INTRODUCTION

Arctic Late Industrialism
Extracting Value through Abstraction

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During a recent visit to the Lofoten Islands of Arctic Norway, some colleagues and I visited a seaweed harvesting company committed to protecting the marine environment through their use of sustainable methods. What struck me was how dependent our conversation quickly became on the use of a computer screen. The employees utilized digital mapping tools where data about seaweed collection was rendered into seductively crisp images. Over the next several days, our traveling seminar continued to exchange (inter)disciplinary knowledge, mediated as often as not by the support of a well-crafted slide deck. I could not help but think that telling stories in the circumpolar North increasingly relies on ready-made digital platforms.

Looking back to another phase of my life in the Arctic, working among the Alutiiq/Sugpiaq of southwestern Alaska during the 1990s, I recalled a version of heritage work wherein the dimensions and values of Indigenous traditions were still mediated through nondigital materials: physical objects, scaffolded by forms of knowing that reached back before the written record. Yet the community-based spaces where this work took place did not fetishize the local or the analog. Rather, they were sites for the creation of a sense of Alaska Native self-awareness and identity explicitly defined in relation to outside experts along new axes of common purpose.

This passage from an unbroken chain of firsthand knowledge accumulation to a moment in which the Arctic is being reimagined as digi-

tal, sensible, and smooth marks a discontinuity, whose characteristics bear a resemblance to the transitional period that Kim Fortun (2012) has called "late industrialism." For Fortun, late industrialism speaks to a degraded state of industrial infrastructure and exhausted explanatory paradigms, overlaid by internet freedoms of exchange. It also reflects the scientific framing of planetary environmental problems such as global warming (Edwards 2010; Masco 2010). Fortun traces the beginning of late industrialism to the 1984 chemical disaster in Bhopal, India, when a Union Carbide chemical plant blew up, killing thousands and injuring many more.

In a kind of ecological homology to the Bhopal scale of human loss, the 1989 *Exxon Valdez* oil spill in Alaska might be said to mark the beginning of *Arctic late industrialism*. A disaster of enormous magnitude, the spill resulting from an oil tanker that ran aground put nearly eleven million gallons of crude oil into Alaska's Prince William Sound. *Exxon Valdez* redefined relations between communities and experts (see Mason 2008) and helped to constitute the Arctic as a source of value ultimately measurable in the face of its own annihilation.

Borrowing Fortun's periodizing terminology as a critical orientation, Arctic late industrialism names lingering aspirations to connect up with the aging infrastructure of lower latitudes and confrontations with the adverse impacts of climate change for land and marine ecosystems, as well as local ways of life. In this unfinished meantime, atrophied plans and path dependencies keep rolling ten years into the future even as sovereignty becomes further decentralized through emerging forms of digital extrastatecraft (Easterling 2016).

This volume examines the processes at work in variously articulated sites of industrial extraction and ecological vulnerability in the contemporary Arctic, while refusing idealized displacements that conceal relations of exploitation, on the one hand, and productions and appropriations of value, on the other. Its contributors do so through methodologically diverse engagements with the concept of abstraction, which gained salience in the mid-twentieth century at the very moment when debates over a transition to postindustrialism led theorists toward new forms of conceptualization (Brick 1992). To apprehend Arctic resource regimes as *abstractive* is at once to evoke and depart from the more familiar *extractive*, and this slippage between prefixes registers various kinds of movements from the material to the immaterial or symbolic and back again.

The chapters in this collection consider the role of indicators, which decontextualize and depoliticize as they quantify, as well as aesthetic forms, which persuade, seduce, and conjure in a different register.

Both, in what follows, are revealed to entail abstractive forms of expertise employed in the service of an effort to make everything under the sun exchangeable as money. In some cases, rationalist confidence in indicators to generate their own criteria and forms of validation is matched by a correspondence to the real. But just as frequently, this confidence is misplaced, producing excesses and gaps that are diagnostic of the unruliness of the material world and its inhabitants. Hence, the volume is concerned with both the accomplishments of abstraction and the many ways it can fail.

Abstractive forms point to processes that unfold beyond the scale of the local, to the point that understanding changes like global warming involves perceiving that "locality is an abstraction" (Morton 2013: 47). But these phenomenal forms still owe their origins to somewhere. As Mary Douglas (1966: 60) writes of deteriorated orders, their "half-identity still clings to them and the clarity of the scene in which they obtrude is impaired by their presence." Such ambiguity produces uneven perceptions, which ramify to produce the Arctic as a kind of diagrammatic representation of one quality of our planet at large: namely, its vulnerability (Helmreich 2011).

Readers familiar with late-twentieth-century debates about the social effectivity of things (Appadurai 1986; Thomas 1991) will recall similar movements between the abstract and the concrete, as mutable notions of identity were said to mirror capitalism's power over individuals through the production of an economy of signs experienced through objects of "specular reflection" (Baudrillard 1981: 37). More recently, the structure of the oil industry has been described in terms of its abstractive tendencies toward modularity, scaling, carbonscaping, technological zoning, and indeterminacy (Barry 2006; Bridge 2009; T. Mitchell 2012; Haarstad and Wanvik 2017; Weszklanys 2015). Michael Watts (2012: 440) describes "deep infrastructures [of] pipelines, rigs, flowstations, tankers, financiers, engineering firms, [and] security forces" that form an oil assemblage that suspends its social actors between life and death.

