



AFTERWORD

Arctic Abstractions

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There are a number of words, what Raymond Williams (1985) calls keywords, which seem to be central to the current political moment, and to what one might describe as contemporary liberal governance. Security, risk, resilience, community, and individualism—all markers of liberal governmentality—would be among them, perhaps even *moreso* during COVID-times. Dependency would likely be another, a keyword that is arguably the single most important term in contemporary discourse on welfare, entitlements, and personal responsibility. To be dependent—upon the state, upon food kitchens, upon popular charity—is a marker of a certain sort of individual failure, pathology even. Dependency carries a stigma and a stain: the implication is a failure to thrive and to achieve independence and self-sufficiency, and in ideological terms to exhibit a number of pathologies or failings (laziness, a lack of thrift, a failure to self-manage, plan, invest, and limit particularly destructive drives).

Raymond Williams's glossary of complex keywords emphasized shifts in historical semantics, new meanings that are intimately bound to the social and political changes of preceding centuries. Keywords were significant and *binding* in their deployment and interpretation, and significant and *indicative* in "certain forms of thought" (1985: 15). Each keyword occupies a complex semantic space—historically situated registers of meaning—in which, as Williams put it, the problems of the words' meanings were "inextricably bound up with the problems it was being used to discuss (p. 15)." Williams's *Key Words* was less concerned with mechanisms governing meaningful change than

in the pressures under which people—classes, social groups—extend and transform word meanings. While the meanings of keywords were unstable, changing over time, Williams chose to accentuate the adversarial uses of language rooted in society as an arena of conflictual interactions and struggles between different social forces. All of this highlighted the social contradictions inherent in meaning attribution: keywords are contested, fought over, and subject to moral and ethical standards and assessment, all the while exhibiting complex, interlocking contemporary meanings whose interaction inevitably remains unresolved.

Neither abstract nor abstraction appeared in Williams’s breviary. But both words have good reason to be there.¹ A book devoted to the abstraction—and the extraction-couplet—must of course confront the conundrum of William’s multiple registers of meaning. There is a general etymological sense in which abstraction implies a removal, a paring away.

Abstraction begins with action, with lines drawn and a cleavage made. It is commonly used as a quantity that can be possessed . . . yet fundamentally the term necessitates a move, and one with direction. The OED includes several variations on “abstraction,” but all of them involve “withdrawing,” “separation,” or “removal.” . . . This sense of stripping away the context applies to all instances of abstraction. We should then ask—what is being removed? (Park 2003, para. 1)

Individuals are now ruled by abstractions, whereas earlier they depended on one another. (Marx 1973)

Everything comes down to Aesthetics and Political Economy. (Mallarmé 2012)

A photograph is a secret about a secret. (Arbus 2016)

According to the Oxford English Dictionary (OED) the word’s Latinate derivation relating to separation (*abstrāctiō*) and draw away (*abstrahō*) is reflected in modern usage where it may euphemistically invoke secret or dishonest removal, pilfering, purloining, all properties that appear in some form in the vivid accounts of Arctic abstraction that appear in this book. The OED offers the following definition: “the act or process of separating in thought, of considering a thing independently of its associations; or a substance independently of its attributes; or an attribute or quality independently of the substance to which it belongs.” In keeping with the sense of separation and rift, Max Weber famously defined abstraction in regard to “isolation” and

“generalization” to which in, his updating of the term in sociological theory, Swedberg (2020) adds a third property, namely the notion of “levels” (the parallel here is with the notion of logical typing). But the general point holds: abstraction implies some sort of direction, movement and separation. Stephen Park (2003) properly observes abstraction is hard to pin down universally but rather must be thought of in terms of what it is working against or separated from: “It will not do to simply locate abstraction, to speak of abstraction *in* something, rather we must also consider its origin, in other words, abstraction *from* something.” The word, in short, is binary, or more properly dialectical, containing within it etymological circumference of a broad sense of purification. Naturally, the referent—what is being moved or withdrawn or separated *from*—accounts for the specific meanings, the differing registers.

Abstraction takes shape—that is to say, is lifted or withdrawn from and examined in reified form—in relation to that which it opposes or to which it serves as a counterpoint. In this book the counterpoint is extraction—or what I will call the concrete (Mason in his introduction notes that the “slippage” between the two terms “registers various kinds of movements from the material to the immaterial or symbolic and back again”). Abstraction in both common and scientific parlance assumes a number of shapes. In her insightful account of abstraction and finance and money—arguably a phenomenon, along with space, that has generated some of richest accounts of abstraction and social life as Mason shows in his introduction (see Harvey 2006; also Stanek 2008; Adkins 2020)—La Berge (2014a: 94; 2021, 2016) properly notes that the word has so many varied meanings, so many theoretical traditions that its “precise meaning . . . [is] almost impossible to ascertain.” In art, and aesthetics more generally, the abstract (Rothko’s color fields) stands in opposition to the figurative; in philosophy it refers to something existing outside of space and time; across the social sciences abstraction is something that exceeds the specific and particular; in the biophysical sciences abstraction is central to method and to hypothetical-deductive model building. Within Marxisms of various stripe—Marxian political economy arguably has the most robust theoretical lineage within the social sciences on the relations between the abstract and the concrete—there are a raft of forms of abstraction: real abstraction, lived abstraction, second order abstraction, and so on.

