
DIGITAL THEORY
FAZI
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Digital Theory

IN SEARCH OF MEDIA

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Digital Theory

M. Beatrice Fazi, Alexander R. Galloway, Matthew Handelman, and Leif Weatherby

IN SEARCH OF MEDIA

University of Minnesota Press
Minneapolis
London

meson press

In Search of Media is a joint collaboration between meson press and the University of Minnesota Press.

This open access publication was generously supported by the Canada 150 Research Chairs Program and Simon Fraser University.

Bibliographical Information of the German National Library
The German National Library lists this publication in the Deutsche Nationalbibliografie (German National Bibliography); detailed bibliographic information is available online at portal.d-nb.de.

Published in 2025 by meson press (Lüneburg, Germany) in collaboration with the University of Minnesota Press (Minneapolis, USA).

Design concept: Torsten Köchlin, Silke Krieg

ISBN (PDF): 978-3-95796-084-9
DOI: 10.14619/0849

The digital edition of this publication can be downloaded freely at: meson.press. The print edition is available from University of Minnesota Press at: www.upress.umn.edu.

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Series Foreword

Our present, characterized by machine-learning processes, technological infrastructures, and emerging data worlds, urges us to think about how media are shaping the conditions under which we live, socialize, communicate, organize, and learn. Searching for media as preexisting conditions of our everyday lives requires us to question the parameters, the limits, the times, the spaces of media today. How do media form to our current situation? And how does the situation make use of them?

This book series looks at these questions by examining the often hidden "terms of media" under which users operate. Rather than producing a set of explanatory keywords to describe media practices, the aim is to understand the conditions under which media are produced, and the ways in which media impact and change those conditions. Clearly, recent technical developments have led to the idea of an always-available knowledge. At the same time, this has transformed the very nature of knowledge production itself, including the assumption that more data must lead to more knowledge. Beyond the mere accumulation of data and knowledge, disciplines—from sociology to economics, from the arts to the humanities—are increasingly in search of media as a way to add context and reinvigorate their methods and objects of study.

Exploring the situation of digital media and technology, this series asks: What are the conditions of media knowledge today? To answer this question, each book features interventions by several authors whose approaches to a concept or term (e.g. archives,

communication, networks, patterns, machine, markets) diverge and converge in surprising ways. By bringing together scholars from different intellectual fields and academic regions, this series aims to advance media and technology theory by provoking new descriptions, prescriptions, and hypotheses—to rethink and reimagine what media can and must do today.

Introduction

M. Beatrice Fazi, Alexander R. Galloway, Matthew Handelman, and Leif Weatherby

The digital is theoretical. The three essays in this volume advance such a claim and aim to demonstrate the importance of this argument for media studies and adjacent fields of intellectual investigation. We propose the digital as not merely an object of theoretical analysis but as an ontological marker overlapping with the very notion of theory itself. We thus address *the digital* as a nominalized adjective instead of theories of digital computers, digital cultures, or digital humanities. This is not to deny that the digital takes many sociomaterial instantiations; rather, it is to suggest that the latter may mask the proximity of the digital to the very notion of theory, thus undermining attempts to make sense of this ubiquitous kind of mediation. We seek, therefore, to give the digital the dignity and power of a concept in its own right, one that bears on not only how we think in the age of discrete mediation but also on how thought putatively happens without us, carried out by machines operating via discrete units.

Here the reader will find theorizations of the digital at the intersections of mathematics, philosophy, and other disciplines. Indeed, a theory of the digital will tend to reshuffle the conventional disciplinary boundaries. It cannot shy away from mathematico-technical discourses but will also engage with cultural theory and philosophy. We approach digital theory, however, as a distinctive intellectual investigation that cannot be subsumed under any other

preestablished schema because it is itself a foundational condition for rational inquiry. Unlike other media, the digital meets the problem of rationality where it is. What unites these three chapters is the wish to address an unanswered question about what this form of mediation *is*—a question that is born ontological but, as we shall see, quickly becomes epistemological, and even metaphysical, as soon as it is asked.

In everyday speech, the term *digital* is frequently understood by way of reference to consumer electronics. This approach suggests that the best way to define the digital (if not the only way) is to inspect actually existing technologies and root the digital there—the internet, smartphones, gaming consoles, server farms, and the like. Often such approaches provide a useful way forward, as evidenced by scholarship successfully addressing the social, cultural, economic, and political implications of such devices. In the long term, however, attention restricted to consumer electronics tends to limit the frame of study of the digital both conceptually and historically.

To remedy this, we prefer a minimal working definition of the digital: *the digital is a form of mediation that uses discrete units.* All three of the chapters in this book will complicate this definition, of course. We favor this minimal working definition because it helps us expand our study beyond a rather narrow industrial history largely animated by a short list of companies (e.g., Microsoft, Nvidia, Alibaba) and a short list of places (e.g., Silicon Valley, Bangalore, Shenzhen). Indeed, this definition provides several additional benefits. It allows us to engage with a more capacious archive of events and notions, and it frees us to find the digital in situations one might not expect. For instance, one of the oldest questions in philosophy and science concerns the dynamic between the discrete and the continuous; it is no anachronism to insist that digital theory is hundreds of years old. Our proposed definition of the digital also makes it much more possible to engage with some of the questions that most animate our respective essays, questions like the nature of thinking and the role of the dialectic.

While the basis of digital theory is quite old, tracing back through figures like Turing, Leibniz, and even Euclid and the Pythagoreans, modern reflections on digitality arrived more or less concurrently with the advent of digital computers in the middle twentieth century. Perhaps the most notable early discussions are contained in the Macy Conferences, particularly the Seventh Conference, held on March 23–24, 1950, where luminaries such as John von Neumann, Norbert Wiener, and Julian Bigelow haggled over the meaning of the terms *digital* and *analog* (see Pias 2016). After these early discussions, themselves somewhat improvisational and ad hoc, the first sustained theoretical reflection on the digital was written by Nelson Goodman in the "Analogs and Digits" section of his 1968 book *Languages of Art: An Approach to a Theory of Symbols.* Goodman's text provoked notable responses by philosophers David Lewis (1971) and John Haugeland (1981). Yet arguably the most significant early study of the digital and the analog was written by Anthony Wilden (1972), a theorist of systems theory, structuralism, cybernetics, and in fact also an early Lacanian. More experimental and capacious than the other inaugural texts, Wilden's chapter on "Analog and Digital Communication: On Negation, Signification, and Meaning" investigated the discrete and the continuous, questions of difference and logical typing, as well as the internal relationship between the digital and the analog, which Wilden characterized through the concept of metacommunication.

Theories of the digital have proliferated further since the 1990s, following the widespread adoption of personal computers and the World Wide Web. In the United States, media theorists such as Janet Murray (1997) and Lev Manovich (2001) both defined the digital by way of a set of features specific to the medium. In German media theory, key texts by the likes of Friedrich Kittler (2001 and 2006), Sybille Krämer (2003), and others have situated the digital within the larger field of writing and cultural techniques. Indeed, German readers have a particular advantage: Bernard Siegert's 2003 book *Passage des Digitalen: Zeichenpraktiken der neuzeitlichen Wissenschaften, 1500–1900* [The Passage of the Digital: Semiotic

Practices in Modern Science, 1500–1900], as yet untranslated into English, excavated the deep history of digital cultural techniques, from double-entry bookkeeping through to the modern flip-flop circuit. And in 2004, Jens Schröter and Alexander Böhnke edited the German-language collection *Analog/Digital—Opposition oder Kontinuum? Zur Theorie und Geschichte einer Unterscheidung* [Analog/Digital—Opposition or Continuum? On the Theory and History of a Distinction], which is one of the most wide-ranging and sustained investigations into the terms *analog* and *digital*.

Taking inspiration from these existing documents, we find consensus around a number of points, particularly the relationship between digitality and symbolic systems. At the same time, we depart from many existing theories of the digital by insisting on an intimate relationship between theory and the digital. Fazi prefers to join theory with the digital, arguing that the digital is a mode of thought. Galloway also treats the digital as a technique within the history of rationality. And Handelman and Weatherby approach the digital as a particular iteration of dialectical reason. In other words, while digital computers have been in operation for several decades, and scholarly reflection on such machines is at least as old, we urge scholars and theorists to plumb the question of the digital and its relationship to thinking. This emphasis is key to our shared endeavor to theorize the digital. With our respective contributions to this volume, we map the distance between the digital and thinking differently, yet we are all willing to embark on such a mapping. This approach, we suggest, has been underrepresented thus far.

Undoubtedly, the operational and conceptual similarities between digital technologies and techniques, on the one hand, and procedures of abstraction and formalization, on the other, have experienced periods of focused scrutiny. Pioneering figures in engineering and computing such as Alan Turing (1936) and Norbert Wiener (1948) interrogated the digitality of calculating machines and its relation to computability, control, and communication in the years following World War II. The legacy of these and comparable

reflections have productively informed theoretical work on the digital. Such conversation with computer science constitutes one of the distinctive characteristics of contemporary media studies. Consider, for example, how digital media theorists often approach mediation (and technology at large) somewhat differently from how a communication scholar would; digital media theorists would attend, as a consequence of a certain familiarity with the algorithmic procedurality and quantitative specificity of digital electronic computers, less to "content" than to "form." As Aden Evens has recently put it, "the digital works by virtue of its formalism," which, far from being arid and lacking, allows bits to be "simultaneously symbol and substance" (2024, 19–20). That combination seems to us redolent of theories of thinking, rationality, and the dynamics of logic and computation that exceed those of computing. Yet, when it comes to addressing the relation between the digital and thought, this connection has been often subsumed into discourses around cognition or intelligence, and around computation as a metaphor or simulative means for both. Equally, despite its original setup as a study of media as "extensions of man" (McLuhan 1964), contemporary media theory has generally been more than happy to delegate the treatment of those topics to cognitive science (a field of research also benefitting from a close affinity with computing). This passing of the buck has perhaps also been encouraged by the way in which philosophy, in its complicated relation with technology, vetoed certain speculative hypotheses granting legitimacy to the digital qua quantification and mathematization. Because of such constraints, theory has failed to develop a theory of thinking; a theory of the digital can make up for that.

Alongside the digital understood in terms of consumer electronics, and perhaps because of such common assimilation, the digital is also often conceived in terms of its "others." The first and most glaring of such contradictory twins is what goes by the name of "the analog." But what is the analog, exactly? In fact, we define it similarly to the digital: *the analog is a mode of mediation using continuous variation.* Is there thus something called "analog theory,"

a counterpart to the digital theory we are advocating to build? One may ask whether we are leaving too much out (of experience, of life, of what attempts to resist technology altogether) by focusing so much attention on the digital. And, potentially worse, one may wonder whether this book is a form of digital evangelism, so to speak, celebrating the thing that it defines. These are all important questions. Suffice it to say, the four of us do not have consensus on the question of the analog, just as we do not have full consensus on the question of the digital.

What we are all keen to avoid, nevertheless, is any romanticizing celebration of the analog as a supposedly superior mode of engagement with reality or as a privileged expression of what it means to perceive, act, and feel. While the 1990s experienced a wave of enthusiasm around the increasingly digital foundations of society, the 2000s and 2010s reacted to twentieth-century fantasies of computational disembodiment by stressing the inevitability of "matter" (often without ever defining the term). This emphasis on materiality is true at a sociocultural level, when for instance the internet became "of things" alongside the expansion of the terrain of neoliberal, corporate economic capture. Within scholarship, however, it is also documented in a series of positions and approaches in cultural and critical theory (of media, technology, and else) that celebrate existence and life as inherently different (or, again, "other") from the representational, linguistic, arithmetic limits of machines. While the four of us have different takes on how a rejection of the "superiority of the analog" argument should be formulated,[1] we all recognize how that argument and its many manifestations end up stifling digital studies. Most significantly, we agree that this situation can be overcome by investigating the ontological status of the digital. In short, if the analog is superior and the digital is inferior, a specific ontological arrangement results: discreteness becomes a kind of epistemic illusion floating atop a world that is instead inherently continuous (and hence, analog). We disagree with this sort of analog chauvinism. If the analog exists, it is coequal with the digital, not superior to it.

Among the so-called synechists (those who favor continuity) may be found ancient philosophers such as Aristotle, as well as modern ones such as Gilles Deleuze, Henri Bergson, and Gilbert Simondon. Indeed, Deleuze is one of the great philosophers of the analog, devoted as he was to the qualitative nature of material and energetic processes largely in the absence of overweening discretizing abstractions such as symbols or numbers.[2] There is a peculiar mismatch between Deleuze's deep insights into the digital condition and his ontology, a mismatch illustrated well by his widely-read "Postscript on the Societies of Control" (Deleuze 1992). Deleuze's ontology is one of "immanence" and "folding" on a "plane" that is "virtual," and while devoted Deleuzians have used his work for the study of discrete technologies, it remains unclear whether Deleuze's philosophy fits the digital at all.[3]

For the purposes of this book, we suspend any relation to the metaphysical uses of the analog, which tends to reduce the very real effects of the digital to a "lie." We carry this even to such non-Deleuzian cases as the media physicalism of Kittler, who preposterously suggested that "There Is No Software" (1997). To consider the digital as a formal epiphenomenon is, in our view, a dead end. Even the "antihype" position against AI, alongside the constant appeal to "embodiment" and nonabstract entities evident in much cultural studies and sociology of technology, seems to sync with (if not directly stem from) this analog origin within the realm of digital studies. We see it as a theoretical cul-de-sac precisely because it does not take the formal, abstract, and rational aspects of the digital seriously enough to counter the dangers it poses in its capitalist form. The world is not fundamentally simpler, purer, or more authentic than its digitally networked doppelgänger. Technology will likely not save us, true. But seeking refuge in poetry or nature will not save us either.

Engaging a similar set of concerns, another "other" to the digital is what we could call "the real." Opposing the digital to the real runs the risk of the same dogmatic, tractionless resistance to the digital that analog philosophy has tended to mount. To be sure, some

thinkers tend to conflate the analog and the real, while others try to separate them. For instance, Lacanian psychoanalysis proposed a tripartite system in which the Real is distinct from that form of provisional continuity and coherency labeled the Imaginary, both of which are likewise distinct from language itself (the Symbolic).[4] According to this system, the digital could be subsumed within the Symbolic. The insistence on the real as a realm separate from and untouched by the digital keeps up the hope that one could simply unplug from the matrix, exiting the illusion of the digital in order to reenter a presymbolic reality. One problem with this view is that it replicates the structure of ideology, in which the digital is tantamount to false consciousness. But, more consequentially, it hypostatizes a presymbolic realm that contracts in proportion with every technological-computational advance, every expansion of the symbolic order.[5] In contrast to these digital others, we hew closely to the two foundational, interrelated questions that guide this volume throughout: as a form of discrete and discretizing mediation, how does the digital relate to thinking; and, subsequently, how does the digital function as a form of thought?

Once again, there are dissimilarities and distinctions between our respective proposals for how to address and develop these questions. The most straightforward way to introduce these differences is by outlining the three different dynamics emphasized in the three chapters.

In her essay, "What Is Digital Theory?," M. Beatrice Fazi urges us to think the digital as thought. She insists that there could be no theory other than digital theory precisely because of the isomorphisms that exist between the digital, theory, and thinking. Her essay, then, opens this volume by making the case for the digital as a general, foundational condition for thinking; definitions of the digital, thought, and theory all meet at a crucial conceptual nexus in chapter 1. Such a conjunction is possible because of the two onto-epistemological movements that Fazi assigns to abstraction (the key operator she sees behind digital technology as a technique of and for thought). Abstraction separates, yet it also unifies.

Theory, in turn, does the same; theory is both a blade and a glue. The operations of discretizing mediation of the digital, finally, are also analytic and synthetic alike. When Fazi argues for a theory of the digital "in and of itself"—a theory that would be able to accommodate the digital's *quidditas,* its *ti esti*—and when she emphasizes how theoretical investigations of the digital in media studies have instead traditionally relied on conceptual proxies to account for the digital, it is to defend abstraction as a double movement. For Fazi, the digital does not need to encounter its own negation (i.e., the analog, or the real-as-the-site-of-the-analog, as what is supposedly outside abstractive formalization) for its actuality to be recognized. Similarly, the digital does not need to wait to be instantiated into thinking (via electronic computers or anything else): the digital is already a form of thought. This is simply because there is no access to reality that would not already involve abstraction. To study the digital is to study this ingression. Digital theory can address the world, and say something meaningful about it, because digital is the form, structure, and function in which the world is thought.

Alexander R. Galloway's essay, titled "A Brief History of Digital Philosophy in 10 Expressions," defines the necessary conditions for any symbolic order of the digital type. For the school of thought known as Digital Philosophy, the world is discrete at its most fundamental level, evidence of which can be found in physics and elsewhere. Departing from that existing school of thought, Galloway explores digital philosophy less as a thesis about nature than as a specific way of doing philosophy. His brief history of digital philosophy thus focuses on the axioms and principles that must be effectively internalized for any form of digitality to make sense in the first place. In other words, the digital is not so much the reality of natural discretization as it is a decision within philosophy, often a rather unnatural decision, which itself ought to be denaturalized. The chapter explores this decision through a series of simple mathemes—ten of them—including some alternative formulas that have refused or otherwise departed from the long history of digital philosophy.

Both Fazi and Galloway remain committed to the discretizing *cut* of the digital and seek this cut beyond the machines that make up our contemporary world. For both authors, the digital is an ancient and capacious concept. However, Fazi and Galloway each assign to the digital a different degree of influence and hold upon the real, which consequently implies a different relation to the analog and thought. For Fazi, to represent is to mediate through discretization, and hence representation is, to a large extent, always digital. For Galloway, on the other hand, the digital is a mode of representation alongside equivalent and equipotent ones (the analog, again, being the most obvious other). While Galloway states that to study the digital is to address a decision within philosophy, Fazi's chapter expands the reach of the digital to all theory insofar as the scope of theory is to mediate between thought and world through representations of the latter.

These first two essays also set up the problem of immanence. Fazi contends that a problematization of immanence should be a central and necessary point of speculation in any theorization of the digital. This is not to say that the digital should be equated to the transcendent. There is no higher realm informing a lower layer or level of reality. Just like the analog is not superior to the digital, the latter is not superior to the former either. Fazi however insists on the danger of flattening thought onto sensation and thus of not attending to the specificities of the two. (Deleuzian theories of the digital frequently reduce thought to sensation: this is a red flag.) While Galloway's chapter, in its conclusion, stresses how tautology may plunge thought again into immanence and thus counteract the expansion of the digital, in Fazi's view the very possibility of thinking tautology in the first place engulfs analog identity in digital difference.

In their essay, "Digital Dialectics," Matthew Handelman and Leif Weatherby also address the question of immanence, except now in the context of dialectical thinking. The tradition of dialectical thinking might at first seem strictly opposed to the discretization of the world, in the same way critical theory opposed quantification

and instrumentalization.[6] The cut of the digital, however, is at the center of a negative dialectics that insists on the entwinement but also the irreconcilable difference of subject and object, thought and world. One might jump to the conclusion that this turn to dialectics represents an attempt to reconcile the digital with its long-lost others, the analog and the real. This move could not be further from the intention here. As Handelman and Weatherby argue, dialectics is the dynamics of concepts, the ability to hold two contradictory ideas in union. The dialectical movements of the digital can be found less in a dialectic of the digital and analog than in the idea of number itself, the discrete natural numbers 1, 2, 3, 4, ... What is dialectical about the digital is that it can serve as both count and operation, number and logic, data and command at the same time. As George Dyson puts it, the revolution of the digital world occurred as Alan Turing, John von Neumann, and others erased "the distinction between numbers that *mean* things and numbers that *do* things" (2012, ix). For Handelman and Weatherby, however, the idea of erasure is only half the story: it is not logic instead of number, nor command's takeover of data, but rather the combination and coordination of both that allowed the digital world to come into being.

In conversation with Fazi's and Galloway's essays, Handelman and Weatherby contend that where rationality, abstraction, and formalism reign, there too we find the space of the dialectical, and so long as that form finds content, the abstraction ends up being real; yet where rationality is dynamic, the coupling of thinking with the digital forms the conditions for what dialectics has always been meant to address. Although the dialectical tradition remains poor in theories that include quantity—except in the case of Hegel—it is nonetheless that space where any transcendental cut coincides with the real, meaning that any account of the digital's ability to combine abstract functions with value-laden data must overlap with the world of the dialectic. This is even more crucial to observe in the case where we think of the digital as offset from the analog. Hegel, Marx, and even Charles Sanders Peirce

regard their more-than-binary systems as specifically tailored to dealing with the persistence of continuity in discrete systems, the truth of a real that is not excluded on the basis that it is arbitrary, symbolic, or formal. Handelman and Weatherby make the case that the digital rests on a contradiction between number as logic and number as representation, showing how the dialectical core of the digital was historically obscured from view by the acrimonious debate between Logical Positivism and Critical Theory. This debate, often called "the positivism controversy" (*Positivismusstreit*), stifled digital theory within a dualistic deadlock. On one side, the digital was defined via purely syntactic formalism (what Handelman and Weatherby call the "analytic conception of the digital"). On the other side, dialectics was primarily understood as something that might explain culture or society but would be inappropriate to apply to numbers or the digital. Breaking through these entrenched positions, Handelman and Weatherby's essay reconstructs the deeply dialectical mixture of quality and quantity missed by both Logical Positivism and Critical Theory and without which, they argue, digital machines could not operate.

The three essays in the book share the premise that the digital is both a medium and an ontological state. Because of this, the digital raises questions far deeper than any of its local manifestations or consequences. These questions—if not the answers—share the same air as the study of thinking and theory itself. Would-be theories of the digital, whether they attach "media" or "critical" to "theory," have hitherto fundamentally misrecognized and misinterpreted the conceptual and significatory depth of the digital. Coming to theoretical terms with the digital as a concept in its own right remains one of the core tasks for thought in a digital age.

