

FORGING

Issue 06

The Society for the Diffusion of Useful Knowledge September 2019



Zackery Hobler, *18133401*, 2018. Archival inkjet print. COURTESY THE ARTIST.

forge (n.)

late 14c., "a smithy," earlier *faverge*, from Latin *fabrica* "workshop, smith's shop," hence also "a trade, an industry;" also "a skillful production, a crafty device," from *faber* "workman in hard materials, smith."

forge (v.)

early 14c., "**to counterfeit**" (a letter, document, etc.), from Old French *forgier* "to forge, work (metal); shape, fashion; build, construct; falsify." "To counterfeit" and "to form by heating in a forge and hammering" is from 14c. in English; later used to mean "issue good money" but came to mean "issue spurious money." "**Make way, move ahead**," of unknown origin, perhaps an alteration of **force** (v.), or from **forge** (n.), via **notion of steady hammering at something**. Originally nautical, in reference to vessels.

The Society for the Diffusion of Useful Knowledge is a serial broadsheet publication produced by the Blackwood Gallery, University of Toronto Mississauga, as part of *The Work of Wind: Air, Land, Sea*, a site-specific exhibition, public program, and publication series designed to expand perspectives on climate change through artistic practices, cultural inquiry, and political mobilization.

The Work of Wind: Air, Land, Sea

Exhibition: 14–23 September 2018
Books: Fall 2018, Fall 2019, Spring 2020
Public Programs: June 2018–September 2019
Broadsheet Series: June 2018–September 2019

The Work of Wind: Air, Land, Sea aims to foster a deeper public awareness of the complex entanglements of ecologies of excess, environmental legacies of colonialism, the financialization of weather, contemporary catastrophism, politics of sustainability, climate justice, and hopeful resilience. It sets out to develop durable visual-cultural literacies and invites publics to create new encounters in the common struggle for a future. The project flows across the city of Mississauga and is distributed locally, nationally, and internationally through a three-volume book series co-published with K. Verlag and *The Society for the Diffusion of Useful Knowledge*, an innovative public program and publishing platform.

The Society for the Diffusion of Useful Knowledge (SDUK)

In order to productively collide with the present crisis, we recognize that ideas cannot be constrained by disciplines. *The Society for the Diffusion of Useful Knowledge* (SDUK) composes and circulates an ecology of knowledge based on the relationship and antagonism of “useful” ideas. The name of this innovative platform is borrowed from a non-profit society founded in London in 1826, focused on publishing inexpensive texts such as the widely read *Penny Magazine* and *The Library of Useful Knowledge*, and aimed at spreading important world knowledge to anyone seeking to self-educate. Both continuing and troubling the origins of the society, the Blackwood Gallery’s SDUK platform brings artists, scientists, activists, and publics into an interdisciplinary, intercultural, intergenerational reassessment of the history of capitalism and colonialism and their environmental legacies in the present.

The **SDUK** broadsheet series brings together contributors from diverse fields in the sciences and humanities, students and faculty from across the University of Toronto Mississauga, community organizations and activists, policy makers and policy agitators, artist researchers and speculative thinkers, all to advance new forms of literacy around climate change discourse.

The Work of Wind: Air, Land, Sea

Curated by Christine Shaw

Presented by the Blackwood Gallery in partnership with the University of Toronto Mississauga, the City of Mississauga, and K. Verlag.
2018–2019



UNIVERSITY OF TORONTO
MISSISSAUGA



MISSISSAUGA



The Society for the Diffusion of Useful Knowledge is developed in collaboration with The Climate Change Project (City of Mississauga, Environment Division).



the
CLIMATE
CHANGE
project

The Work of Wind: Air, Land, Sea is one of the 200 exceptional projects funded in part through the Canada Council for the Arts’ New Chapter program. With this \$35M investment, the Council supports the creation and sharing of the arts in communities across Canada.



Canada Council
for the Arts
Conseil des arts
du Canada
**New
Chapter**
2017 and Beyond

01	GRAFTING	June 2018
02	COMMUTING	August 2018
03	BEARING	March 2019
04	SHORING	May 2019
05	ACCOUNTING	July 2019
06	FORGING	September 2019

Publisher

Blackwood Gallery
University of Toronto Mississauga

Editorial Collective

D.T. Cochrane, Alison Cooley, Fraser
McCallum, Christine Shaw, Joy Xiang

Designer

Matthew Hoffman

Copy Editor

Jeffrey Malecki

Printer

Thistle Printing



Contributors

Bureau of Linguistical Reality,
D.T. Cochrane, Thirza Cuthand,
Phil De Luna, Bonnie Devine, Michael
DiRisio, Orit Halpern, Zackery Hobler,
Sarah Pereux, John Paul Ricco,
Erin Robinsong, Ciara Weber, Wretched
of the Earth Collective, Joy Xiang,
Alize Zorlutuna

Staff

Christine Shaw, Director/Curator
Alison Cooley, Assistant Curator
Fraser McCallum, Project Coordinator
Michael DiRisio, Curatorial Assistant
Emily Cadotte, Educational
Programming Assistant
D.T. Cochrane, Research Associate



Blackwood Gallery

University of Toronto Mississauga
3359 Mississauga Road
Mississauga, ON L5L 1C6
905-828-3789
blackwood.gallery@utoronto.ca
blackwoodgallery.ca

Whose Woods These Are

Zackery Hobler

Fire has a wild and unpredictable capacity to destroy, remake, and renew. In a series of photographs, Zackery Hobler documents conservationists’ efforts to restore landscapes through controlled burns (see cover). Fire has come to be recognized as a crucial part of forest and grassland ecology in many recent conservation practices, against earlier methods that took a strictly preservationist approach to forest management. This latter method prohibited Indigenous nations across Canada from managing their territories through fire stewardship, even as controlled burns have been a documented practice for thousands of years.

Some tree species, like lodgepole pines across the West coast, only release their seeds when triggered by fire. This unusual adaption shows that conventional thought must be unsettled to better understand ecological worlds. Like the fiery and combustive imagery of the *forge*, Hobler’s image asks how transformation can be effected through re-engaging materials and thought processes that have been naturalized or ossified.

How to Read this Broadsheet

This sixth broadsheet in the SDUK series rounds out a sustained engagement with climate change, environmental crisis, and resilience that has taken place across multiple sites in Mississauga throughout 2018–19. Concluding this series, though by no means ceasing the Blackwood’s work on climate justice, this issue reflects on how to reckon with, and move forward, in an age of ecological anxiety and accumulating destruction—with hope, but also with urgency. As in the return of fire to landscape conservation documented in Zackery Hobler’s cover image, **FORGING** looks to artistic, poetic, political, and scientific catalysts to re-enliven suppressed or way-laid knowledges in favour of a more livable future.

Readers may begin by wondering **what futures we inherit, forged out of extractive industries**. Articles by Orit Halpern and Michael DiRisio explore the legacies and contemporary conditions of metals and mining—Halpern untangling the gold industry’s turn towards datafication (p. 10), and DiRisio narrating a social and environmental history of nickel (p. 23). Thirza Cuthand confronts extractivism in an artist project that ties together trauma, uncertainty, and queer and Indigenous futurity (p. 20).

Historically-minded readers may be asking: **What strategies do we have for understanding how past(s) and present(s) may guide future action?** Artist projects in this issue use tactics of observation to see a way forward: from divination at the shores of Lake Ontario in a Turkish coffee reading by Alize Zorlutuna (p. 14); to studies of weather and prayers for collective healing by Erin Robinsong (p. 8); to a meditation on the colonial apparatus of cartography and a call to re-account for territory by Bonnie Devine (p. 6). Joy Xiang narrates a history of debt and climate reparations, advocating for an expansive and relational view of debt (p. 22).

Those itching to take action but skeptical of individualistic approaches to environmental responsibility may be asking **how can collectivity address the urgency of our contemporary environmental moment while accounting for the differential effects of climate change?** An open letter from grassroots collective Wretched of the Earth (p. 4) calls for organizers of contemporary climate justice movements to commit to principles of inclusion, and to recognize established systems of oppression as the foundations for climate crisis. A profile of the Blue Dot

Movement (Weber, p. 25) addresses environmental rights frameworks, while an interview between UTM student Sarah Pereux and Professor John Paul Ricco explores the complexity and necessity of imagining collective futures and afterlives (p. 15).

Those interested in inventive responses to uncertain climate futures might wonder **what new forms of value might assist us in encountering climate breakdown?** Clean-tech engineer Phil De Luna explores promising developments in creating useful fuels from CO₂ emissions (p. 16), while the Bureau of Linguistical Reality (p. 18) propose that we need new terminology—language that can robustly account for diverse experiences of climate change—to nurture greater climate dialogue. D.T. Cochrane (p. 24) suggests that we explode the economic notion of value, and instead consider it as a function of power and social relations.

As in every SDUK broadsheet, this publication concludes with profiles of local organizations (p. 26) and a glossary of terms that illuminate, complicate, and enrich its contents. We urge readers to consider these pages as tools—devices to carry into conversation and climate action.

An Open Letter to Extinction Rebellion

Wretched of the Earth



Wretched of the Earth bloc at People's Climate March for Justice and Jobs, London, UK, November 29, 2015. COURTESY WRETCHED OF THE EARTH COLLECTIVE.

This letter was collaboratively written with dozens of aligned groups. As the weeks of action called by Extinction Rebellion were coming to an end in late April 2019, our groups came together to reflect on the narrative, strategies, tactics, and demands of a reinvigorated climate movement in the UK. In this letter we articulate a foundational set of principles and demands that are rooted in justice and which we feel are crucial for the whole movement to consider as we continue constructing a response to the "climate emergency."

Dear Extinction Rebellion,

The emergence of a mass movement like Extinction Rebellion (XR) is an encouraging sign that we have reached a moment of opportunity in which there is both a collective consciousness of the immense

danger ahead of us and a collective will to fight it. A critical mass agrees with the open letter launching XR when it states, "If we continue on our current path, the future for our species is bleak."

At the same time, in order to construct a different future, or even to imagine it, we have to understand what this "path" is, and how we arrived at the world as we know it now. "The Truth" of the ecological crisis is that we did not get here by a sequence of small missteps, but were thrust here by powerful forces that drove the distribution of resources of the entire planet and the structure of our societies. The economic structures that dominate us were brought about by colonial projects whose sole purpose is the pursuit of domination and profit. For centuries, racism, sexism, and classism have been neces-

sary for this system to be upheld, and have shaped the conditions we find ourselves in.

Another truth is that for many, the bleakness is not something of "the future." For those of us who are Indigenous, working-class, Black, Brown, queer, trans, or disabled, the experience of structural violence became part of our birthright. Greta Thunberg calls world leaders to act by reminding them that "Our house is on fire." For many of us, the house has been on fire for a long time: whenever the tide of ecological violence rises, our communities—especially in the Global South—are always first hit. We are the first to face poor air quality, hunger, public health crises, drought, floods, and displacement.

XR says that "The science is clear: It is understood we are facing an unprecedented

global emergency. We are in a life or death situation of our own making. We must act now." You may not realize that when you focus on the science you often look past the fire, and look past us—you look past our histories of struggle, dignity, victory, and resilience. And you look past the vast intergenerational knowledge of unity with nature that our peoples have. Indigenous communities remind us that we are not separate from nature, and that protecting the environment is also protecting ourselves. In order to survive, communities in the Global South continue to lead the visioning and building of new worlds free from the violence of capitalism. We must both centre those experiences and recognize those knowledges here.

Our communities have been on fire for a long time, and these flames are continually fanned by our exclusion and silencing. Without incorporating our experiences, any response to this disaster will fail to change the complex ways in which social, economic, and political systems shape our lives—offering some an easy pass in life and making others pay the cost. In order to envision a future in which we will all be liberated from the root causes of the climate crisis—capitalism, colonialism, extractivism, racism, sexism, classism, ableism, and other systems of oppression—the climate movement must reflect the complex realities of everyone's lives in their narrative.

