



The Road Map to Brave New World: Cartography and Capitalism from Gulf Oil to Google

By Timothy Erik Ström

Abstract

This paper explores the shifting practices in and between cartography and capitalism. It compares two road maps of the same territory created one-hundred years apart; a Gulf Oil map from 1915 and a Google Map from 2015. These representations of space serve as entry points into examining some of the larger transformations that have occurred within capitalism over the century. I am interested in how the classic world order of Fordism has been reconstituted by cybernetic capitalism. I argue that the world order has been intensified and reorganised on a more abstract level, with profound subjective and material consequences.

Keywords: Abstraction, cartography, capitalism, Fordism, Google, technology.

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Introduction

There are many roads to Brave New World; but perhaps the straightest and the broadest of them is the road we are traveling today, the road that leads through gigantic numbers and accelerating increases (Huxley 2004).

These words were written in 1958 by Aldous Huxley as he was reflecting on his classic science fiction novel, *Brave New World*, published a generation earlier in 1932. Writing in the USA during the post-World War II boom, Huxley was living at the historic high point of classical Fordist capitalism, a social formation that he had long criticised. I am using this quote as an anecdotal introduction to this article by imagining that it is not just ‘roads’ that we follow to Brave New Worlds, but that there are also ‘maps’ that have been abstracted from these roads, maps that lead us onwards to various dystopic futures. This article has a dual focus: it is interested in exploring the changing nature of capitalism and the changing nature of cartography. This dual focus is held together by a consideration of the role of abstraction as a social process (discussed below).

The article begins by critically analysing two road maps of the same territory made a century apart; one produced by Gulf Oil in 1915 and the other produced by Google in 2015. The early map can be seen as part of a cartographic transformation that pioneered the conventions of the road map, thus making it a direct genealogical ancestor of Google Maps. These representations of space serve as entry points into examining some of the larger subjective and material changes and continuities that have occurred within capitalism over the century. Thus, I am interested in how the order of Fordism emerged from industrial capitalism, spread unevenly around the world, before being reconstituted by the abstracting processes of cybernetic capitalism, which also spread unevenly around the world. Before getting to these two maps though, I must first flesh out more precisely what I mean by ‘abstraction’ (Ström 2017).

As this special edition of *Culture Unbound* is focusing on mediatization, I would like to contribute to discussions on this subject by emphasising the importance of *abstraction in service of capitalism*. In this article, abstraction is understood as a material social processes, a lived relation with the world that is shaped by patterns of social practice and the production of subjectivity (Hinkson 2016; Sharp 1985).¹ Abstraction is one of the “defining features of the human condition”, with its roots going back long before the rise of any media (McGilchrist 2012:21). Indeed, its origins preceded the written record, for writing itself as an abstraction of speech, an isomorphic translation into symbols embedded on an external media. Prior to this, speech itself is an abstraction of thought, albeit an embodied abstraction of practical consciousness, one that was fundamentally social, recipro-

cal and embedded in relationships and history (Williams 1977:166). In this sense, abstraction is constitutive of social relations, practices and being: it is not just an activity that occurs in the heads of isolated individuals.

Furthermore, the forces of abstraction have unevenly increased across history's unfolding, with a sharp increase beginning with the rise of capitalist modernity in the 'long' 16th Century (c.1450–1640) (Braudel 1992; James 2006; Wallerstein 1974). As Marx noted, increasing abstraction is one of the major tendencies of capitalism as a world-historic system: an all-encompassing trend of this mode of practice and its impact on human activity (1976). With this in mind, I critically analyse the organizing power granted by abstraction and how it has been bound up with capitalism's "quest of power by means of abstractions", to use Lewis Mumford evocative phrase (1963: 24).

Putting abstraction in such terms resonates with attempts to stretch mediatization out into a long-term general historical transformation. Friedrich Krotz, for instance, has formulated it as a kind of meta-process behind modernity (2009). From the perspective advanced here, processes of mediatization are underpinned by intensifications in the social processes of abstraction. I return to these points in the latter part of this article where I rework the concept of 'augmentation' as both an analytical tool and as an argument by building on these conceptions. More immediately, I turn to cartography and the production of space.

The Map to the Road

Looking down from above is perhaps the central metaphor for abstraction, hence maps are potent symbols of this process, as well as technological manifestations of it. They literally draw away from the embodied landscape to represent it on a more abstract level, a process that imbues the map with an organizing power. In this article, I analyse two maps as ways into the shifting dynamics of cartography and capitalism. In so doing, these maps are cultural artefacts that both represent and dialectically produce the world. Put bluntly, maps, as images, do not merely reflect the world, but actively contribute towards constructing reality (Durante 2013: 48; Mitchell 2005: 105).

Before looking specifically at road maps, I shall briefly evoke the larger cartographic genealogy that preceded them. This begins with a brief consideration the *Miller Atlas* (1519), one of the first European maps of the Americas produced soon after the conquest began in 1492. This map is from a tradition called 'portolan charts' which began in the Mediterranean in 13th Century after compasses were first imported to Europe from China. Portolan charts were made as practical navigational aids and their representations consisted of labelled coastlines and waters covered with compass roses to help navigators sailing along the seaboard.

This representational technique had the effect of leaving the interiors of the continents empty. In the context of the ‘New World’, this emptiness could be filled by the wild speculation and exotic fantasies of the mapmakers, as can be seen in detail reproduced in Figure 1.



Figure 1. Map of Brazil, Miller Atlas, 1519, Wikipedia Commons. This Map was made by the cartographers Lopo Homem, Pedro Reinel and Jorge Reinel, and illustrated by miniaturist António de Holanda.

With the intensification of imperialism, mapmakers began to shift their emphasis from the coastlines of the Americas, to mapping the rivers, for they served as the primary avenues by which continents were penetrated by colonial forces. Then, in the industrial expansion of the 19th Century, the focus of maps moved away from rivers and towards railway lines, which came to dominate cartographic representations (Black 1997). This latter change occurred in the context of the American doctrine of ‘Manifest Destiny’—a complex and contested mix of divine mission and capitalist opportunism, imperial ambition and outright plunder—which saw the westward expansion of the United States and its conquest of indigenous lands. These railway maps dominated until the early 20th Century, when they were replaced by the road map associated with the rise of the automobile.

Late 19th Century railway maps differed significantly from the early 20th Century road maps, principally because, under the control of the locomotive operator, a train follows its tracks along a specific and predetermined route. This meant that a passenger would need a spatial itinerary of stations and a timetable to navigate. By contrast, a car does not run on rails and is independently piloted so, unlike a

train, one cannot assume any given starting place, destination or route. Navigating on roads thus requires the more open-ended cartographic form of the 'network map'.