Notes

1 The "superiority of the analog" thesis finds its most philosophically refined elaboration in Massumi (2002).

2 See discussions in Fazi (2018) and Galloway (2022).

3 For some of us, a Deleuzian philosophy of the digital would indeed be a contradiction, and any such attempt to build one risks transducing or translating the

logico-quantitative aspects of digital technology into the intensive qualities of Deleuzian ontology. See Fazi (2019).

4 We capitalize the "Real" only in specific reference to Lacan; on the relationship between the Lacanian Real and the digital, see Kittler (1999).

5 See Weatherby (2025).

6 See chapter 1, "The Trouble with Logical Positivism," in Handelman (2019).

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[1]

What Is Digital Theory?

M. Beatrice Fazi

The Digital in and of Itself

What is *digital theory*? It would be tempting to answer this question by addressing the academic area of study that is often so named. However, I will not do this. I will not represent the academic field of digital theory; I will not depict it or characterize it. I am not composing a report, and nor am I flying a flag. Undoubtedly, there are snapshots that could be taken at this moment in time that would render the general shape of this area of inquiry. There are maps to be drawn; these maps may not be the territory, but they are useful tools for orientation. There are ethnographies to compile about theoretical scholarship on the digital too—literature reviews and "scoping exercises," as the bureaucratese of funding institutions calls them. In this chapter, however, I will not produce any of these inventories. This is partly because I envisage it more as a wish list than as a survey, but mainly because such surveying might not tell us much about what digital theory is or could be, anyway.

The crux of the matter is that, while there are many studies of the digital, most of them cannot be called "digital theory." Certainly, some propositions in digital studies are distinctively theoretical. This does not mean, however, that these propositions are de facto offering a digital theory. I am being literal here; taking the words in this expression in their primary sense, I use *digital theory*

to mean "a theory of the digital," that is, a study of the digital *in and of itself.* What I am presenting, then, is the observation that many theoretical studies of the digital rather proceed by and work through great proxies: culture, society, economy, politics, art, and the greatest proxy of all, media. There is nothing wrong with this; in fact, there is plenty good about the kind of work it involves, which investigates how different categories of both individual and collective existence produce and reproduce themselves vis-à-vis digital technology. For the sake of the present study, however, let us take things literally; let us consider how the type of scholarship I am referring to often addresses ways in which the digital is lived, experienced, exchanged, communicated, signified, perceived, acted upon, and thought about, yet much less frequently addresses *what the digital is.*

In some cases, this neglect is involuntary, which is to say that it is not even recognized. If the neglect is acknowledged in these cases, however, a possible response to my concern would be that the digital is what the digital expresses in culture, in society, in economy, in politics, in art, and in media, especially. A possible response to my objection, that is, would be that there is no being of the digital if not through its modes, byproducts, and effects. In other cases, however, what I argue to be a general negligence of ontological questions about the digital reveals methodological constraints and ideological commitments through and by which theoretical approaches are often framed and sustained. Here, I want to address two such cases.

First, theory is routinely understood as critique.[1] Doing digital theory is thus understood as doing criticism of the digital condition. This equation between theory and critique is not specific to digital studies but rather an enduring, consolidated equivalence within the humanities. It is a Kantian and Frankfurtian legacy, of course.[2] Historically, however, it is also the result of decades of internal academic feuds, such as those that took place in the 1980s and 1990s, when theory was the object of a war of sharp words amid competing scholarly paradigms, some of which attacked theory's

raison d'être.[3] In that context, the work of the theorist was either celebrated or condemned for feeding the sociolinguistic appetites of a discourse (i.e., of a system of thought) through its very same critical analysis.

To be clear, I am not claiming, as others famously have, that critique has "run out of steam" (Latour 2004; see also Felski 2015). Mine is not a polemic against critical readings of the digital per se. A little cynical, often unforgiving, and never inclined to offer ready fixes, theory as critique is valuable not despite but because of these characteristics. Theory is critique of a crisis one dares to care about. Yet, if we are to follow my proposed definition of digital theory as a study of what the digital is, there is a sense in which, within a strictly critical approach, the question "What is it?" becomes an *interrogatio non grata,* a question *not* asked by critical theorists not only of the digital but also of everything else. Whether devoted to deconstructing texts, uncovering the materiality of social life, or finding and exposing power practices, theory as critical analysis habitually glosses over ontological questions, partly because it fears reinstating traditional philosophical canons and metaphysical classifications and partly because such ontological questioning is not considered central to the diagnostic and emancipatory tasks of critique. This inattention to ontological foundations is a limit of critical theories of the digital that I would like to see the same theories overcome.

While what I call "digital criticism" develops a series of post-Kantian assumptions on what theory can ask about its own object of inquiry, what I refer to as "digital phenomenology" sets too specific expectations as to what theory should or should not be doing. I understand digital phenomenology as another distinctive way of doing theory within digital studies. Elsewhere, I have described as phenomenologically inspired those approaches that posit a perceptual or experiential continuum as the ground upon which it becomes possible to explain the digital, mostly via hypotheses about intentionality, consciousness, and embodiment (see Fazi 2018a). Here, however, I am using the term "phenomenology"

more broadly to refer to the philosophical method and tradition that investigate the origin and meaning of first-person experience and the possibility of approaching both Being and beings in their situated, lived orientation.

Strictly speaking, questions about what the digital is get to be asked within phenomenological frameworks. However, they get asked insofar as the digital can be presented to the lived world of an experiencing subject, who is positioned as the source of the digital's meaning and whose experiences are taken as central to the understanding of what it feels like to live under a digital condition. This recalls scholarly observations around the English translation of Martin Heidegger's text *What Is Called Thinking?* (*Was heißt Denken?*), first published in 1954, particularly those concerning the English translation of its title (Heidegger 1968).[4] *What Is Called Thinking?*—yes, but also "What calls for thinking?"—that is, what brings it forth, what directs us to it or demands it, even? A similar expanding sense of this questioning could be applied to digital phenomenology. Thus, "What is called the digital?" might also be phrased as "What calls for the digital?" "What brings it forth?" "What directs us to it?"—or, indeed, "What requires it?"

There are many reasons why digital studies sit comfortably within media studies, the obvious one being that digital media constitute a large part of the consumer electronics that instantiate and propel the digital into the wilderness of experiential relations. Scholarship on the digital has not yet fully developed the theoretical implications of mediation as this operates via digital technology; media studies (and digital studies within it) remain fresh and engaging because of this only partially exploited potential for conceptualization and explanation. Nonetheless, in a digital phenomenology context, which is much pervasive in media studies, mediation is largely approached as a matter of existential translation, or revelation, via the experience of a "user" (broadly construed). As such, these disclosures cannot be directly included in the set of theories of the digital in and of itself but should be addressed as theoretical investigations of how the digital can

be coextensive with or mapped across the subjectivities that experience it.

"In and of itself" is a tricky expression. The central claim I have proposed so far has been that a theory of the digital should ask, "What is the digital?" and thus look for its ontological characteristics. *Quidditas* is a term that comes from the dusty, Scholastic past of philosophy and its medieval recuperation of classical antiquity. Often transliterated in English as "quiddity," *quidditas* is the abstract nominalization of the Latin interrogative pronoun *quid* (the question word "what") and was used by the Scholastics to encapsulate Aristotle's expression *to ti ên einai* (τὸ τί ἦν εἶναι, or "the what it was to be," translated into Latin as *quod quid erat esse*). Scholastic philosophy thrived on arguments over and for distinctions through rhetorical disputation; the concept of *quidditas* held much operational power in that setting because it allowed the scholars to address the *what* that makes something different from other things. The same operational power can be exercised in relation to the present discussion on the digital, yielding digital theory as a study of the digital's "whatness" or, in other words, a study of what makes the digital different from what it is not.

Traditionally, the concept of *quidditas* was used to refer to a logical determination, which makes the notion particularly interesting for our purposes. *Quidditas* is a whatness that is given in thought, noetically; it is not a description of the essential nature of a thing but rather the definition of an ontological whatness as this is epistemically expressed and elaborated. The difference between a description and a definition is key; this difference also returns us to the limiting scope of digital phenomenology highlighted above. Digital phenomenology aims to describe, not define. This goal is in line with the hermeneutic remit of phenomenological enterprises in which ontological questions are directed toward the interpretation of existence, and description is a basis for interpretation, thus explication. Defining, on the other hand, is a specific mode of answering an ontological questioning that gives rise to an equally specific type of knowledge, one that is not primarily interpretative but explanatory.

In order to expand on this claim, it is useful to consider philosophical sources that are not generally associated with theoretical studies of digital technology but can support the argument being made here for the importance of asking ontological questions leading to definitions. These sources are not necessarily superior to the analyses of phenomenology or critical theory. They are, however, sufficiently historically and conceptually distinct to allow for the possibility of opening up a path toward the "in and of itself" of the digital that digital theory should be concerned about.

In classical antiquity, the answer to the question "What is it?" was fully addressed only in the definition of the *what* in question. This is Platonic as much as it is Aristotelian and is best exemplified in the Socratic question, *Ti esti?* (Τί ἐστι; "What is?"). This deceptively simple question is the dialectical core of the dialogical inquiries of Socrates, who would ask it to his interlocutors in order to discern the universality of that dialogue's premises and then build a rigorous definition that would break with both the rhetorical tricks of the Sophists and common doxa.[5] This kind of questioning uncovered how those who thought they knew, in fact, did not. The admission of ignorance was the point at which Socrates wanted to arrive, as the ground upon which true, solid, rational reasoning and conceptual analysis become possible.

In philosophical usage, the Socratic *ti esti* and the Scholastic *quiddita*s have often assumed comparable functions and translations.[6] These examples from the history of philosophy can be similarly used to argue for digital theory as an investigation of the digital in and of itself. *What is the digital?* This is the question that should be at the heart of digital theory. Obviously, it is not the only question that a theoretical approach to the digital can ask, but it does constitute a central grounding moment for digital theory, a moment that defines what digital theory is via the search for the definition of the digital itself. Digital theory starts as a theory of the digital, then, a theory of the condition, status, situation, entity, and event that can be defined "digital" and of the reasons and rationales of that defining.

If generality is the propelling force of theoretical work and generalization a prerogative of theory, it follows that in the verb "to be," theorists can find a means for conveying both the impetus and the choice to ask for definitions. The most common but also most irregular English verb, "to be" is syntactically special (in some structures, for example, it can be omitted) and semantically distinctive (it can mean "occur" or "happen" and is used to express identity, equivalence, and the existence of an entity and also, predicatively, an entity's qualities and characteristics, its behavior, position, and actions in progress). Because of the diverse predicative, locative, existential, and veridical functions of this verb, what and how "to be" can be said to signify is a matter of philosophical concern. Whether it can express the depths of ontology remains an open discussion, and asking "What is the digital?" already situates digital theory within such metaphilosophical debates about the vocabulary of being.

When asking "What is the digital?" we are inquiring about the reality of the digital. We are investigating the specificities of the digital, the possibility for it to be a subject or an object with predicates, and its capacity to preserve its difference from nothingness. Arguing for a theory of the digital that starts from ontological definitions, however, does not equate to endorsing a "digital ontology." This expression denotes a set of beliefs about the ultimate nature of reality, according to which being digital is a characteristic of nature. I do not hold such a belief and am not claiming that theories of the digital should.[7] Rather, I am arguing for an investigation of what the digital is, which is quite different from that which sustains the idea that all beings are themselves digital. While what is known as "digital ontology" uses the digital to explain reality, I want to ontologically explain the reality of the digital. At the same time, however, I am arguing for this reality to be defined and not only described. This is the scope that I ascribe to digital theory.

In the act of defining, a cutting or division is involved; clarification is achieved through distinction and separation. Characteristic of definition, however, is also the establishment of a connection to

meaning. Defining is not a unique act but an iterative procedure, one in which care should thus be taken to avoid circularity. Indeed, an argument for the importance of defining requires a characterization of the kind of definitions sought. For digital theory, I am saying, these are *ontological definitions,* which generalize but also qualify, like any theory worthy of the name does. A definition is not only a specification of that "what" which is particular to something but also a delineation of the criteria and conditions that distinctively identify that whatness. To define the digital ontologically (as a theory of the digital should do) is thus to assign to the digital certain attributes (certain features, traits, aspects, etc.). It is also to place the digital, as an idea and an object, within a structure of predication and thus within a dynamic that is about being as much as about logos (and hence, truly onto-logical, insofar as predicates pertain *to* things and are said *of* things).

If the digital is also to be defined through its predication, this predication should address the digital positively, that is, by stressing what the digital is as opposed to what it is not.[8] When addressing digital media or digital computers, for example, a useful (and common) definition is advanced via comparisons with analog equivalents. Comparing and contrasting the digital and the analog is part of the ontological exercise I am advocating. Such evaluation, however, falls short if it remains confined to apophatic accounts of the digital in terms of what is not analog (or vice versa), as if there were little one could positively affirm about this beyond that distinction and negation. The digital should not be theorized as an unknowable source or ineffable manifestation of a past, present, or future techno-representational condition. Conceptualizations of the digital/analog relationship such as, for instance, those presented in Galloway's and Handelman and Weatherby's essays in this volume (respectively, chapter 2 and chapter 3), successfully show how asking "What is the digital?" involves instead operating at the level of the theoretical generation of this very same notion—an idea that acts as an onto-epistemological hypothesis and, as such, can become the object of a theory.

Equally, the act of defining the digital cannot be restricted and reduced to the act of calling something "digital." Here, we should return to the earlier observation that theoretical studies of the digital often proceed through proxies: they do not present a theory of the digital in and of itself but focus on something that can be depicted as digital (much can be certified "digital" today just for happening at a time when digital technology is so ubiquitous). I borrow the term "proxy" to assess this circumstance, taking the term from the vocabulary of law rather than from computer science (where it is also widely used).[9] In a legal context, a proxy is an intermediary power, an entity that moves back and forth between two sides and is authorized to function as a substitute for another. This implies not only mediation but also substantive agency and delegation alongside substitution. Think, for example, of a "proxy vote," which is a form of voluntary representation, a relay of agency where a proxy stands in for their counterpart. Or think of a "proxy war," a conflict that is carried out vicariously, often surreptitiously, with one force acting on behalf of another. In suggesting that digital studies often offer theories of the digital by proxy, I mean that forms of surrogacy are in place there, too. The concept of *digital culture* provides a good example.

Within digital studies, digital culture is delegated the active role of explaining not only the culture underpinned by digital technology but also much of what is digital about that technology. The adjective *digital* itself is left largely unquestioned because it is used as a gateway to address something else, something that happens to be sustained through the means that the adjective is supposed to identify. I believe that theories of digital culture are legitimate theoretical inquiries, just as are theories of digital economy, digital art, digital society, and the like. Culture, economy, art, society, and other categories are not to be dismissed or underappreciated; on the contrary, they help us to see how the concept of the digital is situated within an arrangement of life practices. Issues arise, however, when these theoretical propositions about digital culture (and digital economy, art, society, etc.) claim to provide a "digital theory"

without realizing the subcontracting of concepts that is occurring there, under their watch. In this process of "proxification,"[10] the digital in and of itself becomes invisible while something else acquires authority over it through a series of conceptual relays.

A theory has the difficult job of shaping and sustaining the intellectual landscape that can accompany a concept in the world. While theorizing is inevitably a selective form of categorization involving a core and a periphery, onto-defining the digital (as anything else) does not mean subscribing to a dual system of essences and accidents or believing that the reality of the digital (as of anything else) has various gradations or more or less tenuous relationships with some forms of instantiation. Equally, onto-defining the digital does not imply neglect of the historical density or material complexity of the concept or a detachment of the digital from social meanings and empirical facts. Objecting that nothing general or formal can be said about the digital beyond its sociocultural phenomenality or its physical instantiations, however, would mean conceding that space, time, context, and content all block the thinking of the digital (and hence, its very own theory), forcing such activity into a concatenation of external relations among concepts and practices.

Theory Is a Blade, Theory Is a Glue

Let us continue the exercise of addressing "digital theory" on the basis of the meaning of the words in this expression. Part 1 of this chapter has made the following argument: digital theory should be understood as a theory of the digital in itself and of itself. We first observed that one can find rich theoretical propositions within the field of digital studies but very few theories of the digital as such and then went on to argue that digital theory should investigate what the digital is and that such investigation should offer ontological definitions. There is another way we could go now, another path to walk, another axis around which our discussion could rotate: we could define digital theory reflexively, as a theory that is digital. Several complexities need to be considered when the first

proposed definition (digital theory as a theory of what the digital is) and this second one (digital theory as a theory that is digital) intersect with each other. I will return to consider this intersection; first, however, we need an explanation of how and why all theory is, to a large extent, digital, for *there is no theory other than digital theory.*

The claim that there is only digital theory is one about the form, structure, and function of theory itself, not about its object. Hence, the assertion is not that all theory concerns the digital but rather that all theory *is* digital insofar as all theory discretizes. This point on discretization is central. According to the minimal definition of the digital that this book proposes and applies, the digital is a mode of mediation using discrete units (see Introduction, in this volume). At the speculative juncture between my two proposed definitions of digital theory, that minimal definition can be activated and mobilized to discover the *ti esti* of theory as entwined with the *ti esti* of the digital, their respective quiddities as related. If we want to understand what digital theory is, we now need to address directly the characteristics of theoretical inquiry and, correspondingly, those of the digital.

It would be impossible to comprehensively summarize how "theory" and its semantic cognates have been reasoned in the long, multilinear trajectory of intellectual history.[11] Under "theory," dictionaries include words such as "conjecture," "thesis," "model," "doctrine," "conception," and "assumption." To theorize is to assess, to predict, to postulate. Even though, in colloquial speech, a theory is often nothing more than a fortunate hunch or an educated guess, ancient Greek etymologies give to theory the heroism it deserves and that we get to recite whenever we do the work of theorizing.

The pursuit of a *bios theoretikos* (βίος θεωρητικός)—a life devoted to knowledge and understanding—was defended by Aristotle but already championed before him by Ionian philosophers and the pre-Socratics.[12] According to this lineage, from which theory takes the most recognizable of its semantic nuances, *theorein* (θεωρεῖν)

is "to look at" or "to behold." Etymologically, theory is tied to observation. This is crucial when considering, for instance, how, since modern times, a scientific theory has had to be consistent with the scientific method and affirmed through verification or falsification.[13] For the ancient Greeks, however, *theorein* was also the looking at performed by the mind's eye, so a mental viewing; *theorein* is thus "to contemplate," "to speculate," "to discern"—an act and an ethos whose seeds are cultivated via intuition and formalization alike.

A theory is more a process than a product. This process incorporates laws and builds on hypotheses, although a theory might also conform to neither. The extent to which a theory is said to need a ground varies, but it is often the case that theory itself is understood to do the work of grounding. Within knowledge institutions, "theory" is frequently juxtaposed with "practice" and the two presented as encompassing different pedagogies. Undoubtedly, there are disparities between the institutionalizations of theory and practice as two modes of knowledge production, yet theory is already a form of doing that has scope for action and realizability.[14] A theory can be descriptive, prescriptive, interpretative, contemplative, speculative, or critical. It might desire empirical support or be thoroughly blasé about that. While there are obviously differences between, for instance, the theory of gravitation (in physics) and the theory of deconstruction (in literary analysis), all theories need to develop a language or a system of symbolic relations that can explain and predict. Through that language, a theory must identify not only variables but also relationships between the variables. Likewise, new concepts can be created and defended, but it is not a theory if these concepts are not interrelated and the connections not demonstrated through the fulfillment of certain criteria. This aspect of theoretical work implies that not all intellectual projects are theorizations, even though they might like or aspire to inhabit the space of theory.

Regardless of whether a theory becomes an accepted body of knowledge within a stable disciplinary canon or remains stubbornly

heretic, autarchic, and isolated, in all cases, the fates of theory and abstraction are joined: the success of the former is a win for the latter, and attacks on theory and theorists are assaults on the routine of abstracting and those who make abstraction their occupation. We should emphasize theorizing as abstracting. *Theory always abstracts* because it condenses and generalizes and because it builds, onward and upward, from the immediacy of existential accumulation and empirical reception. Theory is a blade, just like abstraction: it cuts through, dissects, separates, distinguishes, parses, delimits. What has been detached via abstraction, however, theory will unite again, still through abstractive activities; the bonding properties of theoretical work are the same adhesive capacities of informing, collating, organizing, and relating that abstraction exhibits—a superglue of concepts, causes, categories, idealizations, features, patterns, variables, and values. Theory is not just analysis but synthesis too, and both the analytic and synthetic acts of theoretical work are based on abstractive operations.

At the beginning of the twentieth century, the mathematician Henri Poincaré stressed the importance of abstraction for his discipline by declaring that "mathematics is the art of giving the same name to different things" (1910, 83). A few years later, another mathematician reflected on similar considerations but extended them from mathematics to experience in general. For Alfred North Whitehead, there cannot be experiencing without abstracting; the first person "who noticed the analogy between a group of seven fishes and a group of seven days made a notable advance in the history of thought" (1967, 20). According to the metaphysics that Whitehead went on to develop in the latter part of his life, there is no such thing as an unmediated access to facts. That mediation, it may be argued from Whitehead, is indeed already abstraction. Whitehead's position on abstraction is complex and need not be reviewed in detail here.[15] His argument is only partially about human understanding; more significantly, it is about the structure of reality or what he calls "cosmology" (that is, for Whitehead, the scaffolding performed by abstraction is also cognitive but primarily

metaphysical). The point on mediation that I advance from it, however, is central to what I want to discuss next, for it opens up my study of digital theory toward a problematization of the concept of *immanence,* one that needs to be developed in pursuit of the argument that all theory is digital theory.