The aims of abstraction differ too as La Berge shows: in art, abstraction provides “medium specificity,” while in social theory—for example, the idea that the economy is performative or a twentieth

century historical abstraction (invention)—abstraction is metonymic, in which an incomplete representation stands in for something more capacious “that cannot be represented” (in this book Howe’s invocation of the iconic image of the polar bear—the canary in the mine so to speak—and the Arctic crisis is a case in point). The diverse register of meanings in which abstract (as a descriptor) and abstraction (as a process) is well represented across the volume as they are put to work in understanding “Arctic late industrialism” (and the circumpolar world more generally). The chapters reflect upon the function of metrics and indicators and their work in decontextualizing and depoliticizing as they quantify, rank, and measure, foundational aesthetic forms (the graph, the photograph) that work to “persuade, seduce, and conjure” (Mason’s language) and the abstractive forms of expertise employed in the service of valuing and monetizing (each some of the most complex forms of abstraction). The very title of the book that invokes abstraction as an *industry* is telling. Abstraction, representation, and agency (Toscano and Kinkle 2015; Toscano 2008)—the ways in which separation, envisioning, and practice emerge in the context of the “New Arctic”—appear in a multiplicity of configurations in *Arctic Abstractive Industry*—melting ice, oceanic sensing, forms of visualization, gas frontiers, and Indigenous signification. At stake are both the accomplishments of abstraction and its tragic failures and excesses.

In his introduction Mason offers a very useful starting point for thinking about abstraction and the cryosphere, a dialectical world of both unbecoming (decay, ruin, endangerment) and becoming (the “New Arctic,” see Serreze 2018), a new world of speculative and the spectacular, Anthropocenic accumulation. Abstraction, Mason suggests, refers to the “value of the substance of a thing (whether living or nonliving) by reference to the conditions of its becoming and to further inversions of value that lead toward its becoming something else.” It is a definition consistent with the notion of removal and purification that I invoked earlier but also breaking from it. To abstract is to detach a part of reality and put into relation with, and often opposition, to the whole, “leading to an inversion in its ascribed value.” Abstraction is at once, he says, a creative act of recognition and a construction of a new reality in which *value* (itself constituted through complex forms of abstraction) is in play. From this perch he poses a raft of questions: What are the politics of representation in this contested terrain? Whose stories are being pressed into service, and to what ends? While Mason does not make clear how abstraction and representation are related as conceptual matters, in my brief remarks

I wish to offer a few observations on this framing and what it might offer our understanding of an emergent Arctic, speculative spaces, digital oceans, and economic forms, more specifically financialized (and neoliberalized) forms of contemporary capitalism.

One of the conceits of *Arctic Abstractive Industry* is that it seeks to focus on variously articulated sites of industrial extraction and ecological vulnerability in the contemporary Arctic while “departing” from (though necessarily “invoking”) extraction and extractive space (what Gavin Bridge (2009) metaphorically describes as the “hole in the ground” approach). In this sense one might say that the extractive stands in for the concrete (rather than the abstract). This of course poses the question of what makes the concrete concrete and the abstract abstract? Marx is, I think exceptionally useful here. Within Marxism, abstraction serves as an indispensable vehicle and yet a hindrance to political economy. Marx deploys the term abstract quite regularly across his work: “Individuals are now ruled by abstractions,” he says in the *Grundrisse*, where the *now* (capitalism) is constituted by abstract labor power as the condition of possibility of capital (1975). As La Berge (2014) brilliantly notes, the concrete is a metabolized result and the abstract a social intuition capable of leading to the concrete. The concept is concrete, says Marx, because it is “a synthesis of many definitions, thus representing the unity of diverse aspects,” whereas “the most general abstractions arise only in the midst of the richest possible concrete development, where one thing appears as common to many, to all” (in La Berge 2014: 97). In sum, the abstract and the concrete are not exclusive but dialectically constituted, each is realized through the other: real abstractions. The dialectical relation between of the concrete and the abstract—the extractive-abstractive couplet—must be maintained if the dangerous reefs of idealism on the one hand and crude empiricism on the other are to be avoided. All of this points to a larger point. If extraction is the concrete, in the Marxian frame, it too contains, or better still, cannot be construed exclusively as a concrete phenomenon. Richard Swedberg’s (2020) recent account of the abstract makes this very clear when he offers a “formal definition” of abstraction as follows: “an abstraction is a representation of a phenomenon that is the result of a selection from another representation, which refers to a more concrete reality.”

