MACHINE FETISHISM > INFORMATION FETISHISM

How machine-dependent information devours libraries and the lithosphere

Mikael Lövgren

Examensarbete (30 högskolepoäng) i biblioteks- och informationsvetenskap för masterexamen inom ABM-masterprogrammet vid Lunds universitet.
Handledare: Olof Sundin
År: 2024

Degree project (30 credits) in library and information science for a master's degree within the Master's Programme in ALM at Lund University.
Supervisor: Olof Sundin
Year: 2024

The central story of Silicon Valley is not the technological revolution it played a role in ushering; it’s the story of land, real estate, segregation, and pollution.

Jason A. Heppler (2024, p. 4)

As the CEO of OpenAI and overseer of ChatGPT, [Sam] Altman noted that artificial intelligence systems consume vastly more power than anyone ever expected, and he frets that new limits to AI roll-outs will soon arise from a lack of available energy.

Timothy Erik Ström (2024, p. 61)

It is amazing that the idea of artificial intelligence is taken seriously at all anywhere in the world […].

Joseph Weizenbaum (2015, p. 108)

Upplägget var rakt igenom korrupt. Så mycket till ansökan skulle inte krävas, sa de. Några sidor om vad som händer när teknologin ersätter mänskligt arbete – särskilt AI, att skriva om AI var väldigt viktigt – och vilka olika scenarier som arbetslivet står inför.

Roland Paulsen (2024)

— Om någon av oss vågade säga: vi skiter i er; i er och er kultur. Vilket väsen det skulle bli. Vilket himla väsen. Fast det är vår olycka att vi aldrig orkar säga det. Säga detta som jag nu säger på skoj: Vi vill inte leka med er längre. Vi lägger oss på rygg och spottar i luften. De löpande banden får rosta och socialkuratorerna testa sig själva.

”Karlsson,” i Folke Fridells (1950, p. 29) *Helgdagskväll*

[S]jälfva den reala indelningsgrunden af de olika områdena för mänskligt vetande är alltför mycket påverkad af anglo-amerikanskt uppfattningssätt, af anglo-amerikanska förhållanden öfver hufvud, för att densamma utan vidare och kritiklöst synes böra upptagas vid våra svenska folkbibliotek.

Gustaf Adde (1915, p. 393)

Title

Machine fetishism > information fetishism: how machine-dependent information devours libraries and the lithosphere

Abstract

The industrial and information revolutions that took shape in the British and Anglo-American empires, respectively, and that are linked in time and space by a westward expansion of capital, have both been justified and referred to as unavoidable and inescapable processes. Thus, they have been understood more as revelations of nature and less as products of a particular and historical society. Karl Marx exemplified this problem with the concept of commodity fetishism, while others later would do the same with the concept of information fetishism. As critical concepts, they unveil the duplicitous and dual character of the commodity and what in this work is conceptualized as machine information or machine-dependent information. Due to the nature of machine-dependent information, the purpose of the present work is to suggest that commodity fetishism and what Alf Hornborg has called machine fetishism, respectively, relate to information fetishism as first-order and second-order fetishism. The hierarchical ordering of these concepts generates analytical distinctions regarding the social and ecological requirements and impacts that these political processes provoke. Methodologically, the concept of information fetishism is examined in a literature review, where its analytical spectrum is tentatively and provisionally discussed and thereafter advanced as a third-order fetishism within the analytical framework of machine fetishism together with associated heterodox theories of information. Two conclusions follow: (1) information fetishism cannot be correctly analyzed or substantially assessed without being understood as a subcategory of machine fetishism; (2) the mainstream perception of machine-dependent information as ontologically detached can imperil both the world and thus the future of libraries.

Keywords

Machine fetishism, Information fetishism, Literature review, Immanent critique, Machine information, Machine-dependent information, Machine-independent information, Library and information science.

TABLE OF CONTENTS

Figures

Figure 1. “Map of the 1858 Atlantic Cable route from Frank Leslie's Illustrated Newspaper, August 21, 1858”; https://en.wikipedia.org/wiki/File:Atlantic_cable_Map.jpg

Figure 2. Sara, Jakob and Oskar Jakobsson at Snávvá prior to the inundation of their land and homestead. Image from the film *Den heliga älven* [The Sacred River] (1957: 30:08 [min.:sec.]) with permission granted by Eva Westman, 2024-03-28. The film is currently globally available here: https://www.filmarkivet.se/movies/heliga-alven/

Figure 3. Oskar Jakobsson (to the right) asks his brother Jakob: “Is it not awful to think that the surface of the water will settle twenty meters above the house?” Image from the film *Den heliga älven* [The Sacred River] (1957: 30:18 [min.:sec.]) with permission granted by Eva Westman, 2024-03-28. The film is currently globally available here: https://www.filmarkivet.se/movies/heliga-alven/

1. Introduction

1.1. A westward historical ecological vignette

Kabelskepp

Vi fiskade upp atlantkabeln mellan Barbadoes och
Tortuga,
höllo upp lyktorna
och beslogo nytt katschuk på såret i dess rygg
15 grader nordlig bredd, 61 grader västlig längd.
När vi satte örat till det gnagda stället
hörde vi hur det surrade i kabeln.

– Det är millionärerna i Montreal och S:t John som
tala
om priset på kubasockret och sänkningen av
våra hyror, sade en av oss.
Vi stodo där länge och tänkte, i en krets av lyktor,
vi tåliga kabelfiskare,
så sänkte vi den lagade kabeln ned till
sin plats i havet.

The Cable Ship

We fished up the Atlantic Cable one day between the
Barbadoes and the Tortugas,
held up our lanterns
and put some rubber over the wound in its back,
latitude 15 degrees north, longitude 61 degrees west.
When we laid our ear down to the gnawed place
we could hear something humming inside the cable.

“It's some millionaires in Montreal and St John
talking over the price of Cuban sugar, and ways to
reduce our wages,” one of us said.
For a long time we stood there thinking, in a circle
of lanterns,
we're all patient cable fishermen,
then we let the coated cable fall back
to its place in the sea.[1]

Our historical epoch could be situated within the themes offered in this poem by Harry Martinson. Martinson was a Swedish tramp, seaman, working-class novelist, poet, critic of technological civilization, and Nobel laureate. The poem gives us a historical and geographical nexus for what could be analytically understood as the westward offshoot of the industrial revolution, i.e., what has been referred to as the information revolution.[2]

1 Translation from Swedish (1931) by Robert Bly (1975, p. 7).

2 The information revolution has been described in the following manner, in the words of Christopher May (2002, p. 20): “Previous technological revolutions have [often been] [...] presented as unavoidable but ultimately socially beneficial. Regarded as the sign of progress, new technologies were ‘assumed to produce, almost as a by-product, the liberation of the human spirit’ [(Slack, 1984, p. 251)]. This led Jennifer Slack to argue that like previous revolutions, the information revolution is presented as if technology itself were autonomous. This is meant to encourage us to place ourselves in a particular relationship with the revolution’s constituent technologies: as users, not creators; reacting to rather than rejecting. Thus the idea of technological revolution may reveal not only possible

As for Martinson and his cable fishermen, the overarching incentive with this vignette is to stop and reflect upon the signals sent through these undersea cables and to ask how they impact the world socially and ecologically. The task of this vignette is thus to follow the westward movement of capital and to offer some geographical nodes and directions for the rest of this investigation. This vignette—and the study as a whole—emphasizes how these signals—or information—are products of a process that subsumes both nature and labour. As such, the signals can only, through analysis, be separated into parts, i.e., the semiotic and dissipative structures that generated them. Martinson gives us hints of the political system, historical actors, and structures that make them possible.

In the original poem in Swedish, the word used by Harry Martinson for rubber is *kautschuk*. Both *kautschuk* (*Hevea brasiliensis*) and gutta-percha (*Palaquium gutta*) have been used to insulate undersea cables. Gutta-percha has by historian John Tully (2009, p. 570) been viewed as "the sine qua non of the success of the undersea telegraph project." Tully informs us that "ordinary natural rubber from the *Hevea brasiliensis* and other South American trees was much less suitable, being prone to rapid deterioration in salt water." What was applied by Martinson and his fellow cable fishermen would thus soon wither and would probably soon be replaced by subterranean materials generated by industrial society.

The natural growth of rubber trees, which is restricted by the daily inflow of solar energy and photosynthesis, pales in comparison with the fossilized biomass that has been compressed and stored in the lithosphere for millions of years. The current hegemonic order that transgressed and vilified the communal and moral systems of the horizontal landscape would enter the subterranean world and discover the prerequisites for industrial society (Merchant, 1980, pp. 2–5, 29–41; Mattelart, 1987, p. 57; Eliade, 1978, p. 57). The extensive mining of the lithosphere in the present epoch is arguably the Faustian bargain par excellence. While few enjoyed the fruits of this bargain in the short-term, many would endure the negative social and ecological consequences in the long-term. This arrogant imperial logic violently broke with the intergenerational ethics inherent to many non-industrial cultures throughout the world (cf. Catton, 1982, pp. 3–4; Trawick and Hornborg, 2015; Foster, 1965; Clastres, 1977; Suzman, 2017).

changes in society, but also the ideological or political importance of making such claims."

The fossilized biomass that has been discharged and hurled into the biosphere at an ever-faster pace is the fixed and immutable premise and outcome of the industrial revolution. Just as the hindrances to the chimera of infinite industrial growth were not so much eliminated as ignored by political economists (cf., e.g., Clark and Foster, 2001, p. 97), the modern subject, i.e.,. the autonomous individual, and the concept of information have been posited as atomized and free-floating, i.e., detached from a social, temporal, and material reality, as discussed by critical scholars (Hayles, 1999, p. 19; Hamilton, 2017; Gare, 2021, p. 31; Hoffmeyer, 1997, p. 79). This could be understood as what Alfred Whitehead (1929) has called the fallacy of misplaced concreteness, i.e., mistaking reductive and abstract theories for reality. It could also be understood as a product of the Cartesian fallacy, where the mental is ontologically separated from the physical. These presuppositions have reigned freely but have now been refuted within research fields such as human ecology and environmental ethics through discussions of the epistemological consequences of the so-called Anthropocene (Malm and Hornborg, 2014; Hamilton, 2017).

In the early 20th century, the undersea cables had sprawled outward from the British empire, covering some 200,000 nautical miles. The telegraph—and later the telephone—would "intensify the subsumption of labour under capital" (Bolaño, 2015, pp. 23–24). Karl Marx (1969, p. 133; quoted in Tully, 2011, p. 123) noted in 1853 "[t]hat [the] unity, imposed by the British sword, will now be strengthened and perpetuated by the electric telegraph." In the Communist Manifesto, published just some years earlier, in 1848, Marx and Friedrich Engels (1968, p. 46) contemplated how the bourgeoisie produced their own gravediggers, i.e., the united proletariat, through modern industry. But perhaps the birth of modern industry created gravediggers of a different kind.

As imperially orchestrated dissipative structures, the undersea cables necessitated massive amounts of gutta-percha and human labor. A historian writes, "between 1860 and 1900 [...] the desire to send information via electrons through copper wire had brought a rain forest species to the brink of extinction and made a significant dent in the forest cover of Southeast Asia" (McNeill, 2019, p. 167; cf. Tully, 2009). The information sent through undersea cables required asymmetric transfers of biophysical resources that were not only upheld by brute force but by arguments found in conventional economics (Hornborg, 2023b).

The telegraph has ideologically been associated with presumed democratic virtues and with “the ’free and unlimited trade between nations’” (Mattelart, 2003, pp. 22–23, 34). In the central nodes of empire the telegraph was—to speak with Alf Hornborg (2001, p. 147)—“susceptible to fetishization.” This local perception of technology naturally only generated a partial view, i.e., it couldn’t grasp technology as a “total social fact” (cf. Mauss, 1954) or its “total global logic” (Hornborg, 2023b, p. 8). In hindsight, these imperial innovations necessitated what has been conceptualized as a “war against subsistence” (Illich, 1981) and as “scorched earth capitalism” (Crary, 2022). When these historical and ecological processes had become hegemonic, Ivan Illich concluded that a “bulldozer lurks in every computer” (1993, p. 118).

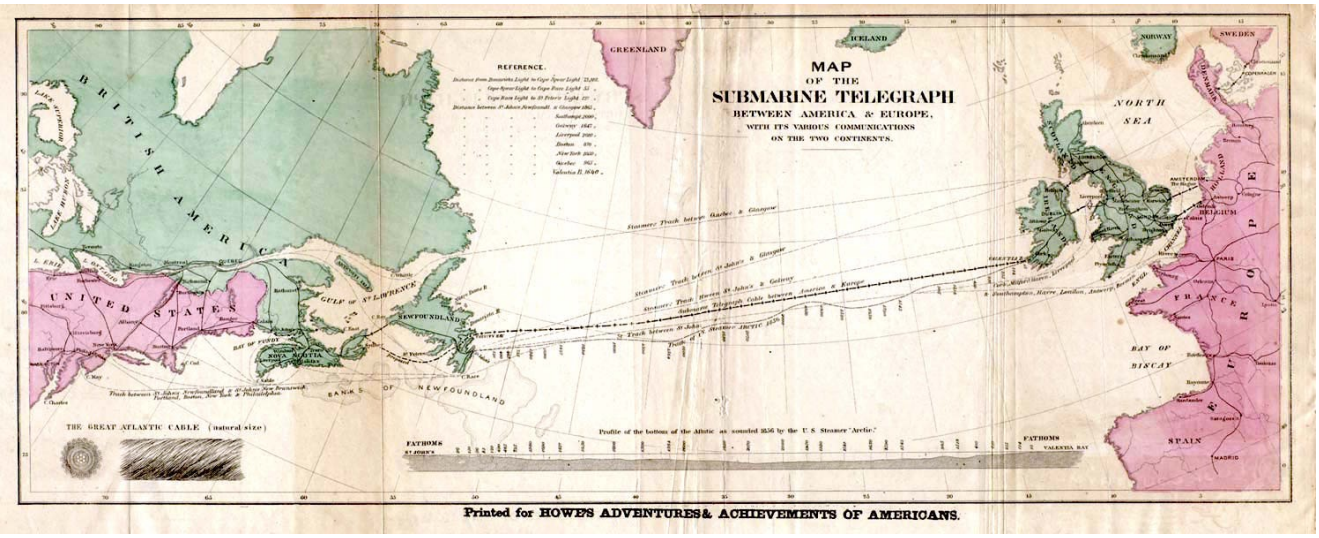

Figure 1. “Map of the 1858 Atlantic Cable route from Frank Leslie's Illustrated Newspaper, August 21, 1858”; https://en.wikipedia.org/wiki/File:Atlantic_cable_Map.jpg

More than an innovative technological infrastructure, the transatlantic telegraph cable (Fig. 1) that would connect the British empire with “British America” and the United States of America in the mid-19th century could be understood as a manifestation of ecologically unequal exchanges (EUE) of environmental harms and non-monetary biophysical resources (Hornborg, 2023b, p. 39). Whereas the British empire had been the birthplace of the industrial revolution, the rise of the Anglo-American empire (cf. Vucetic, 2011) in the 20th century would become the place where the information revolution could expand due to indispensable military funding, making it an inherent part of the military–industrial complex (Turner, 2008; Levine, 2018; González, 2022; Harris, 2023). It is notable that the establishment of information technologies, which added fuel for geological-

changing processes, necessitated the imperial orchestration of class and race violence and the competition for hegemonic rule of the world-system, i.e., not so much advocating universal emancipation and mutual aid as universal submission to the latest entrepreneurial innovation.

If the Anglo-American information revolution could be said to have its origin in the Atlantic cable and be the accomplishment of a "settler-colonial administration and robber baron philanthropy" (Geoghegan, 2023, p. 173), then the direction and design of the industrial revolution were, according to economic historians Maxine Berg and Pat Hudson (2023), greatly impacted by the transatlantic slave trade. The centrality of private property and "human cargoes" in the making of the industrial revolution is a subject that has been ignored by most historians, with some rare and resolute exceptions (Williams, 1944; Inikori, 2002). Other central commodities associated with the transatlantic slave trade were sugar—as mentioned in Martinson's poem—and cotton (Mintz, 1986; Hornborg, 2006; Berg and Hudson, 2023).

The profits extracted from the shackled human capital would stay in the pockets of a vast group of enslaving entrepreneurs in the British empire after the abolition of slavery. As such, this capital would secure the westward expansion of technological infrastructure, like the Atlantic cable.[3] Berg and Hudson (2023, pp. 195–200) also mention the "mid-Victorian philanthropic boom, in financing museum and art collections […] and the foundation and development of universities" that had followed the British Slavery Abolition Act of 1833. This philanthropic boom had been made possible through the reparations paid to 45,000 individual slave owners for the loss of their human commodities, some 800,000 slaves of African origin. These economic reparations were first settled in full by the British state in 2015.

3 "The Great Atlantic Cable" was completed in 1858 by an "Anglo-American consortium" but would break down after a few weeks with a total of 271 sent messages. It would take some years before it was working more stably. Behind this "empire of ocean cables" we find the "[Manchester] cotton merchant turned cable magnate John Pender" (Müller, 2016, pp. 1–9). In *Footprints in the cotton fields: The Industrial Revolution as time–space appropriation and environmental load displacement* Alf Hornborg (2006) has shown how cotton merchants during these years benefited immensely from the slave labor in the American South. Regarding the British import of cotton, historian Joseph E. Inikori (1989, p. 377) writes, "between 1790 and 1860, the slave plantations of the southern U.S. cheaply provided the bulk of it. Thus, the contribution of slavery to the growth of the industry did not end when England abolished the slave trade in 1807 [nor in 1833]." In *Cotton Imperialism: Manchester Merchants and Cotton Cultivation in West Africa in the Mid-Nineteenth Century* historian Barrie M. Ratcliffe (1982, p. 89) (1982, p. 89) quotes Marx (1963, p. 121): "Without slavery you have no cotton, without cotton you have no modern industry." Ratcliffe adds: "Manchester at the mid-century was afraid it would lose some or all of its American supply." Ratcliffe (1982, p. 94) also mentions the aforementioned John Pender, "the Manchester spinner," and a failed business venture of his. Ratcliffe does not discuss the transatlantic cable, but the failed cotton business might have been what pushed Pender in that direction.

In the United States of America, slavery is equally ingrained in society (Waldstreicher, 2010; Baptist, 2016) and has been economically fundamental to the establishment of libraries and book collections (Moore, 2019). Reviewing Sean D. Moore's *Slavery and the Making of Early American Libraries: British Literature, Political Thought, and the Transatlantic Book Trade, 1731-1814*, library historian Wayne A. Wiegand comments that not only did slavery's ghost lurk in colonial Anglo-American libraries but so did "the ghosts of patriarchy and social class" (2020, p. 551). Moore himself writes about the first Anglo-American presidents and their "practice of trading slave cultivated crops for books" (2020, p. 24). One of these presidents, Thomas Jefferson, whose writing, reading, and thinking had been made possible through slavery (cf. Cohen, 1969; Ovetz, 2022), would later sell his library to the Library of Congress in 1815 (Joudrey, Taylor and Wisser, 2018, p. 370). The French anthropologist Claude Levi-Strauss (1961, pp. 290–292) had in the Brazilian Amazon once noticed that writing "[enhanced] the prestige and authority of one individual […] at the expense of the rest" and concluded "[that] the primary function of writing [...] is to facilitate the enslavement of other human beings."[4] Jefferson both wrote high-brow prose[5] and, as an entrepreneurial enslaver, enslaved fellow humans, who the British had legally codified as non-humans (Berg and Hudson, 2023, p. 203), and inaugurated the westward expansion with the so-called Louisiana Purchase in 1803, i.e., what later was conceptualized as the USA's "Manifest Destiny" (Kakel, 2011, p. 24).

These ghosts of slavery, patriarchy, and social class, which are parameters that can be gleaned from Martinson's poem and the Atlantic Cable, were still very much present in the early 20th century in the USA. This was a time when "librarians across the land were emphasizing the public library's role as a conservator of order" (Harris, 1975, p. 14). Afro-American W.E.B. Du Bois (1902, p. 809; quoted in Wiegand, 2015; Popowich, 2019)—who was professor of history and sociology at Atlanta University—commented on this: "I am taxed for the Carnegie Public Library of Atlanta, where I cannot enter to draw my own books." Carnegie Public Library was named after robber baron Andrew Carnegie, a devout social Darwinist (Hofstadter, 1944, pp. 31–35; Gare, 1993, p. 168), whose "magnificent philanthropy" and "vicious union-busting" have been viewed as two sides of

4 Levi-Strauss (1961, pp. 251, 262–264) also notes how telegraph stations, telegraph wires, and telegraphists were attacked by "Indians" in the Brazilian Amazon.

5 See page 65.

the same coin (Krause, 1988, p. 130). Carnegie's motivation for funding public libraries was "to make men not violent revolutionists" (quoted in Harris, 1975, p. 15).

These idyllic proceedings—as Marx (1976, p. 915) would say—would not just fade away; instead, the philanthropic politics of the Carnegie Institution would help fund the research done by the *Eugenics Record Office*, where not only supporters of Nazi Germany worked[6] but also two centrally positioned scholars of the early information age, i.e., Vannevar Bush and Claude Shannon (Geoghegan, 2023, pp. 36–40). The modern concept of information would sprout in this Anglo-American context where information technologies were configured for the purpose of "cultural unification and homogenization" (Geoghegan, 2023, p. 92). The connotations of the concept of information have been said to be synonymous with "the next stage in American civilization" (Kline, 2015, p. 5). Moreover, discourses about an information revolution would diffuse outward from its Anglo-American center (May, 2002, pp. 3–4), i.e., from sender to receiver, "from top to bottom; from the central transmitters and technological elites to administered subjects" (Mattelart, 2003, p. 82).

The Atlantic Cable, the transatlantic slave trade, and the industrial revolution seem to share the same political trajectory. What these imperial orchestrations have made possible could perhaps best be understood as what Lewis Mumford (1964; Roos, 2021, p. 56) defined as "authoritarian technics." There is no novelty in proposing that the expansion of the imperial machine age has pushed both human and non-human lifeforms toward the abyss. In a banned novel, Henry Miller (1934, p. 103) writes that "America is the very incarnation of doom. She will drag the whole world down to the bottomless pit." Mahatma Gandhi (1948, p. 64) similarly concluded: "Industrialism is, I am afraid, going to be a curse for mankind." During Gandhi's lifetime, there were also discussions—now more or less forgotten—about the necessity to transcend modern technology—"that has been reared on a base of social and economic injustice" (Penty, 1920, p. 242)—with a real post-industrial age (Penty and Coomaraswamy, 1914; Penty, 1917, 1922; cf. Mattelart, 2003, pp. 44–45). Instead, more fossil fuels were added to the pyre.

6 The zeitgeist of these times, as noted by historian James Whitman (2018, p. 12; cf. Kuhl, 2002; Kakel, 2011; Westermann, 2016), bears witness to how "the Nazis frequently noted [...] [that the USA] stood at the forefront of race-based lawmaking." After WWII, as noted by Mahmood Mamdani (2020, p. 22), "[t]he Allies who prosecuted individual Nazis at Nuremberg were invested in ignoring Nazism's political roots, for these roots are also America's."

Disparate voices have ascertained that the industrial revolution—which subsumes the current information revolution—would not have been possible without despotic and authoritarian politics (Le Bon, 2001, p. 26; cf. Huberman, 2022, pp. 20–21; Engels, 1972, p. 731; Marx, 1976). According to Friedrich Engels, "wanting to abolish authority in large-scale industry is tantamount to wanting to abolish industry itself" (1972, p. 731; quoted in Roos, 2021, p. 56). Before him, French socialist Charles Fourier had postulated that "[i]ndustry has become the torture of peoples" (quoted in Mattelart, 2003, p. 30). Apologists of the British empire, and thus the industrial revolution, would, however, claim that "the manufacturing enterprise of civilization must be allowed free course" (quoted in Coomaraswamy, 1949, p. 2). Equivalent ideological positions would set the scene and configuration of the information revolution, which by the 1990s was defined as "friction-free capitalism" (Gates, 1996). The latter conceptualization mirrors the combined decontextualized models of mainstream economics[7] and information theory.[8]

Anthropologist Alf Hornborg (2023b, p. 28) has posited that the emergence of political economy was not only "coeval with early industrialisation, [...] but [also] coincided with the expansion of the British empire." According to Hornborg: "The vocabulary and assumptions of political economy shrouded not only the rationale of industrial working conditions but also the material asymmetries of world trade." Sociologist Jean Baudrillard (1981, pp. 178–180), writing about "the cybernetic illusion," situates the ideological role of information theory on a similar footing, i.e., as the one historically held by political economics.[9] It is conspicuous how these historically and contextually confined conceptual peculiarities of political economics and information theory have been presented as rigorous and decontextualized universals.

Now, however, with the January 6 Capitol attack in 2021, and books by Norwegian sociologist Johan Galtung (2009)—discussing *The Fall of the US Empire-And Then What?*—together with

7 Ivan Illich (1982, p. 10) explains: "Westernized man is *Homo oeconomicus*. We call a society 'Western' when its institutions are reshaped for the disembedded production of commodities that meet this being's basic needs."

8 See the literature review below.

9 Jonathan Beller (2017, p. 22) takes this analysis a step further: "Like Claude Shannon's mathematical theory of communication, capital's exchange-value was 'content indifferent' so long as it increased. […] In considering the general formula for capital, M-C-M' (where M'>M), we will see that McLuhan's most famous phrase, 'the medium is the message,' was made precisely of and for that medium, namely capital, even if he did not recognize it." It could perhaps also be suggested that Friedrich August von Hayek was one of the first to envision some sort of cybernetic capitalism: "It is more than a metaphor to describe the price system as a kind of machinery for registering change, or a system of telecommunications" (1945, p. 527). Frank Webster and Kevin Robins (1989, p. 336), however, notes that "[t]he objective of a cybernetic market place, and the fantasy of society as a producing and consuming machine, goes back [...] to [Frederick W.] Taylor, [Henry L.] Gantt, and the rest."

diplomat Richard Haass' (2018) *A World in Disarray: American Foreign Policy and the Crisis of the Old Order a*nd historian Alfred W. McCoy (2021, p. 9) who predates the end of "the Washington world system […] to perhaps something like 2030"—this epoch is at crossroads and the world is possibly no longer unipolar but increasingly multipolar. The point, nevertheless, is to contemplate a concept that is thoroughly shackled to Anglo-American imperial history.

1.2. The research problem: information fetishism

In the midst—or in the ruins—of this historical epoch, the ubiquitous oddity of information fetishism is excavated, i.e., the phenomenon where information is perceived as atomized, autonomous, ontologically independent, and thus insulated from social and material strata. Information fetishism relates back to commodity fetishism in the same way as the information revolution relates back to the industrial revolution. The fetishization of the former and latter veils and confuses how these phenomena are part of the same social and ecological processes that have catapulted planet Earth into a new and unstable geological epoch (Hamilton, 2017). Information fetishism as currently framed in the literature, however, doesn't take into account how this phenomenon is both socially and ecologically destructive.

Today, the phenomenon of information fetishism is possibly as prevalent in the power politics of the United States of America as in the People's Republic of China (Heeks et al., 2024), i.e., in all countries where capital and commodity production rule supreme. This historical process has accelerated every decade since the formation of the industrial revolution in the British empire and would advance during the Great Acceleration (cf. McNeill and Engelke, 2016) after World War II, in the era of Anglo-American global dominance. This was the historical epoch when fossil-fuel-reliant motor and information highways were opened up. Anthropologist Tim Ingold (2020, p. 4; cf. Vopson, 2020) has concluded that "the much-vaunted 'digital revolution' will almost certainly self-destruct, probably within this century. In a world facing climate emergency, it too is manifestly unsustainable." As will be seen in the literature review below, information fetishism can be understood in varied and, sometimes, problematic ways, depending on the epistemological and ontological position of the scholar. The fact that the problem of information fetishism is ingrained in much library and information science (LIS) is also part of the problem.