Many have employed the word *immanence.* In theology, a deity is immanent if not separate from the created world but within it, expressed through it. For pantheists, for example, God is not above the material world but encompasses it. In the lay lands of social and cultural theory, too, immanence is much invoked: *immanent critique,* for instance, is a mode of analysis based on internal standards to evaluate an object of inquiry as part of the social world, inherently developing implications and overcoming the contradictions for such evaluation from within.[16]

Because of the multiple uses of this concept, digital theory's guarded distrust of the theme of immanence must be cast carefully. The concept has many implications and applications; I am certainly not suggesting that they are all antithetical to the definition and scope of the digital theory I am proposing. Immanence and its supposed opposite, transcendence, are related but also relative terms; in order to differentiate among nuanced meanings and determine which should be the target of our inquiry, it is useful to ask what is immanent to what (or, conversely, what transcends what).[17] There is a particular way of answering this question that constitutes a red flag for digital theory, which is the answer that emphasizes—and swears by—the immanence of thought to sensation. Such a configuration of immanence makes of thinking and feeling not only two indistinguishable processes or states but, in effect, the same thing. This is the configuration of immanence that is problematic for a theory of the digital as such and for an understanding of theorizing as itself digital.

I have written extensively on how any flattening down of thought onto sensation—whether in the name of an intensive metaphysics of affect or on behalf of the enactive extensions celebrated by cog-

nitive science—would hinder a philosophical study of the specificity of digital computers since it tends to obfuscate how this specificity lies on the abstractive operations of logico-quantitative formalization, on which these technologies rely and thrive (see Fazi 2018a). Submarine cables for fiber-optic transmission, orbiting satellites of high-grade aluminum, silica sand in microchips, the courtrooms of international law, the market diagrams for supply and demand, the hours of coding work, and the attention strategies of platform dynamics—all these and a thousand more expressions of the materiality of the digital are the object(s) of serious and profound analyses within media studies. And yet, the onto-epistemological power of this "accidental megastructure" (Bratton 2015, 8) would not amount to or account for much but for its relationship with a dimension of intelligibility—a relation that is established at the operational level of the single algorithmic procedure (in fact, within the very definition of what an algorithmic procedure is) and which also manifests more evidently, at the largest epiphenomenal scale, each time somebody wonders whether machines can think.

In philosophy, the concept of "intelligibility" denotes what results from activities of abstraction and what is itself apprehensible only through abstraction. Divergent opinions about intelligibility help to delineate distinctions between empiricism and rationalism, for instance, or between materialism and idealism. None of these debates in the history of philosophy can claim to have had the last word on this topic, however, nor do different configurations of the thought–sensation relation map neatly onto these distinctions. If we are to engage with the issue of intelligibility (and I think we should), it is important to focus on abstraction as its motor. Abstractive discretization is the modus operandi of digital technology, but, as I am arguing, abstraction at large can also be used as a metonym for theory and, moreover, as I will argue next, for the condition, state, and concept of the digital, beyond its instantiation in electronic devices.

To theorize is to mediate between world and thought, and this mediation is the separation of an intelligible dimension from the

undefined blob of sensation—a "drawing away"[18] performed via the addition of representational intercessions. Most significantly, a theory is never identical to that which it is supposed to mediate precisely because it abstracts from it. The world (or its subset, life) might not match precisely with its representation in thought, but this does not mean that one is ahead of the other or less real, less impactful, less meaningful. In the words of Thomas Aquinas, "abstrahentium non est mendacium" (abstraction is not lying).[19] For the medieval philosopher, that declaration was meant to defend universal concepts as acts of thought and products of the intellect.[20] Expanding on the philosophical implications of that abstractionism,[21] we can appropriate Aquinas's assertion to highlight that the mediation I am emphasizing is not a process that detaches us from the world but one that allows us, in fact, to *enter* the world and *inhabit* it via an *abstractive access to reality.* Abstraction is not lying insofar as it is not fooling others and ourselves with discursive deceptions or artful flights of fancy but rather is purposefully carving up the world and what is in it so as to both engage with and engender its forms, structures, and functions. The symbolic has as much reality as the real and so have abstractive mechanisms that, while stripping away via selection, are positively producing their own self-standing actualization. Acknowledging the reality of abstraction is among the most concrete things we can do.

I want to return now to a key claim in my overall argument: all theory is digital theory because all theory discretizes. What has been discussed so far confers a further qualification to the second definition of digital theory proposed here. According to that further definition, digital theory is straightforwardly a theory that is digital. The point I am able to demonstrate now is that it is the abstractive character of theory that makes a theory digital, literally. Theory is an abstractive discretization, and discretizing through abstractions is what the digital is and what the digital does.

Abstraction both subtracts and adds; it separates and unifies again, which is possible because of the mediating cuts that it performs. Abstraction destroys but also builds back; it is both blade and glue.

The digital, too, whether in its expression in electronics or taken as a theoretical concept, is an abstractive technique made of cuts and mediations. The digital, too, is both destruction and production. Of course, digital technologies are marked by discreteness because they work with and through discontinuous values. The key point here, however, is that digital technologies are discretizing first and foremost because they are abstractive techniques of distinction and mediation.

In this respect, it is important to stress that the computational and the digital are not synonymous. To compute is to systematize reality through quantitative abstractions. Computation is a method of rationalization, proceeding and progressing in logico-quantitative terms. In the twentieth century, the notion of "computability" was formalized via the proposal of a method that would make it possible for a computing machine to address any task as long as this could be expressed as an activity governed by rules and divided into finite and well-defined steps (that is, as long as this task could be expressed *algorithmically*). In this algorithmic form, computational mechanisms arrange and organize quantifiable entities into sequential successions of separable states. The computational is then a broader category than the digital; in relation to the world we live in today, the computational is best understood as the method of the contemporary digital systems that operate in and sustain that world. The digital, on the other hand, is a mode of automating and managing the computational method (that is, the aforementioned systematization of reality) via representation and mediation. Within electronics, then, it is the representational mediation through which computation's rational structuring is made possible. However, just as computation is not limited to the digital, so also is the digital not restricted to the computational.

This distinction between the computational and the digital is useful for the questions tackled in this chapter.[22] For instance, it should be emphasized that I am claiming that all theory is digital, not that all theory is computational. Mine, then, is not a computationalist argument. To theorize is not to calculate but to represent reality in

abstraction and through abstraction, and that representation might be phrased in terms of poetry, mathematics, or whatever pleases us most—that same act of mediating world and thought is already a discretization, an abstractive cut. It is in this sense that there is no theory other than digital theory.

Thinking the Digital as Thought

I have proposed two definitions of digital theory. According to the first definition, digital theory is a study of the digital in and of itself. A theory of the digital should ask, "What is the digital?" and look for the ontological characteristics of digitality. The second definition of digital theory approaches the expression "digital theory" even more literally: digital theory is a theory that is digital. To explain this, I had to introduce the affinity between theorizing and abstracting and between the abstract and the digital. These considerations now open up the possibility of addressing the digital as a mode of thought. If all theory is digital theory, does it follow that thought is digital too? The concepts of the digital, of thought, and of theory all meet at a key juncture despite the surplus of actions, states, and operations that are usually given these names.

Remarkable tautologies distinguish most attempts to explain the characteristic features of thought. Look up a definition of thought and you will most likely find that it is conceptualized as the outcome of a thinking process or as the act of thinking itself. The tautological character of these definitions exemplifies the complexity of this issue but does not block or hinder any serious study of it. Rather, this difficulty should be approached as an invitation to produce such a study. Thought supplies thinking with multiple meanings. This is particularly relevant when considering the eventuation of thought in technological contexts or, more specifically, alongside (and also because of) computational automation. Since there is no universally agreed-upon definition of what thought is, different images of thought can be advanced. Some will be useful to explain what humans do well, and others will be more valuable or suitable to account for what digital machines do differently.

For Alan Turing, the fact that there is no established definition of what thinking is (or, for that matter, of what a machine is) was a cause of ambiguity that had to be eliminated. He aimed to do this when proposing to ask no longer whether a machine could think but whether a machine could pass his "imitation game."[23] Out of Turing's sleight of hand emerged one of the official origin stories for the field of artificial intelligence (AI)—the latter being developed throughout the second part of the twentieth century also as a byproduct of the philosophical and technical questions so clearly identified by Turing's benchmark test for the cognitive potential of "discrete state machines" (Turing 1950, 439). Despite the undeniable significance of Turing's approach, however, questions about thought and about what thought is cannot be eliminated; they can be avoided or sidestepped only to a certain extent and only for some time before they come back to haunt computing and human–machine relations. The much-discussed shortfalls of the Turing test as a goal for cognitive computing,[24] as well as the fallacies of what I call the "simulative paradigm" (Fazi 2019, 813) as a technique of alignment of humans and machines, are evidence of this.

When speaking metaphorically of hauntings, media theorist Friedrich Kittler's mission of "expelling the spirit from the humanities" (1980) springs to mind. With that provocative pronouncement, Kittler highlighted how the humanities have failed to think technology. A kind of exorcism is needed, in Kittler's view, to evict from the humanities the spectral visitations of hermeneutics or any residue of anthropocentrism. Kittler was surely right to expose the humanities as technophobic, for the humanities, traditionally, have been such. Differently from Kittler, however, I argue that there is nothing to expel or excise from the humanities' remit, which should, on the contrary, expand rather than contract. When claiming that questions about thought "haunt" us, then, I mean that the *ti esti* of thought cannot be ignored for long (or any longer). This involves acknowledging a relation between thinking and being (and, equally, between thought and world), a relation that, ever since Parmenides, has never quite ceased to provoke and challenge philosophers.[25] The history of philosophy, and that of

thought itself, can be couched as the history of the ways in which that relationship has been recounted and of the ways in which it has not—of how it has been proceduralized and included and of how it has not.[26]

For Kittler (2009), philosophy has been largely oblivious to technology; his proposed corrective was to steer the humanities (qua philosophy) toward *media theory* (or better, for him, *Medienwissenschaft*). I propose here to go a step further or rather, to move a step to the side while still advancing forward. I am claiming that the humanities (and philosophy) would benefit from recognizing not strictly media studies but digital theory as central to them, for digital theory is an intellectual investigation of that relation thought/world that is so foundational to the humanities themselves. In this sense, digital theory can do what neither continental nor analytic philosophy quite managed to do, that is, to *think technology as thought.* If philosophers were to find a "home away from home" in digital theory, it would be precisely because of such a promising prospect.

Despite its many polyphonic focuses and orientations (existentialism, phenomenology, postmodernism, deconstructionism, pragmatism, etc.), the continental tradition in philosophy is somewhat monotonic in its pronouncements about technology. The influential Heideggerian "question concerning technology" (Heidegger 1977), from which many of these positions draw, is an inquiry regarding thinking. Heidegger demonstrated that to ask about the role of technology in society is to investigate the emergence of a specific type of thinking—for Heidegger, an instrumental, calculative form of thought that turns anything into a resource in the name of efficiency and productivity. With its framing, technology hides and makes us forget about Being, thus standing as a substantial obstacle to any kind of reflection, philosophical or otherwise. This Heideggerian view of technology can be endorsed or rejected, but either way, it would be correct to say that a large part of continental philosophy regards technology if not as a danger, at least as a loss—a loss of authenticity but also of materiality, experiential

relations, intentionality, and existential specificity. This kind of rhetoric is idiomatic of positions that go from neomaterialism to situationism via a plethora of other *isms* in the Western canon.

In the first volume of *Technics and Time,* Bernard Stiegler stated that "philosophy has repressed technics as an object of thought"; in philosophy, "technics is the unthought" (1998, ix). Stiegler's own philosophical project aimed to make up for that repression by stressing how technology is, in fact, an enhancement or supplement upon which thought has implicitly always relied.[27] While I do not agree with his identification of technology with prosthetics, Stiegler's phrasing of philosophy's original disavowal of technics is useful because it allows us to comment that, in the continental tradition, technology is generally believed to generate only a weakened mode of thought, which, however, is ultimately antithetical to anything close to genuine thinking. Due to orbiting satellites we can photograph the Earth as the bluest dot, which is a spectacular technological accomplishment. Yet continental philosophy argues that because of such technological framing, our feet are no longer safely standing on solid ground. Technology unmoors us. It builds a road to cross a forest but also makes us approach that forest as something merely to be crossed rather than, for instance, contemplated. For continental philosophy, thought (as the act of thinking) is something to be defended, to be protected from this drawing away from the richness and immediacy of an empiricist lifeworld or (conversely yet comparably) rationalist truth-events.

The analytic tradition in philosophy might phrase these issues differently, impatient as it is toward any speculative spectacle, yet technology remains unthought also within that tradition. Richard Rorty once distinguished between "fuzzies" and "techies" to denote continental and analytic philosophers, respectively. By his own admission, that was a "crude and oversimplified picture of the tensions within contemporary philosophy" (2004, 21). Rorty's characterizations, however, could be developed here to contend that analytic philosophers are "techies" less because they are experts in technology and more because they are preoccupied with

a rather technical form of philosophy, which focuses on argumentatively controlled and contained reasoning and aims at clarifying scientific practice. Analytic philosophy has not really challenged the grammar, assumptions, or norms of the continental question concerning technology. Famously, it emphasizes the engineering of thought and the instruments of thinking (language, above all). In this respect, technology is a framework that, borrowing from science, is used to explain but which is not itself explained. While *technology* is not a pejorative word per se, it is largely approached as a vehicle through which thinking can be treated in terms of a delineated problem to be solved and to which technology, however, still remains only prosthetically related.

What would it mean, then, to think technology as thought? Why should digital theory be able to do what philosophy has not? Here we need to pivot to the proposed investigation of the *quidditas* of the digital, which, as we saw, is related to the investigation of the *quidditas* of theory and which, we discover now, is connected to the investigation of the *quidditas* of thought. It is necessary to turn again to that discussion and develop it vis-à-vis the claims I also advanced about the need to problematize the concept of immanence.

If abstractive discretization is the modus operandi of both digitality and theory, adopting a position that prioritizes immanence cannot but generate suspicion of the two precisely because they each abstract. However, when considering the relationship between thinking and being (and that between thought and world), one sees that these are not immanent but mediated—indeed, abstracted. The question that needs to be asked here is whether the condition of possibility for that relation might be defined as itself digital. To think "digitally" is to think through abstractive mediations and representations, but is that not what all thinking does? If so, does not the digital become the condition for all thinking in the first place?

In asking this, my aim is to develop a study of the reality of the digital beyond consumer electronics. It is worth stating again that

pursuing this study does not involve endorsement of a view of the universe as digital information. Mine is an argument about the reality of the digital, not about reality as digital. Equally, I am not advocating for a "computational metaphor."[28] Since its inception, cognitive science (often with the blessing of analytic philosophy of mind) has developed a view of cognition as computation. The mind is approached as a computer and vice versa. Advocating for thinking the digital as thought, however, does not imply supporting this view. First, as clarified earlier, there is a difference between the digital and the computational. Second, and more significantly, I do not intend to take something technological and make it an analogy to explain something else. The very concept of "thought" should not be modeled on digital technologies. There is no metaphor here. The digital is a condition (of and for thought) larger that the technology it gets to be. Both a blade and a glue, thought builds up by breaking down. It is expressed and realized in the formation of ideas, concepts, desires, judgments, which are all representational mediations, indeed abstractions. By separating the world and uniting it again, thought opens up reality. Any access to the world via thought is a digital portal.

Thinking the digital as thought does not entail forgiving or defending the colonization of all there is via digital technologies, either. To counteract how "software takes command" (Manovich 2013) of most social and cultural practices, we are told we should resist the digital and its ubiquity. We should log out, switch off, "touch grass,"[29] and disconnect to reconnect; we should detox from apps and screens and the techno-saturation of life to improve our well-being and defy the commodification of human experience. By addressing the *quidditas* of the digital and that of thought, however, one discovers that to refuse the digital is to refuse thought. Importantly, that discovery must not be used to excuse or justify the capture of multiple expressions of living and their reduction into something that can be quantified and thus instrumentalized via digital technology (a "like" button on a social media platform, for instance, as an instrument to measure affective reactions and

consequently extract economic value). That discovery, rather, suggests that refusing to partake in the ways in which capitalism uses digital technology for its ends cannot be equated to a refusal of the digital in and of itself. There is a difference between, on the one hand, the political, economic, and sociocultural ideologies pushing for forms of separation, detachment, and alienation through digital artifacts, and, on the other hand, the digital as one onto-epistemic marker of discretization operating through abstraction and representational mediation. The development of a sophisticated critique of certain naive understandings of immanence is crucial, and a digital theory can provide the locus, impetus, and method with which to do that. Max Horkheimer and Theodor W. Adorno were certainly no friends of technology. Their stating that "all mystical union remains a deception" (2002, 31), however, is a phrase aptly leading to the point I am making here: thought involves distance, and digital theory can tell us something significant about the world (including its histories and materialities) because it is in and through digital forms, structures, and functions that the world is thought.

Digital theory is a study of the digital in and of itself. It is a theory that is digital. All theory is digital theory, and thought does what the digital is. These claims, which I have argued for here, show that it is impossible to remove the digital from the theoretical, just as thought cannot be evacuated from the digital. To do digital theory is to stand in front of forms, structures, and functions of separation and address them as what makes us whole.

Notes

1 This does not happen only in digital studies but also in the larger context of the theoretical humanities. "Critique has become the primary mode of practicing theory," Michael Hardt notes; "critique, of course, covers a wide variety of practices: relatively generic means of fault finding, methods to question the truth of authority, techniques to reveal the figures of power that operate in dominant discourses or ideologies, and even the specific Kantian procedures of investigating the limits of human understanding, reason, or judgment" (2011, 19).

2 "Frankfurtian legacy" here denotes the intellectual inheritance of the Frankfurt

School of critical theory, established in the 1920s and associated with the Institute for Social Research there (currently a part of the Goethe University Frankfurt).

3 I am referring to what are known as the "science wars" and the "theory wars." For an account of the latter in a US context, see Duggan (1998).

4 That publication collects a series of lectures Heidegger gave at the University of Freiburg between 1951 and 1952. Excerpts from the same lectures are also published in English in the book *Basic Writings,* where the title is translated as "What Calls for Thinking?"; see Heidegger (1993).

5 When asking "What is virtue?" for instance, Socrates would not be satisfied with the circularity of a list of examples of virtuous acts or virtuous people. His *ti esti* was to be answered with a definition, which had to be general and capable of explaining. See Plato (1984). Socratic questioning, especially in Plato's early dialogues, often resulted in *aporia* (ἀπορία), a testing moment when one is perplexed and at a loss. This aporetic moment does not arise from the disclosure of false beliefs and mere opinions that follows an ontological inquiry. "What is *x*?" Socrates would ask: *aporia*—the impasse of an interlocutor who realizes they do not know—arises from the difficulty of circumscribing or delimiting this *x* while at the same time opening it up to the generality of definition. The concept of *quidditas* from Scholastic philosophy aims at a comparable form of generality. It is not *haecceitas* ("thisness") that is sought but "whatness," not the something that makes a thing a particular thing but the what that can be applied to all things similar. As a logical operation, an act of defining is thus tied to an ontological determination (and vice versa). This ontological questioning leading to definitions also lays the foundations upon which to build further epistemological investigations.

6 See how this is discussed in Courtine and Rijksbaron (2004).

7 I have addressed some of claims and stakes of digital ontology in Fazi (2018b). In chapter 2 of this volume, Alexander R. Galloway also considers digital ontology. In the context of our shared project of working toward the establishment of a digital theory, we agree on the need to distinguish theses about the nature of reality on the one hand and theories of digital representation on the other. Galloway also differentiates digital ontology (often called "Digital Philosophy") from his own historical and conceptual reconstruction of "digital philosophy," which he defines as a distinct way of doing philosophy always implying a "decision." In this respect, however, our positions diverge, insofar as I argue that all theory is digital theory and thus all philosophy is discretizing too (and all philosophers decide).

8 I am not arguing here for the kind of "positive knowledge" that positivist positions might advocate. Positivism (old or new) calls "positive" a type of knowledge that is quintessentially objective—that is, certain, universal, rational, and true because acquired and systematized through quantifiable and measurable sensory experience, the scientific method, and the empirical observation of what is given (such as, for instance, natural phenomena). Instead, I mean a kind of definition that stresses the presence of distinguishing features in its object rather than their absence.

9 A proxy server, for instance, is a computer system that acts as an intermediary between a client and another server from which a resource has been requested.

10 Dylan Mulvin has described proxification as "a culturally conditioned practice of consistently using some things to stand in for the world." In this sense, proxies "mediate between the practicality of getting work done and the collective, aesthetic, and political work of capturing the world in an instant" (2021, 5). Mulvin's analysis focuses on material proxies, while I want to consider how concepts can become proxies within the context of theoretical inquiries; however, his important critical questions about dynamics of power within delegation and its mediation can also be applied to the scenarios I am considering, in relation, for instance, to the activity of world-making produced by theories of the digital that address the latter only by proxy.

11 In this essay, I refer to theory at large and not to that particular intellectual entity that goes by the capitalized term "Theory." Such an entity did exist, however, and was so triumphant as to deserve a capital letter. Theory was a quasi-canon of mostly French contributions, created within the American academy from the 1970s through the 1990s as "a crucial bridge that enabled an initially improbable rapprochement between the 'close reading' of literary texts . . . and their analytical or philosophical location beyond the involutions of a plain close reading of the literary text" (Surin 2011, 4). See also Cusset (2008).

12 "Aristotle never explicitly articulates what *theoria* is, but he does provide clues. Most important, it is regularly characterized as the actualization of knowledge" (Roochnik 2009, 70).

13 In the course of the twentieth century, there have been various philosophical attempts to characterize good (scientific) theory. Logical Positivism, for instance, emphasized observational vocabulary as the basis for empirical meaning. According to the "verifiability principle" that follows from positivist assumptions, a statement is meaningful only if it is empirically verifiable. Karl Popper's "falsifiability criterion" (2002) famously opposed the concept of verifiability, proposing instead that a theory is scientific if it can be proven false. While philosophy has pursued a normative dimension for theory in science, what counts as a good theory in the humanities has been less well investigated, although scholars have often stressed theory as a specific way of conceiving the scope and sense of humanistic research.

14 For a central figure of postwar French theory, Gilles Deleuze, "philosophical theory is itself a practice, just as much as its object. It is no more abstract than its object. It is a practice of concepts, and it must be judged in the light of the other practices with which it interferes" (2005, 268).