While the abstractions of oil and other commodities continue to be examined through the frame of petroculture (Wilson, Szeman, and Carlson 2017; Kinder and Stepanik 2020), less attention has been paid to the forms of value created by their concretization as climate change (but see Tsing et al. 2017). In this introduction, I suggest that transformations in theories of value beyond the dichotomy of classical political economy and Marxism form the preconditions for this analytical movement. In the chapters that follow, Arctic late industrial themes such as vulnerability, financialization, and the loss of life prompt con-

tributors to reflect on the depletion of the Earth and the possibilities for rebuilding value through various modes of aesthetics and ethics (see also Davis and Turpin 2015).

Throughout, the concept of abstraction that we employ cannot be reduced to constructions in the mind. Our usage is closer to that of Slavoj Žižek (1989), who has explored abstraction as a strange sort of inversion that takes place in the value of commodities. In the context of market exchange, value assumes the guise of a natural property of another entity, money. But he argues value is properly understood as an insignia of a network of social relations between the agents of production. Thus, for Žižek (1989: 24), abstraction is misrecognition: "What is really a structural effect, an effect of the network of relations between elements, appears as an immediate property of one of the elements, as if this property also belongs to it outside its relation with other elements."

In this volume, abstraction 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. To abstract is to detach a part of reality from the rest of it. The part that is abstracted is put into relation with and often opposition to the whole, thus leading to an inversion of its ascribed value. The critical theorist Alberto Toscano (2015: 70), whose work on abstraction is an important source of inspiration for this volume, notes that this process constitutes an "additive practice" that entails both arbitrary and focused selection. Hence, moving beyond Žižek, abstraction is at once a creative act of recognition and a construction of a new reality.

The study of abstraction can thus help us attune to the formal operations that make "impossible equations possible" (Rancière 2015: 107), whereby representation, expression, and adoptions of form disclose the politics of production (and of representation itself). Indeed, Toscano (2008: 58) has called for the cultivation of "warm abstractions" that could serve as more supple, figurative counterparts to the mechanisms of political economy. In an era that will be defined by melt and glare, it is not unreasonable to suggest that all abstractions are becoming warm abstractions, with far-reaching consequences for both theory and praxis.

In the remainder of this introduction, I draw on existing scholarship and on my own research to suggest some possible stakes and consequences of approaching Arctic late industrialism through the prism of abstractive industry. I then offer an overview of the interventions that the individual chapters make, as well as those that the

volume as a whole seeks to make in the domain of Arctic research and in social studies of energy and climate more broadly.

Assembling the Valuable and Vulnerable

Despite the profound power of abstractions—what Stuart Hall (1992) describes as their formulating practices that enable divisions such as "The West and the Rest"—Michel Foucault (1971) considered abstractions as fragile, noting that discursive abstractions give rise to anxiety. Their appearance suggests an ambiguity that likely gives reason to institutional authority in support of their legitimacy.

Foucault identifies multiple forms of uncertainty that define the materiality of such anxiety: first, uncertainty arising from suspicion of the conflicts and injuries that lie behind the work of abstraction, even long after use has "chipped away" the rough edges; second, as mentioned, by the performativity of abstractions as written or spoken objects; third, uncertainty associated with their transitory existence, that is, their "destined oblivion" (1971: 8); and finally, uncertainty arising from the barely imaginable dangers of their own possibility, however humdrum they may seem. Such possibilities led Foucault to make the following hypothesis: the production of abstractions is at once controlled and redistributed according to certain procedures whose role is to channel its powers; to cope with chance events; and to evade its ponderous forms of materiality. Gesturing to this procedural approach, I want to identify several conceivable starting points for this volume's abstractive agenda.

In the sections that follow, I identify three forms—Decay, Imagery, and Inflection—that comprise a partial typology of the kinds of abstractive industries emerging in the Arctic. *Decay* calls attention to the Anthropocene's emerging politics of difference whereby academics address the crucial position of the Arctic land/seascapes and coupled atmospheric systems as both indexing and accelerating global climate change. *Imagery* focuses on the concealment of production by industry and government whose efforts in calculative thinking summon together such "nondevelopments" as the rich visual displays of infrastructure that traffic in the denuding of the risk and peril of operations. Finally, *Inflection* calls attention to external discourses ("natural resources," "labor") that replace critical judgment on dispossession and exploitation thus giving rise to identitarian movements and critical ecologies. These three social configurations require material entities and competent agents engaged in valuation practices which I

refer to as "assembling the valuable and vulnerable" (see also Richardson and Weszkalnys 2014: 16).

My understanding of assembling emerged during the 2010s when I became witness to expert energy forecasts of the Russian Barents area. Development prospects included Exxon and Rosneft in the Kara region; Conoco and Lukoil in the Nenets; and Statoil and Rosneft in the Barents Sea. Conceptualizing the Barents energy future as concrete and knowable enabled disparate individuals to envision development through a simultaneity of time. Expectations (forecasts, scenarios) whether as real-time representations of future technological situations or as wishful enactments of desired futures (Borup et al. 2006) often serve as strategic resources for attracting attention from (financial) sponsors to stimulate agenda-setting processes (Van Lente 1993). Their policy adoption implicates standardization, investment decisions, and regulation. These informational spaces also comprise forms of assembly and circulation that fashion regions into *valuable* extractive frontiers. Building these values drew my attention to the recursive capacities of *internal* and *external* practices aimed at mobilizing and performing indicators and aesthetics, examples of which can be read throughout this volume's chapters.

