce a theoretical framework for studying writing in Web 3.0 that is critical and metabolic—a framework I call a *materialist ecology of writing* (MEOW).<sup>15</sup> MEOW is a new materialist approach to theorizing writing based on the premise that digital writing tools, and the informational production they foster, radically displace individual human agency and relocate it amongst the flows and stocks of energy, matter, information, and capital that continually metabolize through every human ecology. Like

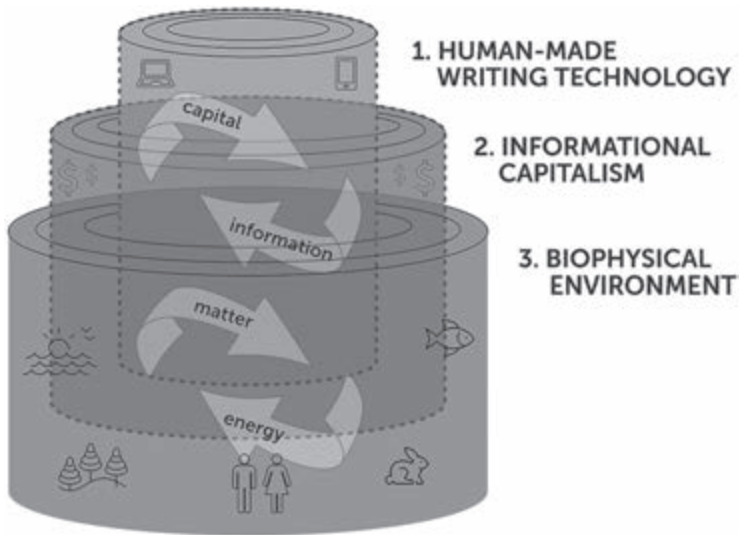


Figure 0.2. Basic diagram of MEOW, composed of three intra-acting material cumuli and flows of energy, matter, information, and capital that continually circulate through each cumulus. (Illustration created by Martha D. Langer, Pear Ink Design.)

other new materialist theories of writing, MEOW assumes that agency resides in collectives of human and nonhuman agents; MEOW, however, specifically foregrounds three fundamental domains, what I call *material cumuli*, that are a part of every actor network that includes human beings: the biophysical environment, informational capitalism, and human-made writing and inscription technologies.

Figure 0.2 illustrates the nested structure of the framework. The arrows represent the metabolic flows of energy, matter, information, and capital that perpetually circulate through and across each cumulus:

**First material cumulus:** Writing technologies and their embodied history of use; the global networked infrastructure of inscription (global archive)

**Second material cumulus:** Web 3.0 and twenty-first-century informational, neoliberal capitalism

**Third material cumulus:** All living, metabolic ecosystems, from the sensorium of the body to the biosphere of the planet

The MEOW framework builds on new materialist trends in the field and the recent “nonhuman” turn in writing studies. Its intent is heuristic—to help writing studies develop our critical materialist and ecological theories of writing in the global contexts of informational capitalism and its growing antagonism with the biophysical environment, including the vulnerable, permeable space of our writing bodies.

The word *cumulus* has been chosen for a few reasons. It’s a term that attempts to capture the agency of historical accumulation. One way in which nonhuman things enact agency is through their development and quantitative accumulation over time, what economist Thorstein Veblen called “cumulative causation.” Veblen coined the term to draw an analogy between socioeconomic development and the evolutionary process of natural selection (Reisman 2012). In social systems, as in natural ones, when the quantity of something accumulates and reaches a critical mass, it begins to enact qualitative changes within that system. This ongoing process of historical accumulation is an intrinsic part of how both natural and human social systems evolve over time. All matter and living systems could be considered cumuli, products of the accumulative layering of time and biophysical activity, from the billions of years of evolution that have shaped the biosphere of the planet, to the economic structures of capitalism, to the cumulative history of human labor that is embodied in every writing technology we use.