1.3. The purpose: a revaluation of information fetishism

By following the westward movement of imperial capital, as schematically laid out in the historical ecological vignette, the purpose is to highlight the interlinked zero-sum dilemma, i.e., the fact that the so-called virtual world of the machine, fossil fuels, and its concomitant machine-dependent information are expanding and flourishing while the biotic world and its concomitant machine-independent information are withering and diminishing. This requires us to scrutinize, reevaluate, and tentatively assess the analytical concept of information fetishism in a literature review. Within the literature review, the possible blind spots and weaknesses in previous definitions and analytical applications of information fetishism, as concerning information that is mediated by machine computation, are discussed. The aim is to offer perspectives that could add qualitative analytical dimensions to the material and social destructive consequences of the information revolution in general terms, but also as manifested in libraries. Included within this aim is to provide some preliminary perspectives regarding the ideology of the machine. This ideology is referred to as machine fetishism, and the critical perspectives that have been previously offered on this phenomenon are of importance in the reevaluation of information fetishism within this study. The hypothesis is that machine fetishism provides a fertile soil for information fetishism. This is the central topic in the literature review, where the following questions are asked:

1. What is information fetishism?
2. What theoretical lacunae/omissions in previous conceptualizations of information fetishism are worth discussing within the framework of machine fetishism?
3. How do information fetishism and machine-dependent information devour the lithosphere and machine-independent information?
4. How does information fetishism devour machine-independent information in and outside the modern capitalist academic library?

2. Method and theory

2.1. Method: literature review

In broad strokes, the purpose of the literature review is to discuss information fetishism with the aim of tentatively advancing the concept, i.e., the understanding of the ecological and social phenomenon. Every time information fetishism is referenced by a scholar, the concept elicits some specific perspectives depending on the context, epistemological, and ontological positions taken or left out. The same applies to information, a concept for which there are a myriad of definitions, but also more broadly to the reader of such a text. The literature review is generated by such confrontations and by recontextualizations through abductive inferences (cf. Danermark, Ekstrom and Karlsson, 2019, p. 113), where information fetishism is understood as a subcategory of machine fetishism. The new context that is offered is information fetishism as understood within the framework of machine fetishism, which demonstrates how machine-dependent information relates through the political ecological nexus of the machine to society, nature, and thus the lithosphere.

From the typology of different literature reviews sketched by Paré *et al* (2015), what is proposed here comes closest to a combined critical and theoretical review guided by an immanent critique, as described by Isaksen (2018). The aim of critical reviews is to "reveal weaknesses, contradictions, controversies, or inconsistencies" (Paré et al., 2015, p. 189). According to Pare *et al* (2015, p. 189) critical reviews "rarely involve a comprehensive search of all relevant literature […]." All of this is important, as the point is to theoretically discuss the concept of information fetishism, i.e., not to make a complete assessment of the literature but to qualitatively scrutinize and perhaps improve information fetishism as an analytical concept. By discussing, developing, and scrutinizing this concept, a better description of the phenomenon and its structure is made possible.

Some literature that is judged to be broadly relevant is examined to spark a discussion about how the concept of information fetishism can be strengthened theoretically. Broadly relevant, in this case, basically means that the concept of information fetishism in some way clearly deals with information technology. Another criteria is that the conceptualization of information fetishism scrutinized and discussed builds on Karl Marx's theory of commodity fetishism. This criteria was selected due to this theoretical tradition's historically dynamic and critical ambition to both understand and change society. Marx critically revitalized and refurbished the concept of fetishism when he turned its critical gaze towards the imperial core by demystifying the fetishes inherent in the industrial revolution in England. The point is to elaborate on one or more contributions of the analytical concept of information fetishism that have been in circulation and that have provided valuable perspectives on the information revolution that spread from the USA and outwards.

With the search process[10] I have tried to find articles and books that (1) concern information that is mediated by the machine and (2) that especially build upon Marx's concept of commodity fetishism. When instances of information fetishism have been found that do not overlap completely with these criteria, they have either been used to describe the broad acknowledgment of the fetishization of information and information technology or to critique those examples that are closer to the criteria. This methodological choice is anchored in the westward movement of capital and interdependent formations of empires and technologies, as partially and preliminary described in the vignette.

Regarding the "theoretical review" Paré *et al.* (2015, p. 188) write that its "primary contribution […] lies in its ability to develop novel conceptualizations or extend current ones by identifying and highlighting knowledge gaps between what we know and what we need to know […]." To strengthen the concept of information fetishism, both the concepts of "information" and "fetishism" are scrutinized. The point is to "'conjecture new real phenomena to explain hitherto unexplained empirical phenomena'" (Okoli, 2015 quoted in Rowe, 2014, p. 246). The greater scope is thus to tentatively take into account, widen, and historicize the possible social and material structures

10 These searches have been done non-systematically but extensively through Google Scholar and the EBSCO search engine provided by Lund University. The search terms have broadly reflected the criteria given here in one way or another and have mainly focused on English articles and books. Modified versions of the following search string have been used: "'Information fetishism' AND 'commodity fetishism' AND ('information technology' OR 'information and communication technology'".

inherent in what is perceived as “information” by different actors, i.e., what the phenomenon of information fetishism arguably conceals.

This literature review is guided and formulated from an immanent critique. Isaksen (2018, p. 98) presents immanent critique as a “method of argumentation,” perhaps predating the philosophical squabbles had by Socrates. Isaksen more importantly presents immanent critique “as the most effective way to persuade someone of a competing perspective because you are arguing from their stated or implicit position” (2018, pp. 97–98; cf. Bhaskar, 2007, 2016). According to Isaksen (2018, p. 98), an immanent critique can thus be used to provide “valid grounds for knowledge and values.” An immanent critique therefore rejects “neutral standpoints” and “take premises and conclusions that are presently available and then develop them on their own terms” (Isaksen, 2018, p. 98). The concept of information fetishism, as discussed here, genealogically builds upon Karl Marx’s concept of commodity fetishism and therefore takes on the theoretical arguments associated with this school of thought.

Isaksen (2018, p. 98) quotes Roy Bhaskar (2016, p. 6), who says that immanent critique “prohibits any simple-minded or unmediated transfers of the results from one context to another.” Since information fetishism has been conceptualized to better grasp the information revolution as being part of an outgrowth of the industrial revolution, the concept should be used for this epoch and not any other. Historical comparisons that predate our fossil-fueled machine age can, however, when necessary, help to develop and complement perspectives on the complexities of phenomena in the present era.

The immanent critique presented by Isaksen (2018, p. 102) draws on critical realism (cf. Wikgren, 2005), a meta-theoretical framework that posits that all knowledge is fallible. The fallibility of knowledge is grounded in the perspective of epistemic relativity which is dependent on a mind-independent reality, i.e., ontological realism. Isaksen writes:

> That some theory or explanation can be critiqued immanently is not a sign that the theorists behind them are somehow less than intelligent, rather it is a sign of a mind-independent reality (ontological realism) that is by its very relation to human minds never grasped directly (epistemic relativity).[11]

11 Jesper Hoffmeyer (1996, pp. 144–145) complements Isaksen here: “One of the strange truths that life forces us to acknowledge comes with the realization of all the dreadful mistakes we have made, even at crucial points in our

(Isaksen, 2018, p. 102)

From this position, it is possible to critically examine something that one finds theoretically valuable and interesting, such as the analytical concept of information fetishism, and perhaps to find ways to strengthen the concept and thus reduce the distance to an objective social and material reality. Harnesk and Isgren (2022, p. 1183) write: “As a method, immanent criticism establishes a process for moving iteratively between the concrete empirical problem and abstract theoretical approaches throughout the task of diagnosis and critique to eventually capture more of the problem.” An inherent aim in this kind of literature review is thus to offer more perspectives and a fuller picture of the complexities of the problem, i.e., here focusing on both the generalities of the problem and finally, also, how they are manifested at an academic library.

Immanent critique is apt for the purpose of scrutinizing the analytical concept of information fetishism and developing it further in order to better grasp the social and material dimensions of machine-dependent information. It should also be noted that the discussion in the literature review develops organically, i.e., concepts and positions change during the analytical process and voyage as new horizons open up. The discussion of possible weaknesses and blind spots follows a similar organic movement forward, with specific sections for each subject, up to the conclusion at the end.

2.2. Meta-theory and applied theory

2.2.1. Meta-theory

> Analyzing the types of research methodologies used in LIS doctoral dissertations, Powel [(1995, p. 324)] found that only 1.9 percent of dissertations between 1925 and 1972, and only 1.4 percent between 1973 and 1981 could be classified as “theoretical” approaches, while a stunning 44.2 percent and 56.1 percent for these respective years relied on survey methodology.
>
> (Bales, 2015, p. 46)

The literature review, with the aim of tentatively reevaluating and developing a theory, could perhaps be associated with those 1.9 and 1.4 percents of LIS scholars, whose approaches were

lives. […] Basically, the entire intellectual operation consists of discovering that one has made a mistake. But this then leaves us very much the wiser. After all, what can we learn from if not our mistakes? Snapping one's fingers at mistakes is the one sure path to stupidity and inhumanity.”

slightly more theoretical than usual.[12] Stephen Bales (2015, pp. 45–46) claims that "LIS literature offers study after study that reduces complex social phenomena to sets of numbers stripped of qualitative content and […] factors related to sociocultural milieu" and that the "non-dialectical materialist […] often fails to see, or even look for, the complete picture." There are even LIS scholars who consciously turn a blind eye and willingly ignore methods of critical research. Thus, LIS scholars Bonnie A. Nardi and Vicki L. O'Day (2003, pp. 69–70) understand the "World Wide Web" as an "amazing success story" but, however, "find the large-scale systemic perspective adopted by [Jacques] Ellul, [Langdon] Winner, and other sociologists to be pessimistic."[13] This study will at least try to break this epistemological confinement and the fetishism surrounding information technologies to confront the greater picture in the face of global crises that are intrinsically linked to the social and material shadow history of so-called amazing success stories (cf., eg., Siegel and Markoff, 1985; Hayes, 1990; Crary, 2022; Berg and Hudson, 2023; Hornborg, 2023b).

We are also told that information disciplines "focus on practical problems [...] and thus cannot provide on their own the reflective intellectual turn necessary to understand their historical and social significance" (Winter, 2009, p. 4889). As information fetishism is not only a practical but also a political problem, what is needed is a theory that exposes the historical, social, and ecological structures of the phenomenon.

Despite the aforementioned statistics, a recommended general hurdle to overcome, according to some LIS scholars (Budd, 2001; Wilson, 2003; Hjørland, 2004; cf. Wikgren, 2005, p. 12), for any research project, is making evident the philosophical basis for the epistemological and ontological positions taken. It should thus be stated that both the meta-theory—or philosophical position—of "empiricism (the view that knowledge derives from experience of the world)" and "idealism (positing thought and language over matter)" are rejected as they don't accept that there exists a mind-independent reality (Wikgren, 2005, p. 12). Mainstream empiricist and idealist perceptions of information and information technologies are thus both rejected. The philosophical position taken here is also "not compatible with upward, downward or central conflationism" (Wikgren, 2005, p.

12 Olof Sundin (2006, p. 1853) writes: "theoretical book[s], written in an abstract style […] are rare in LIS. On the contrary, the field is a pragmatic one with a predominantly empirical research interest."

13 Andrew Dillow (2012, p. xix) adds to this unreflective and uncritical hubris when speculating that "we are entering a phase of rapid growth in internet usage (can you still believe that the majority of the people on our planet have yet to experience this wonder?)"

14), i.e., e.g., the flattening out of human agency in posthumanistic approaches where “librarians are not assigned any specific position or legitimacy,” i.e., not even above that of “furniture [...] and “computers” (Rivano Eckerdal, 2018, p. 1409; cf. Carlsson, 2013; Sundin and Haider, 2024),[14] or Anthony Giddens’ structaration theory, “where agency and structure are regarded as ontologically and analytically inseparable” (Wikgren, 2005, p. 15). This research project thus subscribes to the critical realist philosophy that makes several crucial scientific distinctions, most importantly between “ontology (the theory of being, which has strong implications for the conceptions of reality)” and “epistemology (the theory of knowledge)” but also between the “human intentionality” that “demarcates agency from structure” (Wikgren, 2005, p. 12,18). From this position, the attribution of personhood to computers by artificial intelligence enthusiasts (cf. Sloman, 1978, p. xiii,x) is thus also rejected. Critical realism also understands reality as stratified and temporal and, importantly, recognizes both the discourses and events of the social world and the reality of the natural world (Wikgren, 2005, p. 14). This analytical combination of the social and natural world follows the approach that “accepts neither the scientific reduction of the natural environment to its physical characteristics, nor the constructionist position which denies biophysical constraints on social life” (Jacobs, 1996, p. 16; quoted in Spash, 2024). Moreover, LIS scholar Bernd Frohmann (2004, p. 17) argues that “[w]hat exists are things and events: the things are documents, and the events are practices with them.” From a critical realist framework, Frohmann’s postmodernist and empiricist stance, however, is not enough. Hence, “we must [also] focus on [...] [the underlying causal] mechanisms, [i.e., e.g., information fetishism,] not only on the empirically observable events” (Danermark, Ekstrom and Karlsson, 2019, p. 5). LIS scholar Marianne Wikgren writes:

14 This conflation and flattening out of qualitatively different entities could also be said to stand closer to the mainstream approach to information, as this theoretical framework arguably voluntarily perceives the world through the framework of the “posthumanist” cybernetic machine, or the cyborg, thus making it hard to distinguish one phenomenon from another. Sara Cannizzaro (2016, p. 294) indirectly differentiates these approaches: “When crossing the street, for example, we are more likely to pay attention to the noise of a car approaching rather than to the sound of the wind (which we perceive as a background noise) [...] [but] when the hearing-impaired person wears a hearing aid for the first time, s/he will find it difficult to discriminate sounds and distinguish background noise from important sounds, as all sounds will sound important!” It could also be noted that the flattening out of human agency, i.e., e.g, the agency of labor, has been the main practice of capitalist apologists since the birth of political economy. Doug Henwood (1995, p. 170) writes: “Like the capitalist apologists who have long sought to make capital an equal factor of production with labor-and to justify, thereby, profit as a reward to production on par with wages—cyber-apologists are now performing the same trick with information.” Much posthumanist research is inspired by Bruno Latour’s actor network-theory. Hylton White has, however, even described Marx as a “theorist of a sort of actor-network” (2013, p. 679). What could be called Marx’s “temporal cosmology,” however, differs radically from what White (2013, p. 680) calls “Latour’s atemporal cosmology.” Accordingly, “Latour ends up simply replicating the way that the society of the fetishism of commodities presents itself: as the only way of life we can possibly have.”

> [Critical realism] focuses on social reality as consisting of social structures that exist "independently of the various ways in which they can be discursively constructed and interpreted by social scientists and other social actors located in a wide range of sociohistorical situations" (Reed, 2001). In other words, [critical realism] distinguishes between a reality independent of what we think of it (the intransitive dimension) and our thinking of it (the transitive dimension). Indeed, to conflate these dimensions, to believe that "what we think is all what is", is, according to Bhaskar (1989), to commit the "epistemic fallacy".
>
> (Wikgren, 2005, p. 14)

This distinction between the intransitive and transitive realms of the world is of great importance when it comes to properly defining machine-dependent information, i.e., the stuff that is fetishized, but more on that below. The intransitive dimension of reality is synonymous with what in critical realism is understood as ontological realism. The transitive dimension is, for example, the world of chitchat but also the world of research, where we debate and construct analytical concepts, i.e., the sphere that in critical realism is defined as epistemological relativism. Here we try to grasp objective reality as best as we possibly can, knowing, however, that our knowledge is fallible. Epistemological relativism is necessarily connected to the concept of judgmental rationality, which posits that there are "rational criteria for judging some theories as better and more explanatory than others" (Wikgren, 2005, p. 14). For the present work, some theories are thus argued to be more adequate than others to explain the phenomenon of information fetishism.

2.2.2. Applied theory

As the literature review provides a thorough description of these concepts, only a brief contextualization of the concepts used in this work is provided here.

2.2.2.1. Machine fetishism > information fetishism

Since the concept of machine fetishism (Hornborg, 1992) is a heterodox outgrowth of the Marxist school of thought, a brief history is given. In Marxist theory, the concept of fetishism implies that a fetishized object has a duplicitous character, i.e., one is associated with its fetishized autonomous appearance, and one is substantial and relational. Karl Marx, who theorized the concept of commodity fetishism, thereby applied a form of judgmental rationality. Marx was not satisfied with the explanations provided by classical political economy. Marx thus described the phenomenon of commodity fetishism like this:

> A commodity appears at first sight an extremely obvious, trivial thing. But its analysis brings out that it is a very strange thing, abounding in metaphysical subtleties and theological niceties. […] [A]s soon as [the table] emerges as a commodity, it changes into a thing which transcends sensuousness. It not only stands with its feet on the ground, but, in relation to all other commodities, it stands on its head, and evolves out of its wooden brain grotesque ideas, far more wonderful than if it were to begin dancing of its own free will.
>
> (Marx, 1976, p. 163)

Like critical realism (Wikgren, 2005, p. 15), Marx's (1976, p. 165) research was socially emancipatory, i.e., he basically pointed out that the commodity "is nothing but the definite social relation between [people] themselves which [in the market] assumes [...] the fantastic form of a relation between things." Machine fetishism as a concept is also emancipatory but differs radically from how Marx perceived modern technology, as will be seen in the literature review.

One central argument in this work is that information fetishism should be understood as a subcategory of both commodity and machine fetishism, i.e., not only commodity fetishism as is commonly thought. This reflects the nature of machine-dependent information, i.e., as being a product of the political orchestration and manifestation of information technologies. This also reflects that the structure that the analytical concepts of commodity and machine fetishism reveal existed prior to the unveiled structure of information fetishism. The revealed structure of information fetishism thus plausibly mirrors the westward movement of capital, as described in the historical ecological vignette above.

2.2.2.2. Heterodox theories of information

The heterodox theories of information in this work use the social and ecological human subject as a reference point to explain what information is. The mainstream theories of information, on the other hand, use the atomized and free-floating machine/computer as a reference point to explain what information is. The former and latter theories are also associated with different colloquial meanings of information. The former tradition argues that the latter tradition mistakes signals and binary code for information.

It could here be noted that the aforementioned distinction between the intransitive and transitive dimensions of the world makes it possible to claim that, for example, machine-dependent

information exists independent of what we think about it. Following this position, we can, however, not claim that machine-dependent information exists independent of the human labour, materials, and energy that are integral to it. The heterodox theories of information are thus used in order to define the nature of machine-dependent information.

3. Information fetishism: a literature review

3.1. Introduction

Road map of the literature review:

3.1. *Introduction.* This introduction introduces the literature review.

3.2. *Brief encounters with the fetishization of information and information technologies*. Presented here are some brief illustrations of how scholars have written critically about the practice of fetishizing information or information technologies. There are quite a few scholars who discuss this phenomenon as problematic, but few have discussed it more than casually. This section, however, confirms that many see current information fetishism as problematic.

3.3. *Bolaño and Henwood*. Some examples of scholars who discuss information fetishism more thoroughly set the scene for the rest of the literature review. These examples are discussed to find common ground and, more importantly, to find possible omissions or weaknesses, and thus things to discuss in the following sections.

3.4. *The colloquial meaning of information x2.* To my knowledge, none of the scholars who have discussed information fetishism have discussed the so-called colloquial meanings of information. This section adds depth to what information as a concept can be about. What is discussed here is

thus basically two competing traditions that have influenced different and competing meanings of information. These traditions either use the machine or the human as the benchmark in their definitions and what is respectively associated with the colloquial meaning of information. The point of this section is to add complexity to the argument of information fetishism while arguing that the definition of information that uses the machine as a benchmark is both problematic and ubiquitous in current society.

3.5. *Machine fetishism > information fetishism*. As touched upon in the previous section, information fetishism in the contemporary world is basically confined to the issue of what can be called machine information, i.e., machine-dependent information mediated and generated by humans through information technologies. Since this is the case, it is argued that information fetishism must not only be subsumed by what Karl Marx defined as commodity fetishism but also by what anthropologist Alf Hornborg has defined as machine fetishism. Neither of the scholars who have discussed information fetishism and whose concepts are discussed here have confronted the weaknesses in Marx's understanding of machinery and technology. This section does this and thus argues that information fetishism cannot be understood if it is not understood as a subcategory to first commodity fetishism and secondly to machine fetishism. Thus, the argument put forward is that information technologies and machine-dependent information belong to second-order fetishism and third-order fetishism, respectively, and that they are all subcategories of commodity fetishism.

3.6. *Information and entropy x2*. In Hornborg's theory of machine fetishism, the second law of thermodynamics—aka the Entropy Law—is of great importance in considering how machinery/computers require a constant flow of materials from society and nature, and thus the lithosphere, in order not to break down. The concept of entropy as used by Hornborg and others who support the heterodox definition of information, however, differs from the concept of entropy as used in classical cybernetics and information theory. Here it is argued that the former concept of entropy (thermodynamic entropy) is apt for discussing information fetishism, while the latter concept of entropy (information entropy) has done more harm than good in trying to explain what information is. The main problem with the latter is that it has been conceptualized, from the perspective of mainstream engineering, as ontologically independent from matter and energy.

3.7. *Machine-dependent information and machine-independent information.* Machine-dependent information, as already touched on in earlier sections, is here analytically compared with machine-independent information. Some historical precursors to machine-dependent information are also presented and discussed. These historical precursors naturally reflect different social forms of machine-independent information.

3.8. *The modern capitalist academic library and information fetishism*. Here, some of the accumulated arguments give us some perspectives on the contemporary academic library.

3.2. Brief encounters with the fetishization of information and information technologies

While there are occasional references to the fetishization of information in the LIS literature or even whole books on the topic of the cult of information (cf. Roszak, 1994), there are relatively few who offer definitions of the analytical concept of fetishism, or more specifically, information fetishism. American librarian Rebecca Lossin (2017, p. 110), for example, argues that "techno-fetishism [is] taking hold of the library sciences," and Swedish LIS scholar Joacim Hansson (2019, p. 128) similarly associates the concept of information with "messianic ideals." Søren Brier (1985, p. 25), a Danish LIS scholar and the creator of the field of cybersemiotics, in an early article, even remarks that the broad fetishization of information technologies and informatics were things that disturbed him on a personal level and what drew him to research the dilemmas of the so-called information society. Thirty years later, Brier (2015, p. 129) would summarize his position by concluding that "[i]t is unethical to understand human communication only in the light of the computer."

We can also take note of the American scholar David M. Levy (2000, p. 24), who writes about the "almost religious belief in the power of information" and puts the view that "information is good, so [therefore] more information is better" at the core of what he calls "the digital library faith." French scholar Armand Mattelart (2003, p. 162) writes about the necessity to counter and to refuse what he calls "[i]nformational neo-Darwinism" and "techno-global millenarianism." British-Kenyan librarian Shiraz Durrani (2014, p. 60) writes about the "mindless rush to meaningless innovation" in the library field. Scottish scholar David Lyon (1988, p. 7), for his part, calls into question the

perception of “[information] technology […] as a semi-autonomous force acting upon society.” Langdon Winner (2001, p. 105) writes critically about “mythinformation: the almost religious conviction that a widespread adoption of computers and communications systems along with easy access to electronic information will automatically produce a better world for human living.” There are other scholars, like Andrew Calabrese (1999, p. 174), who review Manuel Castells books (1996, 1997, 1998) on the so-called information age, who modestly sum up his conclusion, writing that there exists “a tendency to fetishize information and information technology.”

Then there are those that include the fetish of information in the title of their book chapters, but that are more concerned with Walter Benjamin’s writing about Charles Baudelaire in 19th century Paris and thus “forms of ‘information’ as newspapers and historiographical ‘historicism’” (Day, 2001, p. 112), rather than what is of concern here, i.e., what could be called machine information—semantic or not—that is made up of signals or binary code that is stored, retrieved, and sent. Or perhaps more to the point, the information that in one way or another is inherent, generated, or mediated by the industrial infrastructure of artificial intelligence, the digital age, and the computer age, i.e., what is perhaps subsumed under the information revolution, or research topics in the digital humanities and LIS. In sum, information generated, transmitted, or mediated by the machine, i.e., machine-dependent information.

3.3. Bolaño and Henwood

Brazilian sociologist César Bolaño neither offers direct nor specific deliberations on the fetishization of information that is associated with the computer or the machine. Bolaño, however, does offer and discuss some perspectives regarding what information fetishism is about in broad terms, i.e., contrary to the authors mentioned above. He does this in his book *The Culture Industry, Information and Capitalism* (2015), which is based on the dissertation that Bolaño (2018, p. 126) defended in the early 1990s. This contribution to the theory of information fetishism thus predates the broad introduction of the internet by some years.

Like Marx’s (1976) deliberations on the dual character of the commodity, Bolaño argues that information has a duplicitous character. Bolaño posits that the “class character of capitalist information” is disguised by “information theorists (or, more generally, ‘bourgeois’ communications

theorists)" and the "[n]eoliberal and postmodernist theorists and their followers, propagandists of an alleged 'information society'" (2015, p. 25,27). What is hidden from view due to the fetishization of information could be illustrated by a statement given by the Italian economist Guglielmo Carchedi (2022, p. 2; emphasis in original), i.e., that "*[k]nowledge is always both material and socially determined.*" This is arguably also true for the machine-dependent information that we are dealing with here. By fetishizing information, these social and material dimensions are thus hidden from view. Bolaño thereby makes a distinction between "class information" and "mass information" and argues that there is "a fundamental contradiction between the essence of class information and its appearance as mass information" (2015, p. 26). The substantial character of class information is thus shrouded and veiled as mass information.

These deliberations of Bolaño are encompassed by the subject of his dissertation, i.e., the cultural industry broadly and mass communication media more specifically. Bolaño also argues that our current epoch, where information is routinely fetishized, has its origin in what he calls the "[so-called] primitive accumulation of knowledge,"[15] that began with "capitalist appropriation of the knowledge of skilled craftsmen and its reprocessing that formed the communicative basis of domination" (Bolaño, 2015, p. 22).[16]

Essentially, Bolaño's concept of information fetishism suggests that there are at least two sides to information. As such, the fetishized approach to information relates to information as free-floating and thus detached from social and material relations, while the other is approached as something substantive and thus complex, with material and social intricacies. Finally, Bolaño (2015, p. 26) also states that "the public is always deprived of substantive information," meaning that the point of research should be to recover the substantive nature of information.[17]

15 Here Bolaño builds on Marx's critique of Adam Smith's discussion about "previous accumulation." Smith's discussion on "previous accumulation" was all too idyllic and ideological for Marx. When Marx wrote about this process, he made reference to it as the "so-called original accumulation." When Marx left out "so-called," he could instead use scare quotes around "original." Ian Angus (2023, p. 206) writes: "For some reason the quote marks are omitted in the English translations, so [Marx's] irony is lost." This has thus also been lost in Bolaño's text. Marx's (1976, p. 875; quoted in Angus, 2023, p. 207) understanding of "the so-called primitive accumulation" was anything but idyllic: "These newly freed men became sellers of themselves only after they had been robbed of all their own means of production and all the guarantees of existence afforded by the old feudal arrangements. And this history, the history of their expropriation, is written in the annals of mankind in letters of blood and fire."