Internal practices suggest assemblies of a wide range of data (models, data sets, algorithms) that give meaning to knowledge in the context of relationships with reference to practical understandings and IT systems (Knorr Cetina 1999). Information-sifting, for example, is selective and depends on high levels of embodied understandings involving years of experience (Wengle 2012). Alternatively, IT infrastructure such as Resource Planning systems employ a logic of conversion whereby the *Arctic* is converted into *knowledge* with the intention of *creating value*. While in the first instance internal practices render embodied knowledge explicit, in the second, technical systems redistribute calculative capacities from humans to machines (Knox et al. 2007).[1] Internal practices refer also to the way indicators and other practical data are mobilized through material and digital forms of knowledge and its deployment. These include reports, memos, scenarios, PowerPoint slides, and interaction. Artifactual data represent integrated packages that capture the activity of transforming information into knowledge that purports to have strategic value while its *present-ability* shapes what is transported externally (Bloomfield and Vurdubakis 2002).

By contrast, external practices call attention to the creation of communities of interpretation around abstractive knowledge. This includes forms of accountability aimed at legitimation. Scholars and advisory experts are increasingly forthcoming about their assembly processes,

pointing to the collective nature of their activity whereby they scrutinize each other's work. In the case of nonacademic expertise, assessments constitute emerging forms of privately provided public goods that are not always subject to independent scientific knowledge (McKenna 2006; Pollock and Williams 2010) but nevertheless have their own forms of accountability (Preda 2005). The structure of networking events for example, common among Arctic specialists until COVID-19, entail spatiotemporal features such as the division of the given time into plenary sessions that everyone can attend and parallel sessions that participants must choose among (Wallace n.d.). The allocation of individual and collective discussion through conferencing represents exemplary instances and instruments of future-management (Pollock and Williams 2015). In the case of Arctic hydrocarbon development, key networking events are settings of interdependencies among resource owners, contractors, regulatory and government officials, academics, and journalists. On display is a highly stylized economy of affects where knowledge is concentrated in forms of corporeality (Boyer 2005) that are central for the staging of verification and for circulating a repertoire of technical terms, acronyms, nonverbal signs, and other "judgment devices" that generate value (Karpik 2010), together with the contingency of this aim.

Thus, internal and external forms of mobilizing and performing mark the instantiation of new spaces of accumulation as well as a particular cultural formation for establishing the conditions of site-specific Arctic operations. By framing these spaces of value-shaping phenomena abstractively, we create dialogue on networked environmental effects and draw attention to the various infrastructures through which resources and representations are produced and circulated. Mapping the heterogenous complexes through which the Arctic is taking shape offers insight into how social adaptations to environmental effects unfold through complex social configurations perpetually constructed through assembly and predicated upon the confidence supplied by conjoining various types of knowledge (Çalışkan and Callon 2009). This is what I call the *Arctic abstractive* and to whose late industrial forms I now turn.

Arctic Decay

The inevitability of loss and fascination with vulnerability are aesthetic structures that characterize the present-day Arctic. For the historian Sumathi Ramaswamy (2004: 1), these structures are central enough to the condition of the present that decay and deterioration are "good

to think in regard to what it means to be modern." Thus, the circumpolar North is becoming modern by unbecoming what it used to be.

Not so long ago, the Arctic was seen as fixed and fast-frozen with ice and snow that covered the region for most of the year. But today, the Land of the Midnight Sun is undergoing a kind of accelerated decay. The species of Arctic decay are many and often relate to environmental degradation, the most dramatic examples of which are disappearing sea ice and eroding coastlines. Driven by greenhouse gas emissions, the Arctic is heating up twice as fast as the rest of the planet. In many places, thawing permafrost—the frozen subsoil beneath the ice—is releasing stores of organic carbon, thereby amplifying the concentration of greenhouse gases in the atmosphere. As of this writing, a wave of wildfires is burning across the Siberian Arctic, sustained by all-time record temperatures of 38°C (100°F). These are just a few of the symptoms of climatically induced ecosystem change, a regime shift that is driving further changes through destabilizing feedback loops that threaten to turn the Arctic into an accelerator of global climate change.

But the articulation of Arctic ruin is not limited to physical, biogeochemical, and ecological processes. Crumbling infrastructure, declining security, and concern for a slipping away of culture suggests a more pervasive "endangerment sensibility," which Fernando Vidal and Nélia Dias (2015) associate with a network of concepts, values, and practices that are threatened with destruction along with the techniques aimed at preserving them.

Recently, in Norilsk, Russia's northernmost city, thawing ground caused an oil storage tank to collapse, pouring more than one hundred thousand barrels of diesel fuel into the Ambarnaya River: the largest spill ever to occur in the Russian Arctic (Kormann 2020). In Alaska, because sea ice no longer forms on the coastline, Native residents of Kivalina are fighting to keep their village—perched on land between the sea and a lagoon—from wasting away because of storms and tidal surges. Christine Shearer (2011) notes that Kivalina's destruction reflects a juridico-political process of climate denial, which reflects the same inequalities of power between communities and corporations that underpin processes of ruination in many global contexts (Navaro-Yashin 2012; Gordillo 2014; Dawdy 2016).