And this complexity needs to be reflected in the strategies too. Many of us live with the risk of arrest and criminalization. We have to carefully weigh the costs that can be inflicted on us and our communities by a state that is driven to target those who are racialized ahead of those who are white. The strategy of XR, with the primary tactic of being arrested, is a valid one—but it needs to be underlined by an ongoing analysis of privilege as well as the reality of police and state violence. XR participants should be able to use their privilege to risk arrest, while at the same time highlight the racialized nature of policing. Though some of this analysis has started to happen, until it becomes fundamental to XR's organising it is simply not sufficient. To address climate change and its roots in inequity and domination, a diversity and plurality of tactics and communities will be needed to co-create the transformative change necessary.

We commend the energy and enthusiasm XR has brought to the environmental movement, and it brings us hope to see so many people willing to take action. But as we have outlined here, we feel there are key aspects of your approach that need to evolve. This letter calls on XR to do more in the spirit of your principles which state that you "are working to build a movement that is participatory, decentralised, and inclusive." We know that XR has already organized various listening exercises, and acknowledged some of the shortcomings in their approach, so we trust XR and its members will welcome our contribution.

As XR draws this period of actions to a close, we hope our letter presents some useful reflections for what can come next. The list of demands that we present below are not meant to be exhaustive, but to offer a starting point that supports the conversations that are urgently needed.

Wretched of the Earth, together with many other groups, hold the following demands as crucial for a climate justice rebellion:

- **Implement a transition, with justice at its core**, to reduce UK carbon emissions to zero by 2030 as part of its fair share to keep warming below 1.5°C; this includes halting all fracking projects, implementing free transport solutions and decent housing, regulating and democratising corporations, and restoring ecosystems.
- **Pass a Global Green New Deal** to ensure finance and technology for the Global South through international cooperation. Climate justice must include reparations and redistribution; a greener economy in Britain will achieve very little if the government continues to hinder vulnerable countries from doing the same through crippling debt, unfair trade deals, and the export of its own deadly extractive industries. This Green New Deal would also include an end to the arms trade. Wars have been created to serve the interests of corporations—the largest arms deals have delivered oil; whilst the world's largest militaries are the biggest users of petrol.
- **Hold transnational corporations accountable** by creating a system that regulates them and stops them from practicing global destruction. This would include getting rid of many existing trade and investment agreements that enshrine the will of these transnational corporations.
- **Take the planet off the stock market** by restructuring the financial sector to make it transparent, democratized, and sustainable, while disincentivizing investment in extractive industries and subsidizing renewable energy programmes, ecological justice, and regeneration programmes.
- **End the hostile environment** of walls and fences, detention centres and prisons that are used against racialized, migrant, and refugee communities. Instead, the UK should acknowledge its historic and current responsibilities for driving the displacement of peoples and communities and honour its obligation to them.
- **Guarantee flourishing communities both in the Global North and the Global South** in which everyone has *the right* to free education, an adequate income whether in or out of work, universal healthcare including support for mental well-being, affordable transpor-

tion, affordable and healthy food, dignified employment and housing, meaningful political participation, a transformative justice system, gender and sexuality freedoms, and, for disabled and older people, to live independently in the community.

The fight for climate justice is the fight of our lives, and we need to do it right. We share this reflection from a place of love and solidarity, from groups and networks working with frontline communities, united in the spirit of building a climate justice movement that does not make the poorest in the rich countries pay the price for tackling the climate crisis, and refuses to sacrifice the people of the Global South to protect the citizens of the Global North. It is crucial that we remain accountable to our communities, and all those who don't have access to the centres of power. Without this accountability, the call for climate justice is empty.

The Wretched of the Earth

Argentina Solidarity Campaign
Black Lives Matter UK
BP or not BP
Bolivian Platform on Climate Change
Bristol Rising Tide
Campaign Against the Arms Trade
Coal Action Network
Concrete Action
Decolonising Environmentalism
Decolonising our minds
Disabled People Against the Cuts
Earth in Brackets
Edge Fund
End Deportations
Ende Gelände
GAIA – Global Alliance for Incinerator Alternatives
Global Forest Coalition
Green Anticapitalist Front
Gentle Radical
Grow Heathrow/transition Heathrow
Hambach Forest occupation
Healing Justice London
Labour Against Racism and Fascism
Lesbians and Gays Support the Migrants
London campaign against police and state violence
London Feminist Antifa
London Latinxs
Marikana Solidarity Campaign
Mental Health Resistance Network
Migrants Connections festival
Migrants Rights Network
Movimiento Jaguar Despierto
Ni Una Menos UK
Ota Benga Alliance for Peace
Our Future Now
People's Climate Network
Race on the Agenda
Redress, South Africa
Reclaim the Power
Science for the People Platform
The Democracy Centre
The Leap
Third World Network
Tripod: Training for Creative Social Action
War on Want

Forging the Land on Paper

Bonnie Devine

There is a way to come to land that disavows the body. The tools of hearing, touch, and smell are not necessarily deployed, nor are feet or hands required in this exploration of country. It is an abstract process and almost entirely imaginary, except for the schematic representations that support and record the gradual disintegration of being and place into an official image and a bureaucratically administered fiction.

The maps in the University of Toronto archive provide the substrate for an exploration without travel, a long trek in the mind, and yield something like knowledge but in the end something not at all like knowledge of the river and the paddle and the lake.

On paper water stretches flat, shallower than the thinnest hide; earth wraps over ridges and under ravines like a drapery of carbon one micron deep. The eye slides over. The mind races past. Congestions of letters give up the names. Here lived the Mississauga. Here mouthed the green river against the breast of the great lake.

Tracts illustrating potential military approaches by competing colonial armies or resistant Indigenous forces are given special attention. Soberly invented campaigns unfold from their surfaces, dispatches to troops tensed along the borders are sent out to the frontier. Here there be dragons. Here a clear unimpeded thoroughfare.

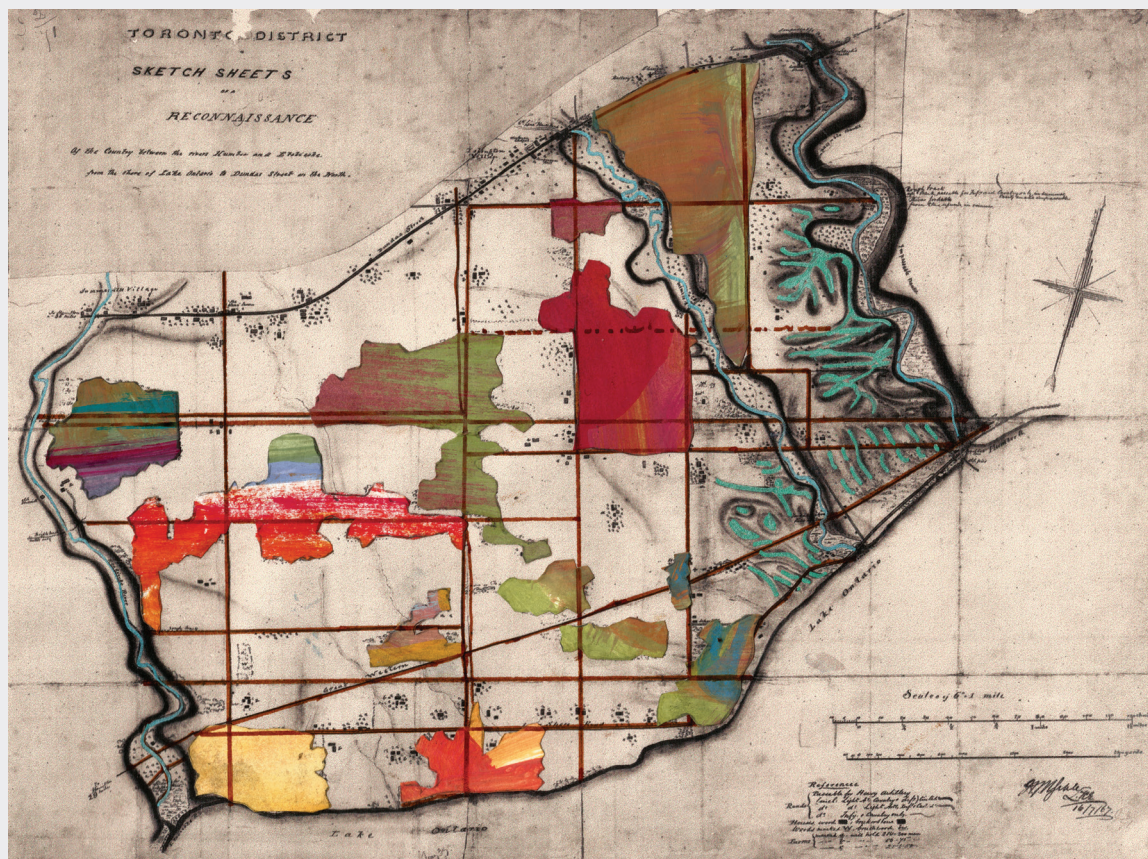
The marches are measured and calculated. Lines drawn in crayon or sometimes careful inks sketch out the fate of the marshland and the distant combatants. The chart's overworked surface obscures the shouts from the field.

In the event, bloodshed was unnecessary. The act of boldly marking up the page was sufficient to simultaneously claim and secure the territory.

We do not know all the approaches to this place, though the map confidently insinuates the opposite. As if the canoe paddle had dipped into



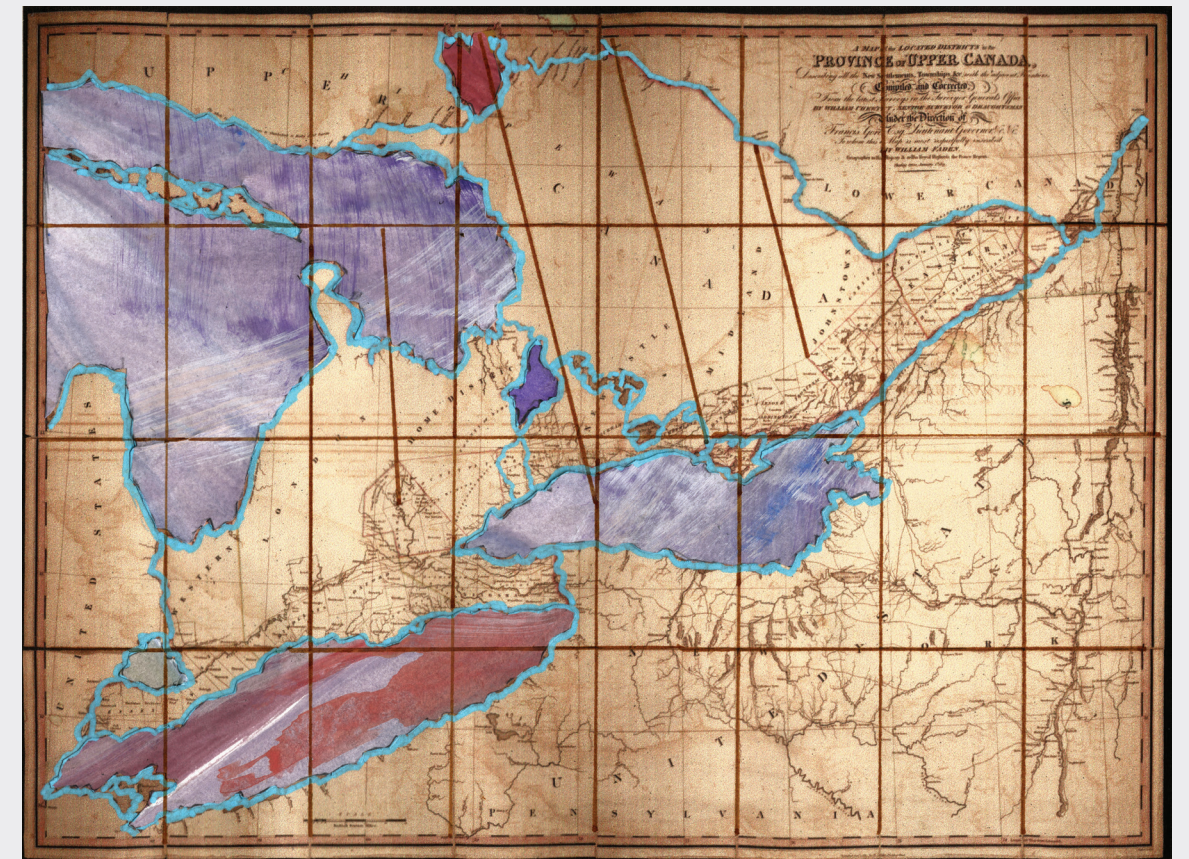
Treaty 22
Collage of acrylic, ink, water-based marker on paper with antique Map of the Mississauga dated 1805



Preparation for Attack
Collage of acrylic, ink, and marker on paper with Toronto District, Sketch Sheets of a Reconnaissance map dated 1867



Algonquin Island
Collage of acrylic, ink, and marker on paper with Toronto Harbour Soundings map dated 1881



Lake Lands
Collage of acrylic and marker on paper with Map of the Located Districts in the Province of Upper Canada dated 1813

the liquid ink, as if the morning sun had glinted off its arcing steel nib.