15 I have dealt with this in Fazi (2018a).

16 Immanent criticism, then, "accepts the presuppositions and terms of a society or work. Such criticism judges a work by its own standards and ideals and confronts it with its own consequences" (Rose 1978, 151).

17 This technique to circumscribe the many uses of the concepts of immanence and transcendence is suggested in Smith (2003).

18 The English word *abstraction* has its etymological origin in the Latin verb *abstrahere,* which means "to draw away," "to detach," "to divert," "to remove," "to separate."

19 Aquinas attributes the origin of the expression to Aristotle, who uses it in book II, chapter 2 of *Physics* (193b 35). See Aristotle (2008).

20 See Smit (2001) and Cory (2015).

21 Abstractionism is "a name for the doctrine that a concept is acquired by a process of singling out in attention some one feature given in direct experience—*abstracting* it—and ignoring the other features simultaneously given—*abstracting from* them" (Geach 1957, 18).

22 Clarifying the relation between the computational and the digital is important also in relation to this book's focus on the digital as an ontological marker and a concept with epistemic power. Handelman and Weatherby, in their essay in this volume (chapter 3), propose that the digital always implies computation. I do not share this view; for me the digital can be spoken of meaningfully without including the computational (although often, especially in contemporary technology, the two are coextensive and operationally exploit each other). As will become evident in the next section of my essay, differentiating the digital from the computational also helps me avoid computationalist assumptions when it comes to assess the relation between the digital and thinking.

23 Known as the "Turing test," this *imitation game* is a procedure devised by Alan Turing to determine whether a machine exhibits intelligent behavior. In order for a computing machine to pass the test, a human interrogator must be unable to distinguish between a machine and a human on the basis of their answers. See Turing (1950).

24 Some of these objections to the Turing test are discussed (and refuted) in Copeland (2000). See also Shieber (2004).

25 In fragment 3 of what remains of his surviving text (a poem), Parmenides expresses the idea that how to think and how to be are the same thing. Some modern commentators have proposed a different translation of this passage, however, underplaying the identity of thinking and being and instead stressing the link between what is thinkable and what is capable of being. These differences in translations are discussed by A. A. Long, who also notes how "what Parmenides says is a continuous challenge to our own thinking about thinking" (2022, 77). For a contemporary interpretation of the foundational role of the ontology of Parmenides, see Severino (1974).

26 This is acutely evident when considering the humanities and ought to be equally clear within the social, formal, and natural sciences too.

27 See Smith (2021); Howells and Moore (2013).

28 For the computational metaphor in psychology, see Boden (1979).

29 The figurative expression "touch grass" is a popular exhortation to spend less time online or on digital devices and instead reconnect with the offline world, nature, etc.

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[2]

A Brief History of Digital Philosophy in 10 Expressions

Alexander R. Galloway

Begin with a mystery, a mystery written in riddles. The first is: *How can two different things be called equivalent?* Fredric Jameson labeled this the first riddle in Marx's *Capital.* "How can one object be the equivalent of another one?" How to comprehend "the mystery of an equivalence between two radically different qualitative things" (Jameson 2011, 23, 47)?

Exchange requires equivalence. For how could two things be exchanged if they are not equivalent? (Answer: deception, theft, or worse.) Marx presented the riddle of equivalence early in his treatise through a now familiar equation, "20 yards of linen = 1 coat" (1976, 139). In that equation two different things, a bolt of fabric and a protective garment, are brought into equation, accompanied by the proper quantifiers ("20 of" and "1 of").

The second riddle stems from what Jameson called "the mystery of the increase of value." Or to pose the same in the form of a question: "How can a profit be made out of the exchange of equal values" (2011, 47)? For if the first riddle insinuated the mutual swapping of equal values, and hence a zero-sum transaction, what explains the accumulation of profit? How can money grow,

as it appears to do under capitalism, if all exchanges are flat and even? Marx wrote the second riddle as *M*-*M*', or money into money prime. With that expression Marx was trying to explain the curious phenomenon of monetary accumulation, or, in his words, "money which begets money" (1976, 256).

The second riddle will return again at the end, but for the moment let us focus on the first riddle. How are two different things made equivalent? Nobody knows, or so it seems, but the behavior may be duly observed and, accordingly, accepted by fiat. Christened with the name *digital difference,* this will serve as the first expression of digital philosophy.

Expression 1. $A = B$

In fact this first expression is rather strange, for it asserts simultaneously that two things are different yet also the same. *A* and *B* are indeed different and assigned different tokens to indicate their difference. Yet the statement of equality (=) asserts that *A* and *B,* while different, are by some measure the same. In what way are they the same? Is difference somehow also another name for "same," or is the mutual difference of *A* and *B* simply overlooked when they are described as equal? Consider an innocent example from arithmetic. The expression "7 + 5 = 12" is only thinkable if the expression "$A = B$" is thinkable. The two terms "7 + 5" and "12" are clearly different—different in notation, in character length, arithmetically different, the left side contains an operation while the right does not—yet, through the miracle of simple arithmetic, the two terms form a quantitative equivalency.

This is not to mention the innumerable examples from outside arithmetic. "20 yards of linen = 1 coat." How could a particular raw material (woven flax) be made equivalent to a particular kind of garment (a coat)? As use-values they are hardly comparable. The formula only begins to make sense as an equation of exchange-values. Even then, one will be forgiven for misunderstanding Marx's sample vignette, as I did on first reading it as a student. Was Marx hinting that the "1 coat" was a coat *of linen,* and that it was sewn

from *these very yards of linen* here itemized ("20 yards of linen")? Did the linen-to-coat equation describe production, I wondered? Did it describe a tailor practicing his trade? Or did the linen-to-coat equation describe exchange, a linen merchant haggling with a coat merchant? (This misunderstanding, or call it an ambiguity, was no doubt Marx's intention. Any tailor will report that a coat requires only 2 or 3 yards of fabric for construction. Hence the heaping of "extra linen" on the left of the equation invites an investigation into a certain element unlisted on the right side, namely *labor-power,* that being the key to Marx's entire treatise. The equation itself announces the ambiguous oscillation between production and exchange.) In sum, whether strictly arithmetical or drawn from more qualitative examples, the equation $A = B$, found in the mystery of production and exchange, forms the first expression of digital philosophy because it shows how different things, if properly quantified by symbolic tokens, may be considered the same.

But this strange name *digital philosophy* has not yet been defined and might not be entirely clear. What is Digital Philosophy? Coined already by others, the name refers to a school of thought stemming, in fact, from physics and computer science rather than philosophy. (The moniker *digital physics* is also used and might ultimately be more apt.) Digital Philosophers claim that the world is discrete at its most fundamental level. They provide evidence for this claim by appealing to observations in physics and elsewhere, in for example the discrete spin states of subatomic particles, or the encoding capacities of DNA. Some of the more adventurous Digital Philosophers then use the thesis of natural discretization to analogize between computation and the world, leading to some rather outlandish speculations of the sort that "we are living inside a computer simulation." I will not here debate the merits of Digital Philosophy, except to say that claiming the totality of the digital is clearly overreach; I maintain both the digital and the analog as coequal modes of mediation (along with other modes as well, perhaps an infinite number). Instead, I want to identify

digital philosophy—written now in lowercase to indicate a general approach rather than a specific school—not as a thesis about nature but as a specific way of doing philosophy. The digital, in other words, is not so much the reality of natural discretization, as it is a decision within philosophy, often a rather unnatural decision, which itself ought to be denaturalized. Thus I will refrain from investigating the implications of, say, the chiral parity states of subatomic particles; apparently there are "exactly two" of these states, the "*left-handed* and *right-handed*" states, as Digital Philosopher Edward Fredkin has explained (2003, 200). Instead, this brief history of digital philosophy (in 10 expressions) will focus on the axioms and principles that must be effectively internalized in order for any form of digitality to make sense in the first place.

Here, then, I follow Fazi's opening exhortation: the digital ought to be defined in itself and not through descriptions of its proxies, that is to say, as a standalone noun rather than as a parade of adjectives (digital culture, digital society, digital economy, digital art, and so on). The reason for this is that definition is a digital technology, while description is not. Digital theory ought to favor definition as a method, while shying away from description.

Expression 1 is an adequate beginning for any discussion of digital philosophy. The expression introduces symbolic tokens and the relation between tokens. Yet to continue one must first backtrack, filling in two key prerequisites necessary for a deeper understanding of the advent of digital philosophy, namely the principle of identity and the concept of symbolic type. For prior to the equation $A = B$, one must assert an even more primary equation, the identity $A = A$ (and likewise the identity $B = B$, plus all such identities of the form $n = n$). At the same time the notion of symbolic type underpins any expression of the form "two different things are the same." Hence in order to journey deep into the domain of digital philosophy we will need to backtrack to a rather traditional if not also conservative posture in Western philosophy, back to the classical formulation of *identity and difference.*

Contemporary cultural theory often defines identity through difference. Yet in the strict sense identity means precisely the opposite, "identity" stemming from the Latin *idem* meaning "the very same." Expression 2, known more commonly as the *principle of identity,* states that something is whatever it is. Given the query "what is *A*?" one may respond with the simplest possible answer, "It is *A*." Taken axiomatically, the principle of identity asserts both that such an answer is *valid* but also that "being one's self" is indeed a positive quality of something and hence may be positively asserted. Known also as the *tautology equation,* the principle of identity traces back to Aristotle, who considered it a necessary and valid foundation for logic, albeit trivial in its apparent circularity.

Yet even this axiom, so apparently intuitive and obvious, has been contested in different ways. The empiricist complaint: What if *A* and *A* are just a little bit different, can they still be called equal? As Gottlob Frege put it, the empiricist John Stuart Mill "holds that the identity 1 = 1 could be false, on the ground that one pound weight does not always weigh precisely the same as another" (1950, 13).[1] All good empiricists would find some truth in Mill's complaint. Measure a gallon of water, then try to measure a second gallon with precisely the same number of drops. Or try for the same number of water molecules. The expression "1 gallon = 1 gallon" starts to look a bit shaky upon close inspection, perhaps clouding the validity of identity overall. (Frege, a digital philosopher if there ever was one, rejected Mill's complaint out of hand. "Mill always confuses the applications that can be made of an arithmetical proposition, which often are physical and do presuppose observed facts, with the pure mathematical proposition itself" [Frege, 1950, 13]. In other words, the "pure" cannot be invalidated by the "applied." File under: "digital philosophy, ideology of.") As we will see shortly, the empiricist complaint is also the analog complaint, for the analog philosopher will want to defend the irreducible particularity of each instance against attempts to name it, such that no *A* could ever

suitably account for the rich complexity of its referent, consigned instead to a blunt if not violent form of reduction—what violence to call 1.0000001 gallons of water by the name of "1"!—and thus no *A* could ever be identical to itself much less to anything else.

Meanwhile, the principle of identity has also been contested on, shall we say, political grounds. Some consider the principle of identity to be the *arch-conservative position* par excellence, and thus, following guilt by association, they attempt to avoid or curtail the principle's influence. Identity is, in this sense, a proxy for essence or natural fact, and thus conservative in the literal sense of preserving static consistency. After all, "A Is A" is the title of the third and final section of Ayn Rand's *Atlas Shrugged,* acting as an absolute ground for her so-called objectivism, a pet philosophy for teenagers and conservatives of all stripes. Likewise the principle of identity resembles that mysterious expression in Exodus 3:14, "I am that I am," God's statement to Moses at the burning bush, voicing an identity that both *suspends* the name, utterable instead as "Yahweh" or "Jehovah," and yet also affirming God's *presence.*[2] (Whether the immortal words of Popeye the Sailor Man, "I yam what I yam," are due to Jehovah or some other source is a question for another day.) At the same time, the politics of tautology is not entirely clear, given how the identity equation reappears in any number of other thinkers on both the left and the right, not least being François Laruelle, to whom I will return briefly at the end.

The principle of identity is buttressed by two other logical principles that extend and affirm its power. One is the *law of noncontradiction* (LNC), which states that if something is what it is, then it cannot also be what it is not, written in symbolic terms as $\sim(A \wedge \sim A)$. The other is the *law of excluded middle* (LEM), which expresses the LNC from a different point of view: something either is the case or it is not the case, with no possible third option ($A \vee \sim A$). Given this exclusion of the third option, the LEM is sometimes also expressed via the Latin phrase *tertium non datur,* meaning "no third (possibility) is given." The LNC and LEM, along with the principle of identity,

are at the heart of logical rationality, ubiquitously deployed in techniques such as the *reductio ad absurdum* and other methods of logical proof.[3]

Identity and difference—they offer a beginning but are not sufficient to construct a full-fledged system of mediation. *We do not yet have digital media.* Instead we have a privileging of the same (identity) and an exclusion of the middle, literally an exclusion of media. So while this does not yet constitute a robust digital philosophy, it does furnish the foundation of discretization, which is the kernel of the digital if not its very essence. In this sense, the LNC and LEM (assisted by the identity equation) are extremely important digital technologies, some of the most important in human history. They introduce a *discretizing gesture* into thought. This discretizing gesture is part of what Fazi identified in the previous chapter.

Nevertheless, the digital has its own particular outline, which will be made slightly more vivid through the definition of *digital identity* as ratio.

Expression 3. *a*/*b*

Ratio persists here in its classical definition as *logos,* that is, a relation between two values. Euclid expressed this neatly in Book 5 of the *Elements*: "A ratio [Λόγος] is a sort of relation in respect of size between two magnitudes of the same kind [δύο μεγεθῶν ὁμογενῶν]" (1956, 114). Here we begin to depart from the general principle of identity toward an identity with specifically digital characteristics. Having formerly posed the question "What is *A*?" and having previously answered "It is *A,*" we are now able to give a different answer, a truly digital answer, that "*A* is a ratio of *a* and *b*."

Identity as digital ratio is very old, dating to the Pythagoreans if not before. The expression stipulates that any identity may be thought of as a relation between two terms. What is the decimal number "4.5" if not the ratio "9/2"? What is the simple whole number "7" if not the ratio "7/1"? What is the fourth interval in music, if not the ratio "4:3"?[4] This sort of definition, where something is defined in

terms of a ratio between two discrete values, constitutes the first expression of simple digitality, which I also nominate *the general formula of the digital* (or Digital I).[5]

In this larval state, the digital and the analog are often difficult to untangle, and one would be forgiven for confusing them. Strictly speaking, the expression "*a*/*b*" derives from geometry, that is, from the ratio of two magnitudes. The expression "*a*/*b*" thus derives from an analog technology, even as it forms the real body of the digital. This kind of dialectical interlacing is common among the digital and the analog, as Handelman and Weatherby will show in the chapter that follows. A digital artifact will often invert into real analogicity, or an analog artifact will, likewise, flip and invert into a digital symbol. So, while the expression "*a*/*b*" derives from geometry, it also provides the form for the rational numbers, which, along with the whole numbers, are at the core of the arithmetic tradition (and hence at the core of the digital).

Expression 3 reveals two important features of the digital. On the one hand it hews to the Rule of Two, where a single identity is expressed through two terms. Indeed, a rough and rude slash intrudes between two magnitudes, dramatizing the Rule of Two in a rather literal sense. At the same time Euclid's "δύο μεγεθῶν ὁμογενῶν" stipulates that the two magnitudes must be homogenous or "of the same kind."

This second feature indicates the notion of *symbolic type.* For these are not just any two magnitudes. They are two elements, *a* and *b,* which have been, as it were, pre-vetted for type conformity. To return to the Pythagorean example, a rational number is a number that can be expressed as a ratio of two whole numbers. In other words, *a* and *b* must be of the same type; they must both be whole numbers. Ancient mathematicians determined whether two values were of the "same kind" by whether they shared a common measure [κοινὸν μέτρον]. And in the simplest sense, this common measure was none other than the humble *monad,* or lone unity.

Type conformity will be familiar to computer programmers. Most

computer languages are based on the notion of data type, wherein generic data (which is nothing other than a collection of numbers) are cast as a specific abstract "type" of data. Common types include *integers* used to represent digital values, *floating-point numbers* used to approximate analog values, *booleans* for true-or-false logical states, and *characters* used to store elements of text. Of course all data types remain simple numbers behind the scenes, which is all the more reason type must be enforced, so that different categories of data can persist as differentiated. In normal situations only data of the same type may be compared, boolean against boolean, integer against integer, and so on; even when this seems intuitive, as when comparing a float with an integer, the necessary safety checks are still being performed automatically by the machine.

In this sense, the very meaning of *identity* shifts after the arrival of full digitality (which I nominate Digital II). Under the general principle of identity, identity was forged from "being one's self." Yet under mature digitality identity is forged from "being of the same kind." In the former, identity refers to an entity's self-similarity. In the latter, it means an entity's relation to a type or family. In other words, after the advent of symbolic type, identity shifts from content to form. Digital rationality is not simply the splicing of two terms but an explicitly *genitive* splicing, that is, where something forms identity by being "of" something else, that is, "of" a homogenous type. This is why Expression 3 introduces type conformity; *a* and *b* must be of the same type to form a relationship. A ratio like "apples/oranges" is, in this sense, strictly prohibited within the digital manifold, because the two terms share no monad as common measure, even as "apples/oranges" is a perfectly normal and common ratio within the fruit salad of real analogicity.

Digital difference ($A = B$) and digital identity (a/b) are a suitable start to this brief history of digital philosophy. These first expressions show digitality as *cardinality,* that is, as the assignation of a sovereign name to a multitude of things.[6] Digital cardinality requires of a name that it be expressible as a ratio, that it be identical to

itself, that it be different from all others, and that it circulate only within a stratum of other cardinal names of the same type. These mathemes are a suitable start, yet one additional expression is necessary in order to begin properly.

Expression 4. $A > B$

Beyond cardinality, Expression 4 outlines the *ordinality* of digital reason. The digital is not just a technology of symbolic naming, it is also a technology for ordering symbols. Ordinality means the ability to put a set of things into an ordered sequence. The expression "$A > B$" means that for any two digital symbols it is possible to compare them in terms of "lesser" or "before" and "greater" or "after." The specific operation of comparison might be complicated or obvious, it might be cumbersome or simple, but Expression 4 states that comparison is indeed possible in principle. Not simply marking the difference of two terms, Expression 4 indicates that, in addition to being different, one token may be *ranked* in relation to another token. Once an ordered hierarchy is established, it becomes possible to localize the position of every digital token within that hierarchy. And while priority is not always obvious, digitality ensures that there is an available mechanism for finding priority. Overall, this system facilitates *digital judgment.* But this feature might also be a curse, given that ordinality is, alas, the *only* mechanism for judgment within digital systems.

To summarize, these are the three basic expressions necessary for a symbolic order of the digital type:

Digital identity: a/b
Digital difference: $A = B$
Digital judgment: $A > B$

I withhold the principle of identity ($A = A$) from this list, since it is not particular to digitality per se but rather prefigures the digital and exceeds it. So, while identity is necessary at the outset, the true identity of the digital lies elsewhere, in a relation between two terms (a/b).

In sum, these first few expressions outline a fully functional symbolic order, including technologies of identity, difference, and judgment. Together these expressions help explain the meaning of the Rule of Two, that is, the introduction of any amount of distinction whatsoever, followed by the structuring of distinction according to symbolic type. To the extent that these principles are fundamental to Western rationality—not the only way of doing philosophy by any means, just a particularly hegemonic way—one can also conclude that philosophy has been digital for a very long time, so much so that *philosophy* and *digital philosophy* are quite frequently the same endeavor.

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All this logocentrism is exhausting. Alas, such are the occupational hazards of studying the digital. Digital philosophy is nearly coterminous with philosophy as a whole, but not entirely. Here I begin to part ways with Fazi: the digital is not synonymous with thinking overall; minoritarian strains exist within philosophy and theory that are nondigital. As I narrate in this chapter, the three most important alternatives to digital philosophy are analog philosophy, the nonstandard method, and dialectics, the latter also being the topic of chapter 3 by Handelman and Weatherby. Thus, as a temporary respite from the *logos,* let us turn next, in Expression 5, to one of the many pathways that contradict, invert, or otherwise depart from the tradition of digital rationality.

"The Greek Logos had no contrary" wrote Michel Foucault at the start of his first major treatise (a book on the contrary of the *logos*). What Foucault meant to indicate with his counterintuitive oraculation was the difficulty of speaking the very thing that resisted speech. Better instead to chronicle "the archeology of a silence," he claimed, than to compel the mute to assume a language (Foucault 2006, xxix, xxviii). Still, Foucault was wrong in a very superficial sense. *Logos* had an immediate and direct contrary for the Greeks in the term *alogos,* meaning literally "no ratio," or more generally the "irrational."

Or, to express it more precisely, "given *x,* there is no ratio such that '*x* = *a*/*b*.'" Recall the Pythagorean calamity discovered at the heart of every circle and every square. The value of π can be expressed as a ratio, the ratio of the circumference of a circle to its diameter. Yet while this ratio is unambiguous and exact within analog geometry, the magnitude is strictly inexpressible in digital notation, except as a proper name. The same is true for the diagonal of the unit square; take any square, designate one side to be length of "1," and the magnitude of the diagonal of the square (√2) is, likewise, strictly inexpressible in digital notation (except as the proper name "√2").[7] Magnitudes like π and √2 are labeled "irrational" numbers because their values cannot be expressed using a ratio of the form *a*/*b.* Expression 5 is thus the expression of the *alogos,* the expression of nondigital value. It stipulates the failure of digital identity (as previously defined in Expression 3).

Here we must be very precise. When posed the question "What is the value of π?" the properly digital answer is "I don't know," given that there is no ratio *a*/*b* of discrete values (Expression 3) that will give you the value of π. Or perhaps the digital philosopher will respond with a symbol or a proper name, stating flatly that *the value of π is* "π." The same question posed to an analogger will generate a more practical response. The analogger will simply draw a circle and point at it. *The value of π is contained right there, available for all to see.*

Expression 5 asserts that the nondigital exists, that there exists something unrenderable by the digital. Not that anyone needed a philosopher to ratify such an obvious truth! Yet arguably the most significant alternative to digital rationality is not the irrational but rather the analog. Two expressions will help to illuminate the analog, two expressions that, on the surface at least, seem to contradict each other.