The environmental effects of land- and sea-based activity on the part of the region's oil and gas sector are well known. But the ongoing instability of global prices for Arctic oil may also be creating a sense of "ontological insecurity" (Dale, Veland, and Hansen 2019: 368), as defined by the undermining of a sense of identity and community.

Consider the eroding stability of the Russian Far North, where out-migration is turning villages into ghost towns (Heleniak 2010). The depopulation of once prosperous regions, such as the coal mining district of Vorkuta, has left residents without basic services and thrown urban viability into question, a type of deterioration that Elena Nuikina (2014: 10) calls "shrinkage."

Yet loss can also resonate with new possibilities that emerge from decay (Rico 2016). Indeed, for the sociologist Georg Simmel (1959: 261), the process of deterioration does not "sink the work of man into the formlessness of mere matter" but rather creates a new form "entirely meaningful, comprehensible, and differentiated." Liz Koslov (2016: 364), for example, counters the negative associations of coastal retreat to argue that it can be empowering for affected communities, finding in them a "positive potential for the process of giving in and giving up to prove reparative rather than harmful."

What are the politics of representation in this contested terrain? Whose stories are being pressed into service, and to what ends? In acknowledging the melting, off-gassing, buckling, and just plain falling apart throughout the region, scientists and national funding agencies have begun referring to the "New Arctic" (Doel, Wråkberg, and Zeller 2014). The phrase uncomfortably recalls the "New World," enacting a sort of intellectual imperialism that accompanies the renaming of a homeland. At the community level, the peril for local ecologies and people's lives is often expressed within an "everyday vernacular" (Callison 2014: 45) that exposes the gulfs between how Arctic residents experience their environment and how climate change is conveyed on the news. In the words of Mabel Toolie, a Native elder of St. Lawrence Island, Alaska, the Arctic is a place where "the Earth is faster now" (Krupnik and Jolly 2002: 7).

Georges Bataille (1997) observed that while progress is prized and achieved through productive activity, the principles of decay and loss are represented by unproductive expenditures: luxury, mourning, war. What designates unproductive forms is that these activities have no end beyond themselves. In this sense, observers of the New Arctic may be viewed as mourners over an unfolding, irreversible ruin. Bataille (1997: 176) qualifies himself, however, arguing that certain expenditures reflect the economic principle of "balance[d] accounts." One of his key illustrations is the institution of the *Potlach*, understood in terms of loss through the giving of considerable gifts—but with the goal of obligating a rival to return the gifts at a later time *and with interest*.

Similarly, executives, lobbyists, and speculators await the New Arctic with expectation, giving decay itself a sense of intention as envi-

ronmental change stands to do "work" for future accumulation. Here, it is fossil energy and its waste, the latter conceived as an externality, that operate as subsidies for capital. Greenhouse gases have set into motion a thermodynamic feedback mechanism that will grant access to new inputs for energy production in the Arctic, in what Leigh Johnson (2010: 835) has called an "iterative cycle of accumulation by degradation." In a perverse reworking of the neoliberal logic whereby the market seeks opportunity at the doorstep of every loss, firms and nations alike are aiming to turn environmental crisis into economic bonanza.

Hence, Arctic decay can be said to harbor the seed of possibility, whereby what was once inaccessible is now potential. As W. J. T. Mitchell (2001: 172) observes, "nothing falls apart, but things come alive. The modernist anxiety over the collapse of structure is replaced by the panic over the uncontrolled growth of structures." Peter Sloterdijk (1987: 151) has also written about the need "to unlock the positivity of the negative" and thus rethink the usefulness of the unuseful, the productivity of unproductivity, as if aversion and anxiety could be a threshold to other ways of knowing.

Perhaps the modernism of Arctic decay heralds the arrival of a new, properly differentiated structure of meaning. For now, amid the fog of Arctic evapotranspiration looms an answer to the question of what makes narratives of deterioration at once credible and incredible: Arctic decay can be said to represent the latest victory of capitalist modernity. What is no longer fixed and fast-frozen confirms that, following Marx, "all that is solid melts into air."

Arctic Imagery

Public representations of the Arctic often include attention-grabbing visuals of the starving polar bear, melting ice cap, and offshore oil rig to depict Arctic biodiversity, climate change, and resource capture, respectively. While such visuals circulate before millions, seldom do they expand our understanding of the contests over meaning and power that underpin these charismatic images. Through their continual display, the Arctic is registered as a delicate, self-enclosed system threatened by global warming, as well as a sort of early-warning system whose indicators of environmental collapse fan cosmopolitan anxieties at lower latitudes. Such images do not carry the weight of accountability associated with written documents; generally, the identity of their creator is never specified. What they share, though,

is a sensuous quality that serves to mobilize aesthetic experience toward particular ends, often at the expense of acknowledging the lived realities of Arctic inhabitants (but see Shields 2019 for *The Guardian*'s statement on rethinking images of climate change).

Images of this sort are aesthetic abstractions, which researchers increasingly approach as devices that reroute the rational delivery of information through appeals to the senses (Ghosn 2012; Mason 2016; Jazairy et al. 2019). Recent work on the "Anthropocene-aesthetic-capitalist complex of modern visuality" (Mirzoeff 2014: 213) draws attention to the production of a sensory (anti)politics for validating matters of concern, or what Jacques Rancière (2004: 13) calls "the system of *a priori* forms determining what presents itself to sense experience."