A hundred years later we still do not know beyond the sounder's figurations what lies beneath.

But the genius of numbers and measurement ensures domestication, and the insult of an island's lithe autonomy is overthrown in the rendering. An artist in downtown Toronto imagines ships and traces the outline of Pier Seventeen. A harbour is born.

A thousand years from now will we understand better the mysterious vestige of the island in its vessel of sweet green water? Will we account for its margins and depths more honestly?

Settlements grow along the edges of the water like hungry feeders at a blossom's lip, whose contour is likewise imagined and drawn.

Stretches of forest become landscape. A tracery of connecting lines, mostly straight, are ruled on the surface. A grid presses lightly against the mountain's face and zig-zags across the pastures of grasslands and shield lands right up to the pole. The pole. Yes. Even this is drawn as the imagined structure securing us in unabating movement.

Like the flower, the lakes and the land are thus taken and named.

The forger's work concluded, the papers bearing these marks lie forsaken yet hoarded in a drawer at the university, the remains of the settlers' lust for dominion. Their rectification is our future work.

All artworks courtesy the artist, 2019. Maps sourced digitally without restriction at the University of Toronto Map and Data Library

Rag Cosmology

Erin Robinsong

Members of Weather

fire weather roof peeling weather house sliding away
weather boat down the road weather Haiyan weather
crop failure weather sliding away or hurtling weather drying up
or filling up with weather falling
ice shelf weather polar vortex weather sandy weather
ice cap melting weather unseasonable disease friendly sandbag
weather crops washing away weather snow
in the Sahara European ski resort closure weather Katrina
bed bug weather coral bleaching weather coffee blight
blackout stressor weather cultural aggression weather
at all costs wealthier weather manmade extreme wealthier
redwoods moving north weather wall weather skull
stormshelter weather wealth weather island nation flattening
or subsuming weather male wealth weather salt in the water
table weather *are cars as unstoppable as spring*

Late Prayer

May our weapons be effective feminine inventions that like life.
May we blow up like weeds, and be medicinal and everywhere.
May the disturbed ground be our pharmacy. May the exhausted
hang out in the beautiful light. May our souls moisten and reveal us.
May our actions be deft as the inhale after a dream of suffocation.
May the oligarchs get enough to eat in their souls.
May we participate in the intelligence we're in.
May we grow into our name. May political harm
be a stench that awakens. May we not be distracted.
Let our joy repeated be power that spreads.
May our wealth be common. May oligarchs come out
of their fortresses and become psychologically well.
May their wealth be returned to the people and places.
May we shift slide rise tilt roll and twist.
May we feel the very large intimacy
And may it assist us.

Italicized text quotes Bernadette Mayer, *Works and Days* (New York: New Directions Publishing, 2016).

"Members of Weather" and "Late Prayer" were first published in Erin Robinsong, *Rag Cosmology* (Toronto: Book*hug Press, 2017). Reprinted with permission of Book*hug Press.

Golden Futures

Orit Halpern



The Malartic Gold Mine in Quebec, August 4, 2017. PHOTO: MAX SYMULESKI.

In the region of Abitibi, in Northern Quebec, lies the Malartic gold mine. The largest open-pit gold mine in Canada, it is a vast expanse of land. The pit itself is approximately four kilometres wide, and the entire mining field is twenty-three square kilometres. Standing at its edge, one can envision what it might mean to inhabit another planet—for this is an inorganic environment. We may speak of the Earth in metaphors of care, life, and love, but in reality almost all the Earth, beneath the very thin strata of top-soil upon which the biosphere rests, is violently antipathetic to carbon-based life forms. Metals and minerals quickly turn acidic and poisonous when they enter the biosphere. Life-sustaining substances like water and air are the very reagents that facilitate oxidation, turning rocks into agents of acidification and destruction of the biological environment.

We have not, however, like the Greek myth of King Midas, yet learned to curse these

gifts borne from this most valuable metal. It is said that Midas turned his own nourishment into gold, realizing that it was a curse. But in contemporary mining what might appear as something to choke on, mainly the toxicity of mining to life, is eternally deflected through chemistry, logistics, and derivation.

The concept of the chokepoint here takes numerous valences. First, there is the literal choking of life through the accumulation of materials that are toxic to the ecology within which the mine exists, terminally threatening the surrounding ecosystems and potentially inducing a literal stoppage point to life itself, or at least certain forms of life. The second form is the limit to the resource itself, as the gold will inevitably run out. The mine is therefore a mortal creature, and one whose life expectancy is short. The third chokepoint lies in value, and capitalist accumulation. The end of gold induces particular concerns for markets

and for speculation, creating an ongoing hunt for new reserves and a drive to hoard existing resources. Fourth, exploration and extraction are themselves constant chokepoints in the productivity and profitability of the mine. Exploration costs the most, guarantees nothing, and takes time. All these locations of stoppage, slow-down, and accumulation—of life, economy, and resources—gesture to the future present tense of the mine. The mine has many temporalities—geological, technical, financial, and organic—and extraction industries mitigate and use these multiple temporalities, and even jams, to evade the ultimate endpoint: resource depletion and extinction. The mine is thus an assemblage of chokepoints—limits to resources, to sustainability and environmental health, and to logistics—that are averted through a series of technical tricks that manage time and flow to avoid choking on all the waste that mines continually produce.

In the course of this brief essay, I will lay out the different yet deeply entangled strategies by which encounters with terminal market failures and catastrophic environmental events are deferred through a new logic of ubiquitous computing merged with algorithmic capital. Zones. Logistics. Optimization. Datafication. Derivation. These are the steps by which extraction infrastructures avoid choking on their own accumulated detritus of heavy metals and toxins by turning it into leveraged futures and credit-debt swaps. Data and Derivation have become global *computational* strategies to avoid terminal failures of security, ecology, and economy, while also turning the future into a hedged bet on life on Earth orchestrated through our machine systems. In the face of Earthly finitude we turn to informatics overload.

Zones

“Quebec is for mining, what Switzerland is for banking... a free trade zone,” the Malartic geo-engineer in charge of dealing with monitoring hydrology, water acidity, and environmental toxicity confessed to me. There are, indeed, many mines along the Canadian shield, a vast expanse that stretches across Canada up to the Arctic. Millions of years ago a glacier swept out the top levels of the earth, leaving the previously deposited minerals and metals exposed and ripe for the picking. But the picking is no longer quite so ripe. “There is no more easy mining on Earth,” the lead mine reclamation geologist at the site, Dr. Mostafa Benzaazoua, informed me. All metals and energy sources on Earth will be depleted, he predicted, by 2155—even if we account for envisioned improvements in technology. As a result, mining has become about chemistry and derivation. Mining literally uses chemical processes to bind with the ore and remove it from the waste rock. The same is true for most other metals, using different agents—in the case of gold, cyanide—to extract the metal from the rock. When ore deposits were better, other processes such as heat could be used. But in today’s world, all extraction has turned to chemistry. In turn, there is a massive and increasing number of tailings ponds, which are not only toxic but also sites of further “mining” through new chemical and technical processes that might derive more ore or recover other valuable metals and minerals in the waste. All of this must happen within the relatively short time that the concessions last, driving a constant effort to derive more value from the site. The mine works 24/7 every day. No stoppage allowed. At the same time, gold is literally used to ground many credit derivative markets, literally becoming a derivative itself. In the face of potentially destabilizing shortages, we turn to logistics.¹

Logistics

Despite the barren terrain, this mine is also lively. And in our technical age, there are many forms of life. The mine is constantly in action, moving in rhythms that Marx might have labeled “metabolic.” Operating without stop, the mine extracts

55,000 tons of rock per day. This rock is moved, tested, and then separated into ore rock and waste rock. The rock with ore will go to a processing plant that will remove the gold, while the rest is immediately laid to rest in the some twenty square kilometres of tailing ponds that lie behind the installation. The mine is a logistical masterpiece. Vast machines lumber through the space carrying their rocks in stately, well-timed rhythms. These large behemoths are perfectly syncopated through the Caterpillar software platform that tracks their movement, load, and speed, while monitoring their loading, unloading, and maintenance times. Each truck costs three million dollars, each tire is eleven feet high and costs \$42,000 to replace—and each tire lasts only about eight hours of driving. The entire mine has a short life. It is anticipated to only last another fifteen or so years (its entire life will have been twenty-seven years), as the concessions cannot be extended and the ore is running out. It is therefore necessary to optimize every operation. These time scales seem paltry in comparison to the geological formations the mine has unearthed, and the vast new territory it has produced in both time and space.²

Optimization

Mines, I was informed, are no longer seen as stable sites, but rather as time-bound organisms, with life spans and afterlives. Since the 1980s when Canada began requiring some efforts at mine reclamation and environmental clean-up (that ironically timed with the moment that major mining corporations benefited from structural readjustment, neo-liberalism, and expanded operations in the Global South), the design of mines has changed radically.³ Mine design must now take into account both the global supply chain and markets, in real-time, and the life cycles of their localities. As Dr. Benzaazoua explained, mines now must submit proposals for reclamation, and plan for their clean-up when filing their request for a concession in Quebec. Their engineering and design plans from the start already assume their impending death and resurrection, and in this there might arguably be an opportunity—for good or ill—as we can begin to imagine what it means to inhabit a toxic and damaged planet.

Mining companies today thus seek to do everything they can to prolong the lifespan of mines, from turning tailing ponds into new resources for construction materials, to figuring out if waste rock might not yet offer a different mineral or metal that might be extracted. There is a constant search through mining detritus in the hope of turning “waste” into a resource. The process must be constantly optimized in the present and into the future. As a result, the mine, Benzaazoua tells us, is a space “of flows”—of capital, machinery, information, and materials. It is also a space of transformation, about chemically extracting the ore from rock. The process of extracting gold using cyanide leaves its own dangerous residues

that must be carefully managed. This chemistry is literally alchemical, transforming rock into gold—and thereby producing markets.

Over ninety percent of what is mined at Malartic, and globally, will be (re)placed underground, into bank vaults. These standing reserves of unused gold will serve as a hedge bet against more volatile derivative and futures markets. Circulation seemingly capable of subverting or diverting this terminal chokepoint, the finitude of gold in the Earth, to mining activity through speed.