16 British historian James D. Fisher (2022) has explored similar themes in his book, *The Enclosure of Knowledge: Books, Power and Agrarian Capitalism in Britain, 1660-1800.*

17 Many scholars have tried to recover the substantive character of capital (Marx, 1976), economics (Polanyi, 1957), life (Emmeche, 1994), landscape (Olwig, 1996), and the machine (Hornborg, 2001). The purpose here is to tentatively try to approximate some partial and fractional dimensions of the substantive character of the elusive and

Doug Henwood, an American Marxist economist, is the only scholar I have found who has provided a definition of information fetishism that focuses on information as mediated by the machine/computer. Thus, the main focus will be on Henwood, and his conceptualization of information fetishism is used as a stepping stone throughout this literature review. Another more general definition of information fetishism will also be mentioned, but mainly as a critique and as fuel for the discussion.

Henwood (1995, p. 171) defines his concept as follows: “With the info fetish, the thingly relation, and the social relation behind it, appears as the relation between bytes—a second-order fetishism, you might say.” Henwood tells us that his definition of “information fetishism”[18] draws on Karl Marx’s (1976, pp. 163–177) concept of commodity fetishism. Marx understood commodity fetishism as a phenomenon where the social relations embodied in the commodity were perceived as relations between things. Henwood aptly defines information fetishism as a second-order fetishism, i.e., where the first-order is Marx’s conceptualization of commodity fetishism. This is conceptually useful, but since the subject here is to be machine-dependent information, it will be argued that information fetishism is better posited as a third-order fetishism, i.e., taking into account the second-order fetishism of machine fetishism. But more on this below.

While Marx was aptly situated in London when he—standing on the shoulders of Hegel and Charles de Brosses (cf. Morris and Leonard, 2017)—theorized the concept of commodity fetishism, Doug Henwood is equally aptly situated in New York as he—standing on the shoulders of Marx and Engels—theorizes the concept of information fetishism. This theoretical westward turn from the industrial and financial capitalism of the British empire to the aggregated forces of industrial, financial, and information—or digital—capitalism in the Anglo-American empire mirrors the transatlantic movement of capital, as spelled out in the vignette.

Henwood (1995, pp. 169–170) describes New York as “the cutting edge of postindustrialism” and as probably having “the most bifurcated labor market in country—heaven for the symbol jugglers, but hell for almost everyone else.”[19] This is arguably a mirror image of the current world-system

duplicitous phenomenon of information.

18 Henwood (1995, 2016) alternately writes about “info” and “information” fetishism. Only the latter is used here.

19 New York had 103,200 homeless people in 2023 (HUD 2023, 2024).

and a manifestation of “the antithesis between mental and physical labour” (Marx and Engels, 1968, p. 324) that demarcates and separates the zero-sum world of zones of entrepreneurial innovation and sacrifice zones (cf. Lerner, 2010; Slobodian, 2023; Trawick and Hornborg, 2015).[20]

Before defining the concept of information fetishism, Henwood (1995, p. 163) observes how economists and sociologists of the so-called information age ignore important analytical parameters —such as society and labor—by conflating information and capital. Henwood (1995, p. 170) comments on how sociologist Manuel Castells offers the “astonishing claim that information is now a ‘directly productive force.’” To perceive what can be understood as machine-dependent information as a productive force in itself and thus without social and material strings attached is arguably information fetishism in a nutshell.

Some twenty years later, Henwood’s irritation is similarly shown while reviewing *Postcapitalism: A Guide to Our Future* by Paul Mason (2015).[21] Henwood (2016) writes: “Mason contends that capitalism can’t survive the latest industrial revolution because it can’t deal with the infinite, costless reproducibility of the digital commodity—aka a nonrival good.” *INFO-GOODS CHANGE EVERYTHING* is the rubric of the section in Mason’s (2015, p. 116) book where he discusses “non-rival goods.” Mason (2015, p. 118) exemplifies these “non-rival goods” with the mp3 track, calling it an “information commodity.” It can be noted that “information” as a “non-rival good” is also celebrated by the open access movement (De Angelis, 2021, p. 646). To use these “costless” and “non-rivalrous goods” in the so-called digital commons, the consumer must get his or her hands on a “rival good,” i.e., some kind of corporate gadget. Mason thus asks us—an avant-garde of consumers?—to consume our way to a post-capitalist society. If you were one of the 653,100 [3.7 million[22]] homeless people (HUD 2023, 2024) in the United States of America in 2023—where a total of 181,399 were found in California, i.e., the home of Silicon Valley—neither these “non-rival goods” nor this middle-class consumer revolution are probably worth celebrating.[23]

20 Marx and Engels not only wanted to abolish “the antithesis between mental and physical labour” but also argued that “[t]he abolition of the antagonism between town and country is one of the first conditions of communal life” (1968, p. 324, 1970, p. 69).

21 Mason reiterates old and ideological tropes of the so-called information age (cf., e.g., Parker, 1976, p. 5; cf. Slack, 1987, p. 5).

22 Another study, from a different methodology, finds “that 3.7 million people in the U.S. population were doubled up in 2019”: “Although recognized by other federal agencies, other countries, and many researchers as a common form of homelessness, people doubling up do not meet HUD’s current definition and are not included in its estimates” (Richard et al., 2024, p. 2).

23 Rebecca Solnit has argued that “homelessness [...] has been exacerbated by the tech boom” in San Francisco (Solnit, 2024, pp. 9–10). Solnit (2024, p. 10) also writes about tech/venture capital billionaires in San Francisco

Mason has seemingly written a book for a narrow and navel gazing audience, in the tradition of sociologist Daniel Bell (1960, 1973) and management consultant Peter Drucker (1955, 1969, 1993). Perhaps he had the so-called urban creative class in mind (Florida, 2005). Or that minuscule enclave associated with the "spirit of informationalism" (Castells, 1996, p. 195; cf. Webster, 2002, p. 104). Perhaps Mason is just stuck in time—a perennial 1990s. A time when the authors of the manifesto *Cyberspace and the American Dream: A Magna Carta for the Knowledge Age (cf. Dyson et al., 1996)* extolled the "creation of a new civilization, founded in the eternal truths of the American Idea." In the 1990s, Al Gore held speeches about "'[t]he promises of a New World Order of Information'" (Mattelart, 2003, pp. 139-140,121). Noticeably influenced by all these gurus and forecasters of the coming information revolution, Mason presents "the educated" and "the networked generation" as the "new agent[s] of change in history" (2015, p. xvii). Regarding Mason's digital avant-garde, it has been claimed that the so-called network society has far from "overcome the ethnocentrism of the imperial age" (Mattelart, 2003, p. 161).[24]

These new agents or these new clothes of the emperor—that arguably "[weigh] like a nightmare on the brains of the living" (Marx and Engels, 1968, p. 97)—could possibly be associated with the aforementioned socially and geographically circumscribed group of "symbol jugglers" (Henwood, 1995, p. 170). These creative entrepreneurs, as described by Henwood and Mason, could be contrasted with another group, i.e., the global peasantry, which according to sociologist Jan Douwe van der Ploeg "is more numerous now than at any time in the world's history" (2021, p. 109). If the former group cherishes networking, private entrepreneurship, and the expansion of technological infrastructures, the latter group generally cherishes the flourishing of the biological world—i.e., the living. Henwood's (1995, p. 170) critical observation from the 1990s is worth quoting here, i.e., that behind the "hi-tech gloss," we find something disturbingly similar to "the nineteenth century or

who support "banning sitting on the sidewalk" and the outlawing of tent encampments.

24 On a similar note, regarding the Victorian epistemology of the 19th century, geographer James Moore (2005, p. 126) has written: "Darwin's living organisms behaved like Englishmen, invading everywhere; or rather, Englishmen to him were invasive organisms, multiplying, spreading across the earth, keeping evolution on the march."

even the early days of the industrial revolution": exciting for a few, miserable for the many.[25] Henwood summarizes his critique like this:

> Mason frequently gets lost in what might be termed (in an homage to Marx) information fetishism. In Marx's notion of the fetishized commodity, we see commodities trading on a market as things in themselves; this arresting spectacle works to obscure all the human activities that produce them. The commodity becomes a "fetish" because it's divorced from its context. Similarly, information fetishists treat information as a thing unto itself, forgetting that it's always information about something—and that this something is typically quite material: an inventory of goods on hand, statistics about a student, an airplane's altitude and speed. […] But in the celebration of immateriality […] these links and dependencies are forgotten.
>
> (Henwood, 2016, 1995, p. 171)

It could be argued that Henwood is rather close to the mainstream concept of information, which perceives information as ontologically independent from matter and energy. But is this tradition at all applicable to the signals or binary code that are sent through wires? Henwood perceives information to have additional "links" and "dependencies," i.e., information is here understood as atomized and free-floating but with accessory stuff attached to it. The mainstream conceptualization of information is thus seemingly detached from the flows of matter and energy that are arguably inherent to everything else in society. Accepting the mainstream definition of information, where information is perceived as a natural object, as will be seen, could be understood as a form of fetishism in itself. Thus, in his definition, Henwood states that bytes, i.e., social relations, are perceived as things, but Henwood says nothing about the material and energy requirements of what could be defined as machine information or machine-dependent information. This is probably due to the fact that matter and energy are not understood as parts of information in the mainstream definition, as it was applied in the field of telecommunications. Signals, binary code, or machine-

25 Henwood's observation is perhaps more objective and less ideological than the one offered by Tom Forester (1987, pp. 53–54) in *High-Tech Society: The Story of the Information Technology Revolution*: "It's therefore not surprising that the [wider Bay] area has continued to attract young, well-educated Americans looking for the good life, as well as Hispanic migrants looking for jobs. This has created a pool of highly skilled scientific and technical personnel—a vital requirement for anew, expanding industry like microelectronics—and a reservoir of unskilled labour eager for assembly-line work." To this, historian Fred Turner (2008, p. 260) adds: "In the mid-1980s, for instance, the Immigration and Naturalization Service estimated that 25 percent of the overall Silicon Valley workforce—approximately two hundred thousand workers—consisted of illegal aliens, many if not most of whom worked in manufacturing. In the same period, 75 percent of all Silicon Valley assemblers were women, many from the Third World. In recent years, both manufacturing and recycling have migrated overseas. And once again, women and the poor find themselves disproportionately engaged in high-risk work. Unprotected by American laws, factory hands in China and elsewhere labor eighteen hours a day at wages that often hover around thirty cents per hour building new computers."

dependent information—if information at all—should be distinguished from information that is differently perceived, i.e., a relation to information that doesn't subscribe to the mainstream approach to information and which is not necessarily subsumed under the machine or information technology. In the following discussion, some bits of Henwood's perception of technology are also problematized, and it is argued that information fetishism must be subsumed not only to Marx's concept of commodity fetishism but also to Alf Hornborg's concept of machine fetishism. This is arguably also true for Bolaño's Marxist framework. Bolaño is perhaps not as close to the mainstream definition of information as Henwood, but the analysis of the material and energy requirements of "mass information" is nevertheless lacking. As Henwood (1995, p. 170), Bolaño focuses more on questions of production than the material and energy requirements of technology, i.e., questions of consumption, or entropic transformation, as orchestrated through market exchange. These themes are discussed next.

3.4. The colloquial meaning of information x2

The point with Bolaño and Henwood's interventions, with their respective conceptualizations of information fetishism, is to argue that information, as one of the supreme ideological concepts of the 20th century, has a duplicitous character, i.e., meaning that information is fetishized, thus leaving its actual social and material foundation veiled, camouflaged, and hidden from view. This duplicitous character also mirrors two competing definitions of what has been called the colloquial meaning of information. While one of these uses the machine/computer as its benchmark in its definition of information, the other uses the human subject and its particular social and ecological context as crucial parameters in its definition of information. The argument that follows argues that the former so-called colloquial meaning of information represents the fetishized formula of information. These fetishized social constellations were arguably prefigured by the fetishization of the machine, which contributed to a situation where it has almost become commonsensical to fetishize information.

Both Bolaño and Henwood give examples of figures in the political sphere, or academia, that act as "propagandists of an alleged 'information society'" (Bolaño, 2015, p. 27).[26] This latter group has

26 Theodore Roszak (1994, p. 31) writes: "All these people – the academicians as well as the industrial experts – were part of the information economy. They worked in firms tied to that economy, or consulted for them, or were linked to academic programs financed in some degree by those firms or by their military customers. From the viewpoint of

arguably empowered the colloquial meaning of information that uses the machine/computer as a point of abstraction. One computer scientist (Adriaans, 2020; quoted in Chowdhury and Chowdhury, 2024, p. 3) thus provides the following definition: “The term ‘information’ in colloquial speech is currently predominantly used as an abstract mass-noun used to denote any amount of data, code[,] or text that is stored, sent, received[,] or manipulated in any medium.” As this definition stands, it must be said to be associated with how information was defined in classical cybernetics and information theory, i.e., what eco-philosopher Arran Gare (2020, p. 343) has called “the science of automatons.” Norbert Wiener’s (1989, p. 16) old definition seems to have defined it: “To me, personally, the fact that the signal in its intermediate stages has gone through a machine rather than through a person is irrelevant and does not in any case greatly change my relation to the signal.” Wiener and Claude Shannon were two of the most influential scholars in these fields. Both were mathematicians and engineers and would have a profound impact on the emerging field of telecommunication, i.e., information technology, and the putative idea of an information society and thus the aforementioned definition of information.

While their approaches differed, both the theories of Wiener and Shannon dealt with the engineering problem of the transmission of signals (Kline, 2015, p. 116). This research field, also referred to as communications engineering, was thus dealing with something rather new under the sun, i.e., signals sent from a sender to a receiver in telecommunication. In their telecommunicational frameworks, Shannon and Wiener offer a “non-contextual” approach to information—common in the engineering sciences—that has been associated with “the transport metaphor of information” (Hoffmeyer, 2005, p. 428; quoted in Hornborg, 2023a).[27] This approach to information has, according to German philosopher Peter Janich (2018, p. 62; emphasis in original), “nothing to do

these funding sources, it was important to be upbeat and bullish about computers, for this was their merchandise. The experts easily adopted that viewpoint, because the health of the computer industry was the life's blood of their profession.”

27 The nuts and bolts that Shannon and Wiener were working with are arguably what James Carey (2009) has called “the transmission view of communication.” Regarding this “view,” Eric Leed (1980, p. 55) has commented: “This view pervades our thinking about the communication process regardless of one’s political stance, for it rests upon the fiction of the autonomous individual, the fiction which provides the continuity of modern Western culture.” Vincenzo Ruggiero (2014, p. 136) follows up, writing, while quoting Peter Brooks (2011, p. 93): “This [autonomous] individual is equated to masturbation, with the self becoming ‘entirely solipsistic and self-satisfying’ and the world outside the self becoming unnecessary. ‘Self-sufficiency or self-pleasuring would undermine reproductive sex and, even more important, destroy the socio-sexual connections on which human civilisation is based. A masturbator is not a good citizen’ [...].” On the same note, historian Fred Turner (2008, p. 261), writing on how the American “anti-political” counterculture coalesced with cybernetics and information theory and set the stage for the so-called digital utopianism of the last decades, confirms: “Like the communards of the 1960s, the techno-utopians of the 1990s denied their dependence on any but themselves.”

with communication that is human and free but would regard *only the functional limits of a technical system*, that of the transmitting machines." Thus, this colloquial meaning of information is shackled to the sphere of the machine and reflects, in the words of Gerd Sommerhoff (1974, p. 92; quoted in Brier, 2008, p. 208), "a trend which [looks] at machines in the first instance and at the living organism only derivatively." Joseph Weizenbaum (1972, p. 611; quoted in Loeb, 2015, p. 8) similarly argues that "we have permitted technological metaphors…and technique itself to so thoroughly pervade our thought processes that we have finally abdicated to technology the very duty to formulate questions."

Janich, nevertheless, describes these theories as "extraordinarily technically successful" (2018, p. 70). Shannon's theory, for example, contributed to the creation of the MP3 format in the 1990s (Kline, 2015, p. 130). That is, the "information commodity," a so-called "non-rival good," as described and cherished by Paul Mason (2015, p. 118) above. Like Sommerhoff, Janich, however, also adds that these theories result in reducing "human language to telecommunicational structures" (2018, p. 70). Gare (2013, p. 348) proposes that "it is a cultural disease to take these models as the source of reality." The fact that these theories have been technically and militarily successful therefore does not suggest that they necessarily have generated socially and environmentally beneficial effects (cf., e.g., Crawford, 2022; Chandler, 2022). Moreover, the acknowledgment of the fact that mainstream engineering and mainstream economics mirror each other inversely has shed light on this process. While the former ignores world society in its accounts of technological progress, the latter ignores nature in its accounts of economic progress (Hornborg, 2019, p. 207). Mainstream engineering could be exemplified by Claude Shannon's (1949, p. 3) statement that society or the "semantic aspects of communication are irrelevant to" his theory. In mainstream engineering and mainstream economics, where the social and material dimensions are respectively ignored, "[t]he territory no longer precedes the map" (Baudrillard, 1994, p. 1). These two fields arguably constitute the pillars of the colloquial meaning of information that is confined to the machine. It is thus emblematic that there have been efforts to introduce terminology belonging to mainstream economics to information studies.[28] From this, it could be proposed that the colloquial

28 Norman Roberts, who advocated this, writes: "Information man, too, operates in environments characterized by scarce resources—human, financial, material—and is constrained to make choices. Further, information behaviour, like economic behaviour, necessarily implies interactions of various descriptions indicating a parallel concern with individual, aggregative and interactive forms of study" (1982, p. 95). The political projection of a particular and peculiar "economic man" as something universal was already criticized by Marx (1976, p. 170; quoted in Brown and Duguid, 2017, p. 130): "Our friend Robinson Crusoe learns this by experience, and having saved a watch, ledger, ink and pen from the shipwreck, he soon begins, like a good Englishman, to keep a set of books. His stock-

meaning of information, which is fettered to the fetishized machine, encapsulates the logic of an ongoing perfect socionatural storm, due to the Cartesian dualism that severs world society from mainstream engineering and nature from mainstream economics. The name of this perfect socionatural storm is the Great Acceleration (McNeill and Engelke, 2016), which similarly to the hullabaloo surrounding classical cybernetics and information theory, began with the end of World War II.[29]

The practice of conflating machines with humans[30] and signals with information has, however, been criticized. Heinz von Foerster (1980, p. 19; cf. Weizenbaum and Wendt, 2015, p. 44), who knew these theories inside and out due to his participation in the Macy conferences (cf. Kline, 2015), has written, "[w]hat is traveling on that wire […] is not information but *signals*." Nonetheless, this practice and these signals arguably mirror the colloquial meaning of the information that we are dealing with here. This has also triggered Sybille Kramer-Friedrich (1986, p. 17) to assert that "seldom before has scientific theory so creatively manipulated language" and Jesper Hoffmeyer (1997, p. 79) to distance himself—and the field of biosemiotics that he was in the process of developing—from this terminology by referring to these signals as "information," i.e., information written with scare quotes implying that something is rather fishy.

Another thing that has been deemed to be fishy is how Wiener conceptualized information as being ontologically independent and thus a free-floating phenomenon. After having stated that Wiener "reduces information to a variety of signals," M.I. Sietrov (1989, p. 217) contemplates this position and proposes that "the most obvious manifestation of information fetishism is the attempt to attach the status of an independent reality to information: information is information, not energy or matter, said Wiener." Sietrov's position is somewhat similar to that stated by Claus Emmeche (1994, pp. 62–63) in his book *The Garden in the Machine: The Emerging Science of Artificial Life*: "The material aspect must be included because neither life nor logic arise out of nothing." Sietrov thus, importantly, adds complementary dimensions not discussed by neither Bolaño nor Henwood. This critique is possibly applicable to Henwood's definition of information, which is rather free-floating and perhaps closer to the colloquial meaning of information that is closely related to the machine.

book contains a catalogue of the useful objects he possesses, of the various operations necessary for their production, and finally of the labour-time that specific quantities of these products have on average cost him."

29 See footnote 71.

30 Classical cybernetics and information theory have notoriously had problems in drawing clear distinction between humans and machines (cf. Hayles, 1999).

What is criticized is thus the proposal that information is a natural object (cf. Janich, 2018). This mainstream approach to information has also influenced textbooks in library and information science (cf. Brier, 2008, p. 53). Brier (2008, p. 426) doesn't "believe that a functionalistic information processing paradigm based [on] an objective statistical information concept, in itself, can provide a sufficient frame that encompasses the phenomenological aspects of meaning and mind." Katherine N. Hayles—who has written widely on cybernetics and information theory—explains the sociopolitical context of this concept of information:

> Wiener knew as well as anyone else that to succeed, this conception of information required artifacts [i.e. machines] that could embody it and make it real. […] Abstracting information from a material base meant that information could become free-floating, unaffected by changes in context. [...] As Carolyn Marvin [(1987, pp. 49–62)] notes, [this] decontextualized construction of information has important ideological implications, including an Anglo-American ethnocentrism that regards digital information as more important than more context-bound analog information.[31]
>
> (Hayles, 1999, pp. 15, 19)

As described, this is a formula and definition that is conspicuously conducive to fetishization, i.e., by obscuring the material and social context of the signals that, in this theory, are the equivalent of information. By defining information as neither matter nor energy and by embedding his concept of information in machine technology—which is fetishized in mainstream discourse—Wiener arguably laid the foundation for information fetishism.

The colloquial meaning of information as tied to the machine/computer is, however, like night compared to day, in comparison to what the colloquial meaning of information had been before the phenomena of machine fetishism and information fetishism had become ubiquitous, naturalized, and hegemonic.[32] Hornborg (2023a) writes that "[t]he term information should be reserved for the relation between a perceiving subject and whatever it perceives. It is not a quantity that is located in the objective world." Information, from this position, is thus whatever the perceiving subject attributes meaning to, i.e., anything that makes a difference. This perspective "implies that there is

31 Digital and analog information correspond with what in this study is conceptualized as machine-dependent and machine-independent information.

32 These two colloquial meanings of information run parallel with what Ronald Day (2010, p. 102, cf. 2000) calls "the conduit or transmission metaphor of information and communication, and, the form-content metaphor for how meaning is embedded in documents and in people's minds (i.e., information understood as "epistemic content," as Frohmann [(2004)] calls it)."

no information outside living beings interacting with their environments" (Gare, 2020, p. 328). This is the older colloquial meaning of the word information that has been accepted as equal to Gregory Bateson's (1972, p. 315; cf. Hoffmeyer, 1996, pp. 65–66) definition of information as *a difference that makes a difference*, where "information is something which is generated by a subject [;, i.e., information] is always information for 'someone'; it is not something that is just hanging around 'out there' in the world" (Hoffmeyer, 1996, p. 66).[33] Bateson's concept of information was thus relational, contrary to Wiener's concept, which existed independently and thus seemingly severed from human culture. This approach to information is applicable to both what could be distinguished as machine-dependent and machine-independent information. Regardless if we are sitting in front of a computer screen, if we traverse some well-trodden path by foot, or if we are reading a book, we are able to establish a relationship that attributes meaning to *a difference that makes a difference*. Here information doesn't "appears as *deus ex machina*" (Adams, 1988, pp. 79–80). But according to Hornborg, Bateson's theoretical framework is still incomplete:

> Although Bateson […] is highly concerned with materiality and with transcending Cartesian dualism, [he] paradoxically remain[s] constrained by a fundamentally Cartesian understanding of society as a nonmaterial system of communication. But if social relations are indeed a subset of ecological relations […] we should expect them to be no less material than the flows of matter and energy which we identify as ecosystems.
>
> (Hornborg, 2016, p. 16)

Gregory Bateson (1972, p. xxvi) posits that "mental process, ideas, communication, organization, differentiation, pattern, and so on, are matters of form rather than substance." The solution here is to argue (cf. Georgescu-Roegen, 1971; Adams, 1988; Mayumi, 2001) that both machine-dependent and machine-independent information are subsets of socionatural relations and thus require consumption and transformation of matter, energy, and human labour. From the meta-theory of critical realism, it could be posited that machine-dependent information exists independently of what we think of it but not independently of the material, energy, and human labour that are integral to it.

33 Søren Brier (2008, p. 175) notes: "Bateson's 'working hypothesis' was that the world's basic constituents are space, time, elementary particles (matter), and energy. But seemingly not information, which he saw as a relational concept." Bateson thus, seemingly, disagrees with Wiener's definition.

3.5. Machine fetishism > information fetishism

If commodity and machine fetishism opened the door for the mainstream definition of information and thus to information fetishism, it would probably attract those that perceive technology as "neutral." And as it happens, Henwood writes the following in his book *After the New Economy*:

> 'Technology' and 'globalization' should be neutral terms; whether they're good or bad depends on how they're used-whether to enrich the lives of billions of humans, or to enrich a small band of executives, financiers, and promoters.
>
> (Henwood, 2003, p. 2)

This juggling of the "good" and "bad" use of "neutral" technologies confines Henwood to a form of "technological moralism" (Mattelart, 1987, p. 261) and "technological neutralism" (Heikkurinen and Ruuska, 2021; cf. Roos and Hornborg, 2024, p. 3; cf. Weizenbaum and Wendt, 2015, p. 34). The social and material genesis and consequences of modern technology seem beyond questioning. Henwood's approach follows "the modern perception of technology as exhaustively accounted for in terms of the harnessing of physical nature" (Hornborg, 2023b, p. 23). As neutral revelations of nature, modern technologies as manifestations of ecologically unequal exchanges are thus not even under consideration. If commented on, the despotic and destructive social and ecological history of modern technology often seems to be reduced to an inevitable and necessary evil, part and parcel of the linear progress of industrial civilization. Hence, it must be argued that even the understanding of technology that is associated with Friedrich Engels is more complex than what Henwood is offering here.[34] Engels had, however, not seen how modern technologies in the 21st century had made the planet into one great sacrifice zone due to the unrestricted expansion of capital.

It has been noted that in Marxist theory, modern technology is often understood as external to theory (Hornborg, 2023b, p. 26).[35] The idea that modern technologies are labor-saving devices is

34 Andreas Roos (2021, p. 56) writes, "since authority was seen by Engels [(1972)] as inseparable from large-scale industry and since industrialism was interpreted as inevitable, Engels' regarded large-scale industry as being exempt from moral questioning or radical critique."

35 Hornborg writes that Marxist theory has "assumed the arcane and alienated form of other academic specialisations" (2023b, p. 9). On this approach to modern technology, Jean Baudrillard (1981, p. 168) has written: "Clearly what we have here [i.e., in the example of Hans Magnus Enzensberger (1974)] is an extension of the same schema assigned, since time immemorial, from Marx to Marcuse, to productive forces and technology: they are the promise of human fulfillment, but capitalism freezes or confiscates them."

often taken for granted. But for whom is labor saved? And who and what does the saving?[36] Henwood, who sensibly is against "forced farm work," nonetheless identifies himself as a "card-carrying eco-modernist"[37] and thus seems to understand technology as an emancipatory power, despite the fact that modern technology is arguably "restricted to a privileged geographical and social space, enjoying net imports of embodied labor time and other resources from less privileged areas" (Hornborg, 2023b, p. 8). Like British Marxist Eric Hobsbawm, Henwood arguably doesn't understand the nature of technology.[38] It is here argued that modern technologies, as introduced during the industrial revolution, reproduce and require an unequal global society, with the British empire as a model. From this perspective, the social and ecological transgressions of modern technology are inherent to the edifice itself.