Network maps are not new. The earliest known network map is called *This is the Way to Rome*, and was created by Erhard Etzlaub as a symbol of Germanic pilgrimages to Rome for the Christian Jubilee in the year 1500 (Akerman 2007: 159). However, early network maps only showed a vague relationship between topography and roads and were not intended as an aid for mobility. This began to change with rise of national mapping projects, such as the ones conducted in France by the Cassini family, a powerful 17-18th Century cartographic dynasty. The maps they produced were the first maps to depict a road network in a systematic way (Brotton 2012: 294-336). Initially motivated by the state's preoccupation with war, internal security and troop transportation, this network map had the unintended effect of increasing regional trade. The Cassini maps exemplified the rising concern for "rationalizing and simplifying internal transportation as a way of diminishing regional control over commerce and increasing the state's role in regulating national trade" (Mukerji 1983: 123-4).

These network maps were used by the state, the military and large commercial forces for planning operations and projecting power; and they were not used by ordinary people as navigational aids. While network maps existed prior to the 20th Century, it was only after the rise of Fordism in the United States, and its subsequent uneven expansion around the world, that road maps became a dominant cartographic form. In the first decades of the 20th Century, the conventions of the networked road map were created, and its main features have remained largely unchanged in the present day (Akerman 2006: 178-89). As private car ownership expanded, road maps became increasingly entangled with everyday practice, shaping the way that people understood and moved through space. These artefacts became implicated in the multidimensional changes that shifted the dominant mode of the production of space (Lefebvre 1991).

A Tale of Two Maps

1915: Gulf Oil Map

Figure 2 is a reproduction of a network road map issued by Gulf Oil in 1915. The map represents two US states, Pennsylvania and New Jersey and was a particularly early example of a networked road map, a cartographic form that would go on to become increasingly widespread as the production and usage of cars expanded along with the Fordist reconstitution of capitalism. The map's producer, Gulf Oil was founded in 1901 by members of the Mellon banking family to exploit an oil

discovery in Texas. The company grew quickly and became a major player in the expanding petrochemical arm of the nascent world order that would become known as 'Fordism'. Gulf Oil has many firsts to their name: in 1910 they became the first company to start drilling for oil underwater; in 1913 they opened the first 'drive-in' petrol station, in Pittsburgh, Pennsylvania; and they were one of the first US oil companies to move into the Middle East, setting up Kuwait Oil Company as a joint venture with the Anglo-Persian Oil Company (BP). During the Second World War, Gulf Oil received a major boost in their attempt to meet the American military's immense demand for oil. In the 1950s Gulf Oil was considered one of the 'Seven Sisters' oligarchy, which collectively controlled around 85 percent of the world's petroleum reserves for decades. After a century of monopoly capital's mergers and acquisitions, Gulf still pumps oil as part of Chevron.²

Gulf Oil was also rather influential in the early making of road maps. According to Harold Cramer, the company dominated the production of road maps until around 1925 when other oil corporations began to follow suit (Cramer 2003). Their earliest road maps were made in collaboration with W.B. Akins, a Pittsburgh-based advertiser, before becoming more professionalised in 1915 when they began collaborating with the Automobile Blue Book Company. Blue Book had been making road maps since 1901 and were endorsed by the American Automobile Association in 1906, becoming "the standard publication of its type" by 1910 (Akerman 2006: 169-70). Figure 2 was issued as an insert as part of the *Automobile Blue Book* for 1915.

On the other side of the map is its cover, an image reproduced in Figure 5. This depicts a confident white male sitting behind the wheel of a powerful red sports car, while his attractive female accessories admire his mastery of the machine. Using the myth of American-style freedom, this image employs socially conservative symbols of youth and gender roles, health and wealth, mobility and modernity which, taken together, form a scene that served to reinforce the underpinning social order of patriarchal capitalism. It was, broadly speaking, this order that Gulf Oil benefited from and sought to reinforce. The corporation put their sizable resources into the creation of road maps as it was in their direct commercial interest to encourage people to consume as much petroleum as possible, hence the maps were designed to facilitate this oil power mobility.

2015: Google Map

Figure 3 depicts a screenshot reproduced from Google Maps on the 2nd of December 2015.³ Founded in Silicon Valley, California in 1998, Google expanded rapidly to become a powerful global institution in the early 21st Century. As of July 2017, Alphabet Inc., Google's holding company, had a market capitalization of

\$669 billion USD. To put this number into some perspective, it is approximately the same as the World Bank's estimates of the GDP of nation-states like Saudi Arabia and Switzerland, both in the top twenty wealthiest countries in the world. At this time Alphabet had the second highest market capitalization of any corporation in the world; behind Apple and before Microsoft and Amazon. That the top four slots are occupied by American tech-giants is significant, and relates to what I call 'cybernetic capitalism', an increasingly dominant social formation that I shall describe more below.

Google Maps is used by up to two billion people every month.⁴ The vastness of this number is also worth reflecting on. One-hundred years ago, there was less than two billion people on Earth, and only a tiny proportion of them, mostly the powerful—governments, military, navigators, planners—would have used maps. Not many other people had any need for such abstractions. Today, Google Maps actively shapes the way an enormous number of people unevenly scattered around the planet imagine the world and their place in it. This has significant social consequences for the production of space. As a way-finding device, Google Maps acutely affects everyday social practice, with up to one quarter of humanity regularly engaging the representation to facilitate their physical movement through embodied space. As many of the statistics used to describe Google suggest, the corporation belong firmly to the path of Huxley's "gigantic numbers and accelerating increases".

Google Maps is both a representation of space and a reproduction of code. Inquiry into it, then, must follow from the "spatial turn in media studies and the media turn in geographical studies" (Thielman 2010: 5). Insights from this juncture are important, as the production of space (Lefebvre 1991) and the social production of software (Fuller 2008), are increasingly intertwined (Kitchin & Dodge 2011). Moreover, it is particularly important to this article, because Google Maps is not just a paper map made on a screen; it is the product of technologies, techniques and social practices that are significantly more abstract in their constitution. Google Maps is an apparatus that emerges from the convergence of cartography, graphical interfaces, search algorithms, web optimization, GPS, surveillance etc.—all bought together within the abstracted material of computing-machines. This is key, for as Manovich notes, it is this ability of computing-machines to combine previously separate media techniques that marks a fundamental transformation in the history of human media and communication (Manovich 2013: 45-6). Google Maps is an exemplar of the emergent phenomena of "deep mediatization", to use the concept proposed by Couldry and Hepp (2016). Hence, it is a product of the underlying processes of abstraction that have intensified greatly since the rise of cybernetic capitalism.