Marxism points to three articulations of abstraction relevant to the contributions on Arctic late industrialism (see Butler 2016). First, in capitalist society the abstract functions concretely. As Paci (1969: 11, 18) puts it: “this concrete function, notwithstanding the fact that it is really abstract, is bound to precise consequences: the social relation

appears as if it were a thing and in fact functions as a thing, while it is not a thing. . . . *The fundamental character of capitalism . . . reveals itself in the tendency to make abstract categories live as if they were concrete*” (emphasis added). Second, Marx (1975) presents abstraction as driving both processes of intellectual fragmentation and the alienation of people from their labor and their lived, bodily experiences. The link between abstraction and alienation is central to the work of Moishe Postone’s reconstruction of Marx’s social theory focusing on the central role played by the domination of people by “abstract, quasi-independent structures of social relations” (1993: 125). Capitalist social relations secure domination via abstraction and impersonality. In Marx’s (1973: 164) words, “Individuals . . . are now ruled by abstractions, whereas earlier they depended on one another. The abstraction, or idea, however, is nothing more than the theoretical expression of those material relations which are their lord and master. And third, in capitalism it is labor that is both concrete and abstract, and that tension is replicated and externalized in other forms” (including as Mason notes in other forms of value, such as money) *and* in forms of social organization and knowledge. Regardless of the primacy of one real abstraction (money) over another (labor power), says Robert Gehl (2012), “the effects of any real abstraction include material consequences . . . real abstractions express themselves in social organization and are expressions of social organization.” The reality is human agency, the abstraction is the immaterial constitution of a whole way of life. A central purpose of *Arctic Abstractive Industries* is to explore these relations between abstraction and forms of life and abstraction is a red thread running across this book.

One domain in which real or concrete abstractions have been deployed to great effect is the production of social space under capitalism—a space for example like the Arctic. Henri Lefebvre (2005) in his theorization of the multi-scalar and hyper complexity of space under capitalism, drew upon Marx directly and the idea that abstraction becomes real in practice (Stanek 2008; Butler 2016). Lefebvre (2009: 88) noted that “there can be no pure abstraction”—no pure abstract space—but rather the “concrete abstract.” He offers an account of the rise of forms of abstraction in thought, practice, and experience in association with the different transformations of modes of production of social space under global capitalism. Abstract forms can be understood in part through the ways in which special processes—fragmentation, scale, nesting, networks—are part of the real abstraction of existing forms of capitalism. These sorts of ideas have been usefully employed in the extractive arena, for example, the concept

of “hyper-extraction” or “the planetary mine” what has been termed expanded, extended, or enhanced extraction (McNeish and Shapiro 2021). These ideas draw upon three strands of political economy. One is the move to deterritorialize and render planetary the mine, and the idea that “capitalist urbanization secrets the planetary mine—everyday, above ground, scattered, diffuse, perpetual and swelling” (Labban 2014; also Arias-Loyola 2020). Central to the planetary approach is not simply scale, and interconnectivity (the city as the “inverted mine”) and breaking with methodological nationalism (the extractive nation or state); rather it is to see extraction as a set of shifting dynamic frontiers produced and enmeshed in forms of contemporary racialized capitalism and empire. A second is the related work of Sandra Mezzadra and Brett Neilson (2020) in their book *The Politics of Operations*.² Their focus is on the production of multiple edges and frontiers of expanding capitalism, the layered sovereignties and variegated legal spaces of global capital,³ and the new spatial and temporal complexities of capitalism associated with capital’s circulation and colonization of social life, what they call the politics of operations. In particular it is the operations of a trifecta of sectors and their connections that provide the core entry point: extraction, logistics, and finance.⁴ Here we are necessarily tacking back and forth between the concrete and the abstract, between materials, flows, sensing, asset classes, money, the image world, and multiple forms of expertise.

The third I shall refer to as extractive rents and value grabbing (a deep resonance here with Mason’s introduction), a body of work that has collectively addressed the question of contemporary capitalism and rule by rentiers (Mazzucato 2018; Piketty 2014; Standing 2016). At the heart of this work too is an engagement with the extraction-abstraction interface. Not surprisingly, financial rentiers, which is to say firms engaged primarily in financial activities and earning revenue primarily through the ownership and exploitation of financial assets, have been in the spotlight, the principal agents of what has come to be seen as the dominance of Wall Street and finance capital. As a form of critique, rents are seen as “unearned” (rather than productive as a source of accumulation) and owners of land, mineral resources, intellectual property, and a panoply of other income-generating financial and non-financial assets are seen to exercise a sort of hegemony within a neoliberalized and financialized capitalism. When economists refer to a rent seeking political economy, they typically invoke a lack of market competition and hence the source of rent is state intervention or restrictions on economic activity. Others see rent as any income derived from ownership, possession, or con-

trol of assets (including financial assets) that are scarce or artificially rendered scarce. Implicit in differing explications of rent—too complex to enter into here—is the notion of a monopoly of power not only of ownership or control but in the marketplace. In this sense rents are income derived from the ownership, possession, or control of scarce assets under conditions of limited or no competition (Christophers 2019, 2020).