Henwood's uncritical take on the questions of the ontology of information and modern technology, however, opens up the possibility of updating the concept of information fetishism. Henwood (1995, p. 171) defined his concept of information fetishism as "a second-order fetishism." Henwood also includes "bytes" in his definition. The concept should therefore be subsumed under the machine; a machine that Henwood considers to be "neutral." The position taken here is the opposite of Henwood's. Neither "technology" nor "globalization" are understood as "neutral":

> Neoclassical economic theory is an ideology originally developed in colonial Britain to justify and morally neutralize the exploitation of its extractive periphery [(Ruggiero, 2014)]. *In its modern, neoliberal guise, it has championed 'globalization' as a modern euphemism for imperialism. The very concept of 'technology' is an indispensable component of this ideology.*
>
> (Hornborg, 2021, p. 214; emphasis added)

36 Hornborg's perspectives on technology that are applied here arguably mirror the politics of cost shifting as elaborated by economist Karl William Kapp (1950, p. 11; quoted in Spash, 2021, p. 27): "For the fact that private entrepreneurs are able to shift part of the total costs of production to other persons or to the community as a whole, points to one of the most important limitations of the scope of neoclassical value theory. As long as it continues to confine itself to market value neoclassical economics will fail to assimilate to its reasoning and to its conceptual system many of the costs (and returns) which cannot be expressed in dollars and cents."

37 Henwood is the host of a weekly talk radio show. The comments about being "a card-carrying eco-modernist" and regarding "forced farm work" are found at 12:41 and 14:40 here: https://www.leftbusinessobserver.com/Radio.html#S221013 ; http://shout.lbo-talk.org/lbo/RadioArchive/2022/22_10_13.mp3 ; https://archive.org/details/cov9ki4mchbrc2ae5ec3lsuqxwgng7d3lmfszyer

38 Only a fetishized perception of technology can create a historiography like this: "The most dramatic and far-reaching social change of the second half of this [twentieth] century, and the one which cuts us off for ever from the world of the past, is the death of the peasantry" (Hobsbawm, 1994, p. 289; quoted in Edelman, 2024, p. 6). This is similar to other instances of machine fetishism in Marxist theory that Henwood should probably find harder to accept: "Just as […] [during the industrial revolution] all forms of labor and society itself had to industrialize, today labor and society have to informationalize" (Hardt and Negri, 2004; quoted in Nigam, 2023, p. 18).

The proposition is therefore that information fetishism should be understood as a third-order fetishism, where the first is commodity fetishism and the second is machine fetishism. This necessitates a presentation of the concept of machine fetishism that is associated with the anthropologist Alf Hornborg. Hornborg (1989, 1992) first tentatively conceptualized machine fetishism in Swedish in the late 1980s. This endeavor to substantiate a fuller and truer semiotic and material meaning of modern technology could—in Hornborg's (2001, p. 3) own words—"perhaps be viewed as an additional chapter in the critical, cultural analysis of capitalism inaugurated by Karl Marx." As with Henwood's information fetishism, Hornborg (2023b, p. 7) has positioned his concept of machine fetishism as "a subcategory of commodity fetishism."

As noted, commodity fetishism was first described by Marx in the first volume of *Capital* (1976, pp. 163–177). In Hornborg's (2023b, p. 29) reading, the concept of fetishism describes "the inclination of humans to perceive social relations between themselves as relations between things […]." According to Hornborg (2001, p. 147), the phenomenon of machine fetishism finds expression in everyday discourses, where the machine tends to be "animated and attributed with autonomous powers of productivity and growth." In one of his methodological strategies used to unveil the power of the machine, Hornborg has juxtaposed "the modern power of the machine with premodern power structures such as that embodied in the Inca emperor" (2001, p. 2). Like the machine, "the Inca emperor […] appears to have been perceived by his subjects as a divine source of wealth and fertility […]," i.e., the Inca emperor "was a concrete reification of a wider system of material exchanges, and as such was attributed with autonomous productivity" (Hornborg, 2001, p. 150, 2001, pp. 240–241). The hypothesis is thus that the historical everyday discourses about the Inca emperor correlate with our fetishistic discourses about the machine. In order to clarify the meaning of these fetishistic practices, Hornborg often cites anthropologist Michael Taussig:

> If we 'thingify' parts of a living system, ignore the context of which they are a part, and then observe that the things move, so to speak, it logically follows that the things may well be regarded or spoken of as though they were alive with their own autonomous powers. If regarded as mere things, they will therefore appear as though they were indeed animate things – fetishes.
>
> (Taussig, 1980, p. 36 cited in Hornborg, 2001, p. 134, 2023, p. 161)

Aiding the expansion of technological infrastructure and the flow of commodities have seemingly become our prime purposes in life. Our tendency to fetishize the commodity and the machine could thus be said to make us slaves to these entities, not only in a metaphorical sense. Such cultural inclinations to "thingify" parts of a living system are in full bloom in contemporary society, where, in the words of Marx, "the process of [commodity] production has the mastery over man" (1976, p. 175). From this quotation—and from another sentence saying that "all [...] *social productive forces of labour* appear as the *productive forces* of capital" (Marx, 1976, p. 1052; quoted in Hornborg, 2023, p. 132)—it could perhaps be posited that Marx includes modern technology in the category of what is fetishised. Hornborg (2023b, p. 132), however, argues that "neither Marx nor his followers have allowed the profound acknowledgment of colonial exploitation and imperialism to contaminate the idea of what technology fundamentally *is*." Hornborg's (2023b, p. 9) critique of modern technology is conducive to a post-Cartesian approach as it does not sequester "society from the material aspects with which it is entwined [...]." Hornborg (2023b, p. 29) argues that Marx's analysis of technology was local in scope, i.e., generally reduced to the appearance of technological infrastructure in Britain. Modern technology should, however, be understood as a global phenomenon with a "total global logic" (2023b, p. 8), as it has been since its birth in the British empire.[39] From these perspectives, it is tenable to argue that every local, regional, or national analysis of modern technology is prone to fetishize the machine as something partly or entirely autonomous, as the true boundaries of the technological system are not taken into account (Hornborg, 2023, p. 19).[40]

For Hornborg, "modern technologies are expressions of market logic", i.e., "the asymmetric structures of exchange" (2001, p. 3, 2023b, p. 3). The systemic boundaries of modern technologies are synonymous with the arbitrary boundaries of the global market. David Harvey (2005, p. 159), from a somewhat similar position, writes that the current "[i]nformation technology is the privileged technology of neoliberalism."[41] From Hornborg's perspective, the mainstream perception of

39 On the prerequisites for modern technology in the British empire, Hornborg (2023b, p. 163) writes that "the system boundaries of steam technology in early industrial Britain should include the lucrative Atlantic slave trade and American cotton plantations."

40 Daniel Bell's conceptualization of a "post-industrial society" falls into this category.

41 Two years after British prime minister Margaret Thatcher proclaimed that there is no alternative to neoliberalism, she contributed to making the acronym "IT" common parlance—"which was quickly picked up by academics"—and assigned 1982 as "Information Technology Year" (Kline, 2015, p. 212). American president Ronald Reagan (quoted in Turner, 2008, p. 175) would just a few years later, in 1988, announce: "In the new economy, human invention increasingly makes physical resources obsolete. We're breaking through the material conditions of existence to a world where man creates his own destiny." Jeremy Walker (2020, p. 69) comments on the guru of both Thatcher and Reagan: "Writing from the ultra-subjectivist Austrian wing of the neoliberal thought collective,

technologies could be said to mirror the disembedded logic of mainstream economics, i.e., the machines are detached from their actual generative contexts. The non-neutral and teleological geographies inherent in global information infrastructure could be exemplified by experiences in former imperial colonies:

> In spite of Nigeria's sophisticated international satellite link-up, the domestic telecommunications system leaves much to be desired and, as in many countries, it is often easier to telephone London from Lagos than to telephone an office across the street [...]
>
> (cf. Mattelart, 1987, p. 257)

These borders of the global market mirror the gunboat and atomic diplomacy of the past and present. Since the first underwater cables were inaugurated in the 19th century, these borders have been associated with "the symbol of the free-trade model of internationalisation" (Mattelart, 2003, p. 34). The "free-trade model" follows the logic of modern money, also conceptualized in economic anthropology as general-purpose money (Hornborg, 2023b, pp. 114–115). On the global market, "[m]oney prices project an illusion of reciprocity that obscures the asymmetric transfers of physical, productive potential from extractive sectors, largely located in the global South, to productive cores in the global North" (Hornborg, 2023b, p. 45). The consumer, a product of the global market, naturally remains blind to these parameters of biophysical resources and labour time that have generated the commodities (Hornborg, 2023b, p. 3).

Both commodity and machine fetishism are, according to Hornborg (2012, p. 3), "fetishes in the sense that they mystify unequal relations of exchange by being attributed autonomous agency or productivity." Hornborg (2023b, pp. 16–38) argues that modern technology has been undertheorised by Marx and by other scholars in the same tradition. He states that "[m]achinery, for Marx, was 'dead labour,' stripped of any moral or political concern" (2023b, p. 4).[42] Even when the global scope of modern technology is taken into account, "Marxist economic theory […]", writes Hornborg (2023b, p. 106), "tends to be incapable of deriving processes of uneven capital accumulation from asymmetric transfers of natural resources." Hornborg (2023b, p. 139), who, as noted, takes a post-Cartesian position, also points out that the Marxist tradition has been prone to conceptually insulate the social from the technical, which "produces a fetishised view of technology

Friedrich Hayek insisted that any temptation toward contemplation of the biophysical dimensions of human social order must be resisted as a symptom of socialist error, forever *verboten* to the true economist."

42 Marx and Engels share this position. See footnote 34.

as magically generative of wealth, rather than a socionatural mechanism for redistributing human time and resources by displacing work and environmental loads." This arguably mirrors Henwood's non-critical take on technology.[43]

The way we conceptualize and understand modern technologies also has consequences for how we define and understand living organisms. Hornborg quotes physicist Erwin Schrödinger, who wrote:

> [a living organism] maintains itself stationary at a fairly high level of orderliness (= fairly low level of entropy) [...] [by] continually sucking orderliness from its environment.
>
> (Schrödinger, 1967, p. 79; quoted in Hornborg, 2023b, p. 17)

Here, Hornborg complements his social theory with a thermodynamical framework, i.e., he basically states that society is dependent on and subsumed to the mind-independent forces of nature. With the First Law of Thermodynamics, it is argued that energy cannot be created or destroyed in an isolated system. The Second Law of Thermodynamics—aka the Entropy Law[44]—states that energy is qualitatively transformed from useful "low entropy" to less useful "high entropy." While the earth is an open system, i.e., it is open to the energy from the sun and the irregular inflow of meteorites and such, industrial society is basically a closed system with its dependence on finite stocks of fossilized biomass and metal ores (cf. Spash, 2024, pp. 116–117; Trawick and Hornborg, 2015; Boulding, 2013). Thus, while all biological lifeforms have evolved due to the inflow of energy from the sun, the imperially orchestrated machines, gadgets, apps, and infrastructure of industrial society, depend on the restless consumption of finite lithospheric stocks. The current

43 The social and ecological impacts of the machine have, however, begun to change these discourses. Andreas Malm (2018a, p. 17) concludes his article *Marx on Steam: From the Optimism of Progress to the Pessimism of Power*, writing that the "increased stability of capitalist power on a global scale and increased instability of the climate have been, ever since the days of steam, two sides of the same coin." Neither general-purpose money nor modern technology could be understood as "emancipatory" or "neutral" as we begin to account for their requirements and consequences.

44 Ecological economist Herman Daly (1977, p. 16) explains the Entropy Law: "Were it not for the entropy law, nothing would ever wear out; we could burn the same gallon of gasoline over and over, and our economic system could be closed with respect to the rest of the natural world." Nicholas Georgescu-Roegen (1976, pp. 58–59) argued that our relationship with the natural world and the forces of the Entropy Law should be enshrined with ethical questions: "Every time we produce a Cadillac, we irrevocably destroy an amount of low entropy that could otherwise be used for producing a plow or a spade. In other words, every time we produce a Cadillac, we do it at the cost of decreasing the number of human lives in the future. Economic development through industrial abundance may be a blessing for us now and for those who will be able to enjoy it in the near future, but it is definitely against the interest of the human species as a whole, if its interest is to have a lifespan as long as it is compatible with its dowry of low entropy."

power politics of industrial society which underpins this process, overflows the biosphere with waste, pollution, and heat.

Hornborg (2023b, pp. 22–23, 30–31), hence, draws a strict distinction between biological structures and the modern technological infrastructure and criticizes those who tend to conflate them (e.g. Haraway, 1985; cf. Hornborg, 2023b, pp. 154–157). It should also be noted that the former and latter categories are respectively associated with the concepts of biomass and technomass. Living organisms have a "capacity for sentience and communication" (Hornborg, 2019, p. 181), which is something that a nonliving structure, such as technology, lacks.[45] Moreover, technomass cannot reproduce as living organisms do.[46] While technomass needs imperial terms of trade to reproduce (cf. Hornborg, 2001), living organisms need a sustainable environment. Both organic (living) and mechanical (nonliving) structures are, however, subsumed under the aforementioned Entropy Law and therefore "require inputs of more high-order energy than they discharge" (Hornborg, 2023b, p. 17). Modern technology "requires inputs of high-order energy such as fossil fuels as well as other resources such as lubricants and spare parts." While biological systems (biomass) have survived independently and without mining the lithosphere for billions of years, modern technological systems (technomass) have been wholly dependent on devouring the stocks of sunshine accumulated in the lithosphere. Modern technology is also inherently dependent on specific cultural models that historically originated with British imperialism (Hornborg, 1992; Gudeman, 1986).

From these analytical distinctions, which highlight what differentiates biological organisms from machines, the attribution of autonomous agency to commodities and machines is equivalent to fetishism. Hornborg (2023b, p. 70) points out that "[i]t is no coincidence that [Bruno] Latour [(2010)] rejects the concept of fetishism as condescending." With the careless attribution of agency in Actor Network Theory (ANT) to living and nonliving structures alike, it makes "the distinction between living and nonliving 'actants' [...] meaningless" (Hornborg, 2023b, p. 70). While others (Thomsen and Brier, 2014, p. 24) argue that the "outcomes are not really accountable" when agency

45 Hornborg also argues—like anthropologist Leslie White (1940)—"that symbols are peculiar to humans" (2023a). Peter Janich (2018, p. 157) adds to this distinction, saying that "a machine cannot use personal or possessive pronouns *meaningfully*." Life, on the other side, according to Claus Emmeche (1994, p. 154) "stands in a permanent nondeterministic pragmatic relation to its environment." As the machine is an artifact of a specific political system, we cannot "assign blame or merit" to the artifact itself. Janich (2018, p. 157) exemplifies this: "When a construction crane blows over in a storm and hurts someone, we do not blame the wind or the crane for the disaster; we look to the machine's designer, manufacturer, or operator."

46 Söderberg and Maxigas (2022) have written about the parochial and Promethean project to create a "self-replicating 3D printer."

is attributed to artifacts, Hornborg (2023b, p. 149) similarly argues that these maneuvers have "significant ideological implications in terms of relinquishing human accountability and depoliticising technology." This theoretical framework of Hornborg—where the concept of fetishism is central—is therefore not compatible with ANT, despite its post-Cartesian approach. To summarize the arguments, in order to understand the machine, it is important to draw analytical distinctions that differentiate the sentient from the ideologically programmed and manufactured mechanisms. It is thus imperative to look beyond the local, narrow, parochial, ideological, and fetishized appearances of commodities, machines, and—not least—information.

By accepting Hornborg's theoretical framework and by arguing that the analytical concept of information fetishism, as conceptualized by Henwood, is subsumed by the machine, information fetishism must be understood as a third-order fetishism, i.e., not as a second-order fetishism as argued by Henwood. As such, information fetishism is understood as a subcategory of (1) commodity fetishism and (2) machine fetishism. Since machine fetishism, as conceptualized by Hornborg, is a subcategory of commodity fetishism, the point is now to illustrate how this non-neutral take on technology analytically empowers the concept of information fetishism.

3.6. Machine fetishism and the mainstream concept of information

It has been argued that by using the concept of "information" unreflectively and casually, one is prone to absorb the "terminology and ways of thinking of mainstream information science" (Gare, 2020, pp. 329–330). Arran Gare has described this conjuncture in Western science and thinking:

> Atomistic thinking in the Twentieth Century led 'information' to be understood as isolated chunks of knowledge and this was taken over by the physicists, who then characterized it as something in the world, independent of anyone, and then tried to impose this inverted, desiccated concept of information on all other disciplines.
>
> (Gare, 2020, pp. 327–328; cf. Hoffmeyer, 1997, p. 79)

As seen above, Henwood proposed that "information fetishists treat information as a thing unto itself, forgetting that it's always information about something—and that this something is typically quite material" (2016). From the framework applied here, this critique sounds agreeable halfway before Henwood describes information as something free-floating and thus detached from the

material and energetic substratum and what serves as its vehicle (cf. Adams, 1988). Henwood is correct in pointing out how information is fetishized as autonomous in the first instance, but as he posits information as free-floating, his model loses relevance when information fetishism and its object, i.e., machine-dependent information, are analytically positioned as a subcategory of machine fetishism.

Henwood's theoretical leanings on the free-floating concept of information must give way to the colloquial meaning of information as being centered around the human subject, as described by Hoffmeyer (1996, 1997) above. Hoffmeyer's position is compatible with Richard N. Adams' (1988, p. 83) position, which maintains "that information in culture requires [...] energetic forms plus the human models of meaning [, which] means [...] that information has no separate reality." This conceptualization of information doesn't presuppose the fetishization of the machine as a model from where to define information, as the other colloquial meaning of information. Norbert Wiener, who is associated with the latter colloquial meaning of information, conspicuously also, like Henwood, understands technology as something neutral but also as something inevitable:

> We have contributed to the initiation of a new science which […] embraces technology developments with great possibilities for good and for evil. […] We do not even have the choice of suppressing these new technical developments.
>
> (Wiener, 1955, p. 38)

> [T]he new industrial revolution is a two-edged sword. It may be used for the benefit of humanity, but only if humanity survives long enough to enter a period in which such a benefit is possible.
>
> (Wiener, 1989, p. 162)

Speaking for humanity at large, Wiener seemingly asks us to give information technology and the concomitant theory of information, i.e., "the new industrial revolution," sufficient leeway—somewhat similar to an invading imperial army in the name of freedom.[47] Despite the authoritarian history, colonial, and class injustices, and the seeds of social and ecological catastrophes inherent in modern technology, Wiener (1989, p. 140) claims that the steam engine "must certainly be regarded

47 Sara Cannizzaro (2016, p. 293) rightly speaks about "smart phones" as an *invasive technology*: "[Smart phones] can be considered invasive as [their] compulsive use in the classroom, in the workplace, in domestic and social situations, might interfere with various aspects of life. One can argue that the smartphone technology exercises control over us, but if considering that the compulsive smartphone behaviour has been programmed into the technology itself by other human beings, then one can see how the control is effectively exercised by other human enterprises through the phone."

as a great humanitarian step forward"[48] and approvingly notes that it "was steam transportation on the Mississippi which opened up the interior of the United States." Wiener (1989, p. 43; emphasis added) also stresses that "[f]or many years, the development of the United States took place against the background of the *empty land* that always lay further to the West."[49] Wiener's cybernetic theories, but also his sketchy historiography, arguably laid the foundation for what Ella Shohat (1999, p. 272) defines as a cyber-discourse that is "rich in imperial metaphors [...] [, e.g.,] 'frontier' […,] 'Wild West.'" In another context, this has been described as the "cowboy economy," where "the cowboy being symbolic of the illimitable plains […] [is] associated with reckless, exploitative, romantic, and violent behavior" (Boulding, 2013, p. 9).

From these historical excursions, Wiener (1989, p. 162) asks us to approach what he calls the "new industrial revolution," i.e., the information revolution, "intelligently" and to praise the engineers: "Let not the fact that this great triumph of [technological] invention has largely been given over to [...] the hillbilly singer, blind one to the excellent work that was done in developing it, and to [its] [...] great civilizing possibilities" (Wiener, 1989, p. 147). Wiener not only holds technology to be neutral, i.e., in the "good" or "bad" sense as applied by Henwood, but Wiener also, seemingly, presents technology as an unrelenting force, a natural force unleashed and understood primarily—or only—by engineers like himself. On top of that, Wiener understands the success of the hillbilly singer as blocking the view of the real genius, the engineer.

It could be argued that the relentless movement of Wiener's "new industrial revolution," with a prefigured cyberspace on the horizon, is ideologically fettered by the westward expansion and the narrative of the so-called "Manifest destiny." As a descriptor of the "continental expansion of the USA," Stuart N. Brotman (2003) finds it a fitting "metaphor [that also] applies today to digital expansion." Alexis de Tocqueville offers some ethnographical notes and Martin Luther King Jr.

48 It should be noted that Wiener's baffling "humanitarian" historiography of the "first industrial revolution" correlates with what Michael H. Harris (1975, pp. 2–3) has exposed as "the myth of public library origins." According to Harris, the mainstream assumption "that the [Anglo-American] public library movement began in a passion of liberal and humanitarian zeal" should be juxtaposed with the actual history, i.e., that "public libraries were generally cold, rigidly inflexible, and elitist institutions from the beginning."

49 As AI and drone warfare have kept bombs falling over Gaza in 2023-2024 (Iraqi, 2024), we should remember that Palestine was also considered to be an empty land, a form of *terra nullius*, before it was colonized. British Colonel George Gawler (quoted in Hyamson, 1918, p. 145; cf. Malm, 2024), who had been governor of South Australia, encouraged this colonization in 1845: "Replenish the deserted towns and fields of Palestine with the energetic people, whose warmest affections are rooted in the soil."

some facts regarding this historical westward expansion, which may be the most important prerequisite in its seizure of land for the technological advances as discussed by Wiener:

> An ancient people, the first and legitimate master of the American continent, is vanishing daily like the snow in sunshine, and disappearing from view over the land. In the same spots and in its place another race is increasing at a rate that is even more astonishing. The American […] does not see anything astonishing in all this. This incredible destruction, this even more surprising growth, seem to him the usual progress of things in this world. He gets accustomed to it as to the unalterable order of nature.[50]
>
> (Tocqueville, 1959, p. 329)

> Our nation was born in genocide. . . . We are perhaps the only nation which tried as a matter of national policy to wipe out its indigenous population. Moreover, we elevated that tragic experience into a noble crusade. Indeed, even today, we have not permitted ourselves to reject or feel remorse for this shameful episode.
>
> (King, 1964, p. 89; quoted in Mamdani, 2020, p. 37)

This unalterable order of nature that guides us through Wiener's "empty land," seems synonymous with what anthropologist Roberto J. González (2022, p. 32) defines as the "inevitable syndrome," i.e., an ideological rhetoric practice that stifles debates concerning new technologies. Here, the neutral take on technology is the convention. Media scholar Bernard Dionysius Geoghegan additionally concludes that "[c]ommunication theory elaborated the myth of a self-made American people" (2023, p. 91).[51] Jonathan Crary (2022, p. 22) has similarly discussed the political naturalization of the internet and the proposal that is repeatedly suggesting that "it is here to stay." These weather-beaten discourses assume that humans everywhere, no matter what, are instinctively hellbent to passively and slavishly consume the latest technological innovation in order to keep pace with the settlers and cowboys at the entrepreneurial and genocidal frontier.[52] Technology and the free-floating concept of information are all neutral and naturalized entities in this frontier universe.

50 This witness could be said to foreshadow Walter Benjamin's (1969, pp. 257–258; Löwy, 2005, pp. 60–62) often quoted *Thesis IX on the Philosophy of History.*

51 Bolaño and Vieira (2015, p. 53), who argue that the internet during the mid-1990s went "from a political-military logic to a privatization, regulation, and economical globalization one that intended to support the capitalistic restructuration and the maintenance of U.S. economical hegemony in international relations," suggest that the "possibilities of transforming small businesses managed by young college students to large Internet firms help to restore the old myth of 'self-made man' brought into the Internet business environment."

52 In his book, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Fred Turner (2008, p. 87) comments on the so-called "Cowboy Nomad": "Grafted onto the historical figure of the American cowboy, this new 'Cowboy Nomad' is part Marshall McLuhan and part Ken Kesey. He roams, but he takes his electronic (and psychedelic) technology with him. He can't bear the commercial American landscape or the middle class, and yet he lives off the bounty they have produced."

Wiener's unilinear perspective on the so-called "first industrial revolution" is revealing here. Wiener (1989, p. 140), for example, claims that "the bulk of production which [the weavers in England] could perform [prior to the "first industrial revolution"] fell far short of the demands of the day." From this market logic perspective, Wiener argues that the introduction of machinery in textile production in England was inevitable and necessary. These weavers are also associated with the Luddite riots of 1811 in England. The Luddite riots could be understood as the most formidable and mass-organized protest and attack on the elite political process to naturalize technology during the industrial revolution. British guild socialist Arthur J. Penty[53] (1926, p. 108; cf. Kiernan, 1941, p. 91) perceived the hangings of weavers, due to their participation in the Luddite riots, "as a turning point in modern industrial history," that would stifle discussions regarding the problems of modern technology.

In sum, it could be suggested that Wiener's fetishized theoretical framework of information was underpinned by an ideological perception of the machine, i.e., what Hornborg has defined as machine fetishism. It could thus also be argued that Henwood, in his theoretical framework on information fetishism, reproduces the fallacy of attributing ontological independence to information.

3.7. Information and entropy x2

Moreover, it should be noted that Henwood presents one form of information fetishism, whose meaning has been generated by some specific epistemological and ontological positions. Henwood (1995, p. 171) concludes that social labour is embedded in the "bytes," but he ignores questions that concern the social and material effects of the metabolic and energetic generation of information and information technology.

53 In his biography of Ananda K. Coomaraswamy, Roger Lipsey (1977, p. 113) writes, in a chapter entitled *England, 1912–1916: Blakean Protest*: "The fanatical, all-encompassing opposition of [Arthur] Penty and Coomaraswamy to industrialism seems willfully blind to an inalterable fact: the irreversibility of the industrial revolution." Penty and Coomaraswamy did not think that the "industrial revolution" was a force of nature; they considered it to be a particular historical and political phenomenon. Penty (1922, p. 14) writes: "[Post-industrialism] means the state of society that will follow the break-up of Industrialism, and might therefore be used to cover the speculations of all who recognize Industrialism is doomed. The need of some such term sufficiently inclusive to cover the ideals of Socialists, yet differed with them in their attitude towards Industrialism has long been felt, and the term Post-Industrialism, which I owe to Dr. A. K. Coomaraswamy, seems to me well suited to supply this want." Regarding William Blake and the subject of Blakean protests, historian E.P. Thompson (1993, p. 229) writes: "Never, on any page of Blake, is there the least complicity with the kingdom of the Beast."