Two Maps Compared

The Gulf map is strikingly similar to Google Map's representation of the same area at this scale, despite the 100 years separating them (Figures 2 & 3). Both maps are dominated by a network of boldly coloured lines representing roads, which connect cities and towns represented as circles. Both networks unfold over a largely plain white background. Neither map depicts railway lines, and rivers are heavily deprioritized. Both maps represent water as a uniform blue; and state borders are represented with broken lines; and both are oriented north and use a similar projection. Thus, at the level of the reproduced images, Google Maps has much in common with its cartographic ancestor.

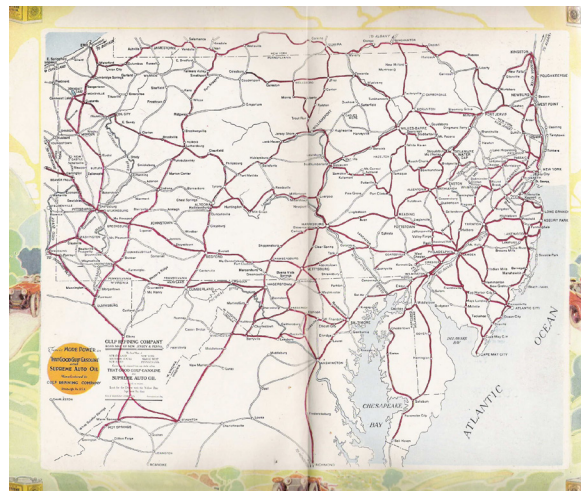


Figure 2. Map of Pennsylvania, 1915, Gulf Oil.

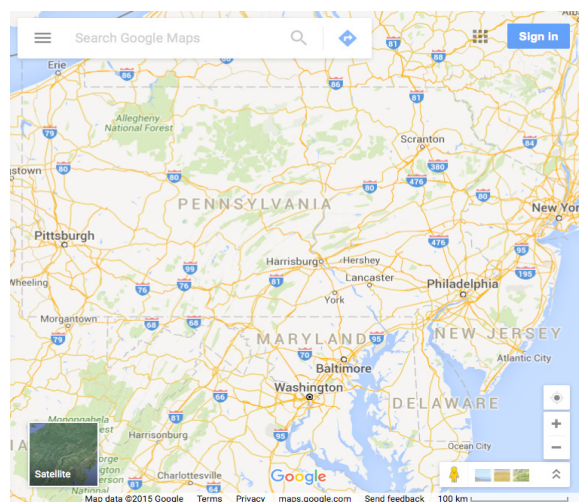


Figure 3. Map of Pennsylvania, 2015, Google Maps.

Many of the differences between the maps can be accounted for by the century that separates their publishing. Take, for instance, the flecks of pasty green that Google use to represent parks and forests. These parks are absent from the earlier map because, like the highway system, the majority of them did not exist 100 years ago. For instance, the Allegheny National Forest, which Google labels in Figure 3, wasn't declared until 1923. Also, most of the major roads that Google represent on its network map simply didn't exist in 1915. The USA's highway network, known officially by the rather clunky name *Dwight D. Eisenhower National System of Interstate and Defense Highways*, was produced under Eisenhower's regime (1953-1961). The five-star general turned president saw an interstate highway system as being key to provide transport routes for the flow of military supplies and troop deployment across the continent in a Cold War context (Petroski 2006: 396-9). Much like with France's national road system in the 18th Century, the US system was motivated by war, and came to have spin-off benefits by facilitating trade, commercial integration and mobility. Google represents these highways by using their official symbol, which is a curious mix of modern and national imaginaries



Figure 4. Interstate 95, Manual on Uniform Instruction Devices.

over a medieval background. Shaped as a knight's shield, the interstate symbol is a kind of abstract coat of arms, rendered in American red-white-and-blue, which centres on a standardized numeral (Figure 4).

Significantly, Gulf Oil represents far more towns than Google does, a discrepancy that stems from the radically different materiality of the two maps. Google Maps can zoom in and reveal exponentially more details than a paper map, hence it is not forced, like Gulf, to include as many places on this scale. Nevertheless, it is still worth to note Google's deprioritization of rural areas in its hierarchy of representation (O'Beirne 2016). Be that as it may, the question of materiality marks the largest difference between the two maps. Google Maps is composed of an abstracted materiality; it is recombined from codes, algorithms and data-banks, all

existing in complex layers within and between networked computing-machines (Ström 2017). The Gulf map, in contrast, is cartographic in the sense of the word's etymological root, *carto*, as in paper, meaning that it is made from pulped trees and inks. The material abstraction of Google Maps constitutes a *qualitative break* between the two images. It is not the same as a paper map translated onto a screen, although there are plainly many parallels between the two cartographic representations. Rather, it possesses a fundamentally different materiality that is an order of magnitude more abstract.

Google Maps exists within a subjective material ensemble of social practices, meanings and technological apparatuses. It is constituted by vast, globe-spanning conglomerations composed of multiple layers of systems and standards, machines and management, labour and legalities, commodities and communications, ideologies and interoperability, products and protocols (Fuchs 2014; Rossiter 2017). Plainly this list goes well beyond the hardware/software divide and spills out into the bundle of practices, relations and meaning-making systems that make up the cybernetic capitalist social formation. Taken as a whole, these subjective material practices constitute the historical conditions that enable the dominant form of contemporary social life. The Gulf map also existed within a similarly large subjective material ensemble, although it was decidedly less abstract owing to its predating the rise of cybernetic computing-machines.

The complexity of the multiple systems of networked computing-machines makes the older 'mechanical reproduction' that Walter Benjamin wrote about, seem comparatively simple (Benjamin 2009: 228-59). One of Benjamin's central points was that the process of reproduction changes the meaning of an image, and this is an enduring point that is worth taking seriously in the more abstracted age of 'cybernetic reproduction.' To create Figure 3, I used my browser to frame Google Maps in such a way as to mimic the Gulf map by covering Pennsylvania and New Jersey at a similar scale. To do this, I negotiated the pre-programmed constraints of the interactive software—zooming in and out, resizing windows, etc.—until I was satisfied with the framing, whereupon I used another piece of software to take a screenshot. The reproduced artefact was coded as a PNG image file, and was thereby severed from Google's servers, cutting it off from the constantly shifting, updating and expanding apparatus. This was undertaken on the 2nd of October 2015 and representations of the same area look different today. The artefact was saved as a file in a digital archive before being pasted into word processing software and surrounded by text, inviting a critical reading of it, thus altering the site of interpretation.