Central to the rentier world so defined is the determination and distribution of property rights that are not deployed to produce new commodities but rather to extract value via rent (what has been called “value grabbing” through “pseudo-commodities” see Andreucci et al. 2017). There is, to take the idea of a planetary extractive system, an expanding class of rentiers operating in the interstices of, for example, the multiple agents in the oil and gas assemblage (financiers, commodity traders, oil insurgents, politicians, military, corporations, and so on) who as it were profit without producing (Lapavistas 2009). Rent-bearing assets—how they are created, their opportunities to extract value, and conflicts and struggles over the property rights that underlie them—are pivotal to contemporary capitalism, and to extraction in particular. Certainly, the state figures centrally in rents because: (i) it typically creates and institutes property rights; (ii) regulates, enforces, and legitimates the distribution of rights and titles and their use; and (iii) because (and this is especially so in oil state), it is itself or acts like a landlord (a “land appropriating state” or “land-lording state”⁵). But these rights might also inhere in international law or through multilateral institutions. Either way, as Andreucci et al. (2017: 38) put it, “the proliferation of private property relations over everything imaginable significantly expands the terrain for rent extraction and related struggles.”⁶ All of this moves extraction into multiple registers and multiple forms of abstraction.

But planetary extraction and the dominant forms of neoliberalized finance capital associated with it, point to the importance of the massive proliferation of rents and rent opportunities—“value grabbing”—to the operations of the oil and gas assemblage. This is no longer solely a product of corrupt rent-seeking petro-states but operates across multiple spaces and sectors, across the licit and illicit, and among cores and frontiers, a development which has the effect of highlighting the blurring of conventional boundaries and borders in thinking about the global political economy of extraction. This is very much one aspect of Bennett’s notion of the “double frontier” in this volume.

I want to conclude with two other brief illustrations that speak to the extraction-abstraction interface and that highlight a number of threads running across the chapters—questions of sensing, iconographic images, and forms of representation—and, to quote from Mason’s introduction, how abstractions mediate ecological, political, technological, economic, and cultural inversions of value brought about by energy extraction in the Arctic and the transformation of vulnerability into forms of value. The forms of spatial abstraction—cartography and GIS for example—is especially relevant in the Arctic as the work on the ice edge has shown (see Steinberg and Kristoffersen 2017). The map is of course not the territory and questions of the conditions of production, circulation, and legitimation of such maps—of Arctic edge, or the sea floor—require precisely the sort of engagement with real abstractions that this volume raises.⁷ Mason’s chapter on the graph is especially generative here and is an echo of other work some of the chapters address, namely sensing. Mason’s examination of the graph—political aesthetics, and to invoke Mallarmé (2012) at the head of this chapter, the relations between aesthetics and political economy—can be productively situated on a larger canvas of what Buck-Morss (1995) and others have called “envisioning the economy,” that is to say how the abstractions of capitalism (capital, the market, divisions of labor) are displayed. The history of visualization is key (Friendly and Wainer 2021; Halpern 2015). Buck-Morss (1995) shows using classical political economy how the economy—fixing and making it—is a representational problem (e.g., Toscano and Kinkel 2015), a sort of cognitive mapping of the sort Mason describes in the Alaska oil and gas sector. There is a powerful echo in the ways that Mason depicts graphs put to work and the much earlier inventions of graphs and pie charts—the seventeenth-century Dutch cartographer working for the Spanish court, Scottish engineer William Playfair working for the Royal Navy—who saw clearly that a story, a narrative, a history could all be “physically seen on a page by abstracting it along a thin inked line” (Fry 2021).

To conclude I want to focus on two abstractive issues: the “digital Arctic,”⁸ and the abstractive processes of commodity trade. On the digital Arctic, let me begin with Calvin Henely (2012): “If you think of Wall Street as capitalism’s symbolic headquarters, the sea is capitalism’s trading floor writ large.” Deepwater resource exploitation of various sorts—oil extraction at eight thousand feet in the Gulf of Mexico, or deep-sea mining of polymetallic nodules offshore in Papua New Guinea—and the world of oceanic extraction—a sort of model

of “high tech” logistics and circulation if ever there was one—offers up many of the insights into the hyper-extraction world of logistics, finance, and the operations of contemporary capital and geopolitics.