Positing information fetishism as an analytical third-order fetishism after commodity and machine fetishism and seeing how the Entropy Law—aka the Second Law of Thermodynamics—is important in Hornborg's analysis also prompts the following question: how has the concept of "entropy" been applied by Norbert Wiener and Claude Shannon? These two scholars have influenced what Gare (2020) calls the mainstream information science and have thus probably impacted Henwood's perception of what information is in colloquial terms. Let us first see how Wiener dramatized his definition of information:

> Electrical engineer Robert Fano at MIT, recalled that sometime in 1947, Wiener "walks into my office, energetically sucking and puffing on his cigar. His belly sticking out and slightly bent backward as he walks, [and] announced 'information is entropy' and then walks out again. No explanation, no elaboration."
>
> (Kline, 2015, p. 64)

Wiener's performative pirouette could be compared with the suggestion given to Claude Shannon by John von Neumann, the Manhattan project scientist. Shannon and von Neumann had discussed what Shannon was measuring in what would later become known as the mathematical theory of communication. Shannon was given the following advice (quotation in Tribus and McIrvinc, 1971, p. 170): "You should call it entropy, for two reasons. In the first place your uncertainty function has been used in statistical mechanics under that name, so it already has a name. In the second place, and more important, no one knows what entropy really is, so in a debate you will always have the advantage." This advice reflects that the main concern seemingly was to win arguments in public debates and less to offer scientific clarity.[54]

By historicizing this process, it could be noted that Shannon, in his theory, built on the work done by Harry Nyquist (1924), whose main purpose was to consider how the telegraphs' speed of

54 Müller (2007, p. 124) is quoted by Bawden and Robinson (2015, p. 1971) saying: "No doubt Shannon and von Neumann thought that this was a funny joke, but it is not—it merely exposes Shannon and von Neumann as intellectual snobs. . . . If von Neumann had a problem with entropy, he had no right to compound that problem for others . . . by suggesting that entropy has anything to do with information." Others have, however, suggested that information is very much subsumed under the Entropy Law (cf. Georgescu-Roegen, 1971; Adams, 1988), in addition to the specific political system that is ruling the world at the moment, but not in the immaterial way as suggested by Shannon and von Neumann; nor Wiener, for that matter. Regarding scientific clarity, Ronald Kline (2015, pp. 97–98) writes: "British biologist J. B. S. Haldane, a founder of the (mathematical) field of population genetics and a friend of Wiener's since the 1930s, had trouble understanding the 'mathematical part of [*Cybernetics: Or Control and Communication in the Animal and the Machine*], and fear I never may master it, as I doubt if I have time to learn [...].'" Hoffmeyer (1996, p. 37), for his part, comments that "we could be excused for wondering at the totally irrational way in which scientists hail mathematics as Nature's guiding principle."

transmission could be improved.[55] Whereas Nyquist had been referring to the term "intelligence," as in the sense of "military intelligence," Shannon would choose to use the term "information," a choice he later seemingly would regret (cf. Mayumi, 2001, pp. 32–33). In his original treaties, Shannon (1949, p. 6; quoted in Beller, 2017, p. 58) underscored the "wish to consider certain general problems involving communication systems […] [and] to represent the various elements involved as mathematical entities, suitably idealized from their physical counterparts." Shannon's concepts, like "information" and "entropy," were thus both chosen arbitrarily and idealized like free-floating entities hovering above society and their physical counterparts. As such, this approach arguably reflects both the logic of mainstream engineering and economics.

While "Shannon defined amount of information to be mathematically equivalent to *positive* entropy, indicating the amount of disorder (unpredictablity) in the communication of messages[;] Wiener defined amount of information as *negative* entropy, indicating the amount of order (predictability) in a set of messages" (Kline, 2015, p. 15). Shannon and Wiener—who presented their theories at the influential Macy conferences[56] in New York in the 1940s and 1950s, which also were attended by Gregory Bateson—applied "positive entropy" and "negative entropy," respectively, and somewhat confusingly, as parameters in their measurement of the "amount of information" transmitted between "sender" and "receiver." Their arbitrary use of the concept of "entropy" could be said to be completely devoid of energetic and material dimensions, as demonstrated in the aforementioned ontological postulation of Wiener.[57] Kozo Mayumi (2001, p. 33,38) has critically concluded that "the alleged equivalence between negative entropy and information is physically baseless"[58] and "Wiener's concept of information has nothing to do with entropy in physics." It is, moreover, probable that it was the distinction made between "power" and "communication" in mainstream engineering that set Wiener on the course to formulate information as detached from energy and matter.[59]

55 Jonathan Beller (2017, p. 57) argues that "necessity demands a re-evaluation of the rise of computation—one that historicizes and socializes the anti-social and anti-historical entity called information." From this perspective, the mainstream concept of information belongs to the same category as Joseph A. Schumpeter's "entrepreneurship." Robert J. Myles (2019, pp. 119–120; cf. Schumpeter, 1969, p. 259) writes that "Schumpeter believed entrepreneurial activity was a constant of history, having 'run its historical course, from the primitive tribe to the modern large-scale corporation […].'"

56 The Macy conferences were important venues from which information theory and cybernetics were disseminated throughout the world (cf., e.g., Kline, 2015).

57 See page 36.

58 It should also be noted that Gilbert Simondon also has criticized Wiener's equation of information with negative entropy (cf. Bardin, 2015; Gare, 2020, p. 335).

It has been noted that both Wiener and Shannon have been critical of the massive use and direct transplantation of their theories into the social sciences (Kline, 2015, pp. 102–134; Gare, 2020, p. 331). Shannon would later posit that information theory had "become something of a scientific bandwagon" and argued that it is not a trivial matter to translate the concepts, i.e., those that he had appropriated for a very specific engineering dilemma, such as "information" and "entropy," "to a new domain" (Shannon, 1956, p. 3; cf. Kline, 2015, p. 103). Knowing the background of Shannon's arbitrary choice and use of "entropy" and "information," this is a very sound recommendation. It is perhaps, as a general rule, best to be cautious before transplanting mathematical formulas or other ideas from mainstream engineering to the social sciences and humanities.

It has, however, also been noted that Shannon has been both ambivalent and inconsequential in his critique. Just a few years after the "bandwagon critique," Shannon seemingly approved of the dissemination of his theoretical framework in the social sciences (Kline, 2015, p. 137). Jesper Hoffmeyer (1996, p. 63), for his part, argued forty years after Shannon that "it is hard to understand why the rest of the world should defer to the physicists' terminology [of "information"] rather than the other way around." As will be argued, this does not imply that a plausible concept of information in the humanities and social sciences should disregard the universal Entropy Law. This means that we need to distinguish between *information entropy,* which is associated with classical cybernetics and information theory, and *thermodynamic entropy,* which is associated with heterodox scholars of information (e.g., Adams, 1988).[60] It is thus argued that the arbitrary and free-floating concepts that are found in classical cybernetics and information theory are problematic and that they should probably not be transplanted to the social sciences or humanities.[61]

For the aim of advancing the analytical concept of information fetishism, the application of the arbitrary use of "entropy" in information theory is thereby inadequate. This is so because the purpose is not to solve a problem in telecommunication from the narrow perspective of mainstream engineering but to offer social and ecological perspectives on the information sent between machines.

59 Wiener (1955, p. 50) writes: "[W]hat distinguishes [communication engineering] from power engineering is that its main interest is not economy of energy but the accurate reproduction of a signal."

60 For a critique of *information entropy*, see Georgescu-Roegen (1971), Atkins (1984), Christiansen (1985; cf. Brier, 2008, pp. 63–64; Barbosa de Almeida, 2017, p. 276,285).

61 This is similar to the free-floating and fetishized concepts of money, commodity, and capital in mainstream economics, i.e., cultural artifacts perceived as autonomous and natural objects.

It could, however, be said to be a social and ecological problem to not include questions of material and energy consumption as a critical parameter while conceptualizing a concept like information fetishism. This is especially true as the technological system that sends and retrieves machine information, which was politically orchestrated and organized during the so-called American century (Turner, 2008; Kline, 2015; Harris, 2023), is wholly dependent on the finite stocks of fossilized biomass found in the lithosphere.[62] If the Entropy Law is not understood as active and to subsume the processes of machine information, then there will not exist an analytical framework that takes into account the expanding and politically constructed dissipative structure that restlessly continues to pollute the land, air, and water. Being dependent on finite resources makes all information and communication technological systems effectively closed systems (Hornborg, 2001; Trawick and Hornborg, 2015; Spash, 2024), i.e., contrary to recent claims by scholars[63] with a strong social constructivist bent, i.e., who perceive "the natural world [to have] a small or non-existent role in the construction of scientific knowledge" (Collins, 1981, p. 3).

As already noted, Henwood (1995) had chosen to focus on issues relating mainly to production and not consumption in his conceptualization of information fetishism. Excluding such a crucial parameter could, once again, be conducive to the very fetishization of information. It would,

62 Sy Taffel (2023, p. 980) writes: "While claims that data is the new oil typically assume digital technologies to be clean, renewable and sustainable, an infrastructural approach reveals the vast quantities of oil and other fossil fuels necessary for digital capitalism, therefore repudiating claims that data can grow exponentially with no material costs."

63 Zane Griffin Talley Cooper (2023, p. 59), for example, writes: "[T]hermodynamics is not, and never has been, a science of certainty. Rather, it is quite literally a science of uncertainty, its laws often as culturally and conceptually elastic as the phenomena they describe. […] But entropy, both as a concept and as a physical process, is far from inevitable, especially in systems as open and differentially entangled with other systems as our global computing infrastructures." Cooper seems to suggest that thermodynamics is some sort of postmodern artifact without foundation in reality and that "our global computing infrastructures" are somehow immune to the Entropy Law, as he proposes this technological system to be relatively open. On the contrary, however, it is arguably effectively closed as it is thoroughly dependent on finite stocks of matter found in the lithosphere. In the same book, where Cooper (2023, p. 45) presents his arguments and where he also wrongly attributes the concept of "negative entropy" to Claude Shannon, Anne Pasek (2023, p. 32) asks us to accept more hi-tech consumer goods in our daily lives: "[W]e may need to Internet of Things (IoT) everything as well, using networks and artificial intelligence (AI) to ensure the most efficient distribution of energy, goods, and capital in the context of a coming resource squeeze." Kathleen Oliver (2023, p. 6), in her LIS master's thesis, *Toxic Tech, Library Service, and Contradicting Values*, writes: "I have a constant uneasiness with digital technology (specifically the 'Internet of things' and data collection) creeping into our homes and lives, seeming to come without critical thought of implications, power structures, and the data's auxiliary or future use." Pasek, nonetheless, asks us to accept this invading corporate army and their profitable but socially and ecologically destructive commodities in the "transition away from fossil fuels" (2023, p. 32). That environmental destruction would be avoided due to the "electronic revolution" was already, and equally, claimed by James Martin (1981, p. 172) almost half a century ago, but it was also thoroughly criticized by Langdon Winner (1986, p. 274) as an expression of "mythinformation."

however, probably be to stretch it too far to conclude that Henwood, due to his present analytical model, is incapable of perceiving information, bytes, and information technology to be subsumed under not only the fetishistic politics of the market but also the thermodynamic forces of nature. What is suggested here, therefore, is that an updated concept of information fetishism could combine, but not conflate, the framework of natural science and political science in order to tackle contemporary questions of social and ecological crises. This could be done within the framework of analytical dualism, which separates society and nature analytically while rejecting the fallacy of ontological dualism (Hornborg, 2023b; cf. Archer, 1982).

Thus, the point is to complement this analysis with Nicholas Georgescu-Roegen's fundamental and straightforward suggestion that no information, in the widest sense, can be "obtained, transmitted, or received without the expenditure of some free energy" (1971, p. 405; cf. Mayumi, 2001, p. 32). This might seem commonsensical, but as noted by Adams (1988, p. 79), "[t]he thinking about energy on the one hand and information on the other has [problematically] evolved as two unrelated conceptual frameworks." Contrary to Wiener, Adams (1988, p. 80) argues that "information may be [conceptually] separated, abstracted from the energy form, but it cannot be reintroduced as ontologically distinct." Information from this perspective is intrinsically entangled with the process and consequences of energy transformation. The degradation of free energy into entropy in any human or machine process is thus part and parcel of any information perceived and encountered by any human or information processed by any machine.[64] Contrary to some scholars (e.g., Wang, 2022), the argument here is that the former kind of information not only follows the rules of human convention but also that it—like machine information—is confined and encompassed by the Entropy Law. In industrial society, the processing of machine information qualitatively shares the logic of "[f]ossil fuels [that] enter our economy as organized matter and energy but exit as dispersed heat, chemicals, carbon dioxide, and microplastics" (Rammelt, 2024, p. 4). There's really no way around this, as machine information has always been intrinsically linked to the process of mining the lithosphere.

As noted above, Shannon's application of "entropy" as a measurement of "information" transmitted by telecommunication technology from sender to receiver differs radically from this account of

64 The signals or binary code, as processed by computers, are only information when interpreted as such by a human (cf. Weizenbaum and Wendt, 2015, p. 44).

physical metabolism,[65] i.e., where the transformation of negative entropy (order) into entropy (disorder) keeps non-living technological structures from failing and living structures from dying. As an employee at AT&T, Shannon's problem was not questions of social and ecological sustainability but the most efficient transmission of signals within the framework of engineering, often for military purposes (cf. Kline, 2015).[66]

In a recent article, Norwegian sociologist Roar Høstaker (2021, p. 44) argues that it is "the duty of the contemporary generations to redress" the illusion of the immateriality of information. Høstaker, like many others, takes issue with the immateriality of information as conceived by the theoretical framework of information theory and early cybernetics. Prior to this suggestion, Høstaker (2021, p. 41) had asked: "How conscious are we as internet users to the fact that every time we do a Google-search we use electricity?" Perhaps it's not the question that is stupid as much as the mainstream discourses that have been propelled from the higher echelons of society. Before this, Høstaker (2021, p. 37) listed some previously powerful figures, such as Alan Greenspan, the former chairman of the Federal Reserve in the USA, who had "claimed that the economy [is] increasingly weightless and intangible due to digitization." Since then, other articles have been published where scholars (e.g., Taffel, 2023, p. 987), while focusing on some specific section of the internet, point out that "[f]ar from being smart, green and weightless, the cloud turns out to be more akin to a miasma of toxic smog." These perspectives arguably correct Henwood's narrow framework.

By contesting the ontological status given information by Wiener and, by so doing, revising Henwood's theory of information fetishism, we can follow the argument given by Georgescu-Roegen about how information is subsumed within the entropic process.[67] Such an argument goes

65 Regarding this, Bawden and Robinson (2015, p. 1971) quote MacKay's (1969, p. 16) critique of Shannon's use of "entropy": "the [Shannon] entropy of selective information-content of a selection should not be facilely identified with the physical entropy of thermodynamics." They also reference Wicken (1987, p. 24), who argues that "complexity" would have been a better term than "entropy" for Shannon.

66 I.e., like for other scholars in this field and employees of AT&T, as the aforementioned Harry Nyquist.

67 This is associated with "time's arrow" (cf. Spash, 2024, p. 117), i.e., the irreversibility of the entropic process. To illustrate, this means that you cannot burn the same specific and unique barrel of gasoline, or firewood, twice. Life, as such, is, of course, also irreversible, according to the same logic. Despite what some scholars (e.g., Daggett, 2019; Cooper, 2023; for a critique on this, see Hornborg, 2023b, pp. 93–102) seem to think, the Entropy Law was a fact of life long before British imperialism and the introduction of the steam engine. These scholars who relativise the Entropy Law do not differ much from the former demigod of strong social constructivism, i.e., Bruno Latour: "A realist would say that microbes were already present in the world before Pasteur lifted the veil on them, but Latour would dispute this; a realist would hold that Venus had its phases before Galileo trained his telescope on them, but Latour would deny this" (Malm, 2018b, p. 120). Georgescu-Roegen (1976, p. 99), however, writes: "The long history of peasant societies may be summarized in a few words: a continuous struggle with the effects of the Entropy Law." To this, Hornborg (2024) adds: "Whereas the economies of nonmodern societies have always

further than Høstaker (2021, p. 33), who merely claims that information depends on what he calls "material support," i.e., still leaving information detached but somewhat embraced by the material world. Georgescu-Roegen's intervention is arguably true both for the information perceived and interpreted by humans and the signals—i.e., what some define as information—transmitted by machines.

It could be argued that machine information—i.e., the signals and bytes—is similar to the products of the factory, where "dead matter comes forth [...] ennobled, while men there are corrupted and degraded" (Pius XI, 1931, para. 135; quoted in Kiernan, 1941, p. 91). However, as with the products of the factory, the entropic process of machine information is not fully understood if the parameter of land is not considered. Regardless of whether we are dealing with machine-dependent or machine-independent information, the relationship to land is fundamental. The political and entropic processes of information thus necessarily both have social and material requirements. As a human artifact, both society and nature are entangled in every form of machine information. Hence, the *modus operandi* of capital has, by Marx (1976, p. 638) been described as being equal to the art of not only robbing the worker but also the land. Something similar is arguably going on when it comes to the entropic effects of machine information. People and land must be degraded when machine information is enthroned.[68]

Høstaker mentions that the complete supply of electricity to keep the information sector going "amounts to about 10% of all electricity produced in the world in 2015, and its share is projected to double within 2030" in tandem with its CO_2 emission that is now on par with the aviation industry (2021, p. 41; cf. Jones, 2018). While 90% of all energy in global society originates from fossil fuels (Voosen, 2018), Høstaker (2021, p. 41) also points the reader to Facebook and their huge data centers that are situated in the north of Sweden due to "this region's accessible hydroelectric power supply." In the 17th century, the northern region of contemporary Sweden was considered to be the country's most important colony. This vast region was, during the same century, metaphorically

struggled with local, natural constraints, it can be argued that the technologies of the Industrial Revolution represent the emergence of strategies to displace such constraints to other parts of world society." For folklorists writing about what seemingly reflects the Entropy Law, i.e., the Sampo in the Kalevala, see Tarkka (2013), and for peasants in South America deliberating on *la fuerza*, see Gudeman and Rivera (1989).

68 In his book *The Message is Murder: Substrates of Computational Capital*, Jonathan Beller (2017, p. 1) sets out to dethrone information: "It's not information that wants to be free; it's us." Some pages later, Beller (2017, p. 19) states: "Simply put, global communication and information processing utilizes planetary dispossession as its substrate. All of our high-tech communiqués are written on the backs of modern slaves. This book included."

equated to “India” by the Swedish Chancellor, Axel Oxenstierna, i.e., after the flawed idiom used by Christopher Columbus (cf. Bäärnhielm, 1976).

Figure 2. Sara, Jakob and Oskar Jakobsson at Snávvá prior to the inundation of their land and homestead. Image from the film *Den heliga älven* [The Sacred River] (1957: 30:08 [min.:sec.]) with permission granted by Eva Westman, 2024-03-28. The film is currently globally available here: https://www.filmarkivet.se/movies/heliga-alven/

In order to produce hydroelectric power in the north of Sweden, i.e., the electricity that now powers corporate data centers, the land and homes of the people living close to the biggest rivers were inundated during the 20th century. Probably because of its shameful history, there is not much scholarly literature to discover about this. There is, however, at least one book and one film that partly cover the story of three Sámi siblings—Sara, Jakob, and Oskar Jakobsson (Fig. 2)—whose homestead was inundated in 1967 (Anderson, 1994; Den heliga älven [The Sacred River], 1957).[69] Their expulsion provided the space for an impoundment facility, with a water reservoir covering an area of 6 000 hectares, i.e., 15 000 acres, on former forests, dwellings, pastures, and farmland. As an evacuation order was given, the siblings reluctantly lingered at their ancestral homestead. When

69 Regarding the dearth of literature see May-Britt Öhman’s (2010; cf. Cederlöf and Loftus, 2024, p. 186) “Being May-Britt Öhman: Or, reflections on my own colonized mind regarding hydropower constructions in Sápmi.”

they finally left their home, it was quickly burned to the ground by employees of the hydropower company of the Swedish state. The ashes that were left are an example of the irreversibility of entropy and life. In a wider sense, this politics of expelling people from their land, in the face of the preliminary and varied resistance throughout the world (e.g., Fields, 2017, pp. 307–308), would provide the means for the centralized accumulation of computational technomass and its concomitant machine information.[70]

After the passing of the siblings, it was noticed that they hadn't used the money that they had received as compensation from the state. Perhaps they cherished their homestead, memories entangled in the land through generations, and their lives as custodians of a semiotically rich landscape more than what the bitter money had to offer (Anderson, 1994, pp. 11–13; cf. Shipton, 1989). This historic case could be generalized on a global level to all peripheries that are now subsumed under the logic of frontier capital accumulation, or what has been called "cybernetic capitalism."[71] As with the barbaric numbers of casualties in contemporaneous drone warfare—a

70 To argue that we are dealing with the social and ecological dilemma of centralized computational technomass and its concomitant machine information, analytically inferred from a "total global logic" (Hornborg, 2023b, p. 8) perspective on technology, perhaps flies in the face of Silicon Valley entrepreneurs who, due to a parochial cognitivist model, claim that information technology per definition is decentralized and emancipatory (cf. Turner, 2008). Lewis Mumford (1934, p. 240, quoted in Mumford[!], 1970, p. 295) a long time ago argued that "the possibility [...] of immediate intercourse on a worldwide basis does not necessarily mean [...] a less parochial personality." Claus Emmeche's critique of the science of artificial life could also give us guidance here. From Emmeche's (1994, p. 160) perspective, this cognitivist/parochial model "creates a simulacrum, its own universe, where the criteria for computational sophistication replace truth and only have meaning within the artificial reality itself." One of the high-priests of this parochial (Silicon) village model was Marshall McLuhan (1964, pp. 11–12; emphasis added), who touted: "Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, *abolishing both space and time as far as our planet is concerned.* As electrically contracted, the globe is no more than a village." Mumford (1970, p. 297) denounced this as "humbug."

71 Timothy Erik Ström (2022, pp. 27–28) dates the birth of cybernetic capitalism to the "the apex of the American national-imperial state, forged during the Second World War." Ström continues: "Indeed, the dawning of the cyber-capitalist age might be dated to 21 seconds past 5:29 am—local time in New Mexico, US—on 16 July 1945. […] The atomic explosion was only possible because nascent computing-machines—IBM's Harvard Mark I—were available to crunch the vast number tables for the Manhattan Project." The Manhattan Project is also "recognized as the first endeavor to use modern project management techniques" (Note, 2016, pp. 6–7; cf. Verzuh, 2005, p. 15; Lenfle and Loch, 2010, pp. 32–36). One scholar (Knafo, 2020, p. 987) rhetorically asks: "At what height should a bomber fly to maximize the effects of its bombing while minimizing losses?" Other scholars have looked to the Third Reich to understand its implications for current management theories (cf. Singer and Wooton, 1976). While some scholars (e.g., Wied, 2020, p. 8) approach management project theories through the logic of instrumental rationality and thus "pass no judgement upon the ends sought by any project," another scholar, to the contrary, states that "[r]ather than being neutral, objective or scientific, management is a very particular brand of politics" (Hanlon, 2015, p. ix). Morten Wied (2020, p. 8), however, judges different projects based on "individual" criteria: "A project is 'good' or 'bad' only seen through the eyes of its individual stakeholders." Wied exemplifies this with the Manhattan project. This technological neutralism and instrumental rationality are dissected by Zygmunt Bauman (2008, p. 115) in *Modernity and the Holocaust*, where Joseph Weizenman (1976, p. 256) is quoted in a discussion on the complexities and perils of modern information technology: "We have learned nothing. Civilization is as imperilled today as it was then." The atrocities in the Third Reich, in Hiroshima and Nagasaki,

technology that relies on satellites and surveillance intelligence—it is important to refrain from the "technocratic discourses that fetishize body counts" (Gusterson, 2019, p. 79; quoted in González, 2024, p. 8), i.e., despite the fact that these numbers explicitly mirror the expansion of the machine on foreign frontiers and the political and entropic effects of machine information.[72] Machine-dependent information, however, not only devours biological structures, human lives and non-industrial cultures; it also materially strips the biosphere of semiotic meaning, i.e., machine-independent information, while making the human habitat increasingly uninhabitable through the expansion of machine computation.[73]

3.8. Machine-dependent information and machine-independent information

From the perspective of machine fetishism and the Entropy Law, Henwood's concept of information fetishism should also be complemented with a discussion of how meaning, as related to context, is essential in the interpretation and perception of information by humans. From this perspective, it is important to distinguish between the information that is dependent on machines and the information that is not. A distinction between machine-dependent and machine-independent information, together with possible historical precursors, could widen and deepen the social and material analytical spectrum. This distinction also historicizes and reveals machine-dependent information as a transitory phenomenon. It also destabilizes Henwood's view of technology as something neutral and information as something free-floating, as these categories mirror historical and political constellations that are fluid in time and space.

current drone warfare throughout the world, and the ongoing massacres in Gaza that are orchestrated by the latest information technologies (Iraqi, 2024; Malm, 2024) must, according to Wied's logic, merely be a concern for the "individual stakeholders." Wied's neoliberal framework, however, collapses if we accept that we live in intergenerational societies. Norwegian sociologist Ottar Brox (1993, p. 133) thus writes: "What is good for the whole—in the longer run—is not always good for shortsighted and influential actors, with power to control our definition of the situation." In cybernetic capitalism, or in neoliberal society, and what Claus Emmeche (1994, p. 158) calls "postmodern science," "we encounter a kind of distancing from the real and the material—a derealization." The latter science is genealogically related to the immaterial philosophy in information theory.

72 Mark Shirk argues, in *Making War on the World: How Transnational Violence Reshapes Global Order,* that "targeted killings [by national states] and bulk data collection" are phenomena that "are here to stay" (2022, pp. 117–118).

73 This is seemingly the hallmark of "progress" according to advocates of so-called artificial intelligence who are of the opinion that "[w]e must lose our reverence for life before any progress can be made in Artificial Intelligence" (Daniell Dennett quoted in Weizenbaum and Wendt, 2015, p. 108).

It is argued that while machine-dependent information is not free-floating, it could be understood as existing independently of what we think about it.[74] It is, however, always dependent on flows of energy, materials, and some kind of social and political design. The social and ecological outcomes of machine-dependent information thus naturally differ from the outcomes of information that is machine-independent. From Hornborg's analytical framework, which is informed by the Entropy Law, it is argued that information that is machine-independent is less prone to transforming finite stocks of fossilized biomass into entropy into the biosphere, i.e., machine-independent information is not necessarily prone to overflowing the biosphere with industrial waste and pollution. The process of making the earth uninhabitable is thus more associated with machine-dependent information due to its necessary gobbling away of the lithosphere, i.e., the ground under our feet. The machine-independent information is also not necessarily saturated with the cultural, political, and ethnocentric bias that is inherent in modern information technology (cf. Geoghegan, 2023, pp. 91–92). Machine-dependent information could thus be said to hold less complex meaning than machine-independent information when understood as a complete socionatural technological process, as its energy and material requirements as a dissipative structure invariably mean greater social and ecological calamities—not least through its biased process of global homogenization.[75] The politics behind machine-dependent information thus seem to be mainly concerned with the expansion of technomass and the fleeting present, while the logic behind machine-independent information seems to be conducive to the generation of sustainable cultures and biological structures in the framework of irreversible and cyclical time.

Describing his fieldwork together with the Athabaskan Koyukon peoples of Alaska, anthropologist Richard Nelson (1983, p. 243) writes that their landscape as a whole is "completely interwoven with [...] meanings [and that every] [...] living individual is bound into this pattern of land and people that extends throughout the terrain and far back across time." This shouldn't surprise us, but it nevertheless needs to be established in the face of narratives and ideologies of terra nullius, empty lands, and wilderness that have co-evolved with an energy- and material-voracious global expansion of technomass. Nelson's findings arguably also mirror the land inhabited by the

74 This rather crude definition is inspired by Mingers and Standing's (2018) conceptualization of information.

75 To counter this process Hornborg (2023a), argues that we need to inscribe more differences that make a "difference and sensitivity to context in the sign system through which we engage each other and the remainder of the semiosphere." Hoffmeyer (1996, p. vii) defines the semiosphere as "a sphere just like the atmosphere, the hydrosphere, and the biosphere. It penetrates to every corner of these other spheres, incorporating all forms of communication: sounds, smells, movements, colors, shapes, electrical fields, thermal radiation, waves of all kinds, chemical signals, touching, and so on. In short, signs of life."

aforementioned Sámi siblings and all others who have been forced to move due to the extensive construction of hydroelectric power in the north of Scandinavia and the north of Finland—or any other industrial project that has historically expelled people from their lands. These regions and their landscapes are often narrowly described as vacant and empty, but like all places where humans dwell, these lands mirror local and dynamic toponymic naming practices (cf. Welinder, 1992, 1994).