Curiously, I have never seen an original paper version of the Gulf map; only a digitized version of it downloaded from the web. Specifically, I found it at the rather abstract location: <http://www.mapsofpa.com/art5pics/1915bbm.jpg>, where my

browser rendered the JPG image file on the monitor of my computing-machine. Visual traces of the original were drawn into a computing-machine via a digital camera or scanner, and encoded in abstracted material before being put online. The century old map did not escape the power of cybernetic reconstitution, with the artefact being reproduced at a greater level of abstraction in the circuits of cybernetic capitalism.

While the question of materiality marks the biggest difference between the two maps, one of the largest qualitative similarities between them is that both are the proprietorial products of powerful corporations and are branded with their company's trademarked logos. Private business had long been entangled with European cartography. Since the beginning of capitalist modernity, some states have sought to expand their control internally and to project control outwards, with both processes requiring a level of organization that was, according to David Turnbull, "only possible when the state, science and cartography become integrated" (Turnbull 1996: 19). This integration is notably incomplete without 'capital', which Turnbull neglected to mention. As Mezzadra and Neilson have noted: "The appropriation of space that lines at the core of modern mapping replicates the appropriation of the commons that establishes private property as well as the colonial conquest with its global geography of genocide and extraction" (Mezzadra & Neilson 2013: 35). Across capitalist modernity, the private sphere has increasingly been involved with the making of maps. For example, the Cassini map of France



Figure 5. "There is more power in that Good Gulf Gasoline", 1915, Gulf Refining Company. This is the cover of the 1915 Gulf Oil map. Thank you to Harold Cramer for the permission to use this picture.

was produced at the junction of capital and state; a sort of proto-public-private-partnership. The influence of private power over cartography went to a new level under Fordism when corporations began producing maps for public use. At this point maps became active tools to encourage consumerism and were hence bound up with the processes of capital accumulation.

As road maps were increasingly circulated in the early twentieth Century, many other industries orbiting the automobile industry—from oil companies to motels, tyre companies to insurance agencies—all embraced road maps as marketing tools. Akerman notes: “wherever possible backsides and margins of maps were filled with advertisements for specific products. Corporate symbols and slogans, particularly the logographic designs that appeared on gas station signs, facades and pumps were ubiquitous” (Akerman 2006: 189-92). As the back of the 1915 map states: “There’s More Power in that Good Gulf Gasoline” (Figure 5). Significantly, neither Figure 2 nor Figure 3 depicts any third-party advertisements. For the Gulf map, this is because the practice of putting ads on maps had not yet come about, and on Google it is because the scale of zoom is too far out for its plethora of advertisements to be shown.

While neither map displays any third-party ads, this does not detract from the fact that both maps serve as *advertisements in and of themselves*. The 1915 map is encouraging people to use it to drive more, thus consuming more of that ‘Good Gulf Gasoline’. This means more dependence on oil, more opportunities for capital accumulation for the company, thus more social power and a tightening of the hegemonic grip of fossil fuels more broadly. The 2015 map is encouraging people to use it more, because all interactions with it leave subjective data-traces that Google can harvest with their surveillance-engines (Ström 2018; Zuboff 2016). These can then be appropriated, commodified and auctioned off to advertisers in a way that increases Google’s revenue stream and contributes to the hegemony of the cybernetic capitalist world order. Both maps are made with the vision of increasing the profit and power of Big Oil and Big Tech respectively. They both attempt to be useful by manufacturing consumer desire and fusing it to a monopolistic brand. In these respects, the Gulf map is a genealogical ancestor of Google Maps. Having touched on some of the similarities and differences between these two maps, I shall now consider how capitalism has transformed between 1915 and 2015, with a focus on how Fordism has been reconstituted.

The Reconstitution of Fordism

The mass production of automobiles was one of the most important industries of the twentieth Century. It was within this industry that the managerial and organisational techniques associated with the modern corporation first arose.

Under the reign of newly professionalised managers, car companies like Ford and General Motors brought together research, design, engineering, production, distribution and advertising (Frieden 2006: 159-64). This meant that on one hand the assembly line and ‘scientific management’ sought to deskill certain workers and render them more replaceable, less powerful and cheaper (Braverman 1998). On the other hand, there was an increasing amount of intellectually trained workers being employed to conduct skilled labour which, in part, reconstituted what it meant to be a worker (Sharp 1968). The practices of car companies were indicative of a larger process within which intellectual activity was increasingly absorbed into the circuits of capital accumulation.

The big car companies were integrated with the petrochemical industries, military-industrial organisations, financiers and others into the ‘carbon-combustion complex’. I draw this concept from Naomi Oreskes and Erik Conway’s hard science fiction *The Collapse of Western Civilization*. The authors define the ‘carbon-combustion complex’ as the “interlinked fossil fuel extraction, refinement, and combustion industries, finances and government ‘regulatory’ agencies that



Figure 6. Power house mechanic working on steam pump, 1920, Lewis Hine, Wikimedia Commons. Image of classic Fordism’s tool-wielding industrial masculinity, encircled by a ‘womb’ of steam and steel.

enabled and defended the destabilisation of the world’s climate in the name of employment, growth and prosperity” (Conway & Oreskes 2014: 54-5). The car companies, as part of this larger complex, were behemoths of mass production and vertical integration, and their rise to hegemonic power contributed to the destabilisation of the Earth’s climate and other multidimensional changes.

Writing in a fascist prison in the early 1930s, Antonio Gramsci analysed the changes that came with what he called ‘Fordism’ (Gramsci 1971: 279-318). Gramsci noted how the social form of Fordism colonised not only the physical labour of the worker, but also aspects of their mental and emotional experiences (Figure 6). The Fordist pact between labour and capital, with its hard work, high wages and lure of consumerism, would significantly alter the subjective and material make-up of twentieth century capitalism. This “process of psycho-physical transformation”, to use Gramsci phrase, can be summarised as:

changes in economic, intellectual, moral, and even sexual habits— changes in people’s ritual perception of social time and space; changes in what things mean; and changes in the way that meaning is produced and consumed; changes whose high-speed global teleelectronic circulation blurs the difference between production and consumption, the actual and the virtual, the real and the imaginary, the pleasurable and the dangerous (Pfohl 2005: 556).