Two vignettes. On 2 August 2007, a Russian submarine with two parliamentarians on board planted a titanium flag two miles down under the North Pole. At stake were the lucrative new oil and gas fields—by some estimations ten billion tons of oil equivalent—on the Arctic sea floor. A decade later in December 2017, the US National Oceanic and Atmospheric Administration (NOAA)—a significant arm of the US Department of Commerce—released a report proclaiming a “New Arctic,” signaling massive, irreversible phase changes in the material composition of the Arctic Ocean and its peripheries.⁹ A world of forbidding sea ice is now construed through the lens of runaway melt, thaw, liquefaction, and off-gassing. A *new ocean* is in the making, demanding to be observed, represented and documented, exploited, and policed at multiple scales.¹⁰

Confronting new systems of global oceanic and atmospheric circulation, a vast constellation of satellites, drones, buoys, cables, super-computers, servers, and sensors will give form to the New Arctic, a digital ocean whose geo-economic and geostrategic value inheres in its rendering as a calculative, computational domain (Steinberg and Kristoffersen 2017). A liquid Arctic is both a knowledge and infrastructural frontier—calling on new forms of “environmental intelligence” (EI) and logistical orders of extraction, circulation, and securitization to come into being. But it is also a new frontier of accumulation, a so-called trillion-dollar ocean. What is at stake is building a logistics space for the Anthropocene.

One part of this digital Arctic story is expressly about oil and gas. Deepwater oil and gas production in the Arctic (and elsewhere) is, of course nothing new; the logistical and infrastructural investments in the oil and gas global supply chain has already left its profound footprint not simply on the ocean floor but in and through the oceanic world (pipelines, flow-stations, risers, rigs, tankers, tank-farms, gas flaring vents, semi-submersible rigs, blowout preventers, and so on).¹¹ It is now commonplace for test wells to delve through seven thousand feet of water and thirty thousand feet of sea floor to tap oil in tertiary rock laid down sixty million years ago. One test well might cost over \$250 million. A great deepwater land grab is in train: primitive accumulation at seven thousand meters. Warming wrought by global climate change has opened Arctic prospects containing an estimated eighth of the world’s remaining oil, and a quarter of its gas (according to the US Geological Survey). Geographer Leigh Johnson

(2010) calls this positive feedback loop capital “accumulation by degradation.” The arrival of peak oil has triggered increasingly high-risk techniques and geographies of extraction, especially in deep water and the extreme environments of the Arctic’s oceanic milieu. The research involved in this turn has resulted in ever more sophisticated sensing, mapping, modeling, and simulation of each phase of oil production.

NOAA has adopted environmental intelligence—rebranding itself as “America’s environmental intelligence agency” to explicitly mold the New Arctic policy narrative as a security concern through the problem of data production, management, and deployment. Adapted from long-standing military-scientific techniques of geographic, meteorological, and otherwise geophysical knowledge production, EI enframes the New Arctic through an established military-industrial-academic complex operating at many levels: structural, logistical, infrastructural (see Arroyo 2021). The scope of ocean monitoring is widening, and an infrastructure is being built to span the oceans. Getting things—information, commodities, people—in circulation entails a sort of mapping of the margins, the new oceanic frontiers, and given the deep history of oceanic life, projects of capitalization, extraction, militarization, territorialization, and policing. DARPA (the US Defense Advanced Research Projects Agency) has a unit—the Ocean of Things, a play on the Internet of Things—that aims to deploy fifty thousand sensors across one million square miles of sea.

What distinguishes the contemporary variant of EI, however, is the addition of speculative finance capital and its logics of risk to the equation, mobilizing this complex in new directions. By giving shape to the risk landscape, EI becomes a strategic domain of value in itself that maps out possible scenarios and multiplies speculative opportunity through the trafficking of New Arctic futures. EI asserts the broader ascendancy of geospatial data in the valuation and evaluation of risky, uncertain futures as a space of economic and political securitization—it is a sort of emerging market—and makes use of the vast resources of Silicon Valley rather than secret state technologies and military satellites, ships, and other sensing platforms typical of Cold War-era big science. Bay Area firms focus on small, automated, cheap systems—from Saildrone’s unmanned solar and sail-equipped sensor packages to Planet Labs’ cubesat swarms—to produce data market ready for just-in-time maritime logistics, everywhere-war security operations, and of course for the extractive sector.

The very idea of a new Arctic Ocean maps out an abstract space: yet-to-be observed, represented, exploited, and policed at multiple spatial

and temporal scales (this is part of the stakeholder narrative in regard to sensing provided by Hepsø and Parmiggiani). EI arbitrates and mediates in other words the New Arctic's figuration and governance as a field of risk and opportunity. In delimiting the New Arctic as an epistemic object and expanding the means by which the region's strategic worth might be evaluated, NOAA's coinage of the New Arctic might appear to be a predominantly American project of a techno-political sort, but it is a supranational enterprise as important to Norway and Russia as it is to China or Canada. New investments abound: the Shell Ocean Discovery XPRIZE to "Accelerate Technology Breakthroughs for Rapid and Unmanned Ocean Exploration"; DARPA's POSYDON communications and navigational system for the deep ocean; China's new fleet of nuclear-powered icebreakers; Equinor's competition to develop artificial intelligence and machine learning technologies for iceberg detection (the chapter by Vidar Hepsø and Elena Parmiggiani explores these trends in relation to computational sensing technologies and simulated models, both of which are capable of translating the complexity of the environment into measurable indicators). This infrastructural boom has helped construct a vast and growing constellation of satellites, drones, buoys, cables, supercomputers, servers, and sensors, a commercially oriented cognitive apparatus for charting the New Arctic resource frontier.