Figure 3. Oskar Jakobsson (to the right) asks his brother Jakob: “Is it not awful to think that the surface of the water will settle twenty meters above the house?” Image from the film *Den heliga älven* [The Sacred River] (1957: 30:18 [min.:sec.]) with permission granted by Eva Westman, 2024-03-28. The film is currently globally available here: https://www.filmarkivet.se/movies/heliga-alven/

Before the expulsion of Sara, Jakob, and Oskar Jakobsson, and all others, there were, for example fireplaces, i.e., historically and culturally important places in the landscape, prior to the engineered inundation, that notably are interlaced throughout this region, i.e., Sápmi, that crosses the borders of several national-states. Every specific fireplace that is encountered in the landscape echoes a unique genealogical history, and as *differences that make a difference*, they are all associated with rules that respect their inviolability (Ryd, 2005, pp. 23–61). These differences in the landscape could all be

understood as relational and thus as possible machine-independent revelations of information. As stories of the land, they would, however, be erased and deracinated as they were submerged under the water, which instead would keep machine-dependent information and data servers afloat and expanding. The historical and local human custodian relationship to this land would be detached by the instrumental rationality of engineering and the logic of state and market. These are thus the authoritarian practices that give machine-dependent information its nihilist context and instrumental meaning from the top-down, i.e., as the sender-receiver relationship as conceptualized in information theory (Fig. 3).

Land is the precondition for both machine-dependent and machine-independent information. While the former depends on mining the lithosphere, the latter doesn't. Hornborg (2016, p. 19) writes that nonindustrial "cosmologies invariably recognized the productivity of the land as the foundation of human society." This is an affirmation of the Entropy Law. Hence, a wide spectrum of cultural models and perceptions of land as a dialectical provider of meaning and energy have developed historically in tandem with the Law of Entropy. The land of these cultures overflows with stories, history, paths, patterns, and, thus, meaning and *a difference that makes a difference*. "When an elder dies, a library burns down" has thus been recognized as both an Alaskan saying and an African proverb (Maina, 2012, p. 13). When a whole landscape is submerged under water to provide electricity for the transmission of machine information, surveillance information, and military intelligence, many machine-independent and relational libraries are lost, while people are forced into foreign political contexts that are devoid of familiar meaning.[76]

Despite "the history of attacks on indigenous cultures and related knowledge systems" (Gómez-Baggethun, 2021, p. 3), land with *differences that make a difference* and the metaphors for the Entropy Law are, however, still found where people are mainly working and interacting with the land without industrial and machine mediators. As noted by anthropologists Stephen Gudeman and

76 This logic is also inherent at the receiving end of technological expansion. Historian Fred Turner (2008, pp. 257–258) writes: "[I]n her widely read [...] memoir *Close to the Machine*, Ellen Ullman (1997) offered a cautionary depiction [...]. A forty-six-year-old freelance software engineer when she wrote her book, Ullman had been programming since 1971. […] Ullman's turn toward technologies of consciousness and toward social and economic networks has hardly brought her into the community she seeks. On the contrary, [...] Ullman has found herself alone in an alien wilderness. […] As Ullman's example suggests, coupling one's life to the technologies of consciousness does not necessarily amplify one's intellectual or emotional abilities or help one create a more whole self. On the contrary, it may require individuals to deny their own bodies, the rhythms of the life cycle, and, to the extent that their jobs require them to collaborate with faraway colleagues, even the rhythms of day and night. […] Furthermore, it may cut individual workers off from participating in local communities that might otherwise mitigate these effects."

Alberto Rivera (1989, p. 267) from their fieldwork in Colombia: “When talking about the ways of sustaining a house, the rural folk or *campesinos* would say that the earth—and only the earth—provides the ‘strength’ or ‘force’ (*la fuerza*) for life.” In a later account on the same relationship to the land, Gudeman (2016, p. 49) writes: “Like a flaming torch, this account about the house throws sparks in many directions.” Early theories of economics similarly argued that land was the basis for everything (Hornborg, 2013). These theoretical inferences in economics in the 18th century mirror the revelations of the Laws of Thermodynamics that were scientifically formulated much later. These theories had other serious fallacies, but at least they understood the importance of land. This realism would, however, soon turn into fantasy as the theoretical framework of conventional and mainstream economics would detach itself thoroughly from questions of land and, thus, energy (Keen, 2023, p. 64). These immaterial theories were notably introduced as the politics of fossil-fueled machinery expelled and replaced the close-nit relationship of humans to the landscape. A similar immaterial framework would, as we have seen, underpin the colloquial meaning of information as fettered to the machine and machine fetishism.

These misty fantasies of immateriality are also inherent in what could be understood as a historical precursor to the fetishization of machine-dependent information, i.e., the fetishization of slave-dependent information found in the early Anglo-American empire. Like all kinds of information, slave-dependent information also mirrors a specific relationship to land and meaning. Thus, once again, it is argued that information is socially and materially determined; not ontologically independent. Slave-dependent information, however, does not necessarily rely on devouring the lithosphere but on the souls and lives of enslaved people. Like machine-dependent information, slave-dependent information is generated by a certain ideology that presents information, or knowledge (Carchedi, 2022), as free-floating, i.e., detached from its social and material foundation. This example shows how a form of machine-independent information, i.e., slave-dependent information, can reflect a social system that was important for the rise of machine-dependent information.

How could this fetishization of slave-dependent information be exemplified? Here we can actually hear it straight from the horse’s mouth—or horses’ mouths, as we are provided with two examples by Richard Ovenden, who is the Bodley's Librarian at Oxford, England. In *Burning the Books: A History of the Deliberate Destruction of Knowledge,* Ovenden quotes Thomas Jefferson:

> ’He who receives an idea from me’, wrote Jefferson, ‘receives instruction himself without lessening mine; as he who lites his taper at mine, receives light without darkening me.’[...] Jefferson’s taper remains alight today thanks to the extraordinary efforts of the preservers of knowledge: collectors, scholars, writers, and especially the librarians and archivists who are the other half of this story.
>
> (Ovenden, 2020, pp. 14–15)

But something substantial is missing from both Jefferson’s writing and not only the interpretation that follows but throughout Ovenden’s book, i.e., the other half of the story. Any reader of Ovenden’s book is advised to cross-check the facts given by consulting the rich literature on the subject, for example, Edward E. Baptist’s (2016) *The Half Has Never Been Told: Slavery and the Making of American Capitalism.* The omission, i.e., the slave-dependent information, could be said to mirror the omissions of the social and material origins of oil-dependent information, i.e., machine-dependent information, in the present day (cf. Nikiforuk, 2012).

To perceive and present information as independent from its social and material origin is thus equal to fetishism. Jefferson, as the sender of instructions, i.e., information (Lund, 2024, p. 3), for his part, detaches himself socially and materially not only from the receiver but from the social and material constellations that preconditioned the transfer of slave-dependent information in the first place. Perhaps Jefferson was one of the first so-called autonomous individuals. As a reader, you pause and wonder if this exchange is based on reciprocity, or was it perhaps a slave—e.g., Sally Hemings (Gordon-Reed, 2021)—who received the information? If so, perhaps the instructions—the “non-rival goods” (cf. Mason, 2015, pp. 116–118; De Angelis, 2021, p. 646)?—given were detested as vile and not cherished as the pinnacle of Anglo-American wisdom. If these instructions were ever burned, then an additional chapter should be added to Ovenden’s book.

Regarding Jefferson’s politically more important writing, historian David Waldstreicher (2010, p. 17) writes, in *Slavery’s Constitution: From Revolution to Ratification*, “that slavery was as important to the making of the Constitution as the Constitution was to the survival of slavery.” To this, Waldstreicher (2010, p. 19) adds: “Silence, compromise, and artful design characterized [the framers’] solutions.” Thus, we should perhaps be wary about reading under Jefferson's taper, as it seems to make both labor and land vanish from the historical record.

These omissions seem to be integral to the ideological design of Jefferson's slave plantation, i.e., Monticello. Jefferson was not only one of the framers and one of the many "entrepreneurial enslavers" (cf. Baptist, 2016); he was also an avid user of "'dumbwaiters,' designed to hide his household slaves from view" (Taylor, 2018; Hornborg, 2023b, pp. 231–232).[77] It has thus been noted that if the dumbwaiter had been invented today, it "would probably be called the 'smartwaiter,' in keeping with Silicon Valley's intelligence-fetishizing argot" (Taylor, 2018).[78] As such, it could perhaps be understood as a prototype of so-called labour-saving devices "making labor seem to disappear" (Taylor, 2018). The fetishization of artifacts, slave-dependent information, and machine-dependent information detaches these processes from their actual social and material foundation.

Norbert Wiener (1989, p. 162), seemingly writing about something similar to Jefferson's dumbwaiter, asks us to "remember that the automatic machine, whatever we think of any feelings it may have or may not have, is the precise economic equivalent of slave labor." Wiener (1989, pp. 162, 140) distinguishes a hypothetical sentient automatic machine from human slaves. What human slaves had done on plantations and in mines historically, the sentient automatic machine would do for "the benefit of man, for increasing his leisure and enriching his spiritual life" (Wiener, 1989, pp. 140, 162). Wiener (1989, p. 140), as already mentioned above, broadly saw this process "as a great humanitarian step forward." It could be argued that Wiener's perception of modern technology is the equivalent of a certain hubris and wishful thinking, in tandem with the narrow perspectives of mainstream engineering. This arguably had consequences for Wiener's definition of information, as already argued. Contrary to Wiener, Alf Hornborg (2023b, p. 198) asks if modern technology "*replaced* slavery, or merely *displaced* it?" From Hornborg's perspective, modern technology could be understood as an extension and continuation of Jefferson's slave plantation, i.e., neither neutral

77 Jefferson's neoclassical and grandiose Monticello—which proved to be fertile ground for this kind of technological innovation—can be compared with the cave where the Anglo-American Quaker Benjamin Lay lived in the 18th century. Perhaps Lay, more than Jefferson, offered a better model for society? Historian Marcus Rediker (2017, pp. 6–7) tells the story: "Benjamin combined Quakerism with abolitionism and other radical ideas and practices that were uncommon for his time and rarely thought to be related: vegetarianism, animal rights, opposition to the death penalty, environmentalism, and the politics of consumption. He lived in a cave for the last third of his life, cultivated his own food, and made his own clothes. For Benjamin these beliefs and practices were all part of a consistent, integrated, ethical worldview—one that could save a planet desperately in need of salvation. He showed that multiple forms and traditions of radicalism could all be part of the same consciousness. He believed that abolition must inform a revolutionary revaluation of all life, premised on a rejection of the capitalist values of the marketplace."

78 For Jefferson's influence on the "California ideology," see Barbrook and Cameron (1996).

nor particularly humanitarian. Thus, there are parallels between the slave-dependent information on Jefferson's plantation and the political orchestration of machine-dependent information today.

This reduction of land, labour, and life to mere machinery, things, innovations, and numbers is thus fundamental to the practice of fetishization. In Cartesian philosophy, animals (Lestel, 2013, p. 314) have been understood as machines in much the same way as the British codified slaves as non-humans (Berg and Hudson, 2023, p. 203) and the unskilled worker in early modern agriculture as a form of machine (cf. Fisher, 2022, p. 43). In a report to the British Board of Agriculture in 1796, it was stated: "The tenants are machines, without will or movement of their own" (quotation in Fisher, 2022, p. 250). To perceive humans as machines, according to historian James Fisher (2022, p. 173), "required the prior conceptual separation between mental and manual labour." The information, or knowledge, generated under such conditions, where people were reduced to mere tools, could also be said to be a political precursor to machine-dependent information.

French historian Marc Bloch (1961, p. 445; quoted in Olwig, 2002, p. 15) has stated that "in the area of Western civilization, the map of feudalism reveals some large blank spaces—the Scandinavian Peninsula, Frisia, Ireland," but some scholars (e.g., Helmer, 1993; Thoré, 2001) have, however, claimed that the universities in Lund and Uppsala, in Sweden, were run like feudal-like institutions. Thus, both universities had peasants working on their land. Any knowledge produced or book written depended on this local relationship to the land, making it a kind of feudal-dependent information. Professor Johannes Schefferus, at Uppsala University, who wrote one of the first books on Sápmi (Schefferus, 1673), for example, also had his peasants tortured when he believed they had misbehaved (Thoré, 2001, p. 148). If we reject the perception of the scholar, i.e., Johannes Schefferus, like the aforementioned American president, as a free-floating and autonomous individual, then the university has always been entangled with disputes regarding how the land should be approached and managed that reflect the social and material origins of both information and knowledge. What has changed is that labour done by peasants—while not planning a rebellion (cf. Firnhaber-Baker and Schoenaers, 2017)—has been displaced to other regions of the world through the introduction of so-called labour-saving devices and fossil fuels (cf. Hornborg, 2023b; Trawick and Hornborg, 2015).[79]

79 The structures of feudal-dependent and slave-dependent information arguably remain in machine-dependent information. Gareth Dale (2021, p. 9) has noted that Richard Cantillon—an 18th century economist—"recognize[d] that a system of prices could produce and reproduce essentially the same social hierarchy as does a feudal system

The fetishization of information technologies, i.e., some of our contemporary so-called labour-saving devices, arguably preconditioned the fetishization of machine-dependent information. If we ever want to assess this dilemma, we should distinguish between machine-dependent and machine-independent information and confront their unique and particular social and material foundations, as well as the artificial division between mental and manual labour. Doing this is to confront the very essence of Western culture,[80] which holds that the individual, the commodity, modern technology, and the concept of information are autonomous, free-floating, and detached from social and material reality. Clive Hamilton (2017, p. 52) has begun confronting these dilemmas by concluding that "[t]he new anthropocentric self does not float free like the modern subject, but is always woven into nature, a knot in the fabric of nature."[81] What needs to be confronted are thus the epistemological models that have underpinned "the most anomalous and unrepresentative period in the 200,000-year-long history of relations between our species and the biosphere" (McNeill and Engelke, 2016, p. 5) that now threaten to make earth uninhabitable.

3.9. The modern capitalist academic library and information fetishism

O evige Korrespondent!
Så lägg det på elden
om du är trött på vårt pränt!

Gunnar Ekelöf (1961)

From the arguments accumulated so far, it could be posited that by adopting the fetishized frameworks of classical cybernetics, information theory, and computer science, and thus the perception of information as ontologically independent and immaterial, the contemporary and mainstream library has become one of the prime proponents behind the expansion of machine-dependent information, to the detriment of machine-independent information.[82] LIS scholar

based on the direct command over labour."

80 See footnotes 7 and 27.

81 This could be compared with Charles Taylor's (1977, p. 9; emphasis added; quoted in Leed, 1980, p. 53) antiquated vision of the autonomous individual: "My suggestion [...] lies in the fact that a disenchanted world is correlative to a self-defining subject, and that the winning through to a self-defining identity was accompanied by a sense of exhilaration and power, that the subject need no longer define his perfection or vice, his equilibrium or disharmony, in relation to an external order. *With the forging of this modern subjectivity there comes a new notion of freedom, and a newly central role attributed to freedom, which seems to have proved itself definitive and irreversible."*

82 Machine-independent information can, but doesn't necessarily, equal slave-dependent information.

Rebecca Lossin (2017, p. 109) sees a dark and dystopian future—or perhaps it's our present—where "'information packages' are continually being tossed onto the digital pyre." This epoch, where toxic stocks of the lithosphere are dumped into the biosphere at an ever greater pace, which means the loss of not only machine-independent information, books, and relational land but also vital biological and ecological structures, has aptly been called a "hyperindustrial age" (Stiegler, 2019).

Decades ago, librarian Richard De Gennaro (1989, p. 43; emphasis added) declared that despite the fact that "many […] were predicting that information technology would put libraries *out of business* […] the evidence is that technology is, in fact, putting libraries *into business*" (quoted in Buschman, 1993, p. 215). This "entrepreneurial direction of librarianship" (Buschman, 1993, p. 216; cf. Govan, 1988; Hansson, 2019; Widebäck and Blomberg, 1992), with its frantic expansion of the fossil fueled digital pyre, has recently been touted as a "freedom project,"[83] in the words of Lars Burman (2019, p. 25), the director of Uppsala University Library in Sweden. It could be noted that Burman's choice of words carries the alluring rhetoric that was associated with the car throughout the 20th century (Sachs, 1992).[84] If Burman sounds like a mid-20th-century car salesman, it could just be that his frame of reference is preconditioned by a specific political structure, i.e., what librarian Stephen Bales (2015) calls MCAL, the "modern capitalist academic library." If the scribe-priests of the early Egyptian libraries were mainly concerned with the reproduction of a specific sacred cosmology (cf. Bales, 2016, p. 7), the modern equivalents are seemingly mainly concerned with the expansion of information technologies and machine-dependent information.

In the same book, Burman (2019, p. 29) writes: "Digitalization is a leveling force." This can perhaps be categorized as a McLuhanesque slogan, i.e., reminiscent of the hi-tech and quasi-shamanic prose of Canadian scholar Marshall McLuhan.[85] As it stands without the support of arguments or reasoning, it reads like an enigma. The practice of leveling (sw. *utjämnande*) has historically had many different political connotations. Historian Peter Linebaugh (2019, p. 263), for example, mentions "universal franchise, regicide, equality, confiscation of the superfluities of the rich, restoration of commons, and knocking down opponents!" Some distinct political dimensions are, however, revealed when Burman (2019, p. 52) refers to the library as a neutral institution, i.e.,

83 All translations from Swedish have been made by the author, if not otherwise noted.
84 Concerning the car, see footnote 44 where Georgescu-Roegen discusses the Cadillac.
85 Regarding the techno-determinist cosmology and writing of McLuhan, see footnotes 9, 52, 70.

similar to Wiener and Henwood's fetishized perception of technology. Lewis Mumford saw the ideological features of this computerized "freedom project" taking form over fifty years ago:

> Though my generation usually associates […] [book] burning with the public bonfires lighted by the Nazis in the nineteen-thirties, that was a relatively innocent manifestation, for it disposed of only a token number of the world's store of books. But it remained for [Marshall] McLuhan to picture as technology's ultimate gift a more absolute mode of control: one that will achieve total illiteracy, with no permanent record except that officially committed to the computer, and open only to those permitted access to this facility. This repudiation of an independent written and printed record means nothing less than the erasure of man's diffused, multi-brained collective memory: it reduces all human experience into that of the present generation and the passing moment.
>
> (Mumford, 1970, p. 294)

Burman's "freedom project," which fetters us to the machine, is arguably an oxymoron on the same level as the aforementioned digital "non-rival good" (cf. Mason, 2015, pp. 116–118; De Angelis, 2021, p. 646). Both concern machine-dependent information that requires unsustainable and increasing investment and consumption of energy, matter, and human labour. This extensive metabolism of technomass, which is subsumed under a biophysical zero-sum logic (cf. Trawick and Hornborg, 2015), invariably devours the land and the lithosphere and deteriorates the global and collective relationship to machine-independent information as found in and outside the MCAL. Burman, like Jefferson with slave-dependent information and Schefferus with feudal-dependent information, doesn't underscore or problematize the social and material requirements and consequences of machine-dependent information. When Burman (2019, p. 24) writes about the expansion of the digital sphere as equal to a "freedom project," he celebrates it by stating that the contemporary modern academic library is more "digital" than "physical." A dichotomy is supposed to convey contrasts, but this dichotomy only conveys the Panglossian, parochial, and local perception of the digital sphere. The fact that the physical digital sphere is sprawling, with the consequential havoc brought upon social and ecosystems worldwide, should probably not be celebrated. This hyperindustrial and digital relationship to land is arguably not an emancipatory project, except for those profiting from the expansion of machine-dependent information.

In the early 1980s, almost forty years before Burman would define the digital age as a "freedom project," Langdon Winner (1984, p. 595)—a student of Mumford—commented on the steady wave of computer enthusiasts who celebrated the expansion of "electronic information," with the critical

disclaimer that it may come “at the cost of placing freedom—and the feeling of freedom—in a deep chill.” Moreover, Winner (1984, p. 592) commented: “Of all the political ideas of computer enthusiasts, there is none more poignant than the faith that the computer is destined to become a potent equalizer in modern society.” Winner (1984, p. 594) concluded by asking if it “is [...] sensible to transfer this ideology, as many evidently wish, to all parts of human life?”

As Burman employs a discourse that visibly hasn’t changed since the introduction of “electronic information,” i.e., machine-dependent information, the time has perhaps come to ask: “Who? Whom? Who takes liberty from whom?” (Linebaugh, 2009, p. 106). Or in the words of Joacim Hansson (2019, p. 180): “Whether working in libraries with critical information literacy or within a critical knowledge organization, one question must permeate all activities: who benefits?” These questions must transcend previous conceptualizations of information fetishism, where machine-dependent information has seemingly been understood as ontologically independent. Thus, machine-dependent information must be understood as being situated in a specific social and ecological context, i.e., the opposite of being free-floating or weightless. These questions must also reject the notion of neutral libraries and information technologies and instead reflect the “total global logic” (cf. Hornborg, 2023b, p. 8) of machine-dependent information. Thus, the whole global zero-sum process where machine-independent information is socially and ecologically deracinated due to the growing and stifling weight of machine-dependent information and information technologies must be considered. As anthropologist Tim Ingold (2019, p. 669) writes, “sustainability is nothing if it is not of everything.” If information technologies—like the tractor that is dependent on global terms of trade (cf. Hornborg, 2001, p. 111)—do not make social and ecological sense for most people on this planet, neither does slave-dependent or machine-dependent information.[86] The fact that the demand for electricity by the information infrastructure is envisioned to double by 2030 (cf. Høstaker, 2021), in tandem with CO_2 emissions, is a parameter that reflects the tip of a melting iceberg of dilemmas enshrined in machine-dependent information. In a warmer world, directors of libraries should begin to take note of the destruction of the social and biophysical world instead of blinding themselves while fanning the flames.[87]

86 Jonathan Crary (2022, p. 2) writes: “The digital tools and services used by people everywhere are subordinated to the power of transnational corporations, intelligence agencies, criminal cartels, and a sociopathic billionaire elite. For the majority of the earth’s population on whom it has been imposed, the internet complex is the implacable engine of addiction, loneliness, false hopes, cruelty, psychosis, indebtedness, squandered life, the corrosion of memory, and social disintegration.”

87 In an anthology dedicated to the question of how libraries relate to land, Ariel Hahn (2023, p. 180; cf. Civallero and Plaza, 2016; Oliver, 2023), while focusing on the toxicity of the digital cloud, writes: “Critical refusal offers those

4. Conclusions

The main subject of this master's thesis has been the concept of information fetishism and how it sheds light on the phenomenon and structure of machine-dependent information and its place in global society. The concept of information fetishism has thus been used as an analytical concept to better understand the nature of machine-dependent information. It has been argued that machine-dependent information has a particular political and social bias that has been presented as both natural and universal. As an ontological phenomenon, machine-dependent information is, however, neither natural nor universal. Contrary to beliefs about the immateriality of machine-dependent information, this study shows that the social and ecological impacts of machine-dependent information correlate with the greater expansion of technological infrastructure. Since the purpose of information technology is machine-dependent information, these entities are basically inseparable. Being reliant on machine-dependent information is equally troubling as being reliant on fossil fuels, as you basically cannot have the former without the latter. The purpose of this master's thesis has been to bring out some of these dark dilemmas in broad daylight. Another overlapping purpose has been to step outside the confinement of the machine and thus to compare machine-dependent information with machine-independent information.

This study has also revealed that the analytical output of information fetishism depends on the epistemological and ontological positions and definitions that scholars state or take for granted. For example, if the so-called colloquial meaning of information, which is defined with the machine or computer as a reference point, is taken for granted, then information as such is understood as ontologically independent from matter and energy. This is problematic when information fetishism takes machine information as its subject, i.e., what in this study has been defined as machine-dependent information. Machine-dependent information is not only dependent on human labor but also on the material and energy that the machine requires; to not understand or ignore this is a case of information fetishism in itself.

of us who labor in the information domain the possibility to reject collectively [...] technologies that perpetuate harm to our planet, our communities, and ourselves." Michael Albert's (2022) book, *No Bosses: A New Economy for a Better World*, might also prove increasingly important.

Scholars who use information fetishism as an analytical concept thus argue that there are two sides to information. This study has complemented previous conceptualizations and thus argued that the superficial appearances of information should be juxtaposed with perspectives regarding how machine-dependent information requires not only social labour but also the unsustainable and unjust consumption of material and energy for its reproduction. As also noted, what is perceived as information from one perspective is not necessarily information but perhaps signals or binary code from another perspective. The problem of fetishism, however, still stands, especially when we are dealing with machine-dependent information: regardless if this is understood as signals or as *a difference that makes a difference*, the problem arises when the relationship to the former or latter is understood as ontologically independent of matter and energy, as in the definition given by Norbert Wiener.

In this study, it has also been proposed that there exist two competing so-called colloquial meanings of information: one is informed by the human subject in a specific social and ecological context, and the other is derived from the fetishized character of the machine or computer. None of these meanings of information have been discussed by Henwood or Bolaño. Sietrov, as described, has, however, understood Wiener's ontological definition of information as a prime example of information fetishism, which also, arguably, constitutes one of the so-called colloquial meanings of information today.

The main omission of previous scholars of information fetishism is arguably the omission regarding the importance of machine fetishism. This study has argued that machine-dependent information, as the focal point of Henwood's theory, cannot be understood without understanding information fetishism as a subcategory of machine fetishism. The latter theory also includes a much-needed critique of orthodox Marxist perceptions of technology that usually ignore world society and the zero-sum logic and material and energy requirements of modern technology. This and the application of the machine-centered notion of information have necessitated a discussion about how entropy relates to information. Here, the so-called concept of *information entropy* has been dropped, and *thermodynamic entropy*, as supported by heterodox theorists of information, has been applied to the analytical framework of information fetishism. As machine-dependent information could be said to exist independent of our thoughts, it still depends on human labor, matter, and energy; thus, the immaterial nature of *information entropy* as an analytical concept has been rejected, while

thermodynamic entropy has been accepted. This is the case since machine-dependent information is subsumed not only under society and geopolitics but also under nature and the Entropy Law.

The distinction between machine-dependent and machine-independent information has also been given more substance by some historical excursions. This has been necessary in order to dispute the fetishized and ahistorical character of the colloquial meaning of information. It has been demonstrated that the social system of machine-dependent information has been preconditioned by social systems that reflect and generate machine-independent information.

It has also been shown that information fetishism is reproduced in the MCAL through the application of antiquated discourses. Although this was only demonstrated with one example, this example mirrors the general and ideological discourse of machine and information fetishism. This approach to society and nature, it has been argued, fans the fire of the digital pyre. This accelerates the consumption of the finite stocks of the lithosphere while deteriorating the conditions for machine-independent information in and outside the MCAL. This is done by shackling society and its citizens even more to the ideology and the institution of the machine. The information fetishism of this process mirrors the hubris and lack of social, historical, and ecological awareness regarding the consequences of technological expansion, i.e., technomass sprawl, which seemingly must proceed no matter what.

Regarding possible future research, the spectrum is wide, as much of the research done for this master's thesis has only touched upon the preliminary and tentative perspectives of information fetishism as understood as a subcategory of machine fetishism. Research projects that explore and contest the information fetishism in contemporary society could thus:

- Critically substantiate the preliminary analytical distinctions made in this study.
- Investigate how the MCAL and its corporate partners are supposed to finance and cool their materially and energy intensive and expanding/sprawling technomass in an increasingly warmer world.
- If it is true that "libraries do not fit into a capitalist market model" (cf. Hansson, 2019, p. 2), then it is also true that libraries shouldn't promote a parochial and fetishized understanding of machine-dependent information. From this position, a research project could ask how

libraries should relate to questions of human labour and land from a non-capitalist and non-fetishized perspective.

- Critically research how the philosophy and historiography of the post-industrial movement (cf. Penty and Coomaraswamy, 1914; Penty, 1917, 1922) in the early 20th century could inform the social and ecological construction of tomorrow's libraries through the abolishment of the artificial division between mental and manual labour.
- As the information sector is about to transcend the CO_2 emitted by the aviation industry, a research project could investigate why activists have focused on the "shameful" emissions of the latter industry but not the former. Question: Why is one industry fetishized while the other is not?