One of my favorite visuals in this vein is a photograph of a rainbow descending into an Alaska mountain range, which appears as an inset in a US Geological Survey publication estimating that the Arctic holds 25 percent of the world's undiscovered oil and gas resources (Bird et al. 2008). This two-page fact sheet is one of the most frequently cited sources in academic, government, and media accounts of Arctic hydrocarbon estimates. Accompanying the photograph is the caption: "Overturned sedimentary rocks of the Lisburne Group [a geological formation] under a midnight rainbow." Here, alongside data points like 90 billion barrels of oil and 1,669 trillion cubic feet of natural gas appears a folkloric symbol that, in the Euro-American context, indexes a pot of gold at the end of the rainbow. Hydrocarbon development is thus subliminally framed in terms of a fortune whose discovery relies as much on luck, magic, and greed as it does on probabilistic methods of modeling and analysis.

In their treatment of economic abstractions, Alberto Toscano and Jeff Kinkle (2015: 29) refer to an "ocular-centric discourse" that recodifies and translates perceptions of risk into concepts of progress, a normalizing technique that is post-textual and, to some extent, post-*con*textual. One example they offer is of the energy company British Petroleum, which spent millions on rebranding itself as simply BP—initials that are now said to stand for "Beyond Petroleum," presented beside a yellow-and-green "solar earth" logo. In point of fact, BP's search for biomass-derived alcohol to replace fossil fuel in passenger cars has been "driving worldwide deforestation and the enclosure of millions of hectares of common land" (Toscano and Kinkle 2015: 245), as well as paving the way for a biofuel monoculture.

Aesthetic abstractions have an unmistakable link to the product defense industry, a term David Michaels (2008) uses to describe organizations whose aim is creating scientific doubt, delaying government

regulation, and affecting legal and judicial consciousness, thereby exposing growing numbers of people to potential harm. Christine Shearer (2011) shows with chilling detail the ability of historical and present-day industries to nurture widespread, dogmatic skepticism among segments of the general public, leading to a citizenry that is unconvinced of harm regardless of the weight of scientific evidence. Lobbying groups, energy companies, and other firms involved in producing, refining, or trading fossil fuels underwrite a specialized service sector that wields images in the vision of progress that their clients seek to promote (Mason 2019).

This sensibilization of debate over Arctic hydrocarbon development suggests that more is at stake than the specifics of any technical controversy (Kristoffersen and Langhelle 2017). The views of energy instantiated in five-year plans, promotional materials, and other industry artifacts amount to a visual appropriation of the Far North, which contributes in turn to a shift in popular understandings and policy choices (Bourmistrov et al. 2015; Vik 2017; Wilson, Hansen, and Rowe 2017). Accepting a particular representation of energy development both sets the terms for future discourse and defines the legitimate participants of political debate.

Aesthetic abstractions can also be understood as a sense-making faculty of vast techno-ontological systems. These mediate between ignorance and knowledge in complex ways, at times propagandizing but at other times capturing, assembling, and performing the complexity of the system's various forms. In this way, visualizations work to recursively diagnose systems and their breakdowns, depicting interactions that continually dissolve industrial forms and summon others into being. Thus, they embody key tensions associated with the modern integrated energy system and its transitions. Their growing centrality may, in fact, suggest the rise of a parallel production system, marked by an aesthetics of abstraction that are symptomatic of a detachment from material infrastructures of energy distribution.

Consider the futuristic images of the offshore Shtokman natural gas field, available on the internet, as envisioned by the Russian energy company Gazprom. In 2010, the Barents Sea was designated as a new energy region capable of contributing to EU energy security. In response to growing demands for oil, projected declines in existing supply, and the desire to protect imports from geopolitical conflicts between Russia and Ukraine, ambitious plans were drawn up and marked by images of a dramatically oversized scale.

Such images contrast with the proposed off-loading site, a town called Teriberka located several hours by dirt road from the Russian

city of Murmansk, which I visited in 2010 and found to be eerily similar to a Hollywood horror movie set in the ruined state of its buildings and roads—even as corporate sponsors assured residents that a renovated city would soon spring up. In this way, aesthetic abstractions create eyewitnesses to a version of modernity that exceeds its industrial inception in two respects: first, in spaces of indeterminancy (of what happened, what is happening, what will happen); and second, in a break between the subject and object relationship of witnessed events, where consciousness comes to be determined by the materiality of the image-being.

Increasingly, interactive representations of Arctic data further amplify both emotion and cognition. The digital outputs of GRID Arendal, an environmental communications center based in Norway, exemplify this turn toward multimedia abstraction of datasets that are too complicated to comprehend (Gautier et al. 2009; Schoolmeester et al. 2019). The humanities scholar Heather Houser (2014) has shown that such information visualizations can bring viewers to the point of "infogasm" through an allure of imagery that astonishes while also promising knowledge. This aesthetic register corresponds to a globalized mediascape in which data transparency aligns with misinformation and manipulation. Thus, Rania Ghosn (2012) highlights forms of erasure whereby representations exclude critical environmental conditions even while touting their own transparency. Wonderment at a technological complex bursting off the planet erases links between production and consumption, displacing the inevitable frictions encountered in making things flow.