The Ocean of Things is of course in the process of both speculation and value. It requires finance (Silicon Valley is already on board) and opens up opportunities for finance capital. And then there is finance capital and state-led investment, the real of abstraction par excellence. Contemporary with the NOAA report, Guggenheim Investment Partners LLC, a New York firm, offered the first Arctic-specific investment portfolio while China published its first comprehensive Arctic strategy for a Polar Silk Road. The US defense contractor and ocean technology startup Liquid Robotics, a Boeing subsidiary, outlined its vision for a digital ocean. The Arctic mineral and energy frontier is what Alexander Arroyo (2021) calls a geography of speculation, building a digital ocean as "a homogenous quantified space . . . to maintain active control over the conditions of circulation."

More generally, new technologies offer the possibility of enhanced recovery rates, the opening of new frontiers previously foreclosed (fracking is an obvious case), and the deployment of high-tech instruments for discovery, estimation, and surveillance of resources (three-D seismic for example in deep water mining). The very idea of the digital mine¹² or the digital transformation of the oil industry (virtual reality, intelligent automation, and interconnectedness of all

devices, hardware will change the face of day-to-day oil and gas operations¹⁴) are cases in point. Oceanic oil and the digital Arctic reveal how the concept of hyperextraction offers a sort of full-screen technicolor picture of twenty-first-century extractive-abstractive political economy—speculative and spectacular forms of accumulation in which the abstractive industries are put to work. It points to a planetary oil and gas assemblage, for example, in which the politics of operations on the ground encompass extraction, logistics, technology, and finance.

Finally, the world of making commodities moves and circulates in its relation to abstractive industry. Until recently, the trading system (the circulation of commodities associated with extraction), has not been a major arena of scrutiny in the fields to which this book contributes. While many of the chapters in this book explore energy and minerals and the abstractions and representations in their valuation, the world of the commodity trading houses (the likes of Glencore, Mercuria, or Trafigura) are for the most part absent. Yet this is a world of finance, investment banks, commodity exchanges, and new financial instruments all of which are almost archetypal instances of abstractive processes at work. To take the case of oil (but it is an extractive story), so-called first trades are the key moment at which oil produced (that is to say the upstream sector) enters the global market (the mid-stream sector) with its price tag. First trade or equity oil is acquired by a considerable variety of buyers and traders—from international oil companies (IOCs) with their large trading desks to the large commodity trading houses, small independents, and even other national oil companies. Commodity trading firms are all essentially in the business of transforming commodities in space (logistics), in time (storage), and in form (processing). Their basic function is to perform physical “arbitrages” which enhance value through these various transformations.

The scale of revenues generated from oil sales coupled with the lack of regulation on how these sales are conducted, creates enormous opportunity for value extraction and rent seeking. According to Global Financial Integrity unrecorded oil sales amount to seventeen billion annually (five hundred thousand barrels per day).¹⁴ In 2016, OECD published a study that analysed 131 corruption cases involving foreign public officials in the natural resources sector, including trading. Significantly, twenty-six (20 percent) of the cases appeared to involve commodity trading. These figures refer only to the number of cases, not to the sums of money misappropriated and if the latter were considered, then the scale of corruption in the trading phase,

measured in terms of financial flows, would be greater still. Trade corruption involving Vitol, Philia and Gunvor in Congo, and Glencore in Kazakhstan have been well documented (see Public Eye 2017). On 26 February 2020 the Swiss Federal Council published a report on “Supervision of commodity trading activities from the point of view of money laundering,” written in response to a postulate by the Council of States, that recognizes the high risk of corruption to which the commodity trading sector is exposed.¹⁵ To the degree that many of the trading houses are not public and the oil commodity trading world is something of a “black box” of abstraction.

The menu of trading risks is broad, including not only the potential for tax evasion and money laundering associated with misinvoicing but also the possibility of bribery, collusion, and below-market pricing associated with the largely opaque oil-backed loans and oil-for-product swap agreements. In Nigeria, for example, a number of beneficiaries of export allocations are nothing but letterbox companies whose sole merit is that they are linked to high-ranking political officials or their entourage. Politically linked holders, “letterbox” or “briefcase” companies, have, as the Nigerian Task Force explained, little or no commercial and financial capacity. In Nigeria, such fake entities represent a major part of the “market.” As pointed out by a Chatham House (2013) report, only 25 to 40 percent of the holders of export allocations actually have the capacity or will to finance, ship, and sell their cargo directly. The entire trading systems attracts many shadowy idle men and PEPs because these companies cater to individuals, serving as fronts for the political class and power brokers.