Expression 6. *A* is incomparable with *B*
Expression 7. $a/b \equiv c/d$

These two expressions affirm analogical difference and analogical identity, respectively. The first affirms qualitative incommensurability. The second defines analog proportion as the similarity of two ratios.

A cornerstone of analog philosophy is that all entities are strictly incomparable.[8] Expression 6 does not simply mean that *A* and *B* are different values ($A \neq B$). Instead, Expression 6 asserts that the system for equating symbolic types is invalid, that no equation of terms will ever come out right. "You can't compare apples and oranges," or so goes the common colloquialism for the ratification of qualitative difference. The colloquialism does not mean that apples and oranges cannot be mixed or combined—pure qualities are freely combined in aesthetics for example—simply that they share no common monad that might act as a yardstick of comparison. Instead, the two ingredients may be mixed or integrated experientially, which is to say analogically. (Paradoxically, then, Expression 6 only makes sense within the ideology of the digital, given that analog experience is constantly combining and intermingling things that are incomparable.)

If the analog states that no two things are strictly comparable, the analog is also defined as a proportion, that is, a relation between two ratios (Expression 7). This seeming contradiction cuts to the heart of the analog and helps reveal its fundamental incompatibility with digital rationality.

Analogos means proportion, which we can gloss as a *qualitative identity.* Expression 7 defines proportion as an identity between two ratios. An orange has a rind, just like an apple has a skin. The parent has big ears, just like the child has big ears. *This is to that as something else is to the other.* In such instances, the question is not so much about the isolated identities of two terms; the parent and the child are not the "same." Instead, a similarity is formed through proportionate ratios. Thus, the head/ear ratio of the parent is

equivalent to the head/ear ratio of the child. Or, to take an example drawn from media technology, consider the *camera obscura* as an illustration of Expression 7. In the *camera obscura,* the outside world, with its own configuration of sizes and shapes, reappears as a projected image, an image that preserves those sizes and shapes in similar proportions. Which is not to reify the *camera obscura* as a realistic or naturalistic way of seeing, merely an analogical one.

Expression 7 might read like a doubling of the digital ratio (*a*/*b*)—analog as echo or twin—but it ends up not being a simple reduplication. Within the analog, the two ratios tend to fall away. And by falling away, the terms of sovereign identity (*A, B,* etc.) are no longer stressed as much as they are in the digital case. What matters instead is the *proportionate relation between two pairs,* not so much the identities of the two discrete pairs themselves. In other words, within the analog, the issue is not so much "what is *x*?" Rather, the question becomes "given a ratio, is there something else with a ratio in the same proportion?" The two digital atoms themselves (*a*/*b* and *c*/*d*) slip into the background, ceding importance to *the proportionate encounter between them,* an encounter of the "similar." This tendency—to play down the two ratios but to play up their mutual proportionality—shows how analogicity shifts away from the quantitative toward the qualitative. A quality emerges through the experience of *similarity,* a similarity that is ironically guaranteed via the radical difference of the two terms. (The analog is thus both the purely similar and the purely different, and hence *the unrankable*; the ordinal capacity of the analog is strictly absolute, not locally relational.) As seen before with Expression 3, the digital and the analog are related dialectically. And indeed here, in Expression 7, two digital kernels invert and reemerge as the raw materials of an analog relation.

One substantial benefit of the analog is that, unlike the digital, the analog does not legislate type. (Using the terminology of structuralism, we might say that the analog has no master signifier.) Type checks are, as it were, outsourced to the digital atoms internal to Expression 7. And these type checks remain internal; they do not

particularly intrude upon the analogical proportion itself. This is evident in transduction and all manner of analog encounters. The coupling of wasp and orchid, as in the writings of Gilles Deleuze and Félix Guattari, illustrates more vividly what Expression 7 expresses in sterile terms. Or consider the transduction of energy through physical media, as with an audio signal moving from air to copper wire and back to air. In such instances, there is no conformity of symbolic type. No symbolic consistency exists between air and copper, nor between wasp and orchid; nevertheless these elements join to form an analog "similarity" at the point of contact, the point of singularity.

Whereas the digital is regulated by quantity and quantitative relation, Expressions 6 and 7 illustrate the importance of quality within analog mediation. This kind of pure quality leads to an interesting expression, Expression 8, known as the *idempotence* expression.

Expression 8. $A + A = A$

Like *identity,* the term *idempotence* stems from the Latin term *idem,* meaning "the same" or "the very same." Idempotence refers to an operation that does not change the original value. In Expression 8, the addition of a second *A* (via the operation "+ *A*") does not change the original value, which remains equal to *A.*

Idempotence seems to violate simple arithmetic. How could something like $1 + 1 = 1$ be true?[9] Indeed, most arithmetical operations are not idempotent. But some of them are. Consider $0 + 0 = 0$ or $1 * 1 = 1$, where the respective operations ("+ *0*" or "* *1*") do not change the original value. Yet while idempotence can be found in digital tech, better examples are found in the analog manifold. Adding two waves together just makes another wave, it does not make double the waves. The resulting wave will most likely have a different form. It might have an exaggerated amplitude (or, just as likely, a diminished amplitude). Yet the addition of a wave does not change the quantitative nature of the wave, only the qualitative nature. The same is true in aesthetics. By mixing two colors

together, a painter does not generate double the colors but rather a single new color (albeit with added paint volume). Expression 8 captures the spirit of the analog, where a quality encounters a quality to generate a quality.

These last few expressions are useful because they focus on *continuity* rather than discretization. Idempotence (Expression 8) shows the *continuity of conditions.* While proportion (Expression 7) shows *continuous similarity* between ratios. And even qualitative difference (Expression 6) is a form of continuity, *the continuity of singularity.* An attention to continuity is invaluable, because whenever one identifies continuity, one has almost certainly departed from the digital. And, further, one has also likely departed from philosophy! The great thinkers of continuity—they are rare—are thus not philosophers in the technical sense, or at least they perform, like Gilles Deleuze or Henri Bergson, a form of philosophical heresy.

Before advancing to the penultimate expression, and to summarize what has been stated thus far across this brief history of digital philosophy, we have defined the digital first through identity, difference, and judgment, but also we have outlined two important departures from the digital, first the irrational (the undigital) and second the analogical (the paradigital). There are many other departures, of course, innumerable alternatives, potentially infinite. For instance, deconstruction is based on a kind of mutual corruption of the system of identity and difference. And, Afro-pessimism (along with parts of critical race theory more generally) argues that blackness is not an "analog" of whiteness, that neither the digital ratio nor the analog ratio can account for blackness.[10] So this is not the whole story by any means. And the more one probes the depth of digital rationality the more one is drawn to the many mysteries and contradictions harbored within.

Return, then, to the beginning, back to Fredric Jameson and the riddles contained in Marx's *Capital.* We began with the first riddle, the riddle of equivalence, the riddle of how something could ever be equal with something else. Digital logic solves this riddle with a

blunt solution. Given the creation of a symbolic order, all entities are, by definition, measurable as equal or different. The second riddle is equally mystifying: *Given the exchange of equals, where does surplus come from?* Digital rationality is stymied on this point, for there are no resources within digitality, classically conceived, that will account for the logic of accumulation. Digital atoms may be the same, they may be different, they may be ranked one against the other, but they contain no internal mechanism for being in excess of themselves, nor in deficit. To solve the riddle, we must depart again from the digital, depart not toward the irrational or even the analogical but toward a new plateau of thinking, toward the realm of dialectical reason.

Expression 9. $A = A'$

Dialectical difference is the backbone of Marx's method, as it was for Hegel before him. Read as "*A* equals *A-prime,*" Expression 9 is contradictory, or at the very least ambiguous. Does this expression describe an identity? Or, if not, does it indicate difference? Dialectical reason stipulates that there is no identity ($A = A$) that does not also generate a difference ($A = B$). Expression 9 is an attempt to contain both of these tendencies together. For example, Marx used the equation *M-C-M′,* which he called the general formula for capital, as a way to show the circulation of money and commodities, namely that money (*M*) may be used to buy the labor-power of variable capital (*C*) in order to produce commodities that may be sold for the original money plus a small surplus (*M*′). The final term *A*′ (or in Marx, *M*′) contains an essential ambiguity or paradox. In one sense, *A*′ means negation *is* possible, even necessary, and hence that *identity always implies negation,* leading to the paradox "*A* and not *A*." Yet in another sense, *A*′ means negation *is not* possible, that any difference already folds back into an identity with itself. Thus there was no outward exchange for Marx that was not also centripetal, that did not also return. And yet there was no exchange without surplus that did not also accumulate. Surplus was not simply a felicitous "bonus profit" for Marx; the surplus difference was already *identical* with the capital that set it in motion.

For his part, Hegel used a similar logic to grasp negation and contradiction. How could a mind come to know a world, Hegel asked, if that world were not, in some fundamental sense, already part of the mind? And likewise, how could a mind come to know a world unless thinking was not already externalized into the world? For Hegel, a self implied the *realization* of that self. And, in that act of realization, the self was no longer strictly itself, while persisting in self-identity. In short, the self is the same but also different ($A = A'$).

Jacques Lacan, who followed Alexandre Kojève's Hegel seminars at the Sorbonne in the 1930s, was also influenced by dialectical reason, even if his Hegelianism was not always obvious. One of Lacan's basic tenets is that the subject is always nonidentical with itself. Yet for Lacan this nonidentity was theorized less in terms of surplus and more in terms of lack, alienation, or castration. So the tick-mark (A') could also be interpreted as a mark of incompletion or finitude, as a way to indicate something barred or blocked (which Lacan sometimes wrote as $, understood as the "barred subject"). So while it may seem obvious or even cliché, it is imperative to underscore that dialectical reason (Expression 9) breaks with the logical principles described at the outset—the principles of identity, noncontradiction, and excluded middle—in that dialectics directly embraces contradiction and the middle (or "third") state in order both *to violate* strict identity and *to uphold* identity in the end.

Here we see the limits of analogy, for if I have wanted to show the affinity between digitality and philosophy, it seems impossible to find a similar affinity between digitality and capitalism. Capitalism is somehow greater and more terrifying than digitality, even as capitalism leverages both digital and analog moments within its ever-widening gyrations. (In crass terms, the essence of Marx's *M-C-M'* is that of a cycle from digital to analog and back to digital [*D-A-D'*]; money cannot self-valorize but must detour through the "analog" space of qualitative commodities, including labor-power, before returning to the "digital" space of quantitative money.)[11] Digital capitalism exists, of course, around the world and in specific

places like Silicon Valley, but the logic of capital accumulation does not derive from the basic logic of the digital, which strictly by itself has no mechanism for the accumulation of surplus.[12] We would need to supplement the digital by coupling it with some metadigital condition (the analog), or, alternately, append Expression 9 to the core definition of the digital, creating some new dialectico-digital hybrid. This latter option, perhaps impossible and most certainly horrific, would nevertheless help solve the "hard question" of meaning that has so eluded scientists working in artificial intelligence. How does data produce meaning? Silicon Valley has their answer (calculate averages at great scale). Yet the answer from Marx is a bit different: digital data cannot generate meaning on its own, strictly speaking, but only through a circuit of interactions between the digital and the nondigital.

I pause the topic here, ceding further discussion of dialectics to Handelman and Weatherby. In the chapter that follows they spell out more intricately the case for a dialectical theory of the digital. While we likely agree in a holistic sense—namely that dialectics is the proper way to subsume the interrelated fields of the digital and the analog—we disagree on some of the more narrow points. In particular, I remain rather stubbornly attached to the strict incompatibility between digital and dialectical. As previously stated, dialectics violates both the principle of identity and the principle of noncontradiction, whereas the digital militantly observes the integrity of those two principles. Because of this, we have digital computers, and we even have analog computers, but I'm not aware of there ever having been invented a dialectical computer. As a computer programmer, I've never seen a dialectical data type in a piece of software, for instance, or a dialectical operator in a line of code. Yet as a programmer who is also a Marxist, I recognize that computers exist at the intersection between machine and flesh, that they harbor qualitatively distinct components within them (plastic, copper, glass, electricity, photons, etc.), and that they exist within a broad social fabric rife with contradiction and antagonism. In that larger sense one might certainly wish to speak about a digi-

tal dialectic. Hence if I ultimately prefer a narrow, arithmetical definition of the digital (as incompatible with dialectics), Handelman and Weatherby address the digital within the expanded field, a field that is no doubt inherently dialectical.

IIIIIIIIIIIIIIII

As this brief history of digital philosophy winds to a close, let me reiterate some of the conditions given at the outset. A school of thought already exists called Digital Philosophy. This school of thought defends a single core postulate, namely that nature is discrete at its most fundamental level. We might, as a seeming anachronism, enlist the ancient atomists on this roster, along with modern adherents to binary logic. Contemporary scientists of cellular automata such as Stephen Wolfram should also be added to the list, as should many others. However, the remit of my own study was not to describe the particular school of Digital Philosophy but rather to specify, by way of a series of arithmetical expressions, the conditions necessary for any form of discrete rationality in the first place (including atomism, binary logic, cellular automata, and other modes of mediation). This more general type of discrete rationality can be termed digital philosophy, in lower case. At the same time, the general definition of digital philosophy has revealed, through silhouette, any number of other forms of thinking and experiencing. Three of these have been outlined above—the irrational, the analog, and the dialectical—although there are certainly others as well.

To conclude this brief tour through digital philosophy and its others, we return to the beginning, to the second expression, the principle of identity, only now slightly altered.

Expression 10. *A* is *A*

At the outset the principle of identity, "*A = A,"* was considered trivial, tautological, and perhaps even rather distasteful. Yet now the altered identity equation ("*A* is *A*"), along with its cousin the immanence equation ("*A* in *A*"), shows a path to exit the digital *logos* even more profoundly and definitively than what was offered by

the *alogos,* the *analogos,* or even the dialectic. The identity equation performs a kind of *logical masking,* in that it pushes forth a name in order to block the imposition of all the other names. (This is one reason identity is at the heart of so many liberation struggles today.) Tautology is thus a prophylactic. It defangs and diminishes the potency of representation, so often a violent imposition. After the type checks of Expression 3, we have seen the hazards involved in "being of the same kind." Wouldn't "being whatever you are" be preferable to "being of the same kind"? Tautology is, in this sense, more profound than one might expect, because it expresses identity as *radical immanence* rather than identity as *genetic resemblance* ("being of the same kind"). Tautological identity is generic rather than genetic. The identity equation does not construct a genetic series based on monadic repetition but rather suspends equation and predication in the form of generic immanence. Thus, contra the previous characterization of identity as conservative, I suspect identity is more radical than it might seem. In the end, tautological identity *degrows* the digital, because it suspends the two-structure at the heart of digital identity, digital difference, and digital judgment (as they have been previously defined in Expressions 1, 3, and 4).

Indeed, this more positive characterization of tautological or immanent identity does not transfer back to the digital easily, if at all. Digital identity is inherently representational. The essence of digital identity is not found in plenitude, not in a type of unrepresentational presence. Rather, the essence of digital identity is precisely its emptiness, its inability to leverage qualitative presence. Digital identity is axiomatic and nothing more, similar to how, in set theory, the null set is defined as equal to itself ($ø = ø$).[13] Such nullness is not coincidental. If immanent identity is, as it were, self-valorizing, digital identity is essentially null, static, and nonvalorizing. In other words, radical immanence turns a weakness (of the digital or other identitarian system) into a strength. Radical immanence is an affirmative principle; it facilitates self-definition not by appealing to representation but by warding it off. I open and

close the chapter with identity in order to highlight this ambiguity: the identity equation may serve as the genetic basis for digital identity or, when deployed differently, as a generic discovery of the absolute nonapplicability of digital technology as a whole.

As a postscript, cast an eye back over the 10 expressions presented here as simple mathemes for digital philosophy and its alternatives. I have not claimed, as many from the school of Digital Philosophy will want to do, that nature is discrete at its most fundamental level. Rather, to repeat, this sketch of digital philosophy has tried to define the conditions through which it is possible to make any digital claim whatsoever (the "isolation of conditions" being a classic digital method). We thus have "10" expressions, which is also the binary notation for the number 2! So Expression 10 loops back to Expression 2, and these *ten* expressions are really *two* expressions. These ten expressions articulate the two-structure at the heart of digital philosophy. They address the difference between two terms by showing some of the possible ways in which two terms can or cannot relate.

Hence we end by reciting a new mantra, that the digital is not so much about "zeroes and ones" as it is about "ones and twos," the digital as the one becoming two, and the analog as the two integrating as one. We return, in other words, to Fazi's elegant notion of "a blade and a glue." At the same time, these two technologies, the blade and the glue, one analytic and the other synthetic, are also the two key moments of the dialectic, toward which the volume now turns.

Notes

1 The social and historical nature of measurement is a frequent topic of interest. See, for example, Emanuele Lugli (2019).

2 On the relevance of Exodus 3:14 for digital theory, see Aden Evens (2024, 32–33).

3 The typical form of the *reductio* proof is as follows: Assume that the goal is to disprove some statement *P.* Start by asserting *P,* then transform *P* until a contradiction is found. Finally, with *P* now demonstrated to be contradictory,

assume LNC on *P* and exercise LEM to validate ~*P,* which is the desired result. While the LNC and LEM are historically significant, alternative logics have been proposed that do not necessarily rely on these principles. One important alternative is Intuitionistic logic developed in the early twentieth century by L. E. J. Brouwer, which, among other things, declined to use the law of excluded middle. Additionally, dialectical rationality, which I will address via Expression 9, does not respect the law of noncontradiction. This is not to mention any number of other traditions—aesthetics and literary theory, to highlight two—within which noncontradiction claims no particular pride of place. Or, as Elizabeth Anker unambiguously put it: "If there is one thing literary studies near uniformly rejects, it is Aristotle's principle of noncontradiction" (2022, 115).

4 Ratio notation of the form *a:b* is related to but not the same as fractional notion of the form *a/b.* To convert from a ratio to a fraction, put one term from the ratio in the numerator, and sum the two terms for the denominator. For example if the ratio of apples to oranges is 3:2, then 3/5 are apples and 2/5 are oranges.

5 In addition to these ancient expressions, modern formulae exist as well. Saussure's definition of the sign as a relation between two terms, signifier and signified, is an excellent example of the digital atom (2011, 65–67). Also following the *a/b* structure, Lacan wrote Saussure's "signifier over signified" using the matheme S/*s* (2005, 413–19). In this sense, both Saussure and Lacan were one step more detailed than the simple geometric ratio, because they assigned specific roles to each element in the ratio.

6 In set theory, the cardinality of a set is, colloquially speaking, the "size" of the set as determined by counting its elements. For example, the set {42, ¶, G} has a cardinality of 3. For large sets, manual counting may become cumbersome, while for infinite sets it becomes practically impossible. Hence cardinality is used as a way to talk about the "size" of a set even under conditions of that set's uncountability. (There are techniques for matching size one-to-one without having to count all elements.) In the current discussion, however, I emphasize not the count of sets, but cardinality as an operation whereby a pure multiple is replaced with a symbolic name. Cardinality is thus the operation whereby the multiple "***" is replaced with the name "3." In this sense, cardinality is intimately connected with the digital, perhaps even its most essential precondition. Cardinality indicates that "digitality" and "naming" are practically synonymous.

7 Symbolic notation is very useful here. For instance, the value 3.141592 . . . may be indicated by the black-boxed symbol "π" without ever having to expand the value into its decimal approximation. Root two may be given the proper name "√2" or "$x^2 = 2$," thereby allowing the magnitude to persist within symbolic notation without ever needing to realize it. This illustrates the potency of the proper name, a powerful digital technology. Under the proper name, an analog value need not appear at all, replaced instead by a discrete symbol.

8 Paul North (2021) has written a compelling treatise on the condition of the "strictly incomparable," which, when taken to its proper conclusion, inverts into

a landscape of ambient likeness, where everything is, in fact, like everything else, even if only in their mutual incomparability.

9 Claude Shannon, an important digital philosopher, nevertheless offered an excellent example of idempotence in his master's thesis on switches and circuits. "*1 + 1 = 1*. An open circuit in series with an open circuit is an open circuit" (1938, 714). Of course much depends on the definition of the humble "+" operator, which in this instance means concatenating two circuits in series, not the more common arithmetical sense of "+" as the sum of two multiples.

10 On Afro-pessimism and the "ruse of analogy" see Frank B. Wilderson III (2010). On blackness and mathematics, see Calvin Warren (2019).

11 Jonathan Beller has experimented with his own reworking of Marx's general formula by migrating the terms to the information age. See Jonathan Beller (2021, 101–72).

12 Some contemporary commentators have suggested otherwise, that pure quantity can self-valorize, citing finance capital and cryptocurrencies as examples. Yet this is the most cynical form of wish fulfillment. Cryptocurrencies that use "proof of work" are explicitly rooted in a source external to number, namely the physical expenditure of energy. And finance capital, while seemingly uncoupled from material constraints and subject to its own internal logic, remains in the last instance a hallucinatory epiphenomenon of real conditions. If money could self-spawn via spontaneous generation, we would have seen it happen by now. Rather, Marxism teaches us that quantity must always detour through quality, that value emerges only through cycles of production, and indeed that the only known source of value, even in the most advanced digital societies, is the qualitative expenditure of labor.

13 In axiomatic set theory, the axiom of the empty set asserts the existence of an empty or null set, while the axiom of extensionality ensures that the null set is equal to itself.