Derivation

The biosphere may be in grave trouble, but it seems we are hedging our bets. The conduct of the mine mirrors the very logic of gold, which has historically always been used to hedge a bet. Even long after the demise of the gold standard and the Bretton Woods accords, gold remains the standard benchmark for security in producing value; gold markets as of 2010 were among the largest debt-hedging markets in the world. It is estimated that the derivative markets are betting on over ten times the annual new mine supply, and by now far more than official reserves. The markets exponentially exceed the reality of production, setting prices and making bets far into the future.⁴ As of 2015, gold markets were considered an extremely important portion of the sovereign debt markets. As the 2008 market crash made evident, there are markets where debts and credit are swapped, betting on futures, potential returns, or even default. Gold markets overshadowed national debt markets, such as the Spanish debt market of the time and that of most nations, and far overshadowed even equity investments and other “hedge” entities like Exxon Mobile and Apple.⁵

Datafication

To achieve this seemingly Sisyphean hedge-bet, we transform space into logistical movements grounded in a quite literal connection between data mining and metal mining. The mine is covered by a network of information-gathering sensors that monitor water, humidity, temperature, winds, atmospheric conditions, geological stability, and topology. The datafication of this space represents the effort to monitor the location of ore, to secure the mine’s structural integrity, and to guard the city within which the mine is located, as well as the boreal forests and many aquifers that are always at risk of coming in contact with the materials, metals, and minerals being removed from the Earth with such speed. The mine’s floor is lined with coring stations that attempt to detect those locations where gold is in abundance—in this case being one ppm, which is to say one ton of rock is dug for one gram of gold. Such low amounts of ore demand constant blasting and excavation to produce anything worth selling. By the end of the mine’s life it will produce 580,000 ounces of gold, and 700,000,000 tons of waste rock.

All the gold, I was told by the mining operatives, that has ever been mined in the world could fill two Olympic swimming pools. There is a constant search for new veins of ore, a search that occurs through the air as well as through core sampling. First airplanes and satellites provide initial information on rock formations, structures, and features that might identify resource fields through electromagnetic surveying, ground-penetrating radar surveys, and often satellite imagery. There are also sensors on the site that monitor and assess every movement and shift of the Earth. So much digging and blasting demands an extensive array of sprinklers that constantly keep the site damp in an effort to control particles and dust from contaminating the air. The mine is unusual for being located within a city, and therefore its immediate impact on human health is of paramount concern. The mine also boasts research stations where geo-engineers attempt, perhaps futilely, to figure out how to guard all this waste rock from water, which will subsequently turn the sulfides and other minerals and metals in the rock into acid. This would have lethal consequences for the surrounding boreal ecosystem.

Among the geo-engineers with whom I spoke, the discourse is medical, and the practices are surgical. The skin of the Earth that has been peeled back is to be covered by a new molt of electronic information, which literally evaluates and manages the membranes between the mine and its world. The mine is a contaminating entity, whose worst effects will simply be contained through the speculations of geo-surveying, the imaginaries of mine reclamation, and the omnipresence of capital.

Speculation

Facing the limits to planetary resources—and maybe life itself—we have turned to ubiquitous computing, geo-sensing, and algorithmic trading. To avoid these

terminal chokepoints of resources and toxins, the mine must conquer the limits of space by deriving value from the future. Derivatives are financial instruments that allow for a certain amount of something (mortgages, minerals, oil, anything) to be traded at some point in the future at an agreed upon price. One can also, for example, bet on the cancellation of an order, or some other event changing the future price of some commodity or security.⁶ Futures derivative markets make a double move. They bet on the change in value of some entity (you can even bet on the weather) between the present to some future point against another change in value of some other entity. But what makes the market interesting is that you can sell your bet *before* the event happens. In doing so, one “hedges” the future. And gold is the longest standing hedge bet. You can pull out when you make money irrespective of what the future might hold.⁷ Time no longer equals money, but rather money derives from bets on relations *between* times. One can swap the debt, for example, on a package of mortgages, or of entire countries, for gold futures, without the homes being sold, or nations paying or defaulting on their loans. You are betting on temporalities of two different markets, looking to bet on fluctuations in price *between* the two markets. The forms of time here are speculative, not predictive. One does not need to calculate the final risk of the action of investment, but only manage the time of the action. Calculable risk has now become just a raw uncertain factor to be managed through algorithmic financial logics that mirror the big data infrastructures of the extraction industries themselves.

Such understandings of time, of course, demand that we inquire about the relationship between derivation and extraction. This logic takes its built form in a discourse of reclamation, optimization, and “sustainability” that now dominates

mining and energy industries. The value of the mine is constantly being transformed through changes in the mine’s function and extractions of value from what before was waste. We are constantly sifting through the detritus of our destruction of the environment in search of increments of changing future values to bet on. What is true of gold, is also true of most other extraction industries, especially oil markets.⁸ We are turning the planet into a derivatives machine.

As future risk transforms into uncertainty through derivation, high technology—and particularly “smart” and “ubiquitous” computing infrastructure—has become the language and practice by which to imagine our future. Instead of looking for utopian answers to our questions regarding the future, we focus on quantitative and algorithmic methods, logistics, and how to move things, not where they end up or measuring the impacts of these actions. We have turned data into gold, and vice versa, not metaphorically, but in practice. The result is the development of forms of financial instrumentation and accounting that no longer (need to) engage with, alienate, or translate extraction from a historical, geological, or biological framework of value. Our planet is now a hedged bet, where finitude in life is converted to surplus information for future speculation.

Uncertainty

This situation may not be hopeful, but it should not lead to despair. We must simply find forms that do not match the vacant speculations of our present. Environmentalists and Indigenous land protectors and human rights activists in Canada right now, for example, are also seeking transformation by attempting to change risk valuations on pipelines and other infrastructure projects by insurance companies, in order to increase the interest rates, and therefore the price of the project to more accurately reflect reality. Increasingly, many of us recognize that transforming the nature, time, and regulation of the bet is the source of a difficult, but possible, alternative future. Despite being seemingly abstract and uncoupled from the present, derivatives also drive human actions.⁹ People build homes, take mortgages, build pipelines, and mines, and subsequently suffer when these markets move. By tying together disparate actions and objects into a single assembled bundle of reallocated risks to trade, derivatives make us more indebted both to each other and to the planet itself, which is often the literal matter of such exchanges.¹⁰ The political and ethical question thus becomes how we might activate this increased indebtedness in new ways that are less amenable to the strict market logic of neo-liberal—and perhaps now neo-extractionary—economics, all of which is algorithmically driven. All futures are bets, and our task now is to open those risk assessments and extractionary hedge bets to the uncertainty that faces all life on Earth.



Wireless infrastructure for sensors and meteorology monitoring. PHOTO: ORIT HALPERN.

This text was first published in *Limn* #10: *Chokepoints* (2018), and online at: <http://planetaryfutures.net/>

- 1 I partook of this experience as part of a research studio course I organized this past August through Concordia University in Montreal, with Pierre-Louis Patoine from Sorbonne Nouvelle 3. This material is taken from visits to Malartic from 2–5 August 2017. Dr. Mostafa Benzaazoua, a mine reclamation expert from the University of Quebec at Abitibi in the Research Institute in Mining and Environment, was our guide and collaborator. I am grateful to his assistance and that of his colleagues in doing this research. On 4 August we were given a tour by the mine staff, whose names are being withheld as a matter of privacy.
- 2 All these numbers were recounted by mine employees on 4 August 2017.

- 3 The holding companies at Malartic Mines are Agnico Eagle and Yamana Gold. YamanaGold is a Toronto-based company that dates from 1980 and has holdings in Brazil, Canada, Honduras, Nicaragua, Chile, and Mexico. Agnico Eagle is an older Canadian firm founded in 1957 that expanded in the 2000s into Finland and Mexico. Both do not trade directly in futures markets, as a result of a market collapse in the early 2000s, but they do sell to banks that then directly use this gold to hedge debt in both central banks and investment banks. See <https://www.agnicoeagle.com> and <http://www.canadianmalartic.com>.
- 4 The difficulty in pricing metals (and oil) as a result of derivatives markets has even led to mines owned by Agnico Eagle to advertise that they do not sell futures. However, while the mine may “guarantee” the price of its

gold, the owners clearly do not—as evidenced by the size of gold derivative and futures markets.

- 5 Dickson Buchanan, “Just How Big is the Gold Market?” 5 August 2015, <https://schiffgold.com/commentaries/just-how-big-is-the-gold-market>. See also Henry Sanderson, “Traders Warn on Gold Liquidity,” *Financial Times*, 18 May 2015, <https://www.ft.com/content/0b68ba36-f3f3-11e4-a9f3-00144feab7de>.
- 6 The result is that the size of the derivatives markets far overshadows the actual world’s gross domestic product, now exceeding it by twenty times. These markets have grown exponentially, by twenty-five percent annually over the last twenty-five years. Randy Martin, “What Difference do Derivatives Make? From the Technical to the Political Conjunction,” *Culture Unbound* 6 (2014): 189–210.

- 7 Melinda Cooper, “Turbulent Worlds: Financial Markets and Environmental Crisis,” *Theory, Culture & Society* 27, no. 2–3 (2010): 167–90.
- 8 Already by 2002 oil markets were the second-largest futures market and one of the largest derivatives markets in the world. “Derivatives and Risk Management in the Petroleum, Natural Gas, and Electricity Industries,” Energy Information Administration, U.S. Department of Energy, Washington, DC, October 2002, https://sites.hks.harvard.edu/hepg/Papers/DOE_Derivatives.risk.manage.electric_10-02.pdf.
- 9 Shiri Pasternak, “Infrastructure and Grounded Authority,” unpublished talk, Concordia University, 11 October 2017.
- 10 Martin, “What Difference do Derivatives Make?” 193.



To avoid immediately killing wildlife, water from the mine must be treated to raise its pH from 2–3 to 5–6. Here, treated water is released into the boreal forest. PHOTO: ORIT HALPERN.

for the waters

Alize Zorlutuna

for the waters (following page) imagines sharing a cup of coffee with the shoreline of Niigani-gichigami (Lake Ontario). Extending a gesture of care to the waters in the form of a Turkish coffee reading for the future. Drawing on symbolic meanings passed down to me through familial lines, the cup speaks to past, present, and future. Reading for, and from, the shoreline, is to read from the place where sky and water and earth meet. Shifts in the shoreline are indicators of larger forces. Reading from this place of relationship between elements, I necessarily consider my own situated relationship to them. To read coffee grounds is to acknowledge the beingness/aliveness/personhood of these elementals, our interlinked relationships with, and responsibilities to them. It is also a gesture of hospitality I only extend to those I wish to build intimacy with, so it is a gesture of love and care—an invitation to closeness.



for the waters Alize Zorlutuna

Underwater *mountain: Obstacle*
A lion in rest at the base
a thickness above the mountain,
heavy.

Deep plummet, phallic incursion: *Obstacle*.
Column arising from depths—A tower maybe.
Cornice washed away by wind,
eroded.
At its base a kind of prehistoric microbial form,
Brainlike,
curling.

So many spirits in the water—teeming with activity

A figure dancing at the *bottom of the cup*,
like dancing at the bottom of the water
Something from *the past*.
Could she be that first one fallen from sky?

Ghosts dance the eternal dance they
Have always danced, unconcerned

giant fish: success

Above them a clearing.
Two filigreed columns ascend
Capital erupting,
scatters dust.

Near the rim—the Future
Birds: The birds are coming in closer
Messengers.
Good news.

A snake: jealously.
Transformation?

At the Lake's edge.
I pour coffee, like greeting an old friend.
A friend who has calmed me for decades.
Horizon blurred where sky and water meet,
our future uncertain.

A density clings to walls.
Small form, outlined where water has run through,
reveals a *bird* in flight.
Huge wingspan in profile.
Messenger.