5. References

Adams, R.N. (1988) *The eighth day: social evolution as the self-organization of energy*. Austin, Tex.: University of Texas Press.

Adde, G. (1915). ‘Bibliotek och biblioteksskötsel (Recension)’, *Nordisk Tidskrift för Bok- och Biblioteksväsen*, (2), pp. 392–394.

Adriaans, P. (2020) ‘Information’. Available at: https://plato.stanford.edu/archives/fall2020/entries/information/.

Albert, M. (2022) *No bosses: a new economy for a better world*. Winchester: Zero Books, an imprint of John Hurt Publishing.

Anderson, H. (1994) *Vid vägs ände: natur och människor vid Lilla Luleälvens källor*. Stockholm: Arena i samarbete med Ájtte, Naturskyddsfören., Svenska turistfören.

Angus, I. (2023) *The war against the commons: dispossession and resistance in the making of capitalism*. New York: Monthly Review Press.

Archer, M.S. (1982) ‘Morphogenesis versus structuration: on combining structure and action’, *The British journal of sociology*, 33(4), pp. 455–483.

Atkins, P.W. (1984) *The second law*. New York, N.Y.: Scientific American Books.

Bäärnhielm, G. (1976) *I Norrland hava vi ett Indien: gruvdrift och kolonisation i Lappmarken under 1600-talet*. Ordfront/Arkivet för Folkets Historia.

Bales, S. (2015) *The dialectic of academic librarianship: a critical approach*. Sacramento, CA: Library Juice Press.

Bales, S.E. (2016) ‘The academic library as crypto-temple: a Marxian analysis’, in E.S. Estep and N.F. Enright (eds) *Class and librarianship: essays at the intersection of information, labor and capital*. Sacramento, CA: Library Juice Press.

Baptist, E.E. (2016) *The half has never been told: slavery and the making of American capitalism*. Paperback edition. New York: Basic Books.

Barbosa de Almeida, M.W. (2017) ‘Local struggles with entropy: caipora and other demons’, in M. Brightman and J. Lewis (eds) *The Anthropology of Sustainability*. New York: Palgrave Macmillan US, pp. 273–289. Available at: https://doi.org/10.1057/978-1-137-56636-2_16.

Barbrook, R. and Cameron, A. (1996) ‘The Californian ideology’, *Science as Culture* [Preprint]. Available at: https://doi.org/10.1080/09505439609526455.

Bardin, A. (2015) *Epistemology and political philosophy in Gilbert Simondon*. Dordrecht: Springer Netherlands (Philosophy of Engineering and Technology). Available at: https://doi.org/10.1007/978-94-017-9831-0.

Bateson, G. (1972) *Steps to an ecology of mind*. New York: Ballantine.

Baudrillard, J. (1981) *For a critique of the political economy of the sign*. St. Louis, Mo.: Telos Press.

Baudrillard, J. (1994) *Simulacra and simulation*. Ann Arbor: University of Michigan Press.

Bauman, Z. (2008) *Modernity and the Holocaust*. Repr. Cambridge: Polity Press.

Bawden, D. and Robinson, L. (2015) '"A few exciting words": information and entropy revisited', *Journal of the Association for Information Science and Technology*, 66(10), pp. 1965–1987. Available at: https://doi.org/10.1002/asi.23459.

Bell, D. (1960) *The end of ideology: on the exhaustion of political ideas in the fifties*. Glencoe, Ill.: Free Press.

Bell, D. (1973) *The coming of post-industrial society: a venture in social forecasting*. New York: Basic books.

Beller, J. (2017) *The message is murder: substrates of computational capital [Elektronisk resurs]*. Pluto Press.

Benjamin, W. (1969) *Illuminations*. New York: Schocken Books.

Berg, M. and Hudson, P. (2023) *Slavery, capitalism and the Industrial Revolution*. Cambridge: Polity Press.

Bhaskar, R. (2007) 'Theorising ontology.', in C. Lawson, J.S. Latsis, and N. Martins (eds) *Contributions to social ontology*. London: Routledge.

Bhaskar, R. (2016) *Enlightened common sense*. London: Routledge.

Bloch, M. (1961) *Feudal society*. Chicago: University of Chicago Press.

Bolaño, C. (2015) *The culture industry, information and capitalism*. New York: Palgrave Macmillan.

Bolaño, C. (2018) 'Do fetichismo da mercadoria ao fetichismo da informação: uma réplica.', *Eptic online: revista electronica internacional de economia política da informaçao, da comuniçao e da cultura*, 20(1), pp. 125–130.

Bolaño, C.R.S. and Vieira, E.S. (2015) 'The political economy of the Internet: social networking sites and a reply to Fuchs', *Television & New Media*, 16(1), pp. 52–61. Available at: https://doi.org/10.1177/1527476414527137.

Boulding, K.E. (2013) ‘The economics of the coming spaceship earth. resources for the future’, in H. Jarrett (ed.) *Environmental quality in a growing economy: essays from the sixth Rff Forum*. Baltimore: RFF Press.

Brier, S. (1985) ‘Informationsbegrebet set i lyset af Batesons bidrag til løsningen af ethologiens grundlagsproblem’, in T. Söderqvist (ed.) *Informationssamfundet: bidrag til forståelsen af information, individ og samfund*. Århus: Forlaget Philosophia.

Brier, S. (2008) *Cybersemiotics: why information is not enough!* Toronto ; Buffalo: University of Toronto Press (Toronto studies in semiotics and communication).

Brier, S. (2015) ‘Nature and machine’, in *Ethics, Science, Technology, and engineering: a global resource*. Gale, pp. 127–130. Available at: https://research.cbs.dk/en/publications/nature-and-machine (Accessed: 14 May 2024).

Brooks, P. (2011) *Enigmas of identity*. Princeton, N.J: Princeton University Press.

Brotman, S.N. (2003) ‘Achieving the digital manifest destiny’, *info*, 5(1). Available at: https://doi.org/10.1108/info.2003.27205aab.001.

Brown, J.S. and Duguid, P. (2017) *The social life of information*. Updated, with a new preface. Boston, Massachusetts: Harvard Business Review Press.

Brox, O. (1993) ‘Let us now praise dragging feet!’, in N. Åkerman (ed.) *The necessity of friction: nineteen essays on vital force.* Heidelberg: Physica.

Budd, J.M. (2001) *Knowledge and knowing in library and information science: a philosophical framework*. Lanham: Scarecrow Press.

Burman, L. (2019) *Meningen med ett universitetsbibliotek*. Uppsala: Uppsala universitetsbibliotek (Scripta minora Bibliothecae regiae Universitatis Upsaliensis, 19).

Buschman, J. (1993) ‘Conclusion: contexts, analogies, and entrepreneurial directions in librarianship’, in J. Buschman (ed.) *Critical approaches to information technology in librarianship: foundations and applications*. Westport, Conn.: Greenwood Press.

Calabrese, A. (1999) ‘The Information Age according to Manuel Castells’, *Journal of Communication*, 49(3), pp. 172–186. Available at: https://doi.org/10.1111/j.1460-2466.1999.tb02812.x.

Cannizzaro, S. (2016) ‘The philosophy of semiotic Information’, in L. Floridi (ed.) *The Routledge handbook of philosophy of information*. London, New York: Routledge, Taylor & Francis Group (Routledge handbooks in philosophy).

Carchedi, G. (2022) ‘The ontology and social dimension of knowledge: the Internet quanta time’, *International Critical Thought*, pp. 1–30. Available at: https://doi.org/10.1080/21598282.2022.2113170.

Carey, J.W. (2009) *Communication as culture: essays on media and society*. Rev. ed. New York: Routledge.

Carlsson, H. (2013) *Den nya stadens bibliotek: om teknik, förnuft och känsla i gestaltningen av kunskaps- och upplevelsestadens folkbibliotek*. Lund: Faculty of Humanities and Theology, Department of Arts and Cultural Sciences, Lund University.

Castells, M. (1996) *The Information Age: economy, society and culture. Vol. 1 The rise of the network society*. Malden, Mass.: Blackwell.

Castells, M. (1997) *The Information Age: economy, society and culture. Vol. 2 The power of identity*. Malden, Mass.: Blackwell.

Castells, M. (1998) *The Information Age: economy, society and culture. Vol. 3 End of millennium*. Malden, Mass.: Blackwell.

Catton, W.R. (1982) *Overshoot: the ecological basis of revolutionary change*. Urbana: Univ. of Illinois P.

Cederlöf, G. and Loftus, A. (2024) *Discovering political ecology*. Abingdon, Oxon ; Routledge.

Chandler, K. (2022) 'Apartheid drone: infrastructures of militarism and the hidden genealogies of the South African Seeker', *Social Studies of Science*, 52(4), pp. 512–535. Available at: https://doi.org/10.1177/03063127221105748.

Chowdhury, G.G. and Chowdhury, S. (2024) *Information for sustainable development: technology, people and society*. London: Facet Publishing.

Christiansen, P.V. (1985) 'Informationens elendighed', in T. Söderquist (ed.) *Informationssamfundet*. Aarhus: Aarhus universitet.

Civallero, E. and Plaza, S. (2016) 'Libraries, sustainability and degrowth', *Progressive Librarian*, (45Winter2017), pp. 20–45.

Clark, B. and Foster, J.B. (2001) 'William Stanley Jevons and the coal question: an introduction to Jevons's "Of the economy of fuel"', *Organization & Environment*, 14(1), pp. 93–98. Available at: https://doi.org/10.1177/1086026601141005.

Clastres, P. (1977) *Society against the state*. Oxford: Blackwell.

Cohen, W. (1969) 'Thomas Jefferson and the problem of slavery', *The Journal of American History*, 56(3), pp. 503–526.

Collins, H.M. (1981) 'Introduction: Stages in the empirical programme of relativism', *Social Studies of Science*, 11(1), pp. 3–10.

Coomaraswamy, A.K. (1949) *The bugbear of literacy.* London: Dennis Dobson.

Cooper, Z.G.T. (2023) 'That which escapes: thinking through heat in Proof-of-Work Systems', in A. Pasek et al. (eds) *Digital energetics*. Minneapolis: University of Minnesota Press.

Crary, J. (2022) *Scorched earth: beyond the digital age to a post-capitalist world*. New York: Verso.

Crawford, N. (2022) *The Pentagon, climate change, and war: charting the rise and fall of U.S. military emissions*. Cambridge: The MIT Press.

Daggett, C.N. (2019) *The birth of energy: fossil fuels, thermodynamics, and the politics of work*. Durham: Duke University Press.

Dale, G. (2021) 'Rule of nature or rule of capital? physiocracy, ecological economics, and ideology', *Globalizations*, 18(7), pp. 1230–1247. Available at: https://doi.org/10.1080/14747731.2020.1807838.

Daly, H.E. (1977) *Steady-state economics: the economics of biophysical equilibrium and moral growth*. San Francisco: W.H. Freeman.

Danermark, B., Ekstrom, M. and Karlsson, J.C. (2019) *Explaining society*. Abingdon, Oxon: Routledge.

Day, R.E. (2000) 'The "conduit metaphor" and the nature and politics of information studies.', *Journal of the American Society for Information Science*, 51(9), pp. 805–811.

Day, R.E. (2001) *The modern invention of information: discourse, history, and power*. Carbondale: Southern Illinois University Press.

Day, R.E. (2010) 'Psychoanalysis as critique in the works of Freud, Lacan, and Deleuze and Guattari', in G.J. Leckie, L.M. Given, and J. Buschman (eds) *Critical theory for library and information science: exploring the social from across the disciplines*. Santa Barbara, Calif: Libraries Unlimited.

De Angelis, M. (2021) 'Commons', in B. Skeggs et al. (eds) *The sage handbook of marxism*. Thousand Oaks: SAGE.

De Gennaro, R. (1989) 'Technology & access in an enterprise society. (cover story)', *Library Journal*, 114(16), p. 40.

Den heliga älven [The Sacred River] (1957). Available at: https://www.filmarkivet.se/movies/heliga-alven/.

Dillow, A. (2012) 'Foreword', in D. Bawden and L. Robinson (eds) *Introduction to information science*. London: Facet Publishing.

Drucker, P.F. (1955) *The practice of management*. London: Heinemann.

Drucker, P.F. (1969) 'The Knowledge Society', *New Society*, 13(343), pp. 629–631.

Drucker, P.F. (1993) *Post-capitalist society*. Oxford: Butterworth Heinemann.

Du Bois, W.E.B. (1902) 'The opening of the library', *The Independent*, 54, pp. 809–810.

Durrani, S. (2014) *Progressive librarianship: perspectives from Kenya and Britain, 1979-2010*. London: Vita Books.

Dyson, E. *et al.* (1996) ‘Cyberspace and the American Dream: a Magna Carta for the Knowledge Age (Release 1.2, August 22, 1994)’, *The Information Society*, 12(3), pp. 295–308. Available at: https://doi.org/10.1080/019722496129486.

Edelman, M. (2024) *Peasant politics of the Twenty-first Century: transnational social movements and agrarian change*. Ithaca [New York]: Cornell University Press.

Ekelöf, G. (1961) *Färjesång*. Stockholm: Bonnier.

Eliade, M. (1978) *The forge and the crucible*. Chicago ; Univ. of Chicago press.

Emmeche, C. (1994) *The garden in the machine: the emerging science of artificial life*. Princeton, NJ: Princeton Univ. Press.

Engels, F. (1972) ‘On authority’, in R.C. Tucker (ed.) *Marx-Engels reader*. New York: W.W. Norton and Co.

Enzensberger, H.M. (1974) *The conscious industry: on literature, politics and the media*. New York: Seabury P.

Fields, G. (2017) *Enclosure: Palestinian landscapes in a historical mirror*. Oakland, California: University of California Press.

Firnhaber-Baker, J. and Schoenaers, D. (2017) *The Routledge history handbook of medieval revolt*. Abingdon, Oxon ; Routledge.

Fisher, J.D. (2022) *The enclosure of knowledge: books, power and agrarian capitalism in Britain, 1660-1800*. Cambridge: Cambridge University Press.

Florida, R. (2005) *Cities and the creative class*. New York: Routledge.

von Foerster, H. (1980) ‘Epistemology of communication’, in K.M. Woodward (ed.) *The myth of information: technology and postindustrial culture*. London: Routledge and Kegan Paul.

Forester, T. (1987) *High-tech Society: the story of the Information Technology Revolution*. 1st MIT Press ed. Cambridge, Mass: MIT Press.

Foster, G.M. (1965) ‘Peasant society and the image of limited good*’, *American Anthropologist*, 67(2), pp. 293–315. Available at: https://doi.org/10.1525/aa.1965.67.2.02a00010.

Fridell, F. (1950) *Hopp-Jerka: noveller*. Stockholm: KF:s BOKFÖRLAG.

Frohmann, B.P. (2004) *Deflating information: from science studies to documentation*. Toronto: University of Toronto Press.

Galtung, J. (2009) *The fall of the US Empire and then what?: successors, regionalization or globalization? US fascism or US blossoming?* Oslo: TUP, Transcend University Press.

Gandhi, M. (1948) *Selections from Gandhi*. Edited by N.K. Bose. Ahmedabad: Navajivan Publishing House.

Gare, A. (1993) *Nihilism incorporated: European Civilization and environmental destruction*. Bungendore: Eco-logical Press.

Gare, A. (2013) ‘The grand narrative of the Age of Re-Embodiments: beyond modernism and postmodernism’, *Cosmos and History: the Journal of Natural and Social Philosophy*, 9(1), pp. 327–357.

Gare, A. (2020) ‘Semiosis and information: meeting the challenge of information science to post-reductionist Biosemiotics’, *Biosemiotics*, 13(3), pp. 327–346. Available at: https://doi.org/10.1007/s12304-020-09393-w.

Gare, A. (2021) ‘Against Posthumanism: Posthumanism as the World Vision of House-Slaves’, p. 56.

Gates, B. (1996) *The road ahead*. London: Penguin.

Geoghegan, B.D. (2023) *Code: from information theory to French theory*. Durham: Duke University Press (Sign, storage, transmission).

Georgescu-Roegen, N. (1971) *The entropy law and the economic process*. Cambridge, Mass.: Harvard University Press.

Georgescu-Roegen, N. (1976) *Energy and economic myths: institutional and analytical economic essays*. New York: Pergamon P.

Gómez-Baggethun, E. (2021) ‘Is there a future for indigenous and local knowledge?’, *The Journal of Peasant Studies*, 0(0), pp. 1–19. Available at: https://doi.org/10.1080/03066150.2021.1926994.

González, R.J. (2022) *War virtually: the quest to automate conflict, militarize data, and predict the future*. Oakland, California: University of California Press.

González, R.J. (2024) ‘Death by remote control: drone warfare in Afghanistan, Ukraine and beyond’, *Anthropology Today*, 40(1), pp. 7–11. Available at: https://doi.org/10.1111/1467-8322.12862.

Gordon-Reed, A. (2021) ‘Sally Hemings: writing the life of an enslaved woman’, in J. Hobson (ed.) *The Routledge companion to black women’s cultural histories*. Milton Park, Abingdon, Oxon ; New York, NY: Routledge.

Govan, J.F. (1988) ‘The creeping invisible hand: entrepreneurial librarianship’, *Library Journal*, 113(1), pp. 35–38.

Gudeman, S. (1986) *Economics as culture: models and metaphors of livelihood*. London: Routledge & Kegan Paul.

Gudeman, S. and Rivera, A. (1989) ‘Colombian conversations: the strength of the Earth [and Comments and Replies]’, *Current Anthropology*, 30(3), pp. 267–281. Available at: https://doi.org/10.1086/203743.

Gudeman, S.F. (2016) *Anthropology and economy*. Cambridge: Cambridge University Press. Available at: https://doi.org/10.1017/CBO9781316442739.

Gusterson, H. (2019) 'Drone warfare in Waziristan and the new military humanism', *Current Anthropology*, 60(S19), pp. S77–S86. Available at: https://doi.org/10.1086/701022.

Haass, R.N. (2018) *A world in disarray: American foreign policy and the crisis of the old order*. New York, NY: Penguin Books.

Hahn, A. (2023) 'Refusing growth: cloud technology, climate change, and the future of libraries and Archives', in L. Zvagintseva and M. Greenshields (eds) *Land in Libraries: toward a materialist conception of education / edited by Linda Zvagintseva and Mary Greenshields.* Sacramento, CA: Library Juice Press.

Hamilton, C. (2017) *Defiant earth: the fate of humans in the Anthropocene*. Cambridge: Polity Press.

Hanlon, G. (2015) *The dark side of management*. Routledge. Available at: https://doi.org/10.4324/9781315754581.

Hansson, J. (2019) *Educating librarians in the contemporary university: an essay on iSchools and emancipatory resilience in library and information science*. Sacramento: Library Juice Press.

Haraway, D. (1985) 'Manifesto for cyborgs: science, technology, and socialist feminism in the 1980s', *Socialist Review* [Preprint], (89).

Hardt, M. and Negri, A. (2004) *Multitude: war and democracy in the Age of Empire*. New York: The Penguin Press.

Harnesk, D. and Isgren, E. (2022) 'Sustainability as a real utopia – heuristics for transformative sustainability research', *Environment and Planning E: Nature and Space*, 5(3), pp. 1678–1695. Available at: https://doi.org/10.1177/25148486211018570.

Harris, M. (2023) *Palo Alto: a history of California, capitalism, and the world*. London: Riverrun.

Harris, M.H. (1975) *The role of the public library in American life: a speculative essay*. Champaign, IL: University of Illinois.

Harvey, D. (2005) *A brief history of neoliberalism*. Oxford ; New York: Oxford University Press.

Hayek, F.A. (1945) 'The use of knowledge in society.', *The American economic review*, 35(4), pp. 519–530.

Hayes, D. (1990) *Behind the silicon curtain*. Black Rose Books.

Hayles, N.K. (1999) *How we became posthuman: virtual bodies in cybernetics, literature, and informatics*. Chicago, Ill: University of Chicago Press.

Heeks, R. *et al.* (2024) ‘China’s digital expansion in the Global South: Special issue introduction’, *The Information Society*, 40(2), pp. 65–68. Available at: https://doi.org/10.1080/01972243.2024.2315868.

Heikkurinen, P. and Ruuska, T. (eds) (2021) *Sustainability beyond technology: philosophy, Critique, and Implications for Human Organization*. 1st edn. Oxford University Press. Available at: https://doi.org/10.1093/oso/9780198864929.001.0001.

Helmer, K. (1993) *Arrendatorer och professorer: Lunds universitets jordegendomar under 325 år*. Lund: Lund Univ. Press.

Henwood, D. (1995) ‘Info fetishism’, *Resisting the virtual life: the culture and politics of information. Ed. James Brook and Iain Boal. San Francisco: City Lights*, pp. 163–172.

Henwood, D. (2003) *After the new economy*. New York, NY: The New Press.

Henwood, D. (2016) ‘Comrades in digits: a sweeping manifesto argues that data will be the death of capitalism’. Available at: https://www.bookforum.com/print/2301/a-sweeping-manifesto-argues-that-data-will-be-the-death-of-capitalism-15798.

Heppler, J.A. (2024) *Silicon Valley and the environmental inequalities of high-tech urbanism*. Norman: University of Oklahoma Press.

Hjørland, B. (2004) ‘Arguments for philosophical realism in library and information science’. *Library Trends*, 52(3), pp. 488-506.

Hobsbawm, E.J. (1994) *Age of Extremes: the short twentieth century 1914-1991*. London: Joseph.

Hoffmeyer, J. (1996) *Signs of meaning in the Universe*. 2. print. Bloomington: Indiana University Press (Advances in semiotics).

Hoffmeyer, J. (1997) *Livstecken: betydelsens naturhistoria*. Translated by A.-M. Seeberg. Stockholm: Bonnier Alba.

Hoffmeyer, J. (2005) *Biosemiotik: en afhandling om livets tegn og tegnenes liv*. Charlottenlund: Ries.

Hofstadter, R. (1944) *Social darwinism in American thought, 1860-1915*. Philadelphia: University of Pennsylvania press.

Hornborg, A. (1989) ‘Imperialismens termodynamik’, *Tvärsnitt 89*, (4), pp. 32–41.

Hornborg, A. (1992) ‘Machine fetishism, value, and the image of unlimited good: towards a thermodynamics of imperialism’, *Man*, 27(1), p. 1. Available at: https://doi.org/10.2307/2803592.

Hornborg, A. (2001) *The power of the machine: global inequalities of economy, technology, and environment*. Walnut Creek, CA: AltaMira Press ([Globalization and the environment, 1]).

Hornborg, A. (2006) ‘Footprints in the cotton fields: the Industrial Revolution as time–space appropriation and environmental load displacement’, *Ecological Economics*, 59(1), pp. 74–81. Available at: https://doi.org/10.1016/j.ecolecon.2005.10.009.

Hornborg, A. (2012) *Global ecology and unequal exchange: fetishism in a zero-sum world*. 1st edn. Routledge. Available at: https://doi.org/10.4324/9780203806890.

Hornborg, A. (2013) ‘The fossil interlude: Euro-American power and the return of the physiocrats’, in S. Strauss, S. Rupp, and T. Love (eds) *Cultures of Energy*. New York: Routledge.

Hornborg, A. (2016) *Global magic: technologies of appropriation from ancient Rome to Wall Street*. New York: Palgrave Macmillan US. Available at: https://doi.org/10.1057/9781137567871.

Hornborg, A. (2019) *Nature, society, and justice in the Anthropocene: unraveling the money-energy-technology complex*. 1st edn. Cambridge University Press. Available at: https://doi.org/10.1017/9781108554985.

Hornborg, A. (2021) ‘Machines as manifestations of global systems: steps toward a sociometabolic ontology of technology’, *Anthropological Theory*, 21(2), pp. 206–227. Available at: https://doi.org/10.1177/1463499620959247.

Hornborg, A. (2023a) ‘Signs of life and death: the semiotic self-destruction of the biosphere’, *Biosemiotics* [Preprint]. Available at: https://doi.org/10.1007/s12304-023-09536-9.

Hornborg, A. (2023b) *The magic of technology: the machine as a transformation of slavery*. Taylor & Francis.

Hornborg, A. (2024) ‘Limiting money: redesigning the artifact that shapes modern people’, *Sustainability Science* [Preprint].

Høstaker, R. (2021) ‘The immateriality of information’, *Cybernetics & Human Knowing*, 28(1–2), pp. 31–45.

Huberman, J. (2022) *The spirit of digital capitalism*. Cambridge: Polity Press.

HUD 2023 (2024) *HUD releases 2023 Annual Homeless Assessment Report | National Low Income Housing Coalition*. Available at: https://nlihc.org/resource/hud-releases-2023-annual-homeless-assessment-report.

Hyamson, A.M. (1918) ‘British Projects for the restoration of Jews to Palestine’, *Publications of the American Jewish Historical Society* [Preprint], (26).

Illich, I. (1981) *Shadow work*. Boston, Mass.: Boyars (Open forum series, 99-0126113-9).

Illich, I. (1982) *Gender*. New York: Pantheon Books.

Illich, I. (1993) *In the vineyard of the text: a commentary to Hugh's Didascalicon*. Chicago: Univ. of Chicago Press.

Ingold, T. (2019) ‘Art and anthropology for a sustainable world’, *Journal of the Royal Anthropological Institute*, 25(4), pp. 659–675. Available at: https://doi.org/10.1111/1467-9655.13125.

Ingold, T. (2020) *Correspondences*. Cambridge, UK ; Polity.

Inikori, J.E. (1989) ‘Slavery and the Revolution in Cotton Textile Production in England’, *Social Science History*, 13(4), p. 343. Available at: https://doi.org/10.2307/1171219.

Inikori, J.E. (2002) *Africans and the Industrial Revolution in England: a study in international trade and economic development*. New York: Cambridge University Press.

Iraqi, A. (2024) *‘Lavender’: The AI machine directing Israel’s bombing spree in Gaza*, *+972 Magazine*. Available at: https://www.972mag.com/lavender-ai-israeli-army-gaza/ (Accessed: 3 April 2024).

Isaksen, K.R. (2018) ‘Without foundation or neutral standpoint: using immanent critique to guide a literature review’, *Journal of Critical Realism*, 17(2), pp. 97–117. Available at: https://doi.org/10.1080/14767430.2018.1427180.

Jacobs, M. (1996) ‘What is socio-ecological economics?’, *Ecological Economics Bulletin*, 1, pp. 14–17.

Janich, P. (2018) *What is information?* Translated by E. Hayot and L. Pao. Minneapolis: University of Minnesota Press.

Jones, N. (2018) ‘How to stop data centres from gobbling up the world’s electricity’, *Nature*, 561(7722), pp. 163–166.

Joudrey, D.N., Taylor, A.G. and Wisser, K.M. (2018) *The organization of information*. Fourth edition. Santa Barbara, California Denver, Colorado: Libraries Unlimited (Library and information science text series).

Kakel, C.P. (2011) *The American West and the Nazi East: a comparative and interpretive perspective*. Houndmills, Basingstoke, Hampshire ; New York: Palgrave Macmillan.

Kapp, K.W. (1950) *The social costs of private enterprise*. Cambridge, Mass.: Harvard University Press.

Keen, S. (2023) ‘Putting energy back into economics’, *real-world economics review*, p. 64.

Kiernan, E.J. (1941) *Arthur J. Penty: his contribution to social thought.* Washington, D.C.: The Catholic university of America press.

King, M.L. (1964) *Why we can’t wait*. New York: Penguin.

Kline, R.R. (2015) *The Cybernetics Moment: or why we call our age the Information Age*. Baltimore: Johns Hopkins University Press.