For much of the 20th Century, Fordism was in ascendency. This multidimensional transformation spread intensively and extensively around the world following the uneven path of capitalist development. Since Gulf Oil’s early road map, the number of people driving cars has increased massively. In 1915, the United States had a population of around 100 million people (7 percent of the world), and a ratio of cars to people of around 25:1000, the highest of any country at the time. The ratio of cars increased dramatically during the ‘roaring twenties’, and then again during the post war boom. This immense increase in cars was one factor which enabled the huge process of suburbanization that occurred after the Second World War, with cities sprawling out according to the unsustainable geometry of

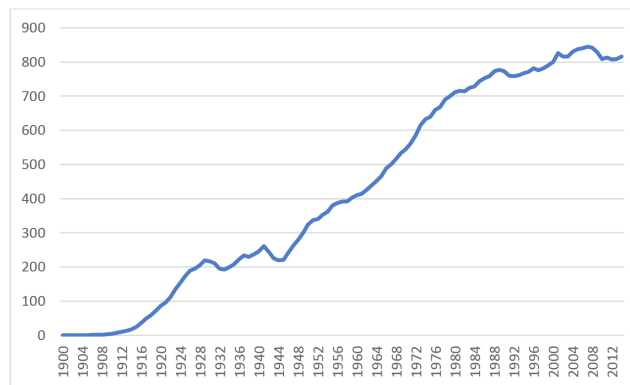


Figure 7. Vehicles per Thousand People in the United States, 1900-2014, Center for Transport Analysis, http://www.cta.ornl.gov/data/tebd35/Spreadsheets/Table3_06.

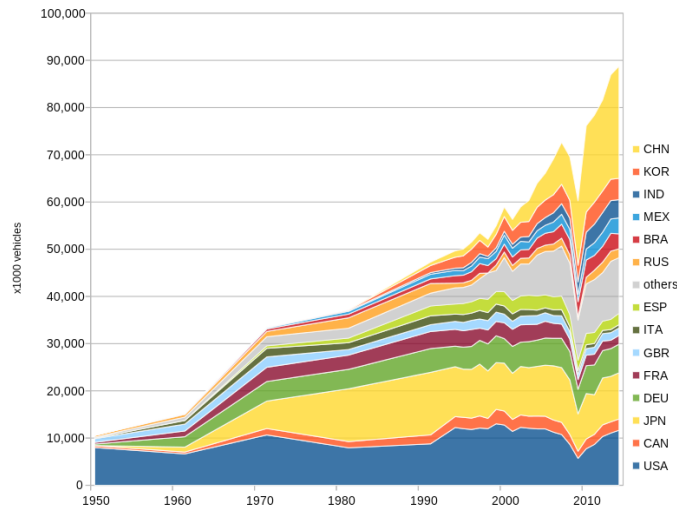


Figure 8. Motor Vehicle Production Volume WikiMedia Commons. Made with data from the Bureau of Transport Statistics.

the automobile. Over the last 100 years, the ratio of cars has continued to climb, and has seemingly only slowed as a result of major global crises (Figure 7 & 8) (Davis 2011: 3-9). Globally, it is estimated that there are over one billion cars in active use, to say nothing of the vast number in rusting ruin. Because there are now so many cars, the need for road maps to facilitate people’s oil-powered mobility has never been greater.

In 1950, around 10 million cars were produced globally, 75 percent of which were produced in the United States. Yet, just thirty years later, the US share had fallen to 20 percent of global production (Figure 9). A large part of this change was due to the massive productivity gains in Japan, which produced less than half a million cars in 1960, and 11 million cars just twenty years later. Over the same twenty-year period, US production rose with only about 100,000 cars. Figure 9 is illustrative of the major reconstitution of global Fordism has played out since 1950.

A decade after Huxley’s 1958 reflection that I opened this article with, massive protests appeared as the first major cracks in the dominant order of Fordist capitalism, and these cracks continued to spread over the following decade or so (Harvey 2005). A microcosm of these processes can be seen in the crisis and reconstitution of Gulf Oil. Firstly, the company reached its peak oil production in 1970, a problem that was unresolvable in the context of infinite accumulation within finite nature. Then, three years later, the OPEC oil crisis broke the ‘Seven Sisters’ oligopoly of global production. This crisis was in part the result of an increasingly independent Third World attempting to assert itself on the global stage (Prashad

2014). As a part of this push from below, Gulf Oil had their highly productive oil facilities nationalised by the Kuwaiti government in 1975, which sent the company into a downward spiral. Gulf Oil's production and reserves dwindled, falling 40% between 1978 and 1982. After fighting off a hostile take-over attempt, Gulf opened itself up to offers from other companies and investors. In 1984 the board voted to sell the company to Standard Oil of California, which subsequently re-branded itself as Chevron.

Curiously, aspects of Gulf Oil survived the merger. This is interesting as it shows how capitalism was reconstituted during the crisis in classical Fordism. The remnant that survived the acquisition went from being part of a vertically integrated petrochemical company to a network of business interests. It left the oil pumping to Chevron and transitioned to a more abstract 'new economy' style of accumulation. The refashioned Gulf Oil employs very few people and had a focus on using its brand to franchise, advertise, sponsor sports events, partner and out-source, with a specific focus on intellectual property, branding, scientific expertise and logistics. So, the crisis in capitalism in the 1970s saw Gulf Oil come undone, have its productive capabilities merged into an increasingly monopolistic market, and the remnants go on to become a new 'flexible' business (Gulf Oil 2017; TSHA 2010). In this way, Gulf Oil's transformation is an example of the broader crisis in Fordism, and its reconstitution on a more abstract level.

The crisis in Fordist capitalism provoked a number of reactionary processes that went along with its reconstitution. I cannot explore them in detail here, but will offer a summary list to point to their breadth: unleashed finance, speculation and an explosion of predatory debt relations; aggressive confrontations with unions and stagnating wages; mass privatizations, outsourcing, and off-shoring; increasing precarious employment, regimes of austerity for the poor, and much deregulation (which is to say deregulating from the public good in favour of re-regulating for corporate interests). In short, the Fordist pact of hard work, high wages and mass consumption was broken and was replaced by a new pact: hard precarious work, stagnant wages and debt-fuelled consumption. Much as with the initial coming of Fordism, the crisis in this mode of practice saw a wide ranging "process of psycho-physical transformation", with multidimensional changes in social formations, practices and meanings. Margaret Thatcher hinted at the breadth of this when she stated the purpose of her reactionary project: "Economics are the method; the object is to change the heart and soul" (Thatcher 1981). In short, the crisis in Fordism marked a major transformation in social subjectivity and materiality.