Arctic Inflection

Across the Arctic, internal and external conditions, forces, and circumstances write and rewrite the history of the region's Indigenous communities. The idea of a close-knit association between Indigeneity and sense of place is today being stretched, looped, and entangled into multi-sited identifications that originate in forced displacements and uprootings as well as the cosmopolitan imagination (Clifford 2013). Contemporary practices of belonging resist simple characterization, as with one-way accounts of the urbanization of rural life. The increased intensity of political practice around identitarian movements may also be seen as a conjuncture of Indigenous heritage and the turn toward corporate social responsibility, producing a kind of post–land-claims capitalist modernity on Native terms. Indigenous

becoming is now associated with new scales and dimensions of value that proliferate in a globally connected, locally inflected postmodernity (Hennessy, Smith, and Hogue 2018; Thisted 2020).

These shifting narratives of belonging involve questions of rights over the extraction of resources against the backdrop of colonial pasts and presents (Overland 2016; Tysiachniouk et al. 2018). For instance, the 2019 offer by US president Donald Trump to buy Greenland highlighted the annual block grant from Denmark in terms of its market value, putting a price on what nations are willing to pay in exchange for military and commercial presence in the Arctic. Similarly, benefit sharing between governments, private companies, and Indigenous peoples frames rights in a context of state ownership authorized to place restrictions on the use, management, and conservation of resources (Sulyandziga 2019; Raymond-Yakoubian et al. 2020). To paraphrase a key informant of mine, why do Alaska Natives not have the same authority over the resources in their territories that the *sheikhs* of Saudi Arabia do?

In this section, I revisit a key social science text written at a previous moment of restructuring in the energy industry to explore abstractions of Arctic Indigenous becoming in the context of rights over resources. In his widely admired *Arctic Politics*, political scientist Oran Young (1992) explains why it is unreasonable to expect the region's Indigenous peoples to return to a traditional life that is based solely on hunting and gathering. It is as if he inverts the trope of Robinson Crusoe—stuck on a deserted island and living like primitive man—to point out that, in the throes of late industrialism, his largely non-Indigenous readers harbor an unexamined commitment to having their Indigenous contemporaries take up the cause of living as such.

Arctic Politics has stood the test of time for its extraordinary attention to detail, relying in its argumentation on the singularity of example. Interwoven, throughout, is thoughtful reflection on the importance of self-governance for Arctic communities and the legacies of colonial violence. Thus, at one point in the book, Young (1992: 58) composes a list of goods and services that today's Arctic Indigenous peoples would be hard-pressed to do without, "from modern homes and television sets to modern education and sewage systems." All of these, Young supposes, entail participation in the cash economy through wage labor. Even if it were possible, Young (1992: 60) suggests a few pages later, returning to pure subsistence "would require a drastic restructuring."

Here, again, Young (1992: 60) reels off another list of consumer necessities to show how Arctic Indigenous peoples remain bound to

capitalism: "snow machines, all-terrain vehicles, pickup trucks, boats with gasoline engines, air transport, and high-powered rifles, along with the fuel and ammunition, heating oil, electricity, communications systems, health care facilities." But he goes on to pose a question that shifts his argument in a different direction: "And who is to say there is anything wrong with this?" (Young 1992: 60) On one reading, this passage presents Young's acceptance of a reality in which Indigenous peoples *could* and likely *should* live as wage laborers. But, on another, its attempt to deconstruct the primitive through a list of purchasable items serves to break the spell of primitive enchantment by substituting the vision of an alienated workforce under commodity capitalism. To borrow from the specialized language of Marxist thought (Sohn-Rethel 1978: 60–67), this is a *real* abstraction whereby a concrete reality is substituted for the abstract (labor-power), thereby enabling abstract determinations to take place in the concrete (as a wage laborer).

Stated less formally, the subsistence fantasy is an ideal whose abstractive work lays the grounds for ongoing colonial expropriation. It does so by abstracting Arctic peoples from modernity and identifying them with the primitivity of "pure subsistence." But, of course, the wage-labor alternative is also an ideal that lays the grounds for further appropriation. It does so by abstracting Arctic peoples from their ancestral right to land, including the minerals beneath the surface, and by identifying them as a workforce whose value consists in the labor they supply. Caught between these rival abstractions, Indigenous peoples in the Arctic are inventing new practices of signification and claim-making to assert their role as full participants in a modernity that must be articulated otherwise.

Overview of the Chapters

This volume is organized around the myriad ways in which abstractions mediate ecological, political, technological, economic, and cultural inversions of value brought about by energy extraction in the Arctic. The chapters that follow examine, in one way or another, the transformation of vulnerability into forms of value, raising questions around how much we as humans can take from nature and who is entitled to define the future of the Arctic. The ordering of the chapters loosely follows an arch of involvement and detachment (Elias 1987) with proximities to a concreteness of politics. While the empirical terrain of this volume is national-circumpolar, the practices of assessing

vulnerability and deliberating over its value are relevant across different environmental systems and approaches to resource management around the globe (Kallis, Kiparsky, and Norgaard 2009; Lakoff 2016).

In "To Melt Away," Cymene Howe introduces the notion of abstractive sensing to grasp affective responses to climate change through the transforming landscapes and soundscapes of Iceland. The hidden destruction of the planet has reverberations in the everyday lives of those who make their homes in and around the Arctic, and sensing dramatic environmental changes proves central to understanding the interrelationship of humans and their contexts in times of technological and industrial acceleration.