A body from the waist down—no head
Upper torso: mind, washed by water, maybe wind.

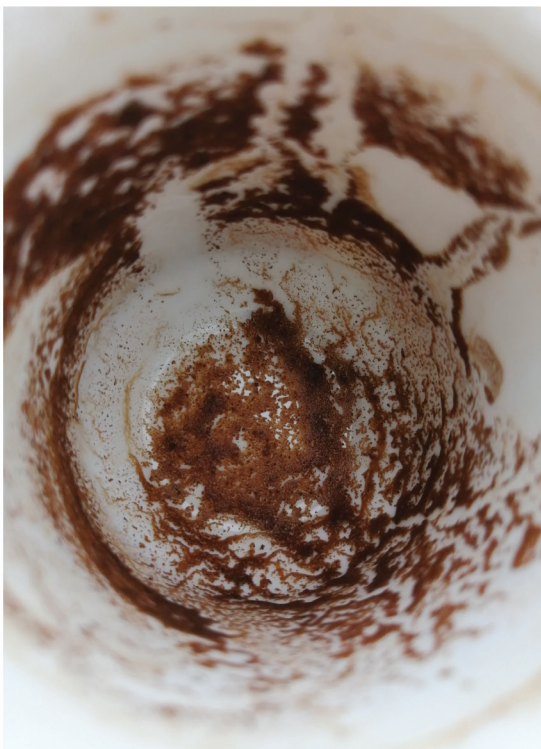
Waves coming in louder.

Headless body floating along the *cup's rim: Future*
Emerges out of the density that has severed it from
its other half.

Swallows in flight dance along the surface of the lake,
arching in and out of the horizon.
Dancing in and out of the cup,
A gift, bearing good news.

Kneeling form
Possibly a Djinni prayer carpet
blowing in wind behind its shoulders
The carpet is the land.
Small figure crawling from the depths,
reaches to touch the Djinni's knee.

Beings emerging from the surface.
Arising from the deep
The *letter T: Someone's name*.
The form of a ghost, like wearing
a sheet.
An eagle: messenger
About to rise in flight.



Two figures,
morphous,
face each other in the darkness.
A *bird*, wings stretched downward,
like hunting prey—a smaller bird at its heels,
Faces a jaguar or other cat head on,
Untrustworthy.

Either in battle or conversation,
It can be hard to tell the difference sometimes.

Italics refer to symbolic meanings
handed down to me by Babanne,
Mubeccel Teyze, and Azmi Zaffer

The Collective Afterlife of Things: An Interview with John Paul Ricco

Sarah Pereux

John Paul Ricco's "The Collective Afterlife of Things" is a long-term research project, and a fourth-year seminar taught by Ricco at the University of Toronto Mississauga. The course explores how artworks contend with the contemporary moment's lack of confidence in the long-term future of social, intellectual, and environmental ecologies. As a prospective student of Professor Ricco, I sat down with him to discuss the ideas behind the course prior to its September 2019 commencement.

What began and continues to fuel your interest in this topic?

"The Collective Afterlife of Things" is a multi-faceted project full of points where art and aesthetics, eco-ethics, the inanimate, and extinction converge. For the past thirty years, all of my work in one way or another has thought about the relationship between art and loss—and how art can be a means of contending with loss, yet in a way that is not redemptive, mitigating, or part of some reclamation project. Instead, I'm interested in art that stages and affirms the undeniable of loss, and that calls for our active and collective participation in sustaining that sense of loss as a major motivating force for action. This project most immediately responds to the current context of climate change, environmental devastation, and political and ideological shifts that have torn at the fabric of social solidarity. Existence is finite, fragile, and therefore needs to be cared for; in my mind, each part of this equation is a collective rather than an individual concern.

Your research uses the term "things" in a very broad sense, including its ability to create a sense of collective familiarity amongst people. Can you define what you mean by "things"? And, why is thinking through these "things" useful for analyzing our current issues?

"Things" encompass material and physical objects, but subjects can also be things when they are seen, used, or cared for in certain ways. Descartes famously divided "things" into *res cogitans* (things that are thinking) and *res extensa* (things that are extended spatially). Since then, continental philosophy has complicated this distinction and rendered it less definitive and stable. In my work and in the work of many others, the *thinking* thing is always an extended thing, and our attention to extended things can also liberate us from an overly anthropocentric perspective. Current issues demand a more eco-cosmological approach, one in which the human, life,

and *bios* are only a tiny fraction of what constitutes the eco-cosmos, and therefore shouldn't be allowed to overly determine our thinking and engagement with the world.¹

How do art, film, and literature function as tools for thinking about the realities of climate shifts, the afterlife, and the apocalypse? Why do unfinished artworks play an important role in this analysis?

In facing extinction, the unfinished artwork is a key example of the modality of the *terminal* in which the work itself—and one's engagement with it—is about acknowledging and affirming the relation between the "ends" of the thing and its incompleteness. If a work of art has loss or extinction "built into it" through a process of incompleteness that calls on us to participate in the withdrawal of the artwork or some part of it, this then is a collective sustaining of the work's terminality—its ongoing un-finishing. Felix Gonzalez-Torres has produced key examples of unfinished artworks, where stacks of sheets of paper or pieces of candy are accompanied by an invitation to take a sheet or piece. Through this participation, the artwork is incessantly moved towards its disappearance, such that the work can be said to exist as much in its collective un-making as in its individual making.

When confronting the Anthropocene and the effects of climate change, the process of decolonization is crucial. How does your background in queer theory influence the way you think about decolonization and the topics of this course?

My work in queer theory has been specifically interested in non-appropriative relations to people, places, and things, and modes of rapport that are not about having, claiming, or occupying in any extended or permanent way. For me, *intimacy* is the name for this relation with the world that does not operate via the will-to-possess. Cruising for sex, and other such hookups, is an example of how one can be in the world in such a way that one can have meaningful exchanges with people, places, and things that do not require laying claim to them. Since art is a practice that relies on making traces, I question if there's a way that art can also participate in this meaningful collective rapport, but in ways that do not claim permanence and that leave hardly a trace. This may involve a commitment to other types of art forms that are not about materiality, but rather involve the immaterial, the momentary, and what might not need to last.

Using the word "collective" suggests a shared understanding of the future, or a shared future reality. But when we talk about "our" future, who are we talking about? How can we account for difference and experiences of oppression or marginalization in imagining a collective future?

If there's a shared sense or understanding of the future that is experienced on a collective level, it's something like a profound and undeniable sense of uncertainty. Yet there is something meaningful here, in that without such implicit or unquestioned assurances about the future, we can't take the future for granted as though it's pre-given—instead, we need to create it.

Just as the future doesn't belong to any one person or group, it also cannot be claimed in the name of any imagined collective totality. I'm interested in the innumerable and incalculable multiplicity of "things": this is a philosophy and a politics based upon the understanding that the world is made up of parts and there's no way of bringing them together into a single whole. Instead, it's about the parceling of the world, in which political questions arise such as: how does this parceling take place; how do things get distributed; and how one can (or cannot) be allowed to partake in them? So in the seminar we read *After Fukushima: The Equivalence of Catastrophes*, in which Jean-Luc Nancy argues that we share a common *inequivalence*.² But what capitalism has done is to institute a logic of *general equivalence* that is upheld by the instrument of money as the measure of value. Nancy says that if we're going to talk about equality, we have to strive for an *equality of inequivalence*. I would say that oppression and marginalization are the means by which that inequivalence is no longer taken to be the only source or condition of equality, but instead is used to institute and perpetuate all kinds of inequity. Rather than following the capitalist idea that we should figure out how to be equivalent to one another, we need to find ways in which your singularity and my singularity can relate to each other without any general measure, except for our shared sense of finitude, uncertainty, and incompleteness.

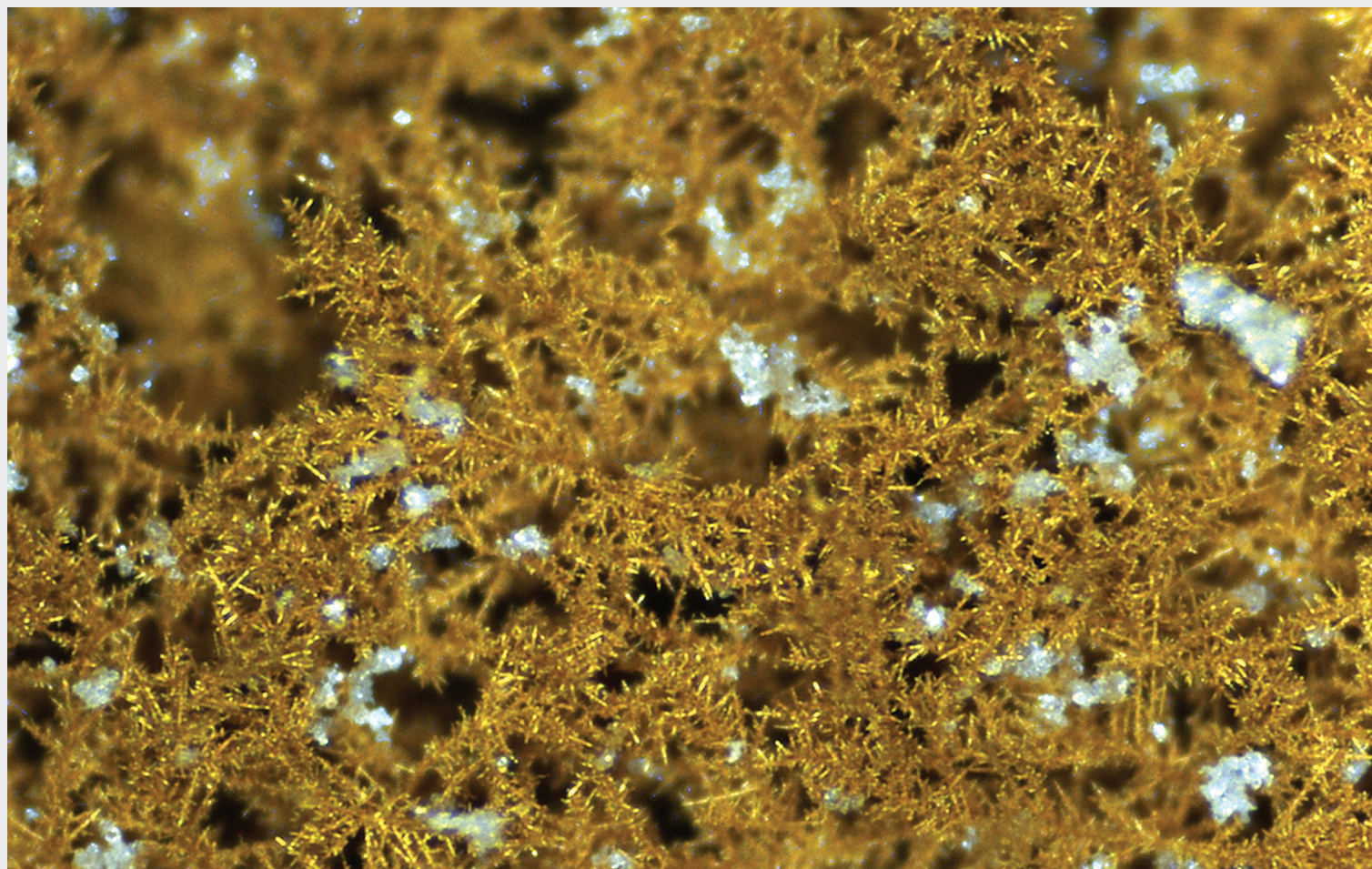
This interview took place on 8 July 2019; it was edited for clarity and length. For a complete edited transcript of the interview, visit www.unbecomingcommunity.wordpress.com

¹ When invoking "bios," Ricco refers to its more limited definition and common usage, one that takes "life" and specifically "human life" to be the irreducible principle of any politics. Here, Ricco is making a distinction between the bio-political and the eco-cosmological.