In addition to cumulative causation, MEOW draws on traditional ecological models of human activity that are common in fields like public health and behavioral psychology, including the well-known ecological model of human development outlined by psychologist Urie Bronfenbrenner. In such models, the individual human agent is placed at the center of analysis; the researcher then moves from the local contexts of the individual to study how individuals and their local contexts are influenced by the larger contexts (regional, national,

planetary) they are nested within.<sup>16</sup> MEOW borrows this basic structure, but rather than placing the individual human agent as the starting point for ecological analysis, it places nonhuman agents and their embodied history as the starting point. In the MEOW framework, at the level of the first material cumulus, the basic unit of analysis could be any human-made object, thing, or technology. MEOW thinks of all nonhuman, human-made things as living fossils that have evolved over time. As such, any technology and its accumulated history could become the entry point for a critical materialist analysis. In this book, my specific focus is on the accumulated history of writing as a technology, its affordance of inscription, and their co-development over thousands of years to fundamentally condition modern socioeconomic life.

As we move outward from the material cumulus of an individual writing technology to the second material cumulus, we find ourselves, along with every other human and nonhuman actor, ensconced in the cumulative conditions of twenty-first-century informational capitalism and the global networked infrastructure of inscription. The developmental history between writing, economy, and the earliest forms of capital circulation can be traced back to the origins of writing and the development of the first cities in human history (something I take a closer look at in chapter 3). This cumulative relationship between writing and capital is alive-and-well in Web 3.0 and together they fuel an informational capitalism that aggressively leverages inscription to accelerate capital circulation.

These first and second cumuli are, in turn, nested within and dependent upon the third material cumulus, the longer evolution of the biophysical environment that is the living, cumulative history of billions of years of natural selection. Constitutive of this cumulus are the basic physical and thermodynamic laws of energy and matter. I'll say more about such laws in chapter 5, but for now I'll simply mention that I'm referring to two basic physical laws: the concept that neither energy nor matter can be created or destroyed; and the irreversibility of time and one-directionality of all metabolic processes, a process known

in thermodynamics as *entropy*. As illustrated in figure 0.2, the perforated borders of each cumulus depict their permeable nature and the arrows depict the flows of energy, matter, information, and capital that metabolize incessantly through all three cumuli.

One of MEOW's primary goals is to displace individual human agents and situated writing practices from the center of our writing theories and foreground instead those aspects of materiality we habitually undertheorize. By doing so, I believe we can further develop our new materialist theories to more effectively study and grapple with the complex metabolic relations between energy, matter, information, and capital. In the chapters that follow I lay out in greater detail how to think through each of these cumuli and how a MEOW framework can be used to theorize writing in Web 3.0. It's still tentative in areas, an initial foray into how we might conceptualize more material, ecological, and metabolic understandings of writing in the twenty-first century.

## LOOKING AHEAD

### *Chapter 1: The Theoretical Roots of MEOW*

In chapter 1 I dig deeper into the key concepts I've introduced here and explore a few new ones, in particular *ecology*, *information*, *metabolism*, *inscription*, *archive*, and *acceleration*, and provide a more thorough discussion of the theoretical roots of MEOW. This includes a discussion of Marxian metabolism and how it's been picked up by modern social and metabolic ecologists who study the relations between the internal (endosomatic) metabolism of organisms and the external (exosomatic) metabolism of the ecosystems we are a part of.

In thinking about the metabolism of human ecologies, I also take a closer look at the concept of information and the uneven, ambivalent relationship writing studies has had with the concept. I argue that, by tying information production to flows of energy and matter, we put ourselves in a better position to theorize the materiality of writing in Web 3.0 and the profound



economic and environmental changes brought on by intensifying information and data production. Thus, my primary goal in chapter 1 is to explain the theory informing MEOW and further articulate the role that writing and information production play in accelerating capital circulation and how this acceleration invariably impacts writing's metabolic relations with flows of energy and matter.