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[3]

Digital Dialectics

Matthew Handelman and Leif Weatherby

Claude Shannon kept a machine on his desk. A wooden box with a single button, the contraption went under the modest name "the ultimate machine" (Kittler 1995, 237–38; Kittler 2006, 49). If a visitor pressed the button, the lid would open, a stylized mechanical hand would extend from inside the box, flip the switch, and disappear, the lid closing behind it. On, off. The drama of the hand served to demonstrate only the binary logic of a switch, the powerful liminal space between the physical and the symbolic on which Shannon had made his career. Shannon was a mathematician and engineer whose "mathematical" theory of communication made today's digital universe possible. He quantified the sending of messages, enabling engineers to exploit a general property of the relationship between the stability of a message and the capacity of a channel, and the type of translation—coding—that would be required to mediate between the two. Shannon was able to show how switching could sustain almost any transmission, if rigged appropriately into logic gates. The machine on his desk was a toy and a cipher, an invitation to think the basis of the problem. You could force nature to speak the language of on and off, 1s and 0s, and by doing that, you could get an awful lot of communication into a channel. The machine was "ultimate" because its message was an exhibition of the function that made other machines possible.

Shannon's toy was a synecdoche of the digital. Or really, of an *interpretation* of the digital that we will dispute here. The toy is empty,

infinite "logic" processing. Since Shannon's time and continuing today—when, instead of a smattering of room-size mainframe machines operating with thousands of switches and dozens of kilobytes, we have gone over to a global infrastructure consisting of zettabytes and ubiquitous handheld computing devices with several billion transistors—we have wavered between this idea of the digital as a toy and a fear of the digital as a monster. In the storyline that these two conceptions accidentally cook up, two thoughts come together that do not really mesh. On the one hand, digital computers are rigid, formal, analytic systems that can do nothing without humans thinking for them and would be utterly transparent if only we had the time—the many lifetimes—to pick apart their operations step by step. On the other hand, the digital is responsible for mis- and disinformation, bias, racism in a new mode (the "New Jim Code," in Ruha Benjamin's [2019] phrase), confusion between reality and virtuality, depression, anxiety, and a global pandemic of despair. It is time to stop accepting that these two narratives sit comfortably with one another.

This story does not exactly make sense, and if we look closer, we begin to see that it is the story, and not the digital, that is a form of what G. W. F. Hegel called "bad infinity," wavering endlessly between contradictory options without ever explaining, synthesizing, or making sense of them. To generate a kind of auto-interpretation of this sort, we propose in what follows that the digital must house a dialectical kernel. It must be both toy and monster, and it cannot be conceived without its constitutive relation to the human. Indeed, it is not clear what a human-less digital means. The only real candidate for the border between human knowledge and something that exceeds it is a representation system. Our task in what follows is to reconstruct two crucial parts of the history of digital theory—one from philosophy, the other from early formulations of computation and digital computers—to show that the digital is a dialectical representation system.

In claiming the digital is dialectical, we do not stray from the minimal definition of the digital offered in this volume's Introduction:

a form of mediation that uses discrete units, the 1s and 0s as the universal sign of the digital world. In this sense, the digital stands alongside other discrete representation systems (language, logic, etc.) but with several key conceptual differences.[1] As a least complex register of difference, the digital as a system of binary bits can encode other systems of representation, such as the ASCII system that encodes letters into numbers into binary. But the digital can also be operationalized through its embedding in physical elements (switches, transistors) so that it can perform things like binary addition (through an adder) or logic tables (through logic gates). In the following, we locate the specificity of the digital neither in its much-purported independence from meaning (Shannon, Friedrich Kittler) nor in its endless toggling between 1s and 0s.[2] Rather, for us the essence of the digital lies in the digital's unique ability to represent and, when put into physical form, operate on those representations. The digital is dialectical in that it unifies number as representation (data) and number as operation (syntax, procedure, logic). This unity in difference is not only the core dialectical element in any digital system but also the specific property of the digital that has enabled the world of digital computation we know today.

The digital's wavering between empty infinite space and the universal monster of data capitalism is thus not the nature of the digital but rather its history, aftereffects of a missed opportunity for theorizing the digital at the moment of its inception. The missed opportunity was the confrontation between the Frankfurt School and the Vienna Circle, between Critical Theory and Logical Positivism, in the late 1930s—this is the first history of the digital we tell here. Initial contact between the schools took place in 1936, the same year that Alan Turing proposed the now standard model of computation (Dahms 1994; O'Neill and Uebel, 2004; Albrecht and Prager 2019). The dispute started over potential collaboration on empirical approaches to sociology but quickly devolved into a fight over the type of logic appropriate for modern philosophy: the formalist logic of Bertrand Russell and Gottlob Frege, as advocated by

the Logical Positivists, or the dialectics of Hegel and Marx, to which the Critical Theorists remained committed. While this confrontation may seem to have little to do with the parallel construction of digital computers, its combatants were to influence and distill the notions of the digital and that of dialectics. The influence of Rudolf Carnap, a main proponent of Logical Positivism, was felt all over the emergent digital world, while the critical theorist Theodor W. Adorno's voice has come to dominate the practice of dialectics down to the present. The battle, however, was carried out by proxies for both sides—Otto Neurath and Max Horkheimer—turning a conversation in which formal and dialectical logic may have been joined into a bitter fight between philosophical scientism and an almost vulgar Marxism.

This story tells us why our concept of the digital is so poor. To build toward a theory of the digital, we must also reconceive the elements the first histories misconstrue. As we show—the second history of the digital we tell—Turing's conception of the digital was not made into a logical black box by its implementation in hardware. The digital is not a logical technique imposed on number but an exploitation of a dialectical property of number itself: its ability to represent and operate, in the terms stated above, at the same time. By combining quantity with logical syntax, the digital envelops all possible semantics, in so far as meaning is based on signs (and no further). In the passage from Grace Hopper and the Harvard machine to the von Neumann architecture, the classical computing machine imitated the very stakes of this dialectic of quantity. Digital computation effectively inverts Hegel's logic, implementing an internally contradictory quantity by means of the reversal of essence and concept. The result is a representation system that is semiotically universal with respect to all other representation.

Digital media theory has always been haunted by Hegel and his dialectic. Bernhard Siegert calls the digital "the liberation of bad infinity," giving it both the ability to intervene physically in symbolic processes, shifting them, and the sense of the "toy" that Shannon and Kittler select for emphasis (Siegert 2003, 17). Kittler, perhaps

the most influential media theorist of the late twentieth century, returns to Hegel and the idea of "bad infinity" symptomatically when describing the logic of the switch: "Shannon's bad infinity, as Hegel would have said, started the digital age with its endless sequence of in and out, yes and no, one and zero" (Kittler 1995, 238). The ultimate machine, Kittler claims, spreads out over the world an indeterminate set of flips, randomly iterating decisions that ground binary logic but have no other destiny. "Bad infinity" would be the logic of a switching operation that runs underneath all purposeful uses of digital technologies. Hegel invoked the figure of "bad" infinity to describe situations in which a concept is called for but unavailable, not yet clear. We keep running the same script for lack of an insight or determination that would allow us to shift gears, toggling between contradictory extremes. This is the situation with the digital today. To borrow Hegel's definition, our current theories of the digital are "the contradiction itself posited as perennially recurring" (Hegel 2010a, §60).[3] These historical moments have held theory back by offering it two incomplete, complementary visions of what digital technologies are. One calls it "empty," the other says it taps into the logical backbone of cognition, and sometimes truth, itself. But both boil down to the same notion, that the digital is "just" something that unfurls logic's own course and so reveals nothing not already contained in that logic. We disagree.

Situating dialectics as an essential component of the digital avoids two vulgar errors common to casual talk of the "dialectical method." The errors are complementary: one says that dialectics is caused, or perhaps performed by, human minds, while the other claims in grand style that it is history "itself" (or in extreme cases, nature) that "is" dialectical. The problem with such formulations has always been that the nondialectical entity is theoretically unsupported. We do not know in advance what a "concept" or a "thought," let alone "history" is, and then proceed to inflect it with the methodological adjective "dialectical." Dialectics pertains to thought—and to history—differently. Hegel is extremely clear on

this point, showing in the wake of Kant and Fichte how objectivity itself is the collective—and therefore historical—capture of an object, "forms of thought" thus making up the immanent theme of dialectics (§41). Commonsense objections to this idea-first approach to the world of objects are almost always severely undercomplex compared to actual competing doctrines. We struggle to find any serious doctrine of cognition that supposes that thoughts are made up of local, causally influential interactions with objects. Hegel may, in this sense, be taken to be well ahead of his time in rejecting a correlationist or representational theory of cognition.

What points us to the digital here is the observation that, for Hegel, everything is dialectical for the specific reason that every representation houses a contradiction that expresses itself as logic, as quantity, and as meaning—simultaneously (§81). Hegel came to speak of the dialectic because he was trying to overcome Kant's tendency to hold propositional logic separate from the "transcendental logic" that constructs nature for us. The result is a metaphysics in which logical, numerical, and conceptual representations are synthesized in every representation. What we will call "the analytic conception of the digital" (or "analytic view" for short) says that the synthesis is done *elsewhere,* not by digital machines but instead by humans.[4] That is, of course, sometimes correct, but it is not really the question. There can be no digital machines without humans, just as there can be no language—and arguably no mathematics—without humans. But in good critical, dialectical, or structuralist style (one may choose any number of words to modify the central impulse of theory), we argue that the systems in question—logical, physical, semiotic—create the binary appearance of the digital and its dialectical essence, which, taken together, make up the world of the digital we live in today.

Shannon's toy no longer illustrates the digital cleanly. The notion that the digital has no truck with the meaningful—that switching mechanisms are not semantic, perhaps best crystallized in the anti-hermeneutic stance of Kittler—rings false in the present. What

semantic process today is *not* digitally mediated, and which digital process has not in some way been shaped by society? We might better say that the digital has *resemantified the world,* leaving the reason why a supposedly empty, purely logical syntax machine was able to do this in the first place obscure.

The digital *feels* binary. Placing digital space in opposition to the real, our vocabularies reflect this fact in the distinction cyberspace/meatspace, or the tense contradiction between social media or life online and "real life." Of course, a moment's reflection reveals that these oppositions are false. Social media warps social life itself, but of course then it just *is* that social life, or part of it. Cyberspace is a material factor in whatever regular space is, just as writing, thinking, and representation in general has always been a factor in "real" space for humans. Indeed, we reject both the line that this virtual or representational order is a violation of some integral "body" that comes before it, but also the view that this space is a logical (or more properly a logico-mathematical) vacuum, sealed off from human bodies or minds until "we" activate it. Both of these views are binary but not explanatory of the dualism that the digital presents us with. The digital *must* manifest as binary yet cannot be explained by means of the logic of two. Dialectics is required.

What we mean by dialectics can be illustrated in conversation with the other essays in this volume. We agree with Beatrice Fazi that the digital and thinking are closely intertwined, and we agree with Alexander Galloway that the digital is a form of discrete mediation. But we disagree that the digital can be separated from computation—indeed, that is what distinguishes it as a form of discrete mediation for us—and we do not think that the digital as a form of thought is restricted to rigid philosophies of discrete mediation like those from Leibniz to Boole and Frege. The contradictory nature of the digital as toy and monster, which underpins the experience of the digital as binary, is only one half of the story. We will claim that this fact is the appearance, not the essence, of the digital, while conceding that, to use Hegel's phrase, appearance is essential to essence.

Fazi is correct in her conclusion that "there is no theory other than digital theory"; thinking itself cuts, glues, partitions, sutures, and so on. The problem Fazi lays out here is one that we see as a problem of the *symbol,* or *representation* more generally. The transcendental-logical aspects of Fazi's digital ontology—those that see a common precedent for operation and thinking as such—are semiotic, for us. But we are also inspired by Fazi's account of Turing in *Contingent Computation* (2018), and we do not assign the digital only to the logical—even if that logic is not formal but the essence of thinking, and theory, itself. The same holds for our relation to Galloway, as we think that discrete mediation and the philosophy particular to that mediation do not suffice to describe the digital. Computation, as the practical conjoining of number as operation and number as meaning, is also required. This does not mean that we seek to write a digital *history* or a *cultural* history of the digital, as a set of techniques. We agree fully with the spirit of *essence* that this volume claims, and we elaborate on the notion of essence with reference to the second, decisive book of Hegel's *Science of Logic,* the logic of essence. The digital shares much with the semantic richness of abstract and creative thought but is delimited by a computational, *non-analytical* (i.e., synthetic) symbolic operation that differentiates its dialectic from the one usually associated with Hegel. In contrast to the analytic conception of symbolic activity—such as in Frege or Newell and Simon's "physical symbol system"—we believe that digital symbols cannot be reduced to their syntax without remainder, even though they are processed by that syntax.

From Hegel through Adorno, dialectics has been the movement of concepts, and these conceptual dynamics, in which the digital takes part, are how we conceive of dialectics even if the digital is not "cognitive" itself (Adorno 2017, 5). Digital dialectics focuses on the conceptual movement of the digital between quantity and quality with an eye toward how the digital in its historical incarnations in the first computers synthesizes logic and meaning, operation and data, none of which, it has turned out, strictly requires a

cognizing mind.[5] Traditional dialectics has tended to fail to deal with operational quantity and has largely sidestepped serious engagement with digital technologies in general. In attempting a dialectical elaboration of the digital, we run the risk of assimilating the digital to dialectical process *as such,* rendering the digital *too* semantically "rich." Where dialectics is universal—it is literally a logical metaphysics, not a theory but an unfolding of the representational processes that sum with the world to make up the real—is as a computational symbolism that is *universal with respect to signs,* a meta-representational totality in development.

We return to dialectics to correct a bracketing that has occurred in our theories of the digital. Consider the process of teaching physics to teenagers. For the purposes of learning about velocity and acceleration, and the mathematics necessary to build toward higher-level physics, you can neglect resistance. But when you do, you are explicitly bracketing a crucial element of the physical world, something that makes up what physics *is.*

The analytic view of the digital, which inherits from Logical Positivism the properties of flatness, independence from meaning, and a totalizing view of knowledge, claims something similar. It goes like this: A mathematician, or a team of them, including coders (women, in the early days) translate a complex problem into a step-by-step process. Early examples included the differential equations needed to split the hydrogen atom, the implementation of Monte Carlo algorithms, and more (Chun 2005; Ensmenger 2010; Dyson 2012). They feed this breakdown into the machine, whose switches once lay open, as the famous pictures show. Receiving an answer, the scientists plugged it back into wherever they needed it in some chain of reasoning external to the machine. While the situation has changed with the rise of global digital infrastructure, the analytic conception of the digital claims the rigid formal process remains the same. A homunculus scientist governs a set of purely deductive logical relations that we humans *implement* to do things, but which have no content themselves. Or, more strictly: they do

not *influence content,* in the sense that they have no "independent" determining power for the semantics of the world. Sure, nearly every action we take might be recorded, rearranged, and predicted by digital systems. But, from smart health monitors to the latest artificial intelligence, these systems do not *do* anything at the level of meaning. Content, in other words, can be ignored.

The sketch above—as well as many in analytic philosophy, media studies, and even critical theory (in its criticism of Logical Positivism [see Handelman 2019])—locates the essence of the digital in a logico-mathematical vacuum. Of course, just like the toy vacuum version of physics, these processes really happen in digital machines. But that is not *all* that happens. The digital universe is vast, ever growing, and complex; it both shapes and is shaped by societies. Indeed, quantity is not something "outside" the dialectic—rather, it is a narrow path through it, an enabling factor for systems of representation that include it (Hegel 2010a, §106).[6] There thus must be some *kernel,* even in the scientist-with-machine scenario, that allows the appearance of the logico-mathematical vacuum to spread into the kaleidoscopic world of digital culture today. We find that kernel in the notion of quantitative judgment as a semiotic process, one that cannot be explained in binary terms. The invention of the computer came as the result of the *end* of the fantasy of that vacuum, and those who created it were fully aware that the syntax machine was not separated from meaning. Strange, then, that our theories should have retrojected that fantasy into the very machines that came to overhaul our entire culture, providing the logistical and semantic lynchpin for the world as we know it today.

In reconstructing the digital dialectic, we trace the movement of the digital and its blockages first by turning to the dialectics of Critical Theory and the syntacticism of Logical Positivism. There is potential for a more productive account of the digital if we dissolve Carnap's blindness to ideology, which would quickly take hold of the new digital technologies, and Horkheimer's hostility to formal logic, which despite the Frankfurt School's polemics would soon

take hold of the world. Let us then put a positive spin on it: the philosophical dispute examined in the next section sets the stage for a more generative encounter between formal and dialectical logic, which we think is essential to grasp the digital's epistemological complexities and ideological tensions.

The Analytic Conception of the Digital

The way the digital is thought about today has its origins in the acrimonious dispute between the Vienna Circle and the Frankfurt School, which took place against the backdrop of the rise of Fascism in Europe. It started with communication between the main organizational figures behind both schools, Neurath and Horkheimer, who initially made contact over shared interests in empirical sociology and plans for collaboration. It soon became clear, however, that Neurath and Horkheimer understood different things under the term *empirical,* e.g., scientific empiricism and dialectical materialism. Indeed, any door for collaboration slammed shut with the publication of Horkheimer's polemical essay against Logical Positivism, "The Latest Attack on Metaphysics" (1937/2002a). The hastily written, scathing text claimed that Logical Positivism held an untenable anti-metaphysical position on thinking—a "rearguard action of the formalistic epistemology of liberalism," as Horkheimer explained it to Adorno—that shared an origin with "neoromantic metaphysics" in "the present sad state of the middle class" (Adorno and Horkheimer 2003, 195; Horkheimer 2002a, 140). Horkheimer solicited but refused to publish a reply from Neurath in the *Zeitschrift für Sozialforschung* (Albrecht and Prager 2019, 25–32) before both schools went into exile in the United States. This episode has mainly been read as a precursor to the *Positivismusstreit* in sociology in the 1960s. But there was also a missed opportunity in the controversy. Logical Positivism's conception of thinking as the combination of the rules of logic and empirical data set the stage, in mainly uncritical terms, for contemporary theorizations of the digital world. At the same time, Horkheimer and Adorno's criticism of Logical Positivism contains the core of a

dialectical conception of the digital, which nonetheless remained unarticulated in their polemics.

The debt that contemporary thinking about the digital owes to Logical Positivism lies in the latter's redefinition of philosophy, which sought to circumvent what it saw as the metaphysical and linguistic ambiguity of philosophy. The debt is in part historical: Walter Pitts studied with Carnap and used the latter's calculus to formalize the logic of neurons in Pitt's and Warren McCulloch's paper "A Logical Calculus of the Ideas Immanent in Nervous Activity" (1943)—a founding document of the digital age. The debt is also conceptual. Consider how the Vienna Circle conceives of its own antiphilosophical philosophical program in the group's 1929 manifesto *The Scientific Conception of the World*:

> The scientific world-conception knows no unconditionally valid knowledge derived from pure reason, no "synthetic judgments a priori" of the kind that lie at the basis of Kantian epistemology and even more of all pre- and post-Kantian ontology and metaphysics. . . . It is precisely in the rejection of the possibility of synthetic knowledge a priori that the basic thesis of modern empiricism lies. The scientific world-conception knows only empirical statements about things of all kinds, and analytic statements of logic and mathematics. (Neurath 1973, 308)[7]

Two points stand out in this statement. The manifesto takes a specific position in the history of mathematical thinking: mathematical judgments are analytic and not, as Kant claimed in the first critique, synthetic judgments a priori (more about this below). To eyes more used to ubiquitous computing and Big Data, the "scientific worldview" also seems to anticipate digital computation itself: Logical Positivism restricts thinking to "empirical statements about things of all kinds" (e.g., data) and the "analytic statements of logic and mathematics" (e.g., computation). Its grandest ambition was to reduce science to logical, "protocol" statements (empirical data) and their mathematical-logical manipulation. However one views

it, this spirit inspired modes of thinking that accompanied the development of digital technologies and have remained a major framework through which we think about them. We call this group of ideas, beginning in Logical Positivism, the "analytic conception of the digital."

The major conceptual contribution that Logical Positivism made to how the digital came to be understood in the second half of the twentieth century resides in the Vienna Circle's use of the term *analytic.* The idea of analyticity and Carnap's focus on the logical analysis of language came to serve, of course, as cornerstones of analytic philosophy.[8] In *The Scientific Conception of the World,* rejecting "synthetic judgments a priori" and asserting that "logic and mathematics" are "analytic statements" intervened more immediately in debates over the nature of mathematical and logical reasoning started by Kant. This debate took shape in one of Kant's first moves in *Critique of Pure Reason,* which was to distinguish four distinct types of judgments (Kant 1998, 141–45). We can think of judgments as either a priori or a posteriori based on whether they follow from empirical experience. A priori judgments are transcendental and are the work of thought alone, while a posteriori judgments are made of the content provided by our experience of the world. Furthermore, a priori and a posteriori judgments either add new information to the object under consideration or unpack predicates contained in the subject; Kant calls the former "synthetic" and the latter "analytic." Analytic judgments clarify a subject, distilling attributes already logically contained in it: all poodles are dogs. In contrast, synthetic judgments add new attributes that are not already logically contained within a subject, for example through experience (some poodles are black and named Loki). Kant made a controversial move by claiming that mathematical judgments are both a priori *and* synthetic, in that they employed information that went beyond definitions contained in algebra (time) and geometry (space) (144–45).[9] In the course of the nineteenth century, mathematicians and logicians called Kant's assertion into question and, as the Logical Positivists would do in

the early twentieth century, came to think of logical and mathematical statements as analytic judgments.

But what does it mean if mathematical statements are analytic and not synthetic in Kant's and the Logical Positivists' terms? This question turns out to be crucial for the historical conception and contemporary theory of the digital.