² Jean-Luc Nancy, *After Fukushima: The Equivalence of Catastrophes* (New York: Fordham University Press, 2015).

Closing the Carbon Loop with Artificial Photosynthesis

Phil De Luna



The surface of a nanostructured gold catalyst, depicting features one-thousand times smaller than a human hair. CO₂ binds to the tips of these gold nanoneedles and gets transformed into syngas, or synthetic fuel. PHOTO: PHIL DE LUNA.

Human activity on the Earth is indisputably demanding more and more energy. As the global population increases rapidly, and quality-of-life measures rise in some developing economies, energy demand continues to grow. Although technological advances can promote longer, fuller, and more productive lives, the corresponding demands on energy production pose a challenge to the urgency of sustainable development.

Energy production fuels global growth and prosperity, but worldwide, the majority of energy continues to be generated from fossil fuel combustion, which contributes to climate change through the production of carbon dioxide (CO₂) emissions. The increase in the atmospheric concentration of CO₂ is causing our world to warm, alongside numerous related and adjacent effects. Extreme weather events are increasing, biodiversity is decreasing, and all across the globe people's everyday lives are being disrupted or uprooted by the changing climate.

Thankfully, renewable energy sources such as solar, wind, hydro, and geothermal can mitigate CO₂ concentrations by generating emissions-free electricity. Fossil fuels, after all, are simply liquefied and pressurized sunlight that has accumulated over millions of years. Renewable energy simply cuts out the middle step: the growth of plants and organic matter that die, decompose, accumulate, and liquefy underground over millennia.

Why, then, aren't we using solar panels everywhere? If there's more than enough energy provided by the sun, why aren't we using it more? As with most things in our world, it all boils down to cost. Photovoltaics have seen massive cost decreases in recent years, with some jurisdictions even pricing solar electricity cheaper than coal.¹ Solar power is particularly affordable in areas with a lot of sunlight, but conversely, it is more expensive in areas that see inconsistent sunlight (such as much of Canada). The mismatch between solar electricity gener-

ation in the middle of the day, and the demand to power your TV to watch Netflix at night, is the largest barrier to fully renewable electricity grids. Intermittency spans not only night and day, but also months and seasons. We won't be heating homes in the winter with solar electricity alone any time soon, nor will we be flying airplanes or moving freight with batteries and solar cells. Renewable energy sources still have much lower energy density (or the amount of energy generated per a given weight or volume) than liquid fossil fuels.

Beyond just energy production, nearly all everyday goods are somehow implicated in fossil fuel production. From the carbon in your phone's plastic components, to the synthetic fibres in your shirt, to the fertilizers used in industrial food production—all of these goods are linked to processes that emit high amounts of CO₂. The comfortable lives many people enjoy is only possible because of our addiction to fossil fuels.

There is another way. Nature's elegant solution is photosynthesis, which synthesizes water, sunlight, and CO₂ into energy, in the form of sugars. However, photosynthesis is less than one percent efficient, and it takes years to grow a tree. By comparison, solar cells are now twenty-two percent efficient in turning sunlight to electricity.² The amount of CO₂ emitted in the atmosphere annually through human activity is vastly larger than what photosynthesis can sequester alone.

In research labs around the world, scientists and engineers are working on a technology called artificial photosynthesis. This process replicates what nature does: it combines energy, CO₂, and water, and then engineers that process to make chemicals and fuels. For example, CO₂ can be electrochemically converted into a variety of hydrocarbons such as ethylene (the precursor to every major consumer plastic), methane (natural gas), and ethanol (a fuel). In doing so, artificial photosynthesis generates usable materials from air pollution. The idea is simple: can we make fuels and chemicals, the building blocks of our society, from the CO₂ in the air rather than from crude oil in the ground? The successful deployment of this process would allow us to convert excess renewable energy into a stable chemical form (as fuels) for long-term seasonal energy storage, thereby solving the problem of intermittency. In addition, fuels made from artificial photosynthesis could integrate into existing and costly energy infrastructure—such as pipelines, tankers, and even your car's gas tank. This is the idea of a truly circular economy, of engineering the carbon cycle, of working towards a renewably powered future.

There are two steps to artificial photosynthesis: capturing CO₂ from the air, and then converting it into something useful. Carbon capture technologies, which address the first step, are beginning to enter the market. Vancouver-based company Carbon Engineering is one leader in this emerging technology. My PhD research was focused on the second step of artificial photosynthesis: converting CO₂ into something useful. I led a team to the finals of the Carbon XPRIZE, a \$20M competition which challenges entrants to capture CO₂ and convert it into a valuable good. Our team, Carbon Electrocatalytic Energy Toronto, focused on generating carbon-based fuels, and base chemicals used in the production of everyday goods.

Artificial photosynthesis is an energy-intensive process. The energy sources powering this process need to be renewable in order for it to close the carbon cycle. At the heart of this technology is a catalyst—a material that combines renewable electricity and CO₂, transforming them into fuels and chemicals. Catalysts come in a variety of materials, like copper, silver, or gold, and are synthesized and engineered in the lab. Catalysts lower the energy required for the electrochemical reaction to occur—they accelerate the process by making it more efficient. Although research is ongoing, catalyst materials are not yet at the point of industrial commercialization. Stability issues (or how long the catalyst can last before being deactivated) continue to pose challenges to researchers. The issue of selectivity, or being able to control which exact fuel or chemical you make from CO₂ (and to make as pure of an output stream as possible), is also a hurdle to overcome.

These are the technical problems that I will be tackling with the Materials for Clean Fuels Challenge Program at the National Research Council. We are committing \$60M over seven years to develop technology that can produce zero-emissions transportation fuels and decarbonize industrial processes. This program is building on my previous collaborative research at the University of Toronto by scaling these technologies from the lab bench into larger devices and systems. This endeavour is just beginning, but the time is right—and urgent—for Canada to mitigate the environmental effects of the petrochemical, oil, and gas sectors by becoming a global leader in these technologies.

¹ International Renewable Energy Agency, "Renewable Power Generation Costs in 2018," May 2019, <https://www.irena.org/publications/2019/May/Renewable-power-generation-costs-in-2018>.

² National Renewable Energy Library, "Best Research-Cell Efficiency Chart," 2019, <https://www.nrel.gov/pv/cell-efficiency.html>.



An electrochemical CO₂ conversion cell. This box has the carbon conversion power of a dozen trees. COURTESY PHIL DE LUNA.

A Dictionary for the Future Present

The Bureau of Linguistical Reality

The Bureau of Linguistical Reality is a public participatory artwork by artists Heidi Quante and Alicia Escott. Established in 2014 out of frustration with the dearth of language that reflected emerging climate realities and shared eco-political anxieties, the project takes up the Linguistic Relativity Hypothesis (also known as the Sapir-Whorf Hypothesis), which holds that the structure of a language affects its speakers' worldviews. Thus acknowledging the social and cognitive power of words, *The Bureau of Linguistical Reality* creates new language as a way to better understand global shifts due to human-made climate change and other anthropogenic events. From 1–9 June 2019, the artists conducted workshops and hosted conversations with individuals and groups throughout Mississauga, inviting participants to coin neologisms expressing their feelings and experiences in the face of a rapidly changing world. Sometimes thwarting existing grammatical and linguistic conventions, the neologisms developed by participants with the *Bureau of Linguistical Reality* also contend with language's hierarchies and inflexibilities: they imagine a world of words shaped differently, and by extension ask for a future shaped otherwise.

Namkalexa

Definition:

Giving a human form, name, or voice to a useful non-living and non-human entity such as a car, digital assistant, tool, or operating system. In particular, there is a compulsion to gender these tools or "assistants" as female.

Usage: "My bank now uses a namkalexa to communicate with me about my account—they call 'her' Penny."

Origin:

Pankaj Aggarwal
University of Toronto Mississauga, June 2019

Namkaran (Hindi naming ceremony) + Alexa (the name given to Amazon's "personal assistant")

Blood Stock

Definition:

A blood stock seemingly offers high returns to investors, but on closer examination of the company's overall business activities, this stock is revealed to have a negative long-term return for the world's people and the planet itself. These stocks often deplete finite natural resources, as extraction processes poison surrounding resources and accelerate the climate crisis. The far-reaching negative impacts of these investments include the depletion of finite global resources as well as climate instability, thereby greatly diminishing returns for future generations and rendering this stock ultimately worthless.

Origin:

Carol Smith
Green Drinks Mississauga, June 2019

Legacy Stock

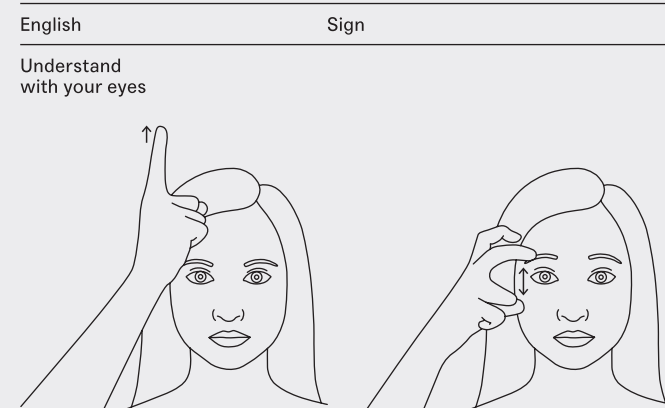
Definition:

A legacy stock is one that considers the well-being of future generations of *homo sapiens*, as well as the wealth of all living beings (animal, plant, and more), essential for a resilient and thriving global ecosystem. Legacy stocks adhere to the highest standards of environmental, social, and governance (ESG) criteria.

Legacy stocks may also provide investments in solutions that address today's human rights and environmental challenges. They provide options for board diversity to reflect the world's diverse many societies and are responsive to shareholder's concerns and values. They contribute to the long-term health of global cultures and environments, and thereby contribute more than they extract from the wealth of future generations.

Origin:

Carol Smith
Green Drinks Mississauga, June 2019



Definition:

A deaf person requires open eyes in order to understand our language, therefore we're inviting you to open your eyes. People can walk around with their eyes open and still not see so much.

Zohaib Qureshi and members of Deaf Muslims of Canada

Prealsthanam

Definition:

Prioritizing economic, governmental, or other systems that were constructed by humans over the earth's innate systems (e.g., carbon or nitrogen cycles). This is often a result of being so embedded in human-constructed systems that you fail to recognize that we as individuals and a species can exchange, recreate, or do away with the systems we have invented, but that we cannot survive without the earth systems we depend on. For example, I can physically give someone bread without the exchange of the human-created system of currency, but I cannot breathe air without sufficient atmospheric oxygen levels that my body has evolved to breathe.

Usage: "'We cannot afford to reduce emissions' is the most prealstham thing I have ever heard!"

Origin:

Prasthanam (Malayalam—South Indian dialect—meaning system) + real

Jiby Mathew

Green Drinks Mississauga, June 2019

F*eezing

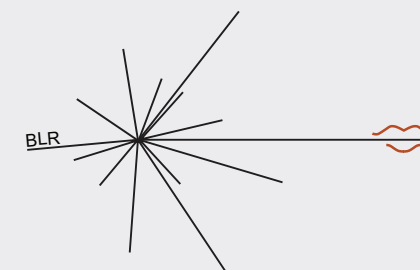
Definition:

Cross-continental climate entanglement. When you are experiencing unusually and unseasonably cold weather in Canada and your closest friends or family members are simultaneously experiencing unusually and extremely hot weather in China. Both parties share a common unease with the local weather that they may attribute to a rapidly changing climate, but their direct experience of this unease is radically different. The experience of f*eezing weather simultaneously becomes both a bond that connects the friends or family members and an experience that highlights their separation.