Although all commodity traders engage in transformation activities, they are tremendously diverse. Switzerland, which is the world’s leading commodities trading hub with an estimated 35 percent share of the oil market, has over five hundred trading companies, almost 90 percent of which are private; 42 percent had less than ten employees and 10 percent more than three hundred (Chatham House 2013: 8). The five largest Swiss independent traders (Vitol, Glencore, Trafigura, Gunvor, and Mercuria) typically trade almost eighteen million barrels per day, equivalent to about 20 percent of global demand. There is no common pattern among in terms of the commodities they trade and transform, in the types of transformations they undertake, in their financing, and in their forms of ownership. Traders and sellers are often linked together in complex financial and joint-venture agreements. The trading assemblage is diverse not only in virtue of the nature of the sale contracts and price negotiations, but also because of the relations and networks linking companies, buyers, finance capital, audit

houses, and credit rating agencies. In engaging in these transformation activities, commodity traders face a wide array of risks, some of which can be managed by hedging, insurance, or diversification, but they face others that must be borne by the firms' owners. On a global canvas, much of the trading activity is centered on a cluster of global trading hubs (the UK, Netherlands, Singapore, Switzerland). Overall, the oil trading system is one of the most abstractive aspects of the global oil assemblage, and for that matter extractives in general.

Viewed through the lens of space and abstraction, the global oil trading *system* is intricate and byzantine, composed of varied assemblages of actors and their contrasting interests and positions within the commodity system operating across multiple regulatory jurisdictions. The trading system is moreover dynamic, market prices are capricious, and risks are legion: and not least the architecture of the system has changed, and is changing, in relation to global capitalism in its recent financialized forms, and in response to market volatility and global competitive pressures. Over the last four decades the system has experienced a thorough-going financialization (Gkanoutas-Leventis and Nesvetailova 2015; Gkanoutas-Leventis 2017). The 1980s liberalization and the institutional changes in the market triggered by the launch of commodity indexes by financial institutions in the early 1990s contributed to the growth of futures contracts and a raft of new actors. But recent market developments spurred by the introduction of permissive regulations in 2000 with the launch of the Commodities Future Modernisation Act (CFMA) in the US, opened the oil commodity markets in general to mutual funds, insurance institutions, and banks. Some of the largest investment banks, later known as "Wall Street Refiners," established specialized departments for trading in the oil market. By 2003 most of the biggest US hedge funds were engaged in commodity markets, their involvement tripling between 2004 and 2007. Finance and abstraction, as La Berge shows, are joined at the head.

As oil became an increasingly popular asset class with investors, it widened the opportunities for hedging but also for financial speculation in oil. Furthermore, the advance of financialization and the integration of financialized markets through indexification, produced endogenous dynamics in this market creating new sources of fragility and risk.¹⁶ Sometimes called "oil vega," this financialization of oil and the rise of paper trades made oil prices both volatile and largely independent of physical trades and market fundamentals. At the same time, despite the plethora of regulatory agencies in global finance, regulatory arbitrage is a defining quality of the global financial sys-

tem permitting commodities markets to thrive in-between various regulatory niches, capitalizing on the permissive regulatory policies nationally, and exploiting unregulated spaces internationally (Gibbon 2004). Most traders operate in and through trading hubs or offshore financial centers associated with favorable regulation and tax rates, strong capital markets, a deep tradition of trade and shipping and human capital resources (London, New York, Chicago, Houston, Calgary, Tokyo, Hong Kong, Geneva, and Zug, and more recently the UAE and Singapore). Traders might be involved simultaneously in the buying, selling, transportation, storage, and refining of physical oil yet at the same time in value terms the overwhelming majority of trades are in so-called paper trades (the futures and derivative markets). In this hub and spoke network system, populated by a diverse suite of buyers, trading and financiers, it is the *opacity* that presents such a challenge to anti-IFF measures.

The oil trading assemblage is not just complex, variegated, global, and multi-scalar in its operations. It exhibits a number of distinctive properties, namely routing of finance through offshore financial centres (OFCs) and is marked by secrecy and lack of opacity. While the average proportion of group subsidiaries owned via OFC-based intermediated holding companies for the top one hundred global industrial firms (in revenues) was 18 percent, for energy traders the average was 29 percent for large integrated firms, and 96.7 percent for independent trading companies (Nesvetailova et al. 2021). The trading system seems to seek out, and even reproduce, opacity in its operations, operating in frontier-like (unregulated) spaces both within the oil producing states themselves but also in the trading hubs and OFCs. All this makes for a shadow world of unprecedented opacity.