Take Kant's explanation of the arithmetic operation of addition as synthesis: the combination of 7 and 5 draws on the notion of time (for Kant a pure form of intuition) as the successive iteration of moments in adding ("+") "5" to "7" to get "=12" (144). While the operation adds information, this information stays within the realm of pure reason. In contrast, the Logical Positivists would have viewed a mathematical equation "5 + 7 = 12" as an analytic a priori statement. As Carnap puts it: "There are statements that are true because of their form alone ('tautologies,' according to Wittgenstein; these match more or less Kant's 'analytic judgments'); they disclose nothing about reality. The formulae of logic and mathematics belong to this type of statements; they are not themselves expressions about reality, but rather the transformation of these types of expressions" (Carnap 1931, 236). This and similar statements associate several qualities with "Kant's 'analytic judgments'": they do not refer to anything in "reality," they are logically equivalent to "tautologies," and their validity derives not from correspondence with some object in the world but rather according to syntactic rules. Mathematics and logic become, in the words of Henri Poincaré, an "immense tautology" that, through analytic steps, unfolds from and reduces back to the principles of identity and noncontradiction (Poincaré 2018, 7). This is the logico-mathematical vacuum at the heart of the analytic conception of the digital.

The analytic conception of the digital aligns the digital with the analytic in the same way—and with many of the same philosophical consequences—that Carnap and Logical Positivism aligned mathematics and logic with analyticity. From Shannon's ultimate

machine to contemporary media theory, the analytic concept of the digital has become a standard view of the digitality of the digital world. "As I define them," writes Galloway in reference to Kant's example of 5 + 7 = 12, "'digital' has a special relationship with analysis, while 'analog' with synthesis. The terms are so similar that, in some instances, they act as synonyms (digital = analysis, analog = synthesis)" (Galloway 2020). If one were to translate the analyticity of mathematics into the analyticity of the digital, then the digital would only unpack (as in the idea of "breaking up" from the Greek origin, *ana-lyein*) the objects supplied to it, adding nothing new in the process. Accordingly, the digital would constitute a tautology valid on its syntactic form alone. It has no direct bearing on the real world (even if it has bearing *in* the real world), instead stretching out as a ceaseless repetition of 1s and 0s. Indeed, the analytic conception of the digital has taken on many of the same characteristics as the scientific conception of the world such as flatness and clarity, detachment from reality, and the assumption that the digital fundamentally contributes nothing new to the objects on which it operates.

One of the most central qualities the analytic conception of the digital inherits from Logical Positivism is the idealization of the digital world as a flat, clean surface lacking depth. An aesthetics of clarity, purity, and harmony has long been located in mathematics and, in particular, in Euclidean geometry.[10] A similar set of features underlie the polemical worldview presented by Logical Positivism:

> The scientific world conception is characterized not so much by theses of its own, but rather by its basic attitude, its points of view and direction of research. The goal ahead is *unified science.* The endeavor is to link and harmonize the achievements of individual investigators in their various fields of science . . . From this springs the search for a neutral system of formulae, for a symbolism freed from the slag of historical languages; and also the search for a total system of concepts. Neatness [*Sauberkeit*] and clarity are striven for, and dark distances

> and unfathomable depths rejected. In science there are no "depths"; there is surface everywhere. (Neurath 1973, 305–06)

Despite the stated commitment to empiricism, this worldview idealizes science and knowledge—*unified* science, *harmonized* achievements, *neutral* and *total* systems, symbolism *freed* from history, *neatness* and *clarity.* Notions of flatness and discreteness accompany the invention of the digital computer in the tape supplied to the Turing machine, which, as Sarah Pourciau shows, stand in contrast to the metaphorical depth of the "ocean" of Big Data (2022, 235). They also find their way into theories of computation: an aesthetics of flatness and clarity underlie what Fazi calls "computational idealism," which associates formal axiomatic systems and, thus, computational structures with "elegance, simplicity, symmetry, and harmony" (2018, 86). The analytic conception of the digital upholds a similar and ubiquitous binary: the analog world is made up of continuity, noise, and irregularity distinct from the discrete and clean world of digital symbols. We agree with both Pourciau and Fazi that this picture is divided wrong and that the oceanic and contingent aspects of today's digital world require a different theoretical starting point than the one that has come down to us from Carnap.

Another quality found in Logical Positivism's worldview that reappears in the analytic conception of the digital is an attempt to separate mathematical-logical form from the contents to which they refer. The significance of mathematical and logical statements as analytic judgments is that they "disclose nothing about reality," as Carnap writes; as tautologies, they are, as he put it elsewhere, "devoid of content [*gehaltleer*]" (Carnap 1930, 23). Horkheimer and Adorno's criticism of Logical Positivism argues that this attempted separation of form and content is ultimately untenable (Horkheimer 2002a, 168–69). But separating form from its content and meaning is foundational not only to early theorizations of the digital but also to media-theoretical approaches to the digital world. Consider Shannon's mathematical theory of communi-

cation: messages often "refer to or are correlated according to some system with certain physical or conceptual entities," but "these semantic aspects of communication are irrelevant to the engineering problem" (Shannon and Weaver 1998, 31).[11] This strict separation also permeates approaches to the digital from analytic philosophy to media theory: meaning is taken to be an aftereffect, something like a hallucination of syntax (Kittler 1999, 14; 2013, 223); or, in the words of John Haugeland, "if you take care of the syntax, the semantics will take care of itself" (1989, 106). In the analytic conception of the digital, meaning is always supposed to be downstream from syntax, allowing the digital seamlessly to provide global infrastructure crossing national, linguistic, and ideological borders with ease.

But with its independence from content, how do the flatlands of the analytic conception of the digital incorporate new information into a network of tautologies? In Logical Positivism, this assignment was to be taken care of by the empiricism: sensory experiences of the scientist translated into elemental, "protocol" statements, which were then fed into the analytic machinery of logic and mathematics.[12] For Horkheimer and Adorno, to limit thinking to current experience acted in the service of maintaining the status quo. But similar sentiments predate Logical Positivism and can also be found in some of the earliest writings on computing. Ada Lovelace, the author of the first computer program, wrote in her 1843 commentary on Charles Babbage's Analytical Engine: "The Analytical Engine has no pretensions whatever to *originate* anything. It can do whatever *we know how to order it* to perform. It can *follow* analysis; but it has no power of *anticipating* any analytical relations of truths. Its province is to assist us in making *available* what we are already acquainted with" (Lovelace and Mendabrea 1843, 722). The Analytic Engine, had it ever been built, was to be true to its name in the Kantian sense of the term: it unpacks, "makes available," whatever the operator provides it with—but, as Turing put it summarizing Lovelace, "never do[es] anything really new" (1950, 450). The idea that digital machines only repeat and amplify what they are

given informs criticism of digital systems, such as the charge that large language models are "stochastic parrots." As the metaphor suggests, a language model stitches "together sequences of linguistic forms it has observed in its vast training data, according to probabilistic information about how they combine, but without any reference to meaning" (Bender et al. 2021, 616–17). On this view, large language models do not add anything new but rather tend to "encode hegemonic worldviews" and "amplify biases and other issues in the training data" (616–17). This perspective on the digital is a consequence of the analytic conception of the digital, but it also frames the digital as a fully transparent medium that acts neutrally (or does not act) on the information given to it.

A final property that the analytic conception of the digital inherits from Logical Positivism is a totalizing view of thought and knowledge. According to the *Scientific Conception of the World,* the theologian or mystic may also use language, but if it does not stick to the strict criterion of empiricism and logical analysis, it constitutes "not theory or communication of knowledge, but poetry or myth" (Neurath 1973, 307). In other words, empirical statements and logical analysis fully encompass all that is known and all that is knowable. Leaders of the artificial intelligence boom, made possibly only with the latest digital technology, might say something similar: intelligence, if not being itself, emerges from digital machines (see Pourciau 2022, 235). The idea that the version of thought recreated by digital machines is thought as such is one of the most foundational myths of the digital age.

In the broadest sense of the term, Critical Theory has steadfastly rejected such a mathematized vision of knowledge, insisting on the nonidentity of mathematics and thought. The aspects of the analytic conception of the digital discussed above are open not only to similar critical objections but also to objections from the history of mathematics itself. The formal flatness of a purely mechanistic digital world is, for instance, punctured by Turing's own results. One of the problems of such statements about the nature of the digital, which are unprovable empirically or logically, is that they

themselves are metaphysics in anti-metaphysical clothing. What was missed in the conflict between Logical Positivism and Critical Theory was thus a critical examination of the formal logic on which the digital would come to run, which was as much a desideratum in the Logical Positivists' analytic conception of the world as in Horkheimer and Adorno's dialectical rejection of it.

A nascent dialectical approach to the digital can be found in Horkheimer's criticism of the Vienna Circle from the 1930s. However, the early Critical Theorists' reaction to Logical Positivism left much to elaborate, especially as debates over mathematical foundations and formal logic gave way to the digital revolution. To be sure, Horkheimer's aim in "The Latest Attack of Metaphysics" is not to rescue metaphysics or the Kantian synthetic a priori. Rather, it is to expose what Horkheimer (and Adorno) perceived as shortcomings in the Logical Positivist program in broader debates over the fate of philosophy amid the rise of authoritarianism. These perceived flaws included the elimination of the subject from the concept of experience, a reductionist perspective of language when advocating for epistemological "purity" (*Sauberkeit,* which they compare to authoritarian purges [*Säuberung*]), and the metaphysical and thus contradictory nature of their claim that equates mathematics and logic with thinking, just to list a few (Horkheimer 2002a, 147, 179, and 183).

Despite its negativity, "The Latest Attack on Metaphysics" and Horkheimer's other articles like "Traditional and Critical Theory" (1937) put forth "dialectical logic" (161 and 163) and "dialectical theory" (2002b, 206–7) as a philosophical alternative.[13] Take a longer passage from "The Latest Attacks on Metaphysics," in which the text equates Logical Positivism with social and political passivity:

> Where, however, man confronts circumstances which do depend on him and yet eyes them as alien and unalterable his thought is bound to be feeble and abstract. Where today there is nothing but dependence, there could instead be constructive resolve on so wide a scale

> that even the character of intellectual behavior would be altered . . . The prerequisite of this goal is that the individual abandon the mere recording and prediction of facts, that is, mere calculation; that he learn to look behind the facts; that he distinguish the superficial from the essential without minimizing the importance of either; that he formulate conceptions that are not simple classifications of the given; and that he continually orient all his experiences to definite goals without falsifying them; in short, that he learn to think dialectically. Modern empiricism joined with mathematical logic [*Logistik*] is a logic of monads. The criticism brought against it because of its "solipsism" is fully justified. (Horkheimer 2002a, 181; translation modified)

To Logical Positivism's "logic of monads," this passage juxtaposes "think[ing] dialectically" and its associated signature moves: the importance of praxis ("constructive resolve," relating "experiences to definite goals"), sensitivity to reification ("look[ing] behind facts"), and the entwinement of particularity and totality. And yet Horkheimer's dialectical correction skips across the surface of Logical Positivism (as "mere calculation") like many Marxist responses to intellectual competitors.[14] It is indicative of the missed opportunities to address a digital dialectic that remains unexplored in the controversy between the Frankfurt School and the Vienna Circle. Neither a purification of number from poetic or metaphysical language, nor a reduction of number to instrumentality can serve as the interpretive hinge for a theory of the digital.

A closer look at the passage indicates that a possible digital dialectic lies in the moment in which Horkheimer's proposed "thinking dialectically" displaces the Logical Positivists' object of analysis. "The Latest Attack on Metaphysics" (and critical theory more generally) is correct in its criticism of Logical Positivism that "the mere recording and predicting of facts" not only ends in technocracy but also dooms the world to the status quo ("the given") and its repetition (179). In the 1930s, a doctrinaire understanding

of this worldview certainly amounts to political "solipsism." To be sure, its main contribution is to show that the program of Logical Positivism, first, cordons off the portion of the world that fits by "fortunate coincidence" into mathematical and formal logical terms and, second, hypostatizes this neat fit into *the* world (147). We gain much by heeding Horkheimer's critique. But this line of reasoning shifts the dialectical attention away from a core epistemological question (formal versus dialectical logic) to a social one ("man confront[ing] circumstances").

Horkheimer's criticism fails to propose a dialectical alternative to Logical Positivism's interpretation of "calculation" and "mathematical logic," not only as a scientific approach to understanding the world, but also as an increasingly active and powerful participant in its construction. The part of totality that evades mathematics is real, but so is the part of totality that allows for mathematical manipulation. Later critical theorists such as Jürgen Habermas addressed this oversight in part by reevaluating instrumental reason as a legitimate form of human interest and proposing a communicative approach to reason.[15] But this line of Critical Theory has not turned the dialectical analysis inward to examine "empiricism joined with mathematical logic" itself. This may have seemed a less pressing task in 1937, a year after the proposal of the Turing machine, as on the other side of the digital revolution. But what would the debate have looked like had Horkheimer brought dialectics to bear on the implicit model of computation (data and formal logic) in Logical Positivism, not only as a social but also a technical and epistemological question? What would the critical theory that emerged from it look like?

Our objection to the analytic conception of the digital and its associated attributes is that they are not the essence of the digital but rather its history, its myths. As their manifesto claimed, the proponents of the scientific worldview "confidently approach[ed] the task of removing the metaphysical and theological debris of millennia. Or, as some have it: returning, after a metaphysical interlude, to a unified picture of this world which had, in a sense,

been at the basis of magical beliefs, free from theology, in the earliest times" (Neurath 1973, 317). It is hard to miss the dialectical regression of the analytic conception of the world to a mythic "unified picture of this world." Indeed, Carnap would struggle to complete his linguistic construction of a logically pure world in his aptly titled habilitation text, *The Logical Structure of the World* (1928). Adorno would frame this problem, building on the work of Walter Benjamin, as the disjunction of language and mathematics and return to it throughout his career. In the meantime, the digital world slowly merged with *the* world.

Sketch of a Digital Dialectics

The long legacy of these ships passing in the night (despite the few shots fired) hampers our attempts to make sense of the ubiquitous digital mediation we live with today. While it is, of course, true that this mediation is discrete and based on measurements that render various natural phenomena numerical in order to manipulate them as representational objects ("datafication" as in Mayer-Schönberger and Cukier [2017]), the binary that emerges from this framing does little explanatory work. Discrete mediation—the minimal concept of digitality we in this volume all agree must be a foundation of digital theory—is *not* opposed to something like "continuous" magnitude; as Galloway and Fazi have both argued in this volume, discreteness is not to be seen as a degenerate mode compared to some original continuity, some body, or some monad. Rather than seeing discreteness primarily in terms of continuity, we see several systems of interlocking discrete mediation as making up the digital and enabling its interaction with other representation systems, like language. The history of digital computing—from Gödel to Turing to the first digital computers—is the exploitation of a contradiction internal to the concept of quantity that allows machines to produce a meta-semiosis that is universal with respect to other signs. This history, we claim, presents an inversion of Hegel's presentation of logic.

The surprising proximity of the digital to thinking itself, as Fazi conceives of it, points us to a different definition of the digital: the translation of a system of representation through a highly specific logico-numerical filter. It is this multidimensional fusion of two systems of representation that makes up the digital itself. And this is what creates the "inverted world" sense of the digital, a confusion of essence and appearance in which the (seemingly) obvious truth that the digital is binary turns out to be its (necessary) appearance, while its essence is the combination of that binary—the pure "protocol" statements of data—and meaning.

The analytic view, from Carnap to Haugeland to its less explicit defenders, separates these two factors, sometimes denying meaning altogether, sometimes assigning it to a "human." It thus runs aground on a contradiction. If digital computation were without meaning "on its own," then humans would have to laboriously activate the meaning across the entire set of circuits used for any calculation. When we instead accept the results of digital computation—be that the smooth functioning of a streaming video, a data torque through some document-term matrix, or a large-scale neural net in action—we have already included digital semiotics in human meaning. The range of possible results in the chain of interpretation—what C. S. Peirce would call the "interpretant," to avoid the psychologism that the analytic view offloads in this precise area[16]—forms the realm of digital interpretation. By taking the binary appearance for the semiotic essence, the analytic view regards all digital culture as unreal, or else evil—wishfully denying it or else calling for its abolition. But it is all too real, and the political-economic forces that sustain it cannot be met by denouncement. Because we find ourselves in a world of digital synthesis, analysis alone cannot save us.

If the later dialectical tradition, at least since the 1930s, has largely abandoned serious analysis of quantity and mathematics, then it must seem natural to turn back to Hegel if we suspect that there is a digital dialectics to be wrung from theory of the present.[17] But

quantity, even when theorists do mention Hegel's decisive contribution to its conceptual history, is too often reified. The dream of a purely logical, answer-rendering tool has become flesh, creeping into every crevice of life today. To be realistic about this creep while avoiding the dream is no simple task. That is what Hegel—and not just "the passage from quantity to quality"—can help ground for us today. Hegel's notion of "measure," in which quality and quantity are synthesized,[18] and in which semantic entities shift their symbolic values, must also be taken into account, along with the logic of essence and its expansion into the triadic, truly dialectical logic of the concept.

Digital systems are representational and so properly belong to a logic of signs or of concepts. Yet they are also operational and so belong to the logic of process or of essence. And digital systems, finally, are in the business of conjoining quality and quantity, which first appear in the logic of being in Hegel's thought. The picture of the dialectic that many appear to have comes only from the logic of being. We propose that digital theory must start in the logic of the concept and work backward to quality and quantity to delimit the digital as a semiotic system in a larger dialectic.

The discrete mediation of the digital is first and foremost not a matter of being but a matter of judgment. And judgment falls, for Hegel, into the gray realm between the logic of essence, in which irrevocable contradiction remains unresolved, and the logic of the concept, where the contradictions of essence find their resolution. In the remainder of this essay, we show that it is a reversal of concept and essence, in which the contradictions of essence constantly dissolve the attempts of the concept to comprehend them, that accounts for both the binary metaphysical appearance and the actual semiotic dynamics of the digital.

Hegel, in one of the most demoralizing passages in all of philosophy, calls the logic of essence "the most difficult part of the logic" (Hegel 2010a, §114). This is because essence, according to Hegel, is the central concept of all phenomena, so that it forms a

contradiction with "mere appearance." This leads to his famous formula in the *Lectures on Aesthetics* that "appearance itself is essential to essence" (better in German: *der Schein selbst ist dem Wesen wesentlich* [Hegel 1975, 8; 1970, 21]). The target of this slogan is not only the devaluing of appearance as mere deception but also the hypostasized idea of nature or a "world" innocent of all signs, concepts, representations—that is, an undialectical world. The *Logic* argues that this world only exists *inclusive* of all of its relations, including those the analytic view brackets, and that the totality of relations does not exist apart from the *judgment.* But in the realm of appearance (nature, primarily) the judgment is always latent, unresolved, making up the appearance itself but without a path to resolving the difference between it and whatever it takes to be "essence" at any stage.

The reason the part about essence is the "most difficult part" of Hegel's magnum opus, we propose, is that the binary of appearance and essence cannot be dissolved into something simpler but rather only into something more complex: the concept. The duality of nature as appearance and essence can only be understood by the concept, which includes both sides of that duality, but also their representation—*Darstellung.* The logic of essence crescendos to the idea of "total relation," which gives way to the *judgment,* the first form—Kant's form—of the concept. Before this point, duality is a persistent feature of essence. Digital machines present precisely this difficulty—we are tempted to explain them out of existence ("they are just very long series of switches") at the level of being ("taking advantage of quantum tunneling effect in silicon" [Kittler 2013, 228–29]). The metaphysics of the digital inverts but respects the logic of essence: rather than projecting a fixed "essence" into *nature,* the digital reifies itself and appears as a fixed *logic*—an "analytic" vacuum in which everything is a tautology.

Until it isn't. In the logic of essence, the relations of nature resolve not into unity or even duality but rather into the (at a minimum) tripartite dynamics of the concept. We propose that the digital allows the logic of essence to *capture* conceptuality, giving it the

appearance of a binary that is ineffectual and below the level of human cognition but which in aggregate has the semiotic effect of changing meanings. It can only do this by *exploiting* quantity—computation, which Hegel grasps earlier in the *Logic*—and filtering it through this inversion of essence and concept.

Any digital sign is a process in the appearance of duality as a contribution to meaning, on the basis of the manipulation of quantity for semantic purposes. Materialist approaches to digital technologies like Kittler's have focused almost exclusively on quantity—as an attribute of being. Cultural approaches tend to focus on the concept (often denying that digital systems contribute anything to conceptuality). The two meet in Kittler's opposition to hermeneutics, in a mute "logic" of the digital that resists any possible interpretation except that grafted onto circuits by human beings. Both readings miss the problem of essence, which is the legitimacy of bad infinity, unresolved binary as appearance. The normal picture of logic in the dialectic guarantees the movement from dyadic to triadic relations in the concept. The digital participates in this movement, inverting it, by exploiting the contradictory unity of quantity. To see this, we need our second history of the digital, the history of the transformation of certain results in the history of mathematics into digital computing machines.

None of this is to deny that humans must design, turn on, and implement code in the machines for computation to happen. Here is where we find common ground with the analytic view: the digital will not resolve into concepts; it stubbornly retains the appearance of "bad infinity." But bad infinity is a *normal* part of conceptual development in Hegel—the digital, in our view, simply bypasses the illusion that concepts are the property of individual minds. The social-semiotic development of the concept is instantiated in the particular representational order of the digital, which turns out to be "universal" (as in, "universal Turing machine") with respect to other orders of representation. It is this totalizing function that the analytic view must always leave beyond the horizon of analysis.

The analytic conception of the digital is baked into the everyday sense of these machines. When we ask them to do something, they do it using data, logic, and computation, and the latter two are usually conflated in the analytic view. But it was precisely the difference between what is logical and what is computational that led to the invention of digital machines. Gödel's incompleteness theorem definitively demonstrates that arithmetic cannot be derived from logic, and that any system that can perform arithmetic cannot be both syntactically complete and internally consistent. Both results imply that computation cannot be analytic; it must borrow an axiom—often invoked to illustrate this principle is the addition of the axiom of choice to Zermelo-Fraenkel set theory—from "outside" to perform at least *one* of its potential operations. This means that the system is *synthetic,* even if parts of its capacity can be stated analytically. It was this insight that produced the quick progression from Turing's paper on computable numbers (1936) to the Central Processing Unit (around 1953).