*Chapter 2: Writing Technologies and their Embodied History of Use*

In chapter 2, I theorize the first material cumulus—the developmental history of writing technologies and their embodied history of use. Part of what gives nonhuman technologies agency lies in this embodied history. That is to say, all human-made technologies are the cumulative product of the long, evolutionary process of time and human trial-and-error. The things we call *tablets* today are the living manifestations of a history of use that can be traced back to the origins of one of the first writing systems—the clay-tablet cuneiform of ancient Mesopotamia. Working from Karl Marx's history of money and the origins of capitalist modes of production, I argue that the development of cuneiform presents for us a different economic history than the one Marx conjectured, a history in which writing, not standardized money, is the indispensable technology for giving rise to capitalist modes of production.

Using the history and evolution of cuneiform as my main example, I trace the developmental tie between writing, quantification, exchange, and capital accumulation that emerges in ancient Mesopotamia circa 4000 BCE. While the hundreds of thousands of tablets that have been found in archeological digs vary in form and function, the vast majority of them are records of accounting and exchange: lists, receipts, orders, and ledgers, to name a few (Goody 1986; Powell 1996). This abundance of economic genres tells us two keys things about the history of cuneiform. One, the emergence of writing is also the emergence of textuality; meaning, it's not simply writing, but also *inscription* and *the archive* that account for the diffuse agency

that writing enacts. And two, the large majority of these texts, economic in nature, are records of the quotidian exchange relations between ordinary Mesopotamians and the palace and temple complexes. Thus, the historical record we have of Mesopotamia strongly suggests that the technologies of writing and information production evolve in a dialectical relation with money, economy, and power.

### *Chapter 3: Informational Capitalism and Web 3.0*

In chapter 3, I explore the second material cumulus in the MEOW framework, the contexts of informational capitalism and Web 3.0. I argue that, in the shift from Web 2.0 to Web 3.0, there is a need to expand our material and ecological theories of digital writing and engage more with the sub-strata of data and metadata that gets inscribed as a byproduct of this writing.

I begin the chapter with a critique of what I call *Web 2.0 writing theory*, an approach to writing theory that celebrates the growth of online writing and the participatory culture that has emerged with social media. I argue that, as we transition into Web 3.0 and accelerating information production, there's a need to re-conceptualize two basic tendencies of Web 2.0 writing theory that have been carried over into new materialist theories of writing. The first is the tendency to background the *exchange value* of writing for an excessive focus on the *use value* that writers find in it. And the second is its *productivist* tendencies and the assumption that *more writing is intrinsically beneficial* for individuals and the shape of public discourse.

Building on my discussion in chapter 2 and the evolution of cuneiform, I extrapolate into the twentieth and twenty-first centuries to theorize the last hundred years as a pivotal turning point in the transition from industrial to informational capitalism, one driven by computerized, digital, global networks and neoliberal economic policies. At the heart of this transition is the rise of *big data* and the corporate data complex of data platforms, data brokers, and marketers that trade in it. I show how, in the past 30 years, the once publicly owned space of the

internet has morphed into a commercialized, global network of inscription designed to produce and collect the flows of consumer-citizen data needed to circulate capital in Web 3.0. I discuss different types of data platforms and focus in on corporate data monopolies like Google, Facebook, and Amazon that manage and control a large portion of how data and information flow in Web 3.0.

*Chapter 4: Information Production, Acceleration, and the Biophysical Environment*

In chapter 4, I place the first two cumuli in the larger cumulus of the biophysical environment and focus on how accelerating information production speeds up the human consumption of energy and matter. Drawing on work from the International Geosphere-Biosphere Programme (IGBP), I explore how, starting with the European industrial revolution, and further accelerating in the 1950s with the rise of digital computing, accelerating informational flows intertwine with capital circulation to speed up flows of energy and matter in ways that are harmful to other systems throughout the larger biophysical environment. The acceleration of information production, spurred by the corporate data complex, has led to problematic spikes in energy consumption at all three stages of an electronic device's life: manufacture, use, and disposal (see figures 4.4a–c, for larger infographics depicting these stages).