Cybernetics in Service of Accumulation

The story of the crisis in Fordism and its reconstitution is important, and one aspect of it that I would like to emphasize here is the role that cybernetics in the service of capitalist accumulation played in this transformation. This relates to my conception of ‘cybernetic capitalism’, an analytical category that focuses on the layer of abstract social practice that is spread unevenly across the capitalist world-system, a layer that bleeds through and transforms patterns of social relations and practices (Ström 2018). Cybernetics has its roots in the techno-scientific developments that began during the Second World War. The term was coined by Norbert Wiener and he brought it to its highest level of condensation in his bestselling book entitled *Cybernetics: Control and Communication in the Animal and the Machine* (Wiener 1948). The four terms from Wiener’s formulation—control, communication, animal/humanity (he used both) and technology—can be made into a thematic lens through which one can critically approach contemporary capitalism. This approach emphasises the roles that technology and communication play in the reconstitution of material and subjective social practices at higher levels of abstraction.

After being formulated in the military-industrial research complex, the rise and spread of cybernetics, in Simon Cooper’s words, has seen an increasing “fusion of intellectual technique with the market so that a vast amount of intellectual energy goes into creating lifestyles based on consumption” (in Hinkson 2016: 47). As noted above, the appropriation of intellectual energy was immanent in classic Fordism, with the integration of engineers and other intellectually trained workers into business, yet it was only after capitalism’s cybernetic reconstitution that this more abstract appropriation became increasingly dominant. Ongoing cybernetic developments were centred on networked computing-machines, and the inseparable bundles of techniques and social practices that enable them. In short, the bundles of technology, technique and practice were put into the service of capital accumulation, thus helping to resolve the crisis in classical Fordism and keep the circuits of accumulation spinning. As networked computing-machines were increasingly woven into social practice, they had a profoundly abstracting influence. These devices enabled technologically extended forms of interaction, which when generalized across sectors of society, reconstituted social forms and practices in more abstract ways, creating “a change that cuts so deeply that it can only be spoken of as a transformation of the mode of being” (Sharp 1993: 231).

The cybernetic reconstitution of Fordist capitalism enabled and underpinned many other well-known processes that contributed to the transformations that began in the 1970s. Take for instance the world historic process of financialization which began in full in 1971 with the US unilaterally dropping the gold standard (Arrighi 2010). By drawing away from the tradition of gold, this more abstract

regime had many crucial cybernetic moments in its constitution, thus differentiating it from older forms of 'dematerialized' currency systems (Graeber 2012). The emergent order was qualitatively different, in part, because of the cybernetic systems of networked computing-machines which allowed it to unfold more intensively and extensively, and on a level of greater abstraction. Following this line of argument, it is also significant that 1971 was the year that NASDAQ, the world's first electronic stock market, came online. These abstract and automated processes of financialization quickly became more profitable than more traditional forms of production. As of July 2017, the NASDAQ Stock Market had an average annualized growth rate of 9.24 percent since it began its trading in February 1971. In comparison, global GDP has grown at an average rate of around 3.8 percent for the last fifty years. Notably, NASDAQ's growth rate has intensified significantly since the Global Financial Crisis, increasing to 17.13 percent per year since June 2009 (Williamson 2017). In the early 21st Century, Ford Motor Company made higher corporate profits from financing consumer automobile loans than it did through selling cars (Leggett 2005). This last anecdote is a symbol of how thoroughly the Fordist order has been reconstituted, with its patterns of accumulation becoming much more abstract.

Another aspect of the cybernetic reconstitution of Fordism can be seen in the world of logistics. The role of shipping containers in facilitating and intensifying global trade is well known. Coming out of the US war machine's organizational developments from the Second World War, via more wars in Korea and Vietnam, the core of the 'container revolution' was solidified between 1968 and 1972 in a series of International Maritime Organization standardization practices which saw more consistent loading, movement and transportation of goods. These standardized boxes are part of an ensemble of cybernetic technologies, techniques and practices that enable this highly rationalized system of global trade, a system that spreads out much further into global supply chains and wide-reaching transformations of social practice (Tsing 2009). All containers are issued unique numbers and are tracked via computerized systems which are implemented to make the processes as automated as possible. The logistical business software that facilitates these processes are as significant as the containers themselves, hence making this cybernetic moment crucial in the critical study of political economy (Rossiter 2017). As Levinson notes, "Computers, and the vessel planners who use them, determine the order in which the containers are to be discharged, to speed the process without destabilizing the ship. The actions of the container cranes and the equipment in the yard all are programmed in advance" (Levinson 2006: 6). Cybernetics thus underpin the logistical transformations that have enabled capitalism's more abstract reconstitution.

Cybernetics in service of capital accumulation have enabled intensifying processes of financialization and logistics—among many others that I cannot outline here—which have served to reconstitute Fordist capitalism on a more abstract level. Computing-machines have contributed to the increasingly abstracted reorganization of nature in service of capital accumulation (Moore 2015). The disarticulation of productive processes, the extension of global supply chains and logistical rationalizations, telecommunication and automated systems, the exploitation of living labour—formal and informal, waged and reproductive—all have been recombined within a cybernetic system to intensify the productive capabilities.

This can be seen in the car industry, where production has continued to intensify (Figure 9). There were more automobiles produced in 2016 than any previous year—94,976,569 cars to be precise (OICA 2017). From the perspective of sheer output, Fordism has never been productive. Yet, there are profound contradictions at the core of this social formation. One material contradiction can be understood through using the ecological economic concept of ‘energy-return-on-investment’ (EROI). This represents the ratio of the energy from delivered from a resource compared to the amount of energy used to obtain it. EROI have dropped significantly over the last one-hundred years. In the US in 1919, oil delivered a massive 1,000-to-1 EROI ratio. It has dropped significantly down to 30-to-1 in 1995 for conventional oil and for ‘unconventional oil’ in the 2010’s, it had dropped

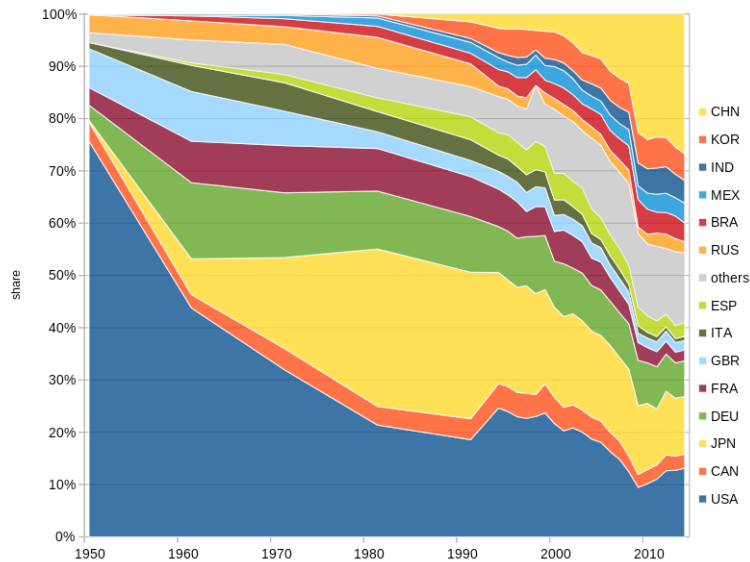


Figure 9. Motor Vehicle Production from 1950, Share Wikimedia Commons. Made with data from the Bureau of Transport Statistics.