Origin:

Henry Bing and Ann Wu (伍允安)
University of Toronto Mississauga, June 2019

火 (mandarin: fire) + Freezing (English slang: to be extremely cold) + * keyboard emoji simulating a snowflake



Refurbreck

Definition:

The for-profit (or public relations-inspired) co-opting of land that has been poisoned, and subsequent glossing over any remediation to expedite the (literal) greenwashing of that space so as to reclaim it into a system of for-profit enterprise. Often the tainted land is used for recreational purposes, though sometimes it becomes the foundation for low-income housing or shady for-profit real-estate ventures.

This process removes the "unsightly" quality of publicly visible pollution, blight, and/or degradation, making the land seem desirable and quaint—but beneath the surface it remains toxic and unhealed.

Refurbrecking underscores the difficulties of remediating and restoring land that has been poisoned, as well as our resistance to face problems we cannot solve and look directly at the quagmires we would rather turn away from. Refurbrecking also addresses how our efforts to restore land are often for our own gain and do not allow letting the land heal itself for its own purposes, independent of ours.

Refurbreck is a different experience than when land was once used for military, mining, or other damaging purposes is properly restored and reclaimed for public good, or multi-species use.

Usage: "Paying to ski on Bowler mountain is a total refurbreck."

Origin:

Jiby Mathew, Louis Duong, Mohammed Hadid,
Emily Cadotte
Green Drinks Mississauga, June 2019

From: Refurbish, break, wreck

Urbanmystara/Mystarpolis

Definition:

The longing to see the full spectrum of stars without toxic, human-made illumination that hides the sky and blocks the starlight.

Mystarpolis is a place where *urbanmystara* occurs.

Origin:

Visaree Bradshaw-Coore and members of Ecosource Youth in Action—Credit to New Credit Program,
June 2019

Terms indicated in blue are still in draft form. As an artwork, The Bureau of Linguistical Reality is dedicated to exploring the evolution and creative potential of language. Sometimes the process of finalizing a neologism takes greater time and collaboration than is possible in a single meeting. If you have a background in socially and environmentally responsible investing and are interested in helping to finalize these terms, please contact HQBureau@gmail.com.



Extractions

Thirza Cuthand

This text originates in a performance I made in April 2019. In this work, I disrobe and pour molasses over my body while video is projected behind me of stock footage from extractive industries, including strip mining, pipeline construction, uranium mining, burning of lumber by-products, etc. Halfway through I begin to clean the molasses off my body with baby wipes while images of assisted reproduction are projected.

Against a backdrop of stock footage of extractive industries, I stand against the culture of anti-Indigenous misogyny that goes with them—including “man camps” of pipeline construction workers that endanger Indigenous women, girls, and 2SLGBTQ people,¹ rapist security companies who enact continued cruelty here and abroad,² and the everyday violence of living under a government that supports extractive industries and their assault on Indigenous lands.

I don’t really have solutions, but I know we lived on this land and nurtured Indigenous systems of management for many thousands of years before colonization. How do we make space, imagine, and create Indigenous and queer futures from

this moment of crisis? I sometimes feel hopeful that maybe everything will collapse and we will go back to these old ways of being, like my blood memory will remember how to survive in tough times.

When I lived in Merritt—one of the roughest, most racist, most homophobic, and transphobic redneck towns in BC—there was a large logging industry that kept the town going. There’s really only snapshots I have of that place, only brief memories. Like how the boys in Junior High kept cans and cans of chewing tobacco in their lockers. Like climbing the mountain on weekends for something to do. Like this huge thing that burned in the night.

The huge thing was metal, like a cone. They called it a Beehive Burner, and it was filled with waste wood like chips, sawdust, and small pieces they had no use for. And at least once a week when it was full they would burn it all. It would glow red in the night like the most malevolent force—like something in a Disney cartoon that signified death and anguish. That town gave me so much trauma as an Indigiqueer kid who didn’t even know I was queer yet. The Beehive Burner became a kind of shorthand for the ignorant evil that lived

in those other teenagers. Those logging, ranching, tobacco-chewing teenagers who hated queers and NDNs.

Extractive industries don’t just sculpt our landscapes, they touch our entire society and dictate how we treat each other based on social status, race, proximity to privilege or to resource-rich areas of land. There’s uranium up in northern Saskatchewan, the province where I lived most of my life. I’ve heard rumours that trucks on Saskatchewan highways are transporting radioactive materials without any signs on them warning us. I used to work in a call centre doing market research for various corporations—they never told us exactly who the surveys were for, but I think one was for the big uranium mining company, Cameco. A respondent once told me he’d seen moose standing in uranium tailings ponds up north, which totally disturbed me.

At the same time as I have been coming to terms with the fact that we are all complicit in resource extraction, war profiteering, and land theft, I’m trying to make a baby.

Indigenous kids are treated as a resource in Canada—how we value that resource

tells us who is interested in caring for Indigenous life, and who considers Indigenous kids a mechanism for siphoning off money into white pockets. Indigenous communities are advocating for the protection of kids, by keeping them with their birth families, securing access to clean water, safe housing and healthy food, and connecting them with the traditions their families have practiced. But at the same time Indigenous kids are being extracted from loving Indigenous parents just like the gold and the diamonds and the oil. Foster parents make more money caring for kids than is given to Indigenous parents.³ Poverty is always a good excuse to take our kids, and all kinds of systemic issues set parents up to fail in the eyes of the law. The system that rewards foster parents with big money while refusing to support families before their kids are removed sickens me. It sickens me that pain and trauma are commodified like that, in the name of “care”—that Indigenous children are treated the same way as the oil, uranium, diamonds, trees, potash, and all the other resources that allow for settler Canada to exist.

In the midst of all this, I did a round of fertility drugs and had ten eggs retrieved in

a fertility clinic to try and fertilize in the future. I picked out a donor I trust and like. It would suck if I spent all this money trying to make a baby only to have Child and Family Services come and take it. And then part of me wonders if the apathetic people are right? The ones who say it’s useless having kids now, we’re all gonna die anyway, this world’s gonna die, we’re at the end.

But maybe that’s what those who benefit from this extractive system want us to believe: that this is the end of hope and life and love. That there’s no more future for the humans. For the Indigenous people. Maybe that’s just a ruse so they can suck out every last drop of blood that this planet has, instead of genuinely finding a way to turn it around. Maybe not having babies any more makes it easier to give up, because if you don’t have people, who needs the future to be okay? Then you won’t have to worry so hard. You can just sit in air conditioning and watch Netflix until the power runs out.

I don’t know. I don’t have the answers. I just have ten eggs in a freezer and some nervy feelings about making sure there are still Indigenous people after I die.

Thirza Cuthand, *Extractions* (video and performance stills), 2019. Commissioned for *Re-Joyce: Wieland for a New Millennium*. COURTESY THE ARTIST AND CANADIAN FILMMAKERS DISTRIBUTION CENTRE.

1 Women’s Earth Alliance and Native Youth Sexual Health Network, *Violence on the Land, Violence on our Bodies: Building an Indigenous Response to Environmental Violence*, 2016, <http://landbodydefense.org/uploads/files/VLVBReportToolkit2016.pdf>.
2 Jonathan Watts, “Murder, Rape and Claims of Contamination at a Tanzanian Goldmine,” *The Guardian*, 18 June 2019, <https://www.theguardian.com/environment/2019/jun/18/murder-rape-claims-of-contamination-tanzanian-goldmine>.
3 Brielle Morgan, Katie Hyslop, Cherise Seucharan, and Tracy Sherlock, “What If We Gave Struggling Families as Much Support as Foster Parents?” *The Tyee*, 6 June 2019, <https://thetyee.ca/News/2019/06/06/Struggling-Families-Foster-Parents>.

To Be Repaired

Joy Xiang

Debt isn't new. As a relational bond, it began with trade, or barter, the idea of an exchange, something owed within something shared. Rather than an immediate trade, debt drags time, the knowledge of what's to be owed later, and not forgotten.

Over time, debt—which is not always financial—came to imply either a possession or lack of power, instead of a promise to be kept. What's mine is yours, for a cost.

What's the status of that promise now? Instead of perpetuating exploitative bonds, can debt be reframed as a way of being responsible to each other and the world, especially in times of climate and other crises?

If climate change will be felt in parts of the world least responsible for the crisis and least able to respond to its worst effects—including loss of life—how do we urgently rethink social relations within and outside of debt, capital, and aid?

*

Debt, as a method of control, arises from the twin machineries of colonialism and capitalism: when nature was first given a price on a global scale, it was gouged for resources and fossil fuels.¹ Regimes of land theft and dispossession, slavery, trade, colonization, and nation-building viciously demonstrated that something doesn't come from nothing; wealth accumulated onto itself and made debtors out of those it took from.

When the world was costed out, the Global North came out on top—those who were best able to prey on other nations, polluting freely over the last century to develop infrastructure and build industrial, economic prosperity.² The predation continues through bad-faith lending programs—policies by the World Bank and IMF that loan money to indebted nations at the cost of deep cuts to social programs and removal of basic food subsidy controls. The idea of debt also links to a history of wrongful *in-*

debtedness inextricably bound up in racism, structural or otherwise³—when Fred Moten and Stefano Harney talk about debt, they speak about marginalized people that are always in debt, bad debt, the kind that can never be paid off and was never meant to be.⁴

As early as 2001, the Intergovernmental Panel on Climate Change (IPCC) recognized that countries contributing an estimated third of greenhouse gasses to global warming will suffer seventy-five to eighty percent of its effects, especially small island states in vulnerable locations.⁵ Restorative justice attempts led by affected countries have brought the idea of **climate reparations** to the fore, highlighting **climate debt**.⁶ At the 1991 UN climate conference, a group of small islands proposed, for the first time, financial support for disproportionate climate devastation. Articles by Naomi Klein and Maxine Burkett in 2009 hastened the talk of climate reparations, and that same year 254 organizations signed the declaration “Repay the Climate Debt” as a call-to-action directed at the Copenhagen UN climate conference.

The notion of climate reparations illustrates that wealthy countries and former colonizers are *actually* the ones in debt—far more than could be quantified in monied terms—for over 500 years of resource exploitation and extraction from other countries (resulting in air and water pollution),⁷ labour exploitation, and emissions displacement, essentially off-shoring the production of their energy-intensive products.⁸ Financial compensation and support are necessary as concrete actions, but these cannot be our only mechanisms. We need to forge new relations and systems of exchange between the exploited and exploiter. In providing support, a new system must also move beyond the dangers of a “charity” mindset that reproduces existing, paternalistic power relations and avoids addressing historical and systemic oppression. An ethical-relational change is absolutely vital: one that prioritizes the self-determination of the formerly indebted.

Consulting firm Moody's Analytics, in a recent economic impact assessment, finds that there are “winners and losers” in climate crisis. Moody's describes how Canada, along with a handful of wealthier countries, stands to gain a slight net positive in economic growth by factoring in crop yields, a longer growing season, and “tourism demand”⁹ (all seeming euphemisms

for food availability, and the necessity of migration due to catastrophe). This is the wrong way to frame climate crisis, as if there are impermeable borders around nations and there are winners in an interconnected system during the unpredictability of life at the end.

To adjust the thinking of debt and reparations—to *repair*—requires conceptual and emotional shifts around finance, progress, and the deep wounds of historical (and contemporary) colonialism. Flipping the usual script, a notable example appeared in 2007, when then-Ecuadorian President Rafael Correa attempted to raise \$3.6 billion from the world to prevent drilling into the crude oil beneath the biodiverse rainforest of Yasuni National Park.¹⁰ The funds were to aid the country's lost revenue from the crude oil, valued at about \$7 billion, and prevent the potential release of 410 million metric tons of CO₂ into the atmosphere. (Unfortunately, the plan drew scepticism from wealthier, oil-dependent nations, but the move was precedent-setting).