As I'll show, while efforts to recycle e-waste are improving and the IT industries are taking steps to design more energy efficient technologies and use more renewable sources of energy, corporate business practices like *planned obsolescence* and the *externalization* of e-waste to developing countries continue to undercut the environmental gains of more efficient design. The ecological imbalances caused by acceleration, and the business practices that fuel it have serious implications for the health of local communities and the planet as a whole. In developing our new materialist theories of writing, we must address the ecological antagonisms caused by accelerating information production

and the growing energy and carbon footprint of our manufacture, use, and disposal of digital writing tools.

*Chapter 5: The Effects of Manufactured Distraction on the Body*

In chapter 5, I remain in the third material cumulus of the biophysical environment but shift from the macrosystem of the planet to the microsystem of the body to consider the effects of accelerating information product on the minds, bodies, and spirits of citizen-consumers. I take a closer look at how the corporate data complex aggressively seeks to stimulate the production of data and how such practices interfere with our ability to think and remember, and, as a consequence, to write. Just as accelerating flows of information are harming the metabolic balance of the planet's ecosystems, so too are they harming our bodies in a multitude of ways and contributing to rising levels of anxiety, depression, stress, and suicide in the United States (Lustig 2018; Twenge 2018; Jowit 2016; Horowitz and Graf 2019).

Drawing on work by Kristie Fleckenstein and the concept of *somatic mind*, I explore how we can better attune to our embodied experience of writing in Web 3.0 and develop a deeper understanding of the social and ecological antagonisms that emerge with ubiquitous inscription. I turn to work in writing studies that looks at the popular tropes of "distraction" and "addiction" used by students to describe their experience of reading and writing in digital contexts. While we should always apply such labels with caution, we nevertheless must be careful not to underestimate the relentless nature of corporate data collection. I look at how the corporate data complex draws on research in psychology and neuroscience to design platforms and products that intentionally encourage habit formation in citizen-consumers. One seismic outcome of this push has been to create a continual state of distraction designed to keep us online and producing data. This constant flow of micro-distractions is profoundly affecting our somatic minds, and, in particular, our *memory*.

In theorizing distraction's impact on memory, I revisit the field's bumpy history with cognitive theories of writing. I discuss how the field's "social turn" in the 1980s and its critique of cognitivist models of writing obscured the body from our study of writing, creating a schism between social and cognitive approaches to writing that persists today. Citing current research on writing and memory, I show how reintegrating cognitive research into our materialist, embodied theories of writing will help us better understand the harms associated with manufactured distraction and the ways it potentially curtails our abilities to write longer, more complex texts.

*Chapter 6: Developing Critical, Ecological Literacies*

In the final chapter, I turn to writing pedagogy and suggest ways universities and writing programs can integrate critical, ecological literacies at the university, department, and classroom levels. Drawing on work from Robert Yagelski and Max van Manen, and combining it with work in education, ecoliteracy, cognitive psychology, and environmental science, I introduce four basic ecological competencies that can serve as a guide for developing ecological literacy at all levels of education.

Building from these four competencies, I share a three-part writing sequence intended to help students *defetishize* their lived experience of writing in Web 3.0 and critically explore their embodied awareness of ubiquitous inscription and constant connection. The primary goals behind the sequence are to use writing as a vehicle for helping students develop embodied learning and better attune to the social and environmental problems we are facing in Web 3.0.

\* \* \*

Web 3.0, big data, and the global archive are in their infancy. We must do our best to imagine what our world will look like 10, 20, 30 years down the road. What will be the effects of another decade's worth of data collection on citizens and consumers? How can we ameliorate or avert the devastating

environmental imbalances that come with accelerating information production and living beyond the earth's carrying capacity? How can we help usher in a digital future and informational economy that works for more of us and is more sustainable environmentally? Answering such questions and taking appropriate action to address these environmental challenges will depend on how we theorize and teach writing and rhetoric in Web 3.0.

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