Knafo, S. (2020) ‘Neoliberalism and the origins of public management’, *Review of International Political Economy*, 27(4), pp. 780–801. Available at: https://doi.org/10.1080/09692290.2019.1625425.

Krause, P.L. (1988) ‘Patronage and philanthropy in Industrial America: Andrew Carnegie and the Free Library in Braddock, Pa.’, *Western Pennsylvania History: 1918-2020*, pp. 127–146.

Kuhl, S. (2002) *The Nazi connection: eugenics, American racism, and German national socialism*. Oxford University Press.

Latour, B. (2010) *On the modern cult of the factish gods*. Durham [NC]: Duke University Press.

Le Bon, G. (2001) *The crowd: a study of the popular mind*. Mineola, NY: Dover Publications.

Leed, E. (1980) ‘Voice and Print’, in K. Woodward (ed.) *The myths of information: technology and postindustrial culture*. London: Routledge & Kegan Paul.

Lenfle, S. and Loch, C. (2010) ‘Lost roots: how project management came to emphasize control over flexibility and novelty’, *California Management Review*, 53(1), pp. 32–55. Available at: https://doi.org/10.1525/cmr.2010.53.1.32.

Lerner, S. (2010) *Sacrifice zones: the front lines of toxic chemical exposure in the United States*. Cambridge, Mass.: MIT Press.

Lestel, D. (2013) ‘The withering of shared life through the loss of biodiversity’, *Social Science Information*, 52(2), pp. 307–325. Available at: https://doi.org/10.1177/0539018413478325.

Levine, Y. (2018) *Surveillance valley: the secret military history of the Internet*. New York: PublicAffairs.

Lévi-Strauss, C. (1961) *Tristes tropiques: an anthropological study of primitive societies in Brazil*. London: Hutchinson & Co.

Levy, D.M. (2000) ‘Digital libraries and the problem of purpose.’, *Bulletin of the American Society for Information Science*, 26(6), p. 22.

Linebaugh, P. (2009) ‘Taking liberties: who? whom?’, *Capitalism Nature Socialism*, 20(4), pp. 103–111. Available at: https://doi.org/10.1080/10455750903441623.

Linebaugh, P. (2019) *Red round globe hot burning: a tale at the crossroads of commons and closure, of love and terror, of race and class, and of Kate and Ned Despard*. Oakland, California: University of California Press.

Lipsey, R. (1977) *Coomaraswamy. 3, His life and work*. Princeton: Princeton University Press.

Loeb, Z. (2015) ‘Introduction’, in *Islands in the cyberstream: seeking havens of reason in a programmed society*. Sacramento, CA: Litwin Books.

Lossin, R. (2017) ‘Against the universal library’, *New Left Review*, (107), pp. 99–114.

Löwy, M. (2005) *Fire alarm: reading Walter Benjamin's 'On the Concept of History'*. London: Verso.

Lund, N.W. (2024) *Introduction to documentation studies: complementary studies of documentation, communication and information*. London: Facet Publishing.

Lyon, D. (1988) *The Information Society: issues and illusions*. Cambridge: Polity.

MacKay, D.M. (1969) *Information, mechanism and meaning.* Cambridge, Mass.

Maina, C.K. (2012) 'Traditional knowledge management and preservation: intersections with library and information science', *International Information & Library Review*, 44(1), pp. 13–27. Available at: https://doi.org/10.1080/10572317.2012.10762911.

Malm, A. (2018a) 'Marx on steam: from the optimism of progress to the pessimism of power', *Rethinking Marxism*, 30(2), pp. 166–185. Available at: https://doi.org/10.1080/08935696.2017.1417085.

Malm, A. (2018b) *The progress of this storm: nature and society in a warming world*. London ; Verso.

Malm, A. (2024) *The destruction of Palestine is the destruction of the earth*, *Verso*. Available at: https://www.versobooks.com/blogs/news/the-destruction-of-palestine-is-the-destruction-of-the-earth (Accessed: 8 April 2024).

Malm, A. and Hornborg, A. (2014) 'The geology of mankind? A critique of the Anthropocene narrative', *The Anthropocene Review*, 1(1), pp. 62–69. Available at: https://doi.org/10.1177/2053019613516291.

Mamdani, M. (2020) *Neither settler nor native: the making and unmaking of permanent minorities*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.

Martin, J. (1981) *Telematic society: a challenge for tomorrow*. Englewood Cliffs, N. J.,: Prentice-Hall.

Martinson, H. (1931) *Nomad*. Stockholm: Bonnier.

Martinson, H. (1975) *Friends, you drank some darkness: three Swedish poets, Harry Martinson, Gunnar Ekelöf, and Tomas Tranströmer*. Translated by R. Bly. Boston: Beacon Press.

Marx, K. (1963) *The poverty of philosophy*. New York: International Publishers.

Marx, K. (1969) 'The future results of British rule in India', in S. Avineri (ed.) *Karl Marx on colonialism and modernization: his despatches and other writings on China, India, Mexico, the Middle East and North Africa*. New York: Doubleday Anchor book.

Marx, K. (1976) *Capital: a critique of political economy. Vol. 1*. Edited by E. Mandel. Harmondsworth: Penguin in association with New Left Review.

Marx, K. and Engels, F. (1968) *Selected works in one volume*. London: Lawrence and Wishart.

Marx, K. and Engels, F. (1970) *The German ideology*. International Publishers Co.

Mason, P. (2015) *Postcapitalism: a guide to our future*. London: Penguin Random House.

Mattelart, A. (1987) 'Informatics and Micro-revolutions in the Third World', in J.D. Slack and F. Fejes (eds) *The ideology of the Information Age*. Norwood, N.J.: Ablex (Communication and information science, 99-0167979-6).

Mattelart, A. (2003) *The Information Society: an introduction*. London: Sage.

Mauss, M. (1954) *The gift: forms and functions of exchange in archaic societies*. Glencoe, Ill.: Free Press.

May, C. (2002) *The Information Society: a sceptical view*. Cambridge: Polity Press.

Mayumi, K. (2001) *The origins of ecological economics: the bioeconomics of Georgescu-Roegen*. London ; New York: Routledge (Routledge research in environmental economics, 1).

McCoy, A.W. (2021) *To govern the globe: world orders and catastrophic change*. Chicago: Haymarket Books.

McLuhan, M. (1964) *Understanding media: the extensions of man*. London: Routledge.

McNeill, J.R. (2019) 'The global environment and the World Economy since 1500', in E.T. Roy and G. Riello (eds) *Global Economic History*. London: Bloomsbury Academic.

McNeill, J.R. and Engelke, P. (2016) *The Great Acceleration: an environmental history of the Anthropocene since 1945*. Cambridge, MA: Harvard University Press.

Merchant, C. (1980) *The death of nature: women, ecology, and the Scientific Revolution*. San Francisco: Harper & Row.

Miller, H. (1934) *Tropic of Cancer*. New York: Medusa.

Mingers, J. and Standing, C. (2018) 'What is information? toward a theory of information as objective and veridical', *Journal of Information Technology*, 33(2), pp. 85–104. Available at: https://doi.org/10.1057/s41265-017-0038-6.

Mintz, S.W. (1986) *Sweetness and power: the place of sugar in modern history*. Penguin.

Moore, J. (2005) 'Revolution of the space invaders: Darwin and Wallace on the geography of life', in D.N. Livingstone and C.W.J. Withers (eds) *Geography and revolution*. Chicago: University of Chicago Press.

Moore, S.D. (2019) *Slavery and the making of early American libraries: British literature, political thought, and the transatlantic book trade, 1731-1814*. Oxford: Oxford University Press.

Morris, R.C. and Leonard, D.H. (2017) *The returns of fetishism: Charles de Brosses and the afterlives of an idea*. Chicago: The University of Chicago Press.

Müller, I. (2007) *A history of thermodynamics: the doctrine of energy and entropy*. Berlin: Springer.

Müller, S.M. (2016) *Wiring the world: the social and cultural creation of global telegraph networks*. New York: Columbia University Press (Columbia studies in international and global history).

Mumford, L. (1934) *Technics and civilization*. New York: Harcourt, Brace and company.

Mumford, L. (1964) 'Authoritarian and democratic technics', *Technology and culture*, 5(1), pp. 1–8.

Mumford, L. (1970) *The myth of the machine vol. 2 the pentagon of power*. New York: Harcourt Brace Jovanovich.

Myles, R.J. (2019) 'Fishing for entrepreneurs in the Sea of Galilee? unmasking neoliberal ideology in biblical interpretation', in R.J. Myles (ed.) *Class struggle in the New Testament*. Lanham: Lexington Books, Fortress Academic.

Nardi, B.A. and O'Day, V.L. (2003) 'An ecological perspective on digital libraries', in A.P. Bishop, A.A. Van House, and B.P. Buttenfield (eds) *Digital library use: Social practice in design and evaluation*. Cambridge: MA: The MIT Press, pp. 65–84.

Nelson, R.K. (1983) *Make prayers to the raven: a Koyukon view of the Northern Forest*. Chicago: Univ. of Chicago Press.

Nigam, A. (2023) *Border-Marxisms and historical materialism: untimely encounters*. Cham: Springer International Publishing (Marx, Engels, and Marxisms). Available at: https://doi.org/10.1007/978-3-031-22895-7.

Nikiforuk, A. (2012) *The energy of slaves: oil and the new servitude*. Vancouver, BC ; Greystone Books ;

Note, M. (2016) *Project management for information professionals*. Amsterdam: Elsevier.

Nyquist, H. (1924) 'Certain Factors affecting telegraph speed', *Transactions of the American Institute of Electrical Engineers*, XLIII, pp. 412–422. Available at: https://doi.org/10.1109/T-AIEE.1924.5060996.

Öhman, M.-B. (2010) 'Being May-Britt Öhman: or, reflections on my own colonized mind regarding hydropower constructions in Sápmi', in P. Elovaara et al. (eds) *Travelling thoughtfulness: feminist technoscience stories*. Umeå: Department of Informatics, Umeå University.

Okoli, C. (2015) 'Critical Realist considerations for literature reviews'. Rochester, NY. Available at: https://doi.org/10.2139/ssrn.2700524.

Oliver, K. (2023) *Toxic tech, library Service, and contradicting values*. Available at: https://era.library.ualberta.ca/items/9c8add4a-51f7-4e5b-a527-d249b98010d1.

Olwig, K. (2002) *Landscape, nature, and the body politic: from Britain's Renaissance to America's New World*. Madison, Wis: The University of Wisconsin Press.

Olwig, K.R. (1996) ‘Recovering the substantive nature of landscape’, *Annals of the Association of American Geographers*, 86(4), pp. 630–653. Available at: https://doi.org/10.1111/j.1467-8306.1996.tb01770.x.

Ovenden, R. (2020) *Burning the books: a history of the deliberate destruction of knowledge*. First Harvard University Press edition. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.

Ovetz, R. (2022) *We the elites: why the US Constitution serves the few*. London: Pluto Press.

Paré, G. *et al.* (2015) ‘Synthesizing information systems knowledge: a typology of literature reviews’, *Information & Management*, 52(2), pp. 183–199. Available at: https://doi.org/10.1016/j.im.2014.08.008.

Parker, E.B. (1976) ‘Social implications of computer/telecoms systems’, *Telecommunications Policy*, 1(1), pp. 3–20. Available at: https://doi.org/10.1016/0308-5961(76)90003-3.

Pasek, A. (2023) ‘From atoms to electrons: an energy history and future of computing’, in C.K. Lin et al. (eds) *Digital Energetics*. Minneapolis: University of Minnesota Press.

Paulsen, R. (2024) *Roland Paulsen: tillsätt hellre en utredning om massproduktionen av ekonomer*, *DN.se*. Available at: https://www.dn.se/kultur/roland-paulsen-tillsatt-hellre-en-utredning-om-massproduktionen-av-ekonomer/ (Accessed: 22 May 2024).

Penty, A.J. (1917) *Old worlds for new: a study of the post-industrial state*. G. Allen & Unwin Limited.

Penty, A.J. (1922) *Post-industrialism*. G. Allen & Unwin Limited.

Penty, A.J. (1926) *Protection and the social problem*. London: George Allen and Unwin, Ldt.

Penty, A.J. (Arthur J. (1920) *A guildsman’s interpretation of history*. London: Allen & Unwin.

Penty, A.J. and Coomaraswamy, A. (eds) (1914) *Essays in post-industrialism: A Symposium of Prophecy concerning the Future of Society*. London: T. N. Foulis.

Pius XI, P. (1931) *Quadragesimo anno*. De Tijd.

van der Ploeg, J.D. (2021) ‘Peasants’, in A.H. Akram-Lodhi et al. (eds) *Handbook of critical agrarian studies*. Cheltenham, UK: Edward Elgar Publishing.

Polanyi, K. (1957) ‘The economy as instituted process’, in K. Polanyi, C.M. Arensberg, and H.W. Pearson (eds) *Trade and Market in the Early Empires: Economies in History and Theory*. New York: Free Press.

Popowich, S. (2019) *Confronting the democratic discourse of librarianship: a Marxist approach*. Sacramento, CA: Library Juice Press.

Powell, R.R. (1995) ‘Research competence for Ph. D. students in library and information science’, *Journal of Education for Library and Information Science*, pp. 319–329.

Rammelt, C. (2024) ‘How entropy drives us towards degrowth’, *real-world economics review*, p. 2.

Ratcliffe, B.M. (1982) ‘Cotton imperialism: Manchester merchants and cotton cultivation in West Africa in the Mid-Nineteenth Century’, *African Economic History*, (11), p. 87. Available at: https://doi.org/10.2307/3601218.

Rediker, M. (2017) *The fearless Benjamin Lay: the Quaker dwarf who became the first revolutionary abolitionist*. Boston: Beacon Press.

Richard, M.K. *et al.* (2024) ‘Quantifying doubled-up homelessness: presenting a new measure using U.S. Census Microdata’, *Housing Policy Debate*, 34(1), pp. 3–24. Available at: https://doi.org/10.1080/10511482.2021.1981976.

Rivano Eckerdal, J. (2018) ‘Equipped for resistance: an agonistic conceptualization of the public library as a verb’, *Journal of the Association for Information Science and Technology*, 69(12), pp. 1405–1413. Available at: https://doi.org/10.1002/asi.24069.

Roberts, N. (1982) ‘A search for information man’, *Social Science Information Studies*, 2(2), pp. 93–104. Available at: https://doi.org/10.1016/0143-6236(82)90003-5.

Roos, A. (2021) ‘Earthing philosophy of technology: a case for ontological materialism’, in Roos, A., *Sustainability Beyond Technology*. Oxford University Press, pp. 59–95. Available at: https://doi.org/10.1093/oso/9780198864929.003.0003.

Roos, A. and Hornborg, A. (2024) ‘Technology as capital: challenging the illusion of the green machine’, *Capitalism Nature Socialism*, pp. 1–21. Available at: https://doi.org/10.1080/10455752.2024.2332218.

Roszak, T. (1994) *Cult of information: a neo-Luddite treatise on high-tech, artificial intelligence, and the true art of thinking*. University of California Press.

Rowe, F. (2014) ‘What literature review is not: diversity, boundaries and recommendations’, E*uropean Journal of Information Systems*, 23(3), pp. 241–255. Available at: https://doi.org/10.1057/ejis.2014.7.

Ruggiero, V. (2014) *Crimes of the economy: a criminological analysis of economic thought*. London: Routledge.

Ryd, Y. (2005) *Eld: flammor och glöd: samisk eldkonst*. Stockholm: Natur o. kultur.

Sachs, W. (1992) *For love of the automobile: looking back into the history of our desires*. Berkeley: University of California Press.

Schefferus, J. (1673) *Joannis Schefferi Argentoratensis Lapponia, id est, regionis Lapponum et gentis nova et verissima descriptio. In qua multa de origine, superstitione, sacris magicis, victu, cultu, negotiis Lapponum, item animalium, metallorumque indole, quæ in terris eorum proveniunt, hactenus incognita produntur, & eiconibus adjectis cum cura illustrantur*. Francofvrti ex officina Christiani Wolffii typis Joannis Andreæ. Anno M. DC. LXXIII.

Schrödinger, E. (1967) *What is life? Mind and matter*. Cambridge: Cambridge University Press.

Schumpeter, J.A. (1969) *Essays on economic topics of J. A. Schumpeter*. Port Washington, N.Y., Kennikat Press.

Shannon, C.E. (1956) ‘The bandwagon’, *IRE transactions on Information Theory*, 2(1), p. 3.

Shannon, C.E. and Weaver, W. (1949) *The mathematical theory of communication*. Urbana: University of Illinois Press.

Shipton, P.M. (1989) *Bitter money: cultural economy and some African meanings of forbidden commodities*. Washington, D.C.: American Anthropological Association.

Shirk, M. (2022) *Making war on the world: how transnational violence reshapes global order*. New York: Columbia University Press.

Shohat, E. (1999) ‘By the bitstream of Babylon: cyberfrontiers and diasporic vistas’, in H. Naficy (ed.) *Home, exile, homeland: film, media, and the politics of place*. London: Routledge (AFI film readers, 99-1238732-5).

Siegel, L. and Markoff, J. (1985) *The high cost of high tech: the dark side of the chip*. New York: Harper & Row.

Sietrov, M.I. (1989) ‘Myths and fetishes of the General Systems Movement’, *Cybernetics and Systems*, 20(3), pp. 215–218. Available at: https://doi.org/10.1080/01969728908902204.

Singer, E.A. and Wooton, L.M. (1976) ‘The triumph and failure of Albert Speer’s administrative genius: Implications for current management theory and practice’, *The Journal of Applied Behavioral Science*, 12(1), pp. 79–103. Available at: https://doi.org/10.1177/002188637601200108.

Slack, J.D. (1984) ‘The information revolution as ideology’, *Media, Culture & Society*, 6(3), pp. 247–256. Available at: https://doi.org/10.1177/016344378400600305.

Slack, J.D. (1987) ‘Introduction’, in J.D. Slack and F. Fejes (eds) *The ideology of the information age*. Norwood, N.J.: Ablex (Communication and information science, 99-0167979-6).

Slobodian, Q. (2023) *Crack-up capitalism: market radicals and the dream of a world without democracy*. New York, NY: Metropolitan Books.

Sloman, A. (1978) *The computer revolution in philosophy: philosophy, science, and models of mind*. Atlantic Highlands, N.J.: Humanities Press.

Söderberg, J. and Maxigas (2022) *Resistance to the current: the dialectics of hacking*. Cambridge, Massachusetts London: The MIT Press (Information policy series).

Solnit, R. (2024) ‘In the Shadow of Silicon Valley’, *London Review of Books*, 8 February. Available at: https://www.lrb.co.uk/the-paper/v46/n03/rebecca-solnit/in-the-shadow-of-silicon-valley.

Sommerhoff, G. (1974) *Logic of the living brain.* London: John Wiley & Sons.

Spash, C.L. (2021) ‘Discussion Paper 01/202: The history of pollution ’externalities‘ in economic Thought’. Vienna University of Economics and Business.

Spash, C.L. (2024) *Foundations of social ecological economics: the fight for revolutionary change in economic thought*. Manchester: Manchester University Press.

Stiegler, B. (2019) ‘Stiegler, B. 2019. For a neganthropology of automatic society, in Machine, by T Pringle, G Koch and B Stiegler. Minneapolis: University of Minnesota Press:2547’, in T. Pringle, G. Koch, and B. Stiegler (eds) *Machine*. Minneapolis: University of Minnesota Press.

Ström, T.E. (2022) ‘Capital and cybernetics’, *New Left Review*, (135), pp. 23–41.

Ström, T.E. (2024) ‘Los Alamos to Neuralink’. Available at: https://arena.org.au/los-alamos-to-neuralink/.

Sundin, O. (2006) ‘Deflating information: from science studies to documentation’, *Journal of the American Society for Information Science & Technology*, 57(13), pp. 1852–1853. Available at: https://doi.org/10.1002/asi.20447.

Sundin, O. and Haider, J. (2024) ‘Sociomateriality’, in A. Hicks, A. Lloyd, and O. Pilerot (eds) *Information literacy through theory*. London: Facet Publishing.

Suzman, J. (2017) *Affluence without abundance: the disappearing world of the Bushmen*. New York: Bloomsbury.

Taffel, S. (2023) ‘Data and oil: metaphor, materiality and metabolic rifts’, *New Media & Society*, 25(5), pp. 980–998. Available at: https://doi.org/10.1177/14614448211017887.

Tarkka, L. (2013) ‘The Sampo: myth and vernacular imagination’, in Frog, A.-L. Siikala, and E. Stepanova (eds) *Mythic Discourses: Studies in Uralic Traditions*. Helsinki: Finnish Literature Society.

Taussig, M.T. (1980) *The devil and commodity fetishism in South America*. Chapel Hill: Univ. of North Carolina Press.

Taylor, A. (2018) ‘The automation charade’, *Logic Magazine*, 5(1).

Taylor, Charles. (1977) *Hegel*. Cambridge.

Thompson, E.P. (1993) *Witness against the beast: William Blake and the moral law*. Cambridge: Cambridge U.P.

Thomsen, O.N. and Brier, S. (2014) ‘Total integrative evolutionary communication: towards a cybersemiotic discourse pragmatics’, *Public Journal of Semiotics*, 6(1), pp. 22–57. Available at: https://doi.org/10.37693/pjos.2014.6.11467.

Thoré, A. (2001) *Akademibondens plikt, universitetets rätt: feodala produktionsförhållanden vid Uppsala universitets gods 1650-1790*. Uppsala: Acta Universitatis Upsaliensis.

Tocqueville, A. de (1959) *Journey to America*. London: Faber and Faber.

Trawick, P. and Hornborg, A. (2015) ‘Revisiting the image of limited good: on sustainability, thermodynamics, and the illusion of creating wealth’, *Current Anthropology*, 56(1), pp. 1–27. Available at: https://doi.org/10.1086/679593.

Tribus, M. and McIrvinc, E.C. (1971) ‘Energy and information’, Scientific *American* [Preprint].

Tully, J. (2009) ‘A Victorian ecological disaster: imperialism, the telegraph, and gutta-percha’, *Journal of World History*, 20(4), pp. 559–579. Available at: https://doi.org/10.1353/jwh.0.0088.

Tully, J.A. (2011) *The devil’s milk: a social history of rubber*. New York: Monthly Review Press.

Turner, F. (2008) *From counterculture to cyberculture: Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Chicago, Ill: University of Chicago Press.

Ullman, E. (1997) *Close to the machine: technophilia and its discontents*. San Francisco: City Lights Books.

Verzuh, E. (2005) *The fast forward MBA in project management*. 2nd ed. Hoboken, N.J: John Wiley & Sons.

Voosen, P. (2018) ‘The realist: Vaclav Smil looks to history for the future of energy.’, *Science*, 359(6382), pp. 1320–1324. Available at: https://doi.org/10.1126/science.359.6382.1320.

Vopson, M.M. (2020) ‘The information catastrophe’, *AIP Advances*, 10(8), p. 085014. Available at: https://doi.org/10.1063/5.0019941.

Vucetic, S. (2011) ‘What is so American about the American Empire?’, *International Politics*, 48(2), pp. 251–270. Available at: https://doi.org/10.1057/ip.2011.14.

Waldstreicher, D. (2010) *Slavery’s constitution: from revolution to ratification*. Hill and Wang.

Walker, J. (2020) *More heat than life: the tangled roots of ecology, energy, and economics*. Singapore: Springer Singapore. Available at: https://doi.org/10.1007/978-981-15-3936-7.

Wang, R.L. (2022) ‘Information is non-physical: the rules connecting representation and meaning do not obey the laws of physics’, *Journal of Information Science*, p. 016555152211410. Available at: https://doi.org/10.1177/01655515221141040.

Webster, F. (2002) *Theories of the Information Society*. London: Routledge.

Webster, F. and Robins, K. (1989) ‘Plan and control: towards a cultural history of the information society’, *Theory and Society*, 18(3). Available at: https://doi.org/10.1007/BF00183386.

Weizenbaum, J. (1972) ‘On the Impact of the computer on society: how does one insult a machine?’, *Science*, 176(4035), pp. 609–614. Available at: https://doi.org/10.1126/science.176.4035.609.

Weizenbaum, J. (1976) *Computer power and human reason: from judgment to calculation.* San Francisco: Freeman.

Weizenbaum, J. and Wendt, G. (2015) *Island in the cyberstream*. Sacramento, CA: Litwin Books.

Welinder, S. (1992) *Människor och landskap: [Humans and landscape]*. Uppsala: Societas archaeologica Upsaliensis.

Welinder, S. (1994) 'The ethnoarchaeology of a Swedish village', *Current Swedish Archaeology*, 2(1), pp. 195–209. Available at: https://doi.org/10.37718/CSA.1994.12.

Westermann, E.B. (2016) *Hitler's Ostkrieg and the Indian wars: comparing genocide and conquest*. Norman: University of Oklahoma Press.

White, H. (2013) 'Materiality, form, and context: Marx contra Latour.', *Victorian Studies*, 55(4), pp. 667–682.

White, L.A. (1940) 'The symbol: the origin and basis of human behavior', *Philosophy of Science*, 7(4), pp. 451–463.

Whitehead, A.N. (1929) *Process and reality: an essay in cosmology*. Cambridge: Univ. Press.

Whitman, J.Q. (2018) *Hitler's American model: the United States and the making of Nazi race law*. First paperback printing. Princeton, New Jersey: Princeton University Press.

Wicken, J.S. (1987) *Evolution, thermodynamics and information: extending the Darwinian program*. New York: Oxford Univ. Press.

Widebäck, G. and Blomberg, B. (eds) (1992) *Biblioteket som serviceföretag: kunden i centrum*. Stockholm: Forskningsrådsnämnden.

Wied, M. (2020) *Wrong, but not failed? Resilience and brittleness in complex engineering projects*. Lyngby: Danmarks Tekniske Universitet.

Wiegand, W.A. (2015) *Part of our lives: a people's history of the American public library*. Oxford New York: Oxford University press.

Wiegand, W.A. (2020) 'Slavery and the making of Early American libraries: British literature, political thought, and the Transatlantic Book Trade, 1731–1814 Moore Sean D.', *Early American Literature*, 55(2), pp. 548–551.

Wiener, N. (1955) *Cybernetics; or, control and communication in the animal and the machine*. New York: Technology Press.

Wiener, N. (1989) *The human use of human beings: cybernetics and society*. London: Free Association.

Wikgren, M. (2005) 'Critical realism as a philosophy and social theory in information science?', *Journal of documentation*, 61(1), pp. 11–22.

Williams, E.E. (1944) *Capitalism and slavery.* London: A. Deutsch.

Wilson, T.D. (2003) ‘Philosophical foundations and research relevance: issues for information research’, *Journal of Information Science*, 29(6), pp. 445–452. Available at: https://doi.org/10.1177/0165551503296002.

Winner, L. (1984) ‘Mythinformation in the High-Tech Era’, *Bulletin of Science, Technology & Society*, 4(6), pp. 582–596. Available at: https://doi.org/10.1177/027046768400400609.

Winner, L. (1986) ‘Myth information: romantic politics in the Computer Revolution’, in C. Mitcham and A. Huning (eds) *Philosophy and Technology II*. Dordrecht: Springer Netherlands (Boston Studies in the Philosophy of Science), pp. 17–28. Available at: https://doi.org/10.1007/978-94-009-4512-8_2.

Winner, L. (2001) *The whale and the reactor: a search for limits in an age of high technology*. Nachdr. Chicago: Univ. of Chicago Press.

Winter, M.F. (2009) ‘Sociology of the information disciplines’, in M.J. Bates and M.N. Maack (eds) *Encyclopedia of Library and Information Sciences, Third Edition*. 0 edn. CRC Press, pp. 4888–4898. Available at: https://doi.org/10.1081/E-ELIS3-120044668.