In "On Computable Numbers, with an Application to the Entscheidungsproblem" (1936), Turing was able to show that mathematical reasoning was a discovery process, leading to genuinely new results that could not be determined in advance. (Turing's paper thus answered David Hilbert's famous *Entscheidungsproblem,* which asked if a decision algorithm could decide before calculation was done if a problem was well-formed.) In doing so, he created a positive result from Gödel's negative one. Gödel's theorem showed that the "analytic view of logic," i.e., the idea that logic is a flat web of interlinking analytic tautologies, does not extend to all of mathematics, computation as it would come to be defined included. Turing's subsequent result showed how numbers in computation were not the result of a fixed syntax but instead a genuinely elaborative process—we could even call it "synthetic." One way to think about what Turing's conception of computation means for thinking is to say that it is *computation* that provides the backbone of knowing, whether that is implemented in silicon or grey matter. That computation is synthetic, in the sense that it updates a series

of recursive indexes to symbolic values. What it means for something to be "true" has one condition here, a dialectical one.

In order to show his result, Turing famously invented a "machine," a tickertape of potentially infinite length with a scanner that moved the tape along one step (in either direction) at a time. He was able to show that such a machine could compute any number that can be computed and that there are uncomputable numbers too, in fact many more than are computable (Turing 1936).[19] It is this rudimentary imaginary machine that houses the power of the digital. This power is the ability to treat any string of numbers as *either* command or data, with the downstream ability to alter data through functions and iterate on the *result,* rather than on the original data. A value can thus be a physical location (a register) or a representation ("3.14159"), which can itself be either an intermediate value in a function or its end result. These seemingly trivial abilities are all violations of the analytic view of logic. The mechanistic aspect of Turing's arrangement strangely demonstrates that physics and representation can be used to "decide" (literally determine) whether a number can be computed in a way that exploits the fact that such a system is specifically *not* complete and consistent. Computation is *discovery* in the sense that the computability of new values cannot be evaluated in advance, yet there is a procedure for checking this once they are formulated. A computer is a machine that checks the dialectical progress of mathematics, and which leaves open the question of how number and concept are most fundamentally intertwined.

Turing can be seen as proving that mathematics and logic are not one (Adorno would have been pleased, had he read Turing's paper), so that when the physical computer re-joins them, it is a sort of cognitive hybrid. A number that is the result of a sequence of calculations—written down as erasable "rough notes . . . to assist the memory," in Turing's metaphor that is the first articulation of computer memory—is not obtained elsewhere (1936, 232). We do not add 7 and 5 by fetching a fixed yet abstract quantity "7" from somewhere in the ether (likewise "5") and then apply a prearranged

program ("addition") to the two quantities. The tape constrains us from thinking that this is the operation, because it is the *only source of both processing and content.*[20] Concepts are constrained here by this synthesis that the imaginary machine performs on the tape.

The analogy is that, although we are used to thinking of operations and numerals as separate when we do arithmetic as exercises, in fact what is happening in mental math is a single stream of relationships that are first joined and only later separated. Whether a human or a computer does the processing, it dips into a nonlogical representational order we call "number," in which proportion, analogy, logic, and now physics can help us operate, but does not comprehend or exhaust the terrain. For Turing, a genuinely arithmetical thought is not actually an abstraction but instead a concrete number, the result of an irreducible thought process. The fact that this irreducibility can be *tested* successfully by a mechanistic process produces the illusion that we are dealing with a binary process, because it separates the formula into functions and data. That separation is anything but "logical"—it relies on the synthesis of physics and representation (the machine), and on the synthesis necessary to evaluate numbers in the first place (the Gödel numbers, or their analog of encoding operations into numbers).

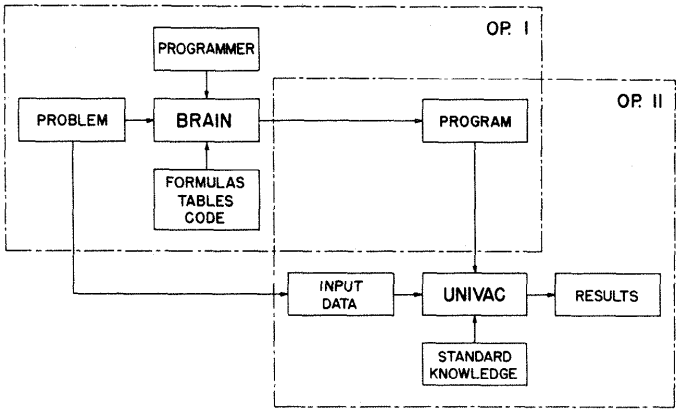
This synthetic process is computational and symbolic. It is, of course, a form of discrete mediation, and it is *one side* of what we call "theory" or even simply "understanding" in general. For this reason, we strongly agree with both Galloway and Fazi that the digital is abstraction, thought, cutting, and separation. In its computational aspect, however, the digital is also *synthetic* in a way that is not simply abstract but that instead undergirds the very differentiation between the abstract and the real in the first place. In other words, computation cannot be subtracted from digital. If cognition is an operation on the real/abstract plane, then the digital is another such operation, one that is not limited to one or another type of representation but captures them all. We thus see the digital as less restricted to theory than Fazi, although their overlap is nearly total. The generation of meaning is shared between minds

and signs, and the digital occupies the place in their dialectic where computation blankets the signs entirely, but not the mind.

When the digital computer was invented after Turing's paper, the relationships among number, representation, and operation had to be given physical form, a new constraint. The analytic view holds that this physical form differs from the theoretical construct of the Turing Machine *because* it is purely logical. A tautologous logic governs the circuit, a string of binary gates. Let us briefly meet the objection that would cede Turing to our dialectical view but deny that this applies to really existing computing.

Take early computer architecture pioneer Grace Hopper's sketch of a math problem, contained on the left side of Figure 3.1. Hopper was a crucial figure in the invention of the subroutine, and therefore of code more generally. Her essay, "The Education of a Computer," is a sort of autobiographical statement of the well-known passage of the term from human woman (clerical labor) to machine process (Hopper 1952).[21] The brain, she suggests simply enough, takes a problem in and diagnoses it, turning to a separate source of formulas, tables, and code. The one is applied to the other, and the result (if no machine is involved) is the answer to the problem. So much for math. When there is a machine in the picture (the Mark, in this case), the problem is turned into the "program" and fed into the computer, which draws the input data (sequence of numbers) from one source and "standard knowledge" (tables, formulas) from another. The results are the answer, again. The program is the point of contact between the human and the machine, the moment everything else hinges on. It is the communicative act in question, the transformation that allows number and physics to interact.

Hopper's diagram describes the "Harvard architecture," so called because the Mark I and II computers she developed with Howard Aiken lived at Harvard University. This architecture is rare today, as it has a severe speed limitation. But this limitation is not a matter of physics but rather of design. The separation of the "problem" (the numerical data) and the "tables" (potential commands) means



[Figure 3.1]. Hopper's diagram of a human using an early computer (Hopper 1952, 244 Fig. 4). Reprinted with permission.

that their combination requires two separate physical acts (and many go-to register commands). Standard knowledge is physically disjoint from the matter at hand. The implicit imagination of computation is that it puts two completely different types of representation together: a thing and an action. That sense of computation is anything but implicit in the Harvard machine.

The canonical next step in the history of computing has been called the "von Neumann architecture," because John von Neumann stated it in comprehensive form for the first time.[22] A simple shift speeds the computer up to workable processing times: the numbers and the commands go all at once through the input on a single "bus." They are not separate. The "arithmetic-logic unit" contains only the simplest stored programs, namely arithmetical and logical functions.

The program, as in the Harvard diagram, is the point of contact between machine and human, but the program and the input and functions are separated by means of code, not architecture. They pass through the same physical location, as Turing had imagined

on his tape. In fact, to implement algorithms on the theoretical Turing machine, one *also* needs to hard-code separations between data and function (see Bernhard 2016). The von Neumann architecture saves *time* above all,[23] but it also simulates the synthesis of calculation. When you add 13 and 9 in such a machine, the intermediate result—Turing's "rough notes"—that must be briefly stored (12, carry the 1 to get 22, in the usual human way of calculating it) serves both as data *and* as a function. The relay between use and expression in this sense is limited, of course, compared to the range of conceptual and linguistic expression in human minds. Indeed, we are not arguing that computers can think. But this indifference between a physical location and a sign, a function and a data point—that can be either, seen one way or the other, at any time—is a core property of really existing digital machines. To give it a positive formulation: the digital computer, both in theory and practice, unites two orders of representation, sign and operation, which otherwise contradict each other.

Humans may perform such computations in some other manner; Turing's machine may even be unrestricted in ways that our daily-use machines can never be. But their limitations do not extend to the core duality—an operational contradiction—that is the *symbol,* which can either refer, or cause a *different symbol* to arise as its interpretant. That combination, which is recognized as a core property of a "physical symbol system" by Newell and Simon in their classic work, "Computer Science as Empirical Inquiry" (1976), is supported by a kind of contradiction between the simultaneously semiotic and material nature of the system itself (symbolic and physical). The set of all concepts is both extensively and intensively infinite: we can think anything and everything we think in concepts is a form of completed infinity. The same operation is true with numbers in their digital-operational form, but the intensive infinity is with respect to *signs.* As signifier and signified, all signs can be absorbed into digital operation, and this appears to be possible because of the operation-meaning contradiction at the heart of the computation that defines digital machines.

The analytic view correctly captures the contradiction but attempts to resolve it. Kittler and his school claimed it was a governing condition for other types of meaning, which is certainly one thing that it does. Chun's proposal (2005) that software is "ideology" points out that the digital must in fact be capable of creating meaning, making something *matter* within the order of representations. Digital computers do this by exploiting chain reactions of binary states onto which the dual vocation of the symbol is imposed. No static materialism can capture such a system and so must either deny its existence or consign it to a transcendental realm that somehow—but how?—restricts "human" meaning. But rather than imposing conditions from without, the digital engages the same systems of representation as humans do from within. They do so by processing numerical data as symbolic value and function.

This is the key to how quantity, that attribute of being, applies to the digital. The dialectical conception of quantity is the material truth of the digital, lacking its ideal or representational form. It is this idea of quantity that lurks in most theories of the digital, unreconstructed and unconnected to the "thought" that is posited as neatly separate from it. It is in *productive indifference* that quantity defines digital operation.

While we hold that the problem of essence and appearance—the three and the two—defines the digital dialectic, we may also make careful use of Hegel's articulation of quantity as "being indifferent to its content." *Number,* Hegel tells us, is the unity of the *count* and *unity itself.* Each member of the set of natural numbers is, after all, a unity, and the idea of number is that unity spread across each digit. This strange property is "thought as a being that is completely external to itself" (2010a, §104). When number works on itself in this respect, we get "quanta," as the determinate reality of number—arithmetic. Hegel is here proposing that number, since it is representation, is internally contradictory and that this particular form of contradiction is *the first to emerge as self-determining* in the dialectic. We take this to mean that quantity as a *category* involves a sort of semiotic propulsion that requires the next step from the

first—precisely because it is indifferent to *quality.* When I think a number, its relation can illuminate or not, but whatever does reveal itself does so on a sure path, according to some pattern. In cybernetics, this notion is called "redundancy." When a machine performs the same operation—so long as it *is* the same operation in terms of content, which Turing proved it can be—then number supervenes on the material identity of a location in the register of that machine and as what is stored in that location. In such a case, we are exploiting the internal contradiction of quantity in Hegel's sense. But that contradiction is not a logical one; it is *definitional* for beings of a certain complexity. Among those beings is surely the digital computer.

This sidebar on dialectical arithmetic allows us to show with some precision how we differ from Galloway's and Fazi's proposals for the digitality of philosophy. Galloway's definition of "digital identity as ratio" in this volume runs close to our point here, but we may also use it to dramatize our difference, since we have opted for the dialectical option that he calls the "horrific" option of a digital dialectics. The question is subtle enough that it may turn out to be terminological, but we pursue it in good faith here because we believe that the concept of "the digital" must include the kernel of the dynamic nature of digital meaning-making (i.e., culture) that we contend with in daily life today. To confront that culture, the metaphysical-ontological question of the digital must be posed, as Fazi claims. But the quantity internal (and internally contradictory) to the extensive nature of thought—its ability to represent *anything*—is the defining element of the digital. Its essence is not the offloaded elements of logic on which the symbols are borne along as if on rails. This is its appearance; its essence is its ability to blanket the entirety of what Fazi correctly calls "culture."

On the surface, all digital media is based in identity. Every symbol must be rigidly secured semantically, lest computation fall apart and the machine break. But Galloway correctly points out that this "identity" is not of the form "a = a," because the machine does not have the content "a" anywhere and must repeatedly refer

quantities to different locations, handling them as equivalents that do not exist semantically. This feature means for us, however, that the digital is *synthetic* in operation, since it therefore features an endless series of "a = b" judgments. In fact, *all identity is synthetic,* as Friedrich Hölderlin first showed in 1795.[24] Galloway says that this nonidentity means that "we do not yet have digital media," since media must cross the boundary of the law of the excluded middle. But this is *precisely* what digital machines do. To defer the part of computation that generates across such a boundary *out* of the machine is only to recognize that the machine must have a sign-system to engage. True, "a" can only be equal to "b" with some prior meaning of their value in play. But the answer that comes back from the machine participates in that value–meaning relationship. There can be no "computing in a non-semantic domain," in the strict sense. The "translation" between "pure computation" and some sign-system (English, usually) is part of the definition of the digital—and it must be so, because it is actually the "pure computation" that enables this interface in the first place, as Gödel and Turing showed. The whole point of the logical revolution that led to computing was to get beyond the possibility that logic would always just be the statement of a limited set of fixed rules about propositional truth-values and would range and operate over some actual content. But the power of the system invented to do that ranging was never explained. That power lies in the (digital) identity of (logical) identity and (numerical) nonidentity. Every digital operation engages this dialectical kernel, activating the difference between logical and numerical unity *as a representational identity* that is conceptually pliable.

The Essence of the Digital

Let us return to Shannon's ultimate machine. We may note that the hand that functions only to turn the machine off has the form of a *short circuit.* If one attaches a wire to the negative end of a battery and loops it to the positive end, this produces a current that feeds back (positively, in technical terms) to the battery itself. The

tendency of such a circuit is to melt the wire (Petzold 1999, 28), and at any rate, the circuit *produces* nothing. Because the loop is closed, this circuit superficially resembles Shannon's machine. But there is an important difference: the ultimate machine *does* something. True, its program is a representation of a short circuit. But a representation is not the same as the thing represented. The difference between off and on is literally melted in the short-circuiting battery; in the ultimate machine, we have a simulation of circuitry. And the representation makes all the difference.

The positive and negative ends of the battery are polarized, and in the circuitry of even so simple a machine as Shannon's, there is some such polarization too. But the hand—whether this is the intent or not (Shannon was famously reticent about such matters)—presents a *second order of difference.* A single physical fact (current flows or does not flow) both carries out the physical act (pushing the button that shuts the machine again) *and* represents the command "turn off the machine." The "bad infinity" of this machine is *by design*—the essence of the machine is this double distinction, the fact that physical states here represent both themselves and symbolic states. The metaphysical contradictions of the digital all emerge from this basic identity—of two things that cannot be said to be one, and which cannot function unless we treat them as identical. In this double distinction lies, in the terms used above, the identity of identity (seen from the perspective of digital use) and nonidentity (contradiction of signifier and signified, switch and symbol). Digital machines do not, of course, produce contradictions within either order—unless they break or we feed them an uncomputable number. But they are based in a contradiction that one can take ideally or materially, with chiastic effects. Those calling themselves "materialists" will tend to disbelieve the identity of physical components with signification so strongly as to undermine the serious effects of the representational system at hand (which is what we call "the digital," for our part of defining digital theory). We tend to think that the position leading from (German) Idealism to

Critical Theory via dialectics is the only one that allows a concrete, not to say material, investigation of digital representation.

It would seem we have gone too far. If digital machines perform the "identity of identity and non-identity," in Hegel's famous formulation, then surely it is only because *humans* performed that synthesis. In other words, the human is that "third" that binds the physical and the representational—digital machines only "signify" because we set them up to, and they signify strictly within the bounds that we humans determine. Almost all critiques of digital systems, from early software to artificial intelligence, contain some version of this claim.

The claim, however, crumples on the least scrutiny. *No* representational system is "human" in the sense of being entirely legible, perfectly designed, or otherwise transparent—this truth was established repeatedly from German Romanticism to High Modernism to structuralism and poststructuralism. But our theoretical conviction seems to evaporate as soon as digital machines create any real effect in the world. As we have seen, the extension of this truth about the non-analytical objectivity of representation to mathematics and its relationship to logic is one of the major results of twentieth-century science, one that led directly to the creation of digital computers. The proper question is *inverted* when we think of "the human" designing, interpreting, and controlling digital machines completely. (Of course, no one claims we do this, but we suppose the idea is that we could, if given enough time, etc.) The proper question, as we see it, is what the relationship is between formal and informal representation systems, among mathematics, logic, and language. Whatever the "third" is that binds matter and meaning, it must be of the order of the sign. For this reason, we have proposed that the digital is a question of dialectical semiotics, a question of how the order of quantity intersects the order of concepts. In dialectics we see the necessary language to describe the material, symbolic, and cognitive challenges that a theory of the digital requires.

Notes

1 On, for instance, the way the digital's usual encoding into binary 0s and 1s informs its objects, see Evens (2015).

2 See the canonical statement of the digital's independence from meaning (Shannon and Weaver 1998, 31). A closer discussion follows in section 1.

3 Cited by paragraph number for generality.

4 Theodor W. Adorno brings up this issue in his discussion of Edmund Husserl and Husserl's discussion of a calculating machine (Adorno 2013, 62).

5 The combination of digital and dialectics has appeared before, e.g., in the volume edited by Peter Lunenfeld (1999). We diverge from the method of these essays in arguing that the digital itself is and must be conceived of as being dialectical. Fazi has recently extended the analysis of synthesis in computing to the realm of generative artificial intelligence (Fazi 2024).

6 "This only can perhaps be remarked, that the determination of quantity is ordinarily listed ahead of quality and as a rule this is done for no given reason. It has already been shown that the beginning is made with being as such, and hence with qualitative being. It is clear from a comparison of quality with quantity that the former is by nature first. For quantity is quality which has already become negative" (Hegel 2010b, 56).

7 The manifesto was published by the "Ernst Mach Society," while the preface was signed by Rudolph Carnap, Hans Hahn, and Otto Neurath. Collective authorship is assumed. We cite from the translation in Neurath's collected works (1973).

8 One may be surprised to note the similarities between Horkheimer's objections to Logical Positivism and later analytic philosophers' questioning "analytic truth," voicing a "hostility to immediacy," and revisiting "the myth of the given," as Richard Rorty put it in (1997, 2).

9 On the fate of Kant's choice to call space and time pure forms of intuition, see Friedman (2000, 27–28).

10 Social tensions over the supposed purity of Euclidean geometry were a feature of debates over infinitesimal calculus in the Early Modern period (Alexander 2014) and in mathematical pedagogy in early-twentieth-century Germany (Pyenson 1983).

11 N. Katherine Hayles shows there were also mathematical theories of communication that took a message's content into consideration. Hayles discusses alternatives to decontextualized information, e.g., the theory of communication proposed by Donald MacKay (Hayles 1999, 54–56).

12 See, for instance, Carnap's and Neurath's contributions to the Vienna Circle's journal *Erkenntnis,* vol. 3. An analysis of protocol statements, which were a contested subject, and similar ideas in Wittgenstein and others, goes beyond the scope of this paper.

13 The full formulation of this thesis can be found in *Dialectic of Enlightenment* (1944/47 / 2002).

14 Horkheimer explains that he wrote the essay hastily and purposefully did not

go into detail about the mathematical logic [*Logistik*], since this would have taken the text "in the wrong direction" (Adorno and Horkheimer 2003, 293).

15 Critical theory's ongoing hostility to formal logic can be found in Habermas's positioning of communicative action as "informal logic" opposed to "formal logic" (1984, 22–23).

16 "The idea to which [a sign] gives rise . . . the interpretant is nothing but another representation to which the torch of truth is handed along; and as representation, it has its interpretant again" (Peirce 1960, §339).

17 A notable exception being the recent book by Redding (2023).

18 A stream becomes a river: so simple a thing as this for Hegel involves *two* syntheses of quality and quantity, each of which is a simple noun with numerical, real, and potentially logical unity residing in it. We may speak of a river in distinction from a stream, we may measure the water in various ways to decide the question, and we may insert either the stream or the river as a variable in a statement. All of these functions are in play in digital computing. See Hegel (2010a, §107–8).

19 Accounts particularly helpful have been Bernhardt (2016) and Petzold (2008). Turing's own association of the digital with thinking, and a definition closer to ours, may be found in his early lecture on the ACE (Turing 2004).

20 Kittler often refers to this distinction, e.g. (1998, 70–78). But he does not account for it in his reading of the hardware/software distinction. It would seem that everything depends on how one thinks that the mathematics the hardware performs joins with "everyday language" and even text in the "new grammatology" that computers inaugurate.

21 On the evolution of the term *computer* from feminized secretarial labor to the machine, see Chun (2013).

22 There is controversy about who really invented the architecture, but rather less controversy that von Neumann's publication of the blueprints (republished as von Neumann 1993) in the public domain rescued the computer from competitive commercial hell (Isaacson 2014).

23 See Thomas Haigh, Mark Priestley, and Crispin Rope (2016) for an account of how the architecture joins three principles of existing computing to add up to the new paradigm.

24 This was the foundational insight of modern dialectics, see Hölderlin (2002, 191–92).

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Digital Theory

***Digital Theory* argues that the digital is theoretical. It proposes a powerful new approach to the often overlooked conceptual side of the digital, starting with a minimal definition of the digital as a form of mediation using discrete units. Pushing the understanding of the digital beyond its interpretation as sheer consumer electronics and instead working with that conceptual definition, the three essays in this volume explore digitality's relation to thinking, signs, and difference, each bringing out distinctive new aspects of the digital's profound theoretical potential.**

Published by the
University of Minnesota Press
in collaboration with meson press