If debt is a promise, the financialization of that promise doesn't replace meaningful human connection or care, but does mark how deeply co-dependent all systems of life and non-life are in a world that has been thoroughly shaped by the idea of capital.¹¹ As Saima Desai, editor of *Briarpatch*, says succinctly in their most recent issue, “capitalism pours gasoline on the flames of the climate crisis.”¹² The rethinking of debt, then—who owes whom, and for what—represents a rethinking of ethical relations that is crucial to approaching the environmental crisis. To Burkett, reparations are an agreement between “victims and perpetrators [...] that their futures are best served through collaboration.”¹³

Though the case for climate reparations reverses the assumed poles of debtor and creditor, this crisis is not a zero-sum game. Structural policies enacted to address climate change must cease to prioritize overall capital gain or think that a purely economic framework is enough to redress deep historical and current injustices. The timeline of possibility for making and keeping new kinds of promises and relations—ones based not on destruction and competition but mutual accountability and survival—increasingly shrinks into a singularity that means *right now*. When structures of debt dissipate, the freed remnants will draw new matter to bond us.

Demon Copper

Michael DiRisio

For much of the twentieth century, Canada was the world's largest producer of nickel, so much so that the nation's five-cent coin was named after the metal in 1922. Nickel's durability and resistance to corrosion make it a common component of many alloys, with its principle use in stainless steel. While Canadian industries have capitalized on nickel's natural abundance, its history is deeply fraught: early extraction methods were deadly; it requires an energy-intensive mining process (including expansive support industries in cities like Mississauga); and it has come to represent an inherent contradiction at the core of renewable energy technologies.

As a central component of nickel-hydride batteries used in electric cars, and a common feature of renewable energy technologies (solar, hydropower, and wind), there is increasing speculation about nickel's future demand.¹ While renewable energy is crucial to broader emissions-reduction strategies, one can easily overlook the impacts of the extraction and refinement of the metals upon which they rely. Nickel is a poignant example: its mining and refinement necessitates the displacement of large volumes of earth, and results in groundwater contamination and the release of substantial sulphur dioxide emissions. These effects clash with the aims of renewable technologies, and thus haunt their promise of sustainability.

Concerns of adverse impacts and tricky refinement have persisted throughout nickel's history. Among its first documented uses, a copper-nickel ore called *paktong* (or white copper) from Yunnan Province was combined with zinc to create an attractive, workable alloy used for coinage in Ancient China.² While nickel has long been used in its various alloy states, it was not isolated until the 1750s. Early attempts at refinement by medieval Saxon miners proved unsuccessful: deposits of a reddish, copper-like ore appeared promising but were unworkable, and released poisonous fumes during processing. These miners began referring to it as *Kupfer-Nickel*—“Old Nick's Copper,” after a German trickster demon—and nickel was thereby

termed devil- or demon-copper.³ Despite their initial hopes, the Saxons deemed it to be treacherous and too difficult to isolate as a metal—symbolically, “demon copper” may still aptly characterize the many tensions and challenges inherent in nickel's contemporary use.

With the advent of safer smelting methods, nickel's use gradually increased, particularly in stainless steel. Canada's large nickel supply comes primarily from Sudbury, where meteoric deposits are among the world's largest. Demand was already outpacing production by the time Sudbury was incorporated as a town in the 1890s, and mine and smelter employees constituted half the town's residents.⁴ Mining replaced forestry as the primary industry, though the resulting increase in worker's wages was tempered by unsafe working conditions—most notably, the constant inhalation of sulphur dioxide emissions. Mining companies held an outsized influence on the town, and so early reports of these working conditions show no signs of recourse for workers' ill health.⁵ While contemporary nickel mining in Canada often involves tunnels running deep underground, early extraction employed open pits, which are labour-intensive and require massive excavation efforts. Early Sudbury mines also imposed precarious working conditions due to nickel's fluctuating market value, causing many mines to close within a few years of opening.⁶

While a more efficient refining process was discovered in 1892, its use released vast amounts of dangerous compounds into the air above Sudbury—including sulphuric acid gas, a component of acid rain. Vegetation around refinement facilities would wither and die,⁷ and to this day workers face respiratory illnesses such as chronic bronchitis, reduced lung function, and lung, nasal, or sinus cancer.⁸ As these concerns persist, so too has the increased use of nickel in a range of industries—demand for nickel soared with the advent of the automobile industry and hasn't slowed since.

While Canadian nickel extraction and refinement continues to be concentrated in Sudbury, its support industries can be found throughout the GTHA, including manufacturers of compressors, drills, rigs, and other mining equipment in Mississauga, Brampton, and Oakville⁹; as well, Vale, the world's largest nickel producer, has their Base Metals Technology Development headquarters in Mississauga. In recent decades, Vale and others have

vastly increased nickel extraction in Brazil and Indonesia, often creating products for North American and European markets. This includes batteries produced in China with Indonesian nickel, which are then exported to Canada and the U.S. in a neo-colonial process that fractures the links between production and consumption and displaces the negative social and environmental impacts that occur along the way.

Growing demand for electric vehicles and renewables is currently driving nickel extraction, with one source projecting a 1.5 times increase in global production by 2030.¹⁰ This unprecedented growth has sparked concern over the environmental impacts of nickel's production and consumption, both locally and globally. Sudbury's soil has been found to have thirty-five to forty-nine times more lead and nickel than the Canadian average;¹¹ and in Southeast Asia, open-cut nickel mines in New Caledonia, the Philippines, and Indonesia require the removal and destruction of native vegetation, often in highly biodiverse regions.¹²

While concerns for nickel's impacts often focus on its extraction and refinement, some are calling for a more holistic “cradle-to-grave” analysis that accounts for its entire life cycle—an important methodology for dealing with this demon copper. Life-cycle analysis highlights not only the potential for gas, liquid, and solid emissions, but also the environmental impact of the circulation, manufacture, and consumption of products that use nickel, where electricity consumption and waste production emerge as greater issues.¹³

The silver lining to life-cycle analysis is its consideration of reuse and recycling—which is significant, since metals have greater potential for unlimited recycling than any other material.¹⁴ Among metals, nickel has an above-average recycling rate (sixty percent in 2018), and the possibility of higher recovery rates in the future,¹⁵ a testament to the material's un-dead nature; just as a demon never dies, so too does waste never entirely disappear. This recovery is crucial in mitigating the adverse impacts on ecosystems and human health, decreasing the degree to which this metal contrasts with the aims of the renewable technologies it supports; as such, a greater recognition of its physical and material flows will only improve our understanding of technology-oriented responses to our present climate crisis.

1 Colonies were stripped of raw materials and their entire economies run to aid the development of colonizer nations. For a brief history of global debt, and how that sometimes conflates with raw materials, see Jubilee Debt Campaign, “History of Debt.” <https://jubileedebt.org.uk/history-of-debt>.

2 Rikard Warlenius et al., “Reversing the Arrow of Arrears: The Concept of ‘Ecological Debt’ and Its Value for Environmental Justice,” *Global Environmental Change* 30 (2015): 2.

3 See Brentin Mock, “Before Repairing the Climate, We’ll Have to Repair the Impacts of Racism,” *Grist*, 23 May 2014, <https://grist.org/climate-energy/before-repairing-the-climate-well-have-to-repair-the-impacts-of-racism>.

4 Fred Moten and Stefano Harney, “Debt and Study,” *e-flux* 14 (March 2010), <https://www.e-flux.com/journal/14/61305/debt-and-study>.

5 Hurricanes Irma and Maria in 2017, for instance, caused over \$6.9 billion dollars (USD) in damage to the seven most affected Caribbean countries, who face the additional burden of being some of the most indebted nations in the world (with a combined debt of over \$52 billion dollars as of 2018). See CEPAL News, “Small Island Developing States Will Not Achieve the 2030 Agenda,” 13 November 2018, <https://www.cepal.org/en/news/small-island-developing-states-will-not-achieve-2030-agenda-if-they-not-obtain-financing-and>.

6 Maxine Burkett, “Climate Reparations,” *Melbourne Journal of International Law* 10 (2009): 513.

7 Nicola Bullard, “Climate Debt: A Subversive Political Strategy,” *El Transnational Institute*, 21 April 2010, <https://www.tni.org/es/node/10897>.

8 J. Timmons Roberts and Bradley C. Parks, “Ecologically Unequal Exchange, Ecological Debt, and Climate Justice,” *International Journal of Comparative Sociology* 50, no. 3–4 (2009): 392.

9 Pete Evans, “Canada's Economy Would Be Less Hurt by Climate Change than Other Countries, Moody's Says,” *CBC News*, 4 July 2019,

<https://www.cbc.ca/news/business/melbourne-journal-of-international-law-10-2009-513>.

10 Lisa Friedman, “Ecuador Asks World to Pay to Keep Yasuni Oil Underground,” *Scientific American*, 1 May 2012, <https://www.scientificamerican.com/article/ecuador-asks-world-to-pay-to-keep-yasuni-oil-underground.v>

11 Orit Halpern, “Hopeful Resilience,” *e-flux*, 2017, <https://www.e-flux.com/architecture/accumulation/96421/hopeful-resilience>.

12 Saima Desai, “Politics for the Present and for the Future,” *Briarpatch* 48, no. 4 (July/August 2019): 2. <https://briarpatchmagazine.com/articles/view/politics-for-the-present-and-for-the-future>.

13 Burkett, “Climate Reparations,” 526.

Part six of a serial column by a member of *The Society for the Diffusion of Useful Knowledge* team on the physical and material traces of climate change and environmental violence in the region.

1 Denis Sinyakov, “One Metal Will Be Transformed by the Electric Car Boom,” *The Globe and Mail*, 31 October 2017, <https://www.theglobeandmail.com/globe-investor/investment-ideas/nickel-forecast-charges-ahead-on-electric-car-battery-demand/article36784954>.

2 William H. Baldwin, “The Story of Nickel: Part I. How ‘Old Nick’s’ Gnomes Were Outwitted,” *Journal of Chemical Education* 8, no. 9 (1931): 1750.

3 Philip Smith, *Harvest from the Rock: A History of Mining in Ontario* (Toronto: Macmillan of Canada, 1986), 59.

4 Ibid., 99.

5 Ibid., 98–99.

6 Ibid, 99–100.

7 Ibid, 66.

8 Agency for Toxic Substances and Disease Registry, *Public Health Statement for Nickel*, August 2005, <https://www.atsdr.cdc.gov/phs/phs.asp?id=243&tid=44>.

9 Jon Cook, “Mining-supply Industry a Boon for Mississauga Economy,” *Mississauga News*, 23 January 2013, <https://www.mississauga.com/news-story/4242285-mining-supply-industry-a-boon-for-mississauga-economy>.

10 Sinyakov, “One Metal”; see also “The Right to Charge” in Issue 02 of this SDUK broadsheet series.

11 Jamie Kneen, “Focus on Mining Giant Vale at World Social Forum,” *Mining Watch*, 5 January 2010, <https://miningwatch.ca/blog/2010/1/5/focus-mining-giant-vale-world-social-forum>.

12 Kenichi Nakajima et al., “Global Land-use Change Hidden behind Nickel Consumption,” *Science of the Total Environment* 586 (2017): 735, <https://doi.org/10.1016/j.scitotenv.2017.02.049>.

13 Terry Norgate et al., “Assessing the Environmental Impact of Metal Production Processes,” *Journal of Cleaner Production* 15, no. 8 (October 2006): <https://doi.org/10.1016/j.jclepro.2006.06.018>.

14 Ibid.

15 André Månberger and Björn Stenqvist, “Global Metal Flows in the Renewable Energy Transition: Exploring the Effects of Substitutes, Technological Mix and Development,” *Energy Policy* 119 