Figure 10. Condamine River burning after coal seam gas mining began in the area. Queensland Australia. Photo by Max Phillips, 2016.

to 5-to-1 for shale oil and 3-to-1 for tar sands (Murphy & Hall 2010). Fordism has never been more inefficient. And yet, Fordism has never been more productive. These two contradictory facts sit next to one another with massive eco-social consequences (Figure 10). This is a case where “gigantic numbers and accelerating increases” lead not to a ‘Brave New World’, but rather to an increasingly desperate encounter with the limits of growth. Figure 10 depicts a surreal photograph of an Australian river on fire after coal seam gas mining commenced in the area. A burning river is a material contradiction worthy of a dystopian imagination.

The Augmentation

The multidimensional transformations in Fordism that started in the 1970s have long been subject to critical analysis. Many writers, such as David Harvey, began speaking of ‘post-Fordism’ in the late 1980s to help explain the profound changes in capitalism (Harvey 1989). While adding the prefix ‘post’ made sense at the time, a generation later we may be in need of greater analytical clarity via new conceptions. The concept of ‘augmentation’ can be helpful to put focus on the increasing abstraction and layering effect under conditions of cybernetic capitalism. The word ‘augment’—which simply means increase, extend or intensify—came to have a new meaning in the context of cybernetics. The term ‘augmented reality’ was coined by the Boeing scientist Thomas Caudell in 1990.

He invented the term when he imagined equipping workers at Boeing's aircraft factories with cybernetic head-mounted displays that could superimpose plans and instructions over their visual fields to increase efficiency and deskilling the workers at a level, hence increasing the centralization and concentration of control (Caudell 1990). In this way, the concept of 'augmentation' is embroiled with the cyber-capitalist response to the crisis in Fordism and the reconfiguration of power, labour, materiality and subjectivity that ensued.

Unlike 'virtual reality'—which replaces a lived reality with a simulated one—*augmented reality overlays an abstracted, technological layer onto lived reality*. This abstracted layer reconfigures that over which it is projected. In this way, augmentation is a very apt metaphor for the processes of cybernetic reconstitution and increasing abstraction that I am describing in this paper. Indeed, in some cases at least, it is more than a metaphor. Google Maps is an augmentation reality apparatus, a cybernetic machine that projects abstraction onto social practice, a phenomenon that has profound consequences on the production of space and subjectivity. To be clear, unlike uncritical celebrants (Chen 2016), my use of the term 'augment' does not imply an 'enhancement'; reality is not necessarily improved by its technological enframing. Rather, while certain aspects of reality may be heightened, other aspects are necessarily impoverished, and the entire experience is reconstituted on a more abstract level.

It is important to note that once overlaid, the more concrete layers do not disappear, abstraction does not simply lead to a one-dimensional technological enframing. Rather, more abstract layers reconstitute more concrete layers of social being, a process that can cause tensions, ambivalences, ambiguities, conflicts, contingencies, and complexities (Cooper 2002). These tensions can even lead to fully blown ontological contradictions (James 2006). In this way, augmentation can be a way to describe processes of mediatization that draw attention to its layering effect and the resultant tensions.

The image of levels and layers is significant. Manovich describes "software as a layer that permeates all areas of contemporary society" (Manovich 2013: 15). Elsewhere, he notes that 'augmentation' involves "overlaying dynamic data over the physical space" (Manovich 2006). Speaking of locative media's interactive production of 'augmented realities', André Lemos notes that we are seeing "several examples of integrated, mixed processes that merge electronic and physical territories, creating new forms and new senses of place" (Lemos 2008: 96), which leads to the creation of "new forms of territorialisation through informational control" (Lemos 2008: 104). In these accounts, the authors describe how augmentation changes the phenomenological experience. Building on these accounts, and others like them, it can be helpful to add an axis of abstraction to the conceptualization. This can help show how phenomenological experience is reconstituted; how more ab-

stracted layers of social relations, practices and subjectivity emerge and interact with more concrete levels. This analytical move allows for a multidimensional exploration of social phenomena and the current qualitative transformations that are unevenly underway.

With this in mind, I now return to the two maps analysed earlier, as the Gulf and Google Maps can be understood as paralleling the distinctions between Fordist and cybernetic capitalism. The production of the Gulf map requires many technologies and intellectual techniques to be brought into existence. The roots of this go back to what Benedict Anderson called 'print-capitalism', which emerged from the interplay of capitalism, technology and empire. Anderson argued that between "1500 and 1800 an accumulation of technological innovations in the fields of shipbuilding, navigation, horology and cartography, mediated through print-capitalism", combined to alter consciousness, hence producing a new more abstract way of organizing the world (Anderson 2006: 188). After 1800, the processes Anderson noted were strengthened with the rise of industrial capitalism. Printing went from being hand-operated Gutenberg-style to being steam powered and far more abstract and productive. This technique, first successfully implemented by Friedrich Koenig over the first decades of the 19th Century, intensified this development. From a media history perspective, these transformations are understood as belonging to the "mechanization" of media, the first of three "waves of mediatization" proposed by Couldry and Hepp (2016: 34-44).

Following Anderson's analysis, it is possible to see how similar patterns have occurred at other historic moments, such as the Fordist reconstitution of 19th Century industrial capitalism. Fordism emerged from the interplay of capitalism, technology and empire, with developments in the extraction and processing of petrochemicals (including plastics and fertilizers), the industrialization of advertising and public relations, telephone enabled centralization, production lines and the invention of modern management techniques (to name but a few). These developments were mediated through the "electrification" of media, the second wave of mediatization (Couldry & Hepp 2016: 44-48). Being composed of older industrial-print techniques, the Gulf Oil map presents a conception of space which is inseparable from the rise of Fordist capitalism.

As Fordism overlaid and reconstituted some of the patterns from print and industrial capitalism, so did the rise of cybernetic capitalism in overlaying and reconstituting Fordism after it hit multiple crisis points in the 1970s. This new order emerged from the interplay of capitalism, technology and empire, with developments in cybernetic techno-sciences, increasingly mobile telecommunications industries, new modes of precarious labour management, and the Global Positioning System (to name but a few). These developments were mediated through the "digitization" of media, the third wave in Couldry and Hepp's schema (Couldry

& Hepp 2016: 48-56). The intense abstractions enabled by networked computing-machines enabled this transformation, opening the way for a state of “deep mediatization”. From this process, cybernetic capitalism has augmented Fordism, reconstituting it on a more abstract level. Much as print-capitalism produced new conceptions of space that were more abstracted than that which preceded it, another qualitative leap into the drawn-away occurred with the rise of cybernetic cartography like Google Maps (Kitchin & Dodge 2011). Apparatuses like this are the products of computing-machines that produces space, practice and subjectivity on more abstract levels.