Among the phenomenal forms that Howe charts is the death of a polar bear, which provokes outpourings of sentiment that are channeled in various hypermediated directions. These public affects call attention to impending extinction, as vanishing ice results in the disappearance of Arctic animals who rely on it. Dead bears become one way of sensing the diminishing cryosphere. In this way, melt serves as an indicator at various scales, from industrial society's dramatic alteration of the global climate to the individual sense of loss at the disintegration of landscapes that no longer wail with the sounds of glacial calving. Abstraction, here, points to an ominous "age of extreme asymmetry," as material mutations of ice underscore the realization that "humans are not the conductors of meaning" (Morton 2013: 164).

In "The Biggest, the Best, the Most, the Last," Danielle Dinovelli-Lang and Karen Hébert reveal the contradictory ways in which the future of life in Alaska now "hangs in the balance." We see extremes of both scarcity and abundance—the infestation of winter ticks that ravage moose, the resurgence of the endangered otter in numbers that threaten other aquatic animals—that can be attributed to climate change and extraction-related impacts. Meanwhile, the interests of Native Alaskans, scientists, game hunters, and conservationists give rise to official designations of vulnerability whereby novel forms of value cinch up with older resource regimes. Techniques like continuous monitoring bear the imprint of a resource-developmentalist vision for the future of animal populations. In this way, Alaska can be seen as a focal point where historically opposed visions of environmental protection and resource extraction converge in the invocation of nature's imperilment.

Like Howe, Dinovelli-Lang and Hébert employ the language of the extreme to call attention to forms of radical deterioration. For Howe, "extreme" refers to an ontological unraveling as the result of human

development, one whose meanings can no longer be managed through comforting abstractions of prediction and control. For Dinovelli-Lang and Hébert, "extreme" relates to imperatives for resource protection that result in a deepening of administrative control over local livelihoods—with the aim of maximizing value. Both chapters also offer visions of opposition. For Dinovelli-Lang and Hébert, radical deterioration signals both stewardship and exploitation; for Howe, it indexes new forms of understanding along with the tendency of meaning to collapse into disorder. Such extremes, noted Karl Marx (1992: 155), "cannot be mediated, precisely because they are real extremes. Nor do they have any need for mediation for their natures are wholly opposed. They have nothing in common with each other, they have no need for one another, they do not complement one another. The one does not bear within it a longing, a need, and anticipation of the other."

In "Timescaping the Arctic with Real-Time Data," Vidar Hepsø and Elena Parmiggiani consider digital assessments of risk mitigation in the context of oil development in Norwegian Arctic waters. They outline two approaches for assessing risk, computational sensing technologies and simulated models, both of which are capable of translating the complexity of the environment into measurable indicators. Such measures render adverse environmental impacts calculable for Norwegian authorities, research institutions, and commercial fisheries, while at least potentially supporting the developmental visions of the oil industry. Here, epistemological concerns over uncertainty are endowed with regulatory and economic implications.

Hepsø and Parmiggiani's chapter may be read in the context of the environmental management techniques described by Dinovelli-Lang and Hébert, whereby a projection of vulnerability promotes both stewardship and exploitation. Unlike state management in Alaska however, in Norway measures are undertaken by industry in collaboration with state authorities (Knol 2011). In this distinctly Scandinavian context, Hepsø and Parmiggiani suggest that the ideological requirements for participation among the different parties are based, at least in part, on an acceptance of the symbolic abstractions that their favored tools employ.

In "Wild Lands, Remote Edges," Mark Nuttall explores the ways in which geological assessments accumulate and enable judgment about opportunities for aligning natural resource development in remote locations within the global market. Today, extraction of minerals in Greenland is largely artisanal, while oil and gas development remains in the planning stages. Enthusiasm for large-scale extraction is lim-

ited in the face of technical and environmental challenges. Nonetheless, appeals to a global market index the appearance of the economy as external to and independent from Greenland's attempts to supply it with resources. Other scholars have interpreted this free-floating version of the market as one of the "fetishized figurations" (Lee and LiPuma 2002: 193) of collective agency that constitutes the social imaginary of modernity. This market acts in the world, causing events and creating effects as a third-person actor to which individuals respond but with which they do not necessarily identify.

For Nuttall, then, the global market is an abstraction that, following Howe, "represents no one person's unmediated experience (or observation) of the world, and yet [is] often recognized and accepted as real." Howe contrasts abstraction as an operation that produces knowable fragments, taking parts from wholes and rearranging them otherwise, to a practice of abstractive sensing that enacts its opposite. Similarly, Nuttall shows that abstractive sensing combines the enigmatic with the palpable, as with the effects of seismic surveys on narwhal behavior. While strict causation proves elusive, Nuttall notes that Greenlandic hunters are increasingly aware that the narwhal is restless (*katsungaarpoq*) and without peace (*eqqissinngilaq*), frightened as changes to sea ice agitate the environment.

In "Forging Off-World Frontiers," Mia M. Bennett examines China's expansion into the global North through the dynamics of supply and demand for iron ore and steel. As Bennett shows, the twin developments of iron mining across the Arctic and investment in steel-intensive infrastructures meant to provision these spaces constitute a "double frontier." Public and private investors take on huge capital costs as a forward-looking strategy for consolidating market position. Yet, given ongoing price volatility, the risks of investment can and often do lead to financial ruin and environmental degradation. Bennett's argument pushes past core-periphery analysis in showing that the agentive, impersonal global market described above can also function as a stand-in for China itself. Here, the double frontier is a double abstraction.