Frontier conditions in which statehood may be limited are not only located at the rough and tumble oil producer end of the global value chain (as Bennett's chapter shows). These conditions are increasingly found at the other end of the oil (and other extractive) assemblage, in offshore financial centers, populated by shell and dormant companies and consolidated and encased by law, financial institutions, audit companies, and the like. In these frontier settings, extraordinarily capable expertise and resources are brought to bear to limit the possibilities for public authority to reach and regulate. In these OFC frontier zones it is evident that the "reach" of public authority is at best partial even in these thickly governed, high-capability regulatory environments such as Singapore or Zurich. They are abstractive zones par excellence.

Arctic Abstractive Industry seems to me to meet up in highly generative ways with the sorts of rethinking of extraction in an expanded sense. In this contact zone the Arctic can be seen as an instructive sort of frontier. It is a forcing house for all manner of new technics, indicators and audit functions, all draped in the language of both decay and becoming. The chapters in a variety of registers show, as Mason properly suggests, symbolic practice denies the sphere of material production its autonomy while at the same time rendering possible production to be extended to every part of the planet. The graph is not simply a graph, a picture of a polar bear not simply an image, a sensing device not simply a generator of indicators. Rather we are in the world of powerful and generative real abstractions, the immaterial construction of whole ways of life.

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Notes

1. The word does appear in the University of Chicago's *Theories of Media Keyword's Glossary* (<https://csmt.uchicago.edu/glossary2004/abstraction.htm>) which I make use of here, along with Leigh Claire La Berge's (2014a) brilliant book *Scandals and Abstraction: Financial Fiction of the Long 1980s* and "The Rules of Abstraction" (2014b) in *Radical History Review*.
2. See also Mezzadra and Neilson (2017) on the multiple frontiers of extraction: excavating contemporary capitalism.
3. While acknowledging the importance of state sovereignty, they pull upon the work of Benton (2010) to emphasize the forms of quasi- or partial sovereignties, and the world of non-state petty sovereigns, to expose the fragmented and uneven complexities of contemporary capitalism.

4. In a very different register, albeit more sensitive to racialized extraction, Gomez-Barris offers a decolonial theoretical account “foregrounding sub-merged perspectives” (2017: 1) anchored in “anarcho-feminist Indigenous critique.”
5. On the land appropriating state, see Schmitt (2003); and on the state as landlord see Hausmann (1981).
6. The proliferation of these rents means not only that they are the basis of capitalist expansion but are the objects of contest and struggle. For example, what group elites receives the import licenses, what ethnic groups are awarded the mining leases, who benefits from corporate community development projects and so on.
7. There is a large and sophisticated body of geographical work on critical geography, see Wood and Krygier (2009) and Pickles (2012).
8. See <https://www.thearcticinstitute.org/arctic-economic-future-digital/>; <https://www.highnorthnews.com/en/2021-will-be-another-year-mostly-digital-arctic-conferences>. See also a project involving Alexander Arroyo and myself and Professors Arthur Mason and Berit Kristofferson in Trondheim and Tromsø respectively entitled “The Digital Arctic,” which is currently in progress.
9. The New Arctic & Digital Ocean (NADO) project was inaugurated in 2018 with support from the Peder Sather Center for Advanced Study and is led by the NADO community at NTNU, UC Berkeley, and UiT. A current project funded by Peder Sather involving Berit Kristofferson, Alexander Arroyo, and Michael Watts addresses the politics of the sea ice edge.
10. Relatedly see the critical oceans scholarship: DeLoughrey (2019); Rozwadowski (2018); Steinberg and Peters (2015).
11. Close to 5 million producing oil wells puncture the surface of the earth: 77,000 drilled last year, 4,000 offshore; 3,300 are subsea. There are by estimations over 40,000 oil fields in operation, more than 2 million kilometers of pipelines blanket the globe in a massive trunk-network and another 75,000 kilometers of lines transport oil and gas along the sea floor.
12. See <https://www.miningreview.com/health-and-safety/the-digital-mine-how-miners-are-turning-a-vision-into-reality/>.
13. See <https://www.oilandgasiq.com/oil-gas/news/what-is-digital-transformation>.
14. See <https://www.futuredirections.org.au/publication/the-threat-of-organised-crime-to-the-oil-industry/>.
15. Of the Swiss Federal Council, “Supervision of commodity trading activities from the point of view of money laundering,” the Money Laundering Communication Office (MROS) shows that over the past ten years several thousand suspicious transactions related to trading. Two major international corruption scandals involving Brazilian and Venezuelan oil companies (Petrobras and PDVSA) alone resulted in more than 1,500 reports between 2015 and 2018. For the report, MROS evaluated a sample of 367 communications on suspicious transactions linked to trading between 2016 and 2018 (without taking into account Petrobras, PDVSA and other “laundromat cases”). These related to around 1.1 billion francs. MROS identified trading in fossil fuels as particularly risky accounting for 85 percent of the samples examined.

16. A substantial literature exists on oil and gas markets and the financialization, securitization, and speculation question; see Moors (2011) for complexities of price determination, also O'Sullivan (2009: 188).

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