Maps and Abstraction

In this final section I briefly consider how maps—and the increasing abstraction inherent in them—reconstitutes social practice and produce a way of being in, and relating to, the world that is more abstract. There are a multitude of ways in which to navigate space, with the majority not involving the mediation of a map. The most concrete methods begin with the drawing of signs from the natural world, such as from the sun, stars, or terrestrial formations like hills and rivers. Navigating using natural formations is a practice that is partly shared by many other migrating animals, from humpback whales to swallows. People can also navigate through space by drawing signs from human experience, such as from memory, whether individual or collective. This could involve asking someone for directions, or through having someone act as a guide. Such navigation is contingent on speech, which is itself an abstraction, however it is also embodied and involves a face-to-face encounter with another human. For most people for most of history, these more concrete forms of navigation were how people moved through space. It is thus more abstract to produce a map than to draw signs from the environment, but far less abstract than using a representational technology.

Mobility becomes more abstract when people begin producing technologies like maps. To produce a paper map, such as the Cassini map of France, requires all sorts of abstract practices to bring them into being; various techniques and technologies such as standardized measurement systems, triangulation and magnetic compasses. Using a paper map to navigate requires constant attention translate between the abstracted space of the map and the embodied space of one’s surroundings. With a paper map, one must plot their own route, and constantly go back and forth between the representation and the territory in order for the map to facilitate mobility. While such practices are far more abstract than looking at the landscape or asking another person for directions, a paper map is far less abstract than a cybernetic apparatus like Google Maps.

Using Google Maps to navigate involves a layer of augmented reality that is connected to a network of globe-spanning computing-machines. The functioning of this system is highly abstract, with layers upon layers of machinery and coded material—semiconductors, interoperability standards, precarious labour, surveillance systems, etc.—all of which are immanent to the very functioning of the map. Such apparatuses serve to augment navigation, which is to say that they project a layer of cybernetic abstraction onto social practice. Through its search and surveillance engines, Google Maps can find a destination and automatically generate a route there. It can even ‘speak’ the directions via a synthesised voice, and one need only follow the directions rather than actively translate: “In 50m turn right”. This augmented process is much more passive than using a paper map and can be understood as the outsourcing of spatial awareness to the cyber-capitalist firm. This abstraction has become part of everyday practice of billions of people unevenly spread around the world. In this way, Google Maps changes social practices of mobility and meaning, technologically mediating it, thus resulting in space being produced in more abstract ways. This is part of the cybernetic reconstitution of everyday practice—the deep mediatization of the world—a phenomenon that is embroiled with the changing nature of capitalism as a world-historic system.

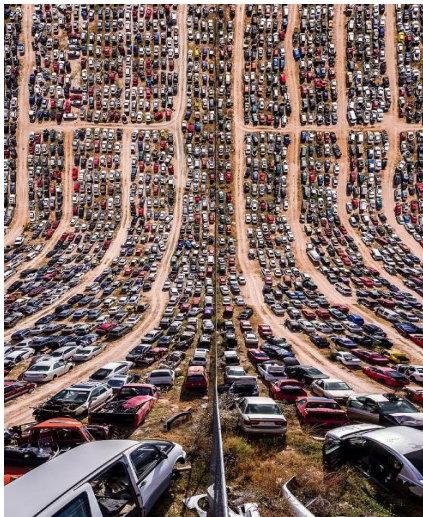


Figure 11 & 12. Aydin Buyuktas, ‘Junkyard’ and ‘Empty Car Park’, Flatlands II Taken by with the aid of drones, these photographs can be seen as visual manifestations of the accelerating curves that Huxley suggests paves the way to Brave New World. Figure 11 on the left shows the exponential waste, and on the Figure 12 on the right shows the increasing abstraction of cybernetic capitalism’s reconstitution of Fordism.

Conclusion

In this paper, I have very briefly looked at a century of transformations within Fordist capitalism by using two road maps as entry points into the narrative. The 1915 Gulf Oil map is a symbol of the world order dominated by capitalism during its Fordist reconstitution. In the same way, the 2015 Google Map is a symbol of an augmented world order dominated by capitalism during its cybernetic reconstitution. As previously noted, there are many parallels between the two maps as well as profound differences. Likewise, there are many parallels between the Fordism that Gramsci wrote about and the augmented Fordism of today, yet there are also qualitative differences. In both cases, the latter has been thoroughly remade by the cybernetic revolution and the technologies, intellectual techniques and social practices connected to it. These new modes have made capitalism simultaneously more abstract and more productive, albeit in a contradictory manner (Figure 11 & 12).

In both cases, the maps are not simply passive images, rather they have both been bound-up with everyday practice and have therefore actively contributed to transforming conceptions of space, affecting the way we move through space, relate to one another and create meaning. Like Fordism exerted a process of “psycho-physical transformation”, in Gramsci’s terms, the newer phenomena of cybernetic capitalism are reorganizing the world in ways that are increasingly abstract. Over the past century, we have been following the road map to a Brave New World. It is not the specific dystopia that Huxley imagined, yet the trajectory of “gigantic numbers and accelerating increases” carries on, with the map reconstituting the territory, abstracting and augmenting it in a relentless cybernetic reorganization.

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Notes

1 This argument was formulated by a number of writers around the Australian academic journal *Arena*. A good summary of this concept can be found in Raewyn Connell’s chapter in a book celebrating fifty years of *Arena*, and the book more broadly summarises the arguments of this line of investigation (Hinkson 2016).

2 The facts from this paragraph were drawn from Gulf Oil’s official website

[<http://www.gulfoilltd.com/timeline/company/>] and the Texas State Historical Association's article on the company [<https://tshaonline.org/handbook/online/articles/dog02>]

3 The digital degrees (co-ordinates) of this map are 40.0668125, -76.8982741, and it was taken at the 7th level of zoom, see [<https://www.google.com/maps/@40.0668125,-76.8982741,7z>]

4 This is a difficult thing to estimate, as Google very rarely give any indication as to how many people use their systems. In 2012 the company announced: "More than a billion people use Google Maps each month to find their way around town and around the world" (McClendon 2012). Since then, the number of people accessing the internet has increase significantly.

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