In their respective chapters, both Nuttall and Dinovelli-Lang and Hébert note the alien objectives of the market that decides which resources to develop on the basis of value maximization. Bennett describes Arctic iron ore being positioned for a generic global market with one important distinction—that this market, including its standards of modernization, transportation, and financialization, is actually the Chinese market. Thus, "the" market for Arctic ore is an abstraction that belies increasing hegemony of a single nation over

manufacturing, development, and capital export of large infrastructure systems.

In "Constructing and Contesting Temporalities in the Mackenzie Gas Project," Carly Dokis reflects on the way that oil companies assemble publics, not by reference to citizenship in a state, but through a possible relation to an emerging object: here, a natural gas pipeline. Her ethnographic research with the Sahtú Dene First Nations people of the present-day Northwest Territories details the biopolitical problem of how to respond to the concerns of specific populations living in the vicinity of disruptive development. There is a dark undercurrent of irony in their status as "necessary participants," which refers to eligibility for decision-making around resource extraction as a result of Canadian land claim agreements.

These scripted interactions resemble the "public-making" practices described by Andrew Barry (2013) in the context of the Baku-Tbilisi-Ceyhan (BTC) pipeline: a public discourse of information, procedures of environmental and social impact assessment, and stakeholder forums. The necessary participants in Barry's study make up a public that does not predate the proposed pipeline but is defined in terms of a fixed distance on either side of the route. Likewise, Dokis demonstrates how Canadian companies aim to contain dialogue within well-defined geographical limits or "baseline" conditions of communities and ecosystems. Yet she also grapples with how spatial limits abstract out from temporalities of concern, including colonial incursions into the lives of Dene people that include policies of assimilation and relocation, abrogation of treaties, and damage wrought by past extractive industries.

In "Material Unconscious of the Earth," Oxana Timofeeva provocatively casts oil development in the Russian Far North in terms of the metaphysical ideal of an eternal return, where energy can neither be created nor destroyed but only transformed. Under the sign of conservation, this ideal gives rationalist justification for bringing the forces of nature, including human nature, under control (see also Rabinbach 1992). Drawing on a heterodox corpus of literary texts and childhood impressions, Timofeeva theorizes late industrial value as the bearer of different natures, "confronted with dual or multiple obligations that are related and equally valued but incongruent" (Fortun 2001: 3).

As being itself is burned up alongside the substances that sustain it, a real opposition between life as value and life as living value loses distinction. In a material sense, modernity is consumed with consuming hydrocarbons with the aim of expanding a global economy. But in an ontological or abstractive sense, the global economy requires not

only burning everything up but doing so for the purpose of transforming it into the money-form.

In "Representation without Resemblance," I examine the way facts are culturally made social through an energy visual type—the graph—whose popularity as an inscription device constitutes a style of aesthetics that celebrates abstractness. Drawing on classical representation as a work of resemblance, I argue that the underlying trait of the graph is transposition whereby assimilation between ideas occurs through distanced reflection. Moreover, by perpetuating hesitation through perception, the graph imposes a new kind of refinement or social habitus of detachment that is associated with designs of the modern energy complex. In this manner, the graph is a material development with a range of viewpoints for facilitating patterns of reflexivity considered essential to the development of commodity energy management. As such, energy graphs are manifestations of a new deregulated stage of energy procurement. Not incidentally, their appearance in Alaska disrupts a process of fixed involvement in the knowledge and emotional economy of hydrocarbon development by rendering politics regressive for market-based extraction. What politicians and economists do with the graph is, of course, susceptible to professional evaluation. But in the cultural process that I describe, the energy graph becomes naturalized as a mode of experience whose abstractness is beyond reproach.

Finally, in his "Afterword: Arctic Abstractions," Michael J. Watts offers a spell-binding journey through a raft of vantage points on the contradictions and possibilities of abstractionist aims. With a hurried step, articulations of the abstraction-extraction interface on social relations (alienation, intellectual fragmentation) and material consequences (labor power, human agency) run headlong into a newly emerging "Digital Arctic"—defined as much by the massive, irreversible phase changes in the material composition of the Arctic Ocean as by the demands for its representation at multiple scales through new systems of satellites, drones, cables, supercomputers, and sensors. As Nicole Starosielski (2015: 17) notes in *The Undersea Network*, distinguishing spaces of digital distribution requires materialities of design and finance by companies invested in conflicting operations of interest. At the center of this new digital ocean—where geo-economic and geostrategic value inheres in its rendering as a calculative, computational domain—is the building of a logistics space for the Anthropocene via a new frontier of accumulation, a "trillion-dollar ocean."

In fact, the Afterword thickens, enlivens, and hurries along my own modest steps toward an introductory framing of abstractive industry.

It may also be considered the first concrete object created in response to the production of this volume. As such, if the chapter by Watts is an indicator of what this volume might inspire in others, then indeed the work (and wait) of authors herein has been justified.

Taken together, these chapters contribute to the social studies of energy and climate by framing the concept of *abstraction* as an insignia of structural effects and the principle of technological exploitation of nature—to treat everything as raw material to be transformed into money. Hence, symbolic practice denies the sphere of material production its autonomy while at the same time rendering it possible for production to be extended to every part of the planet, including the Arctic.

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Notes

1. The STS scholar Antti Silvast has reminded me in personal conversation that such machineries of knowledge production create epistemic subjects that are derivative of machineries or erased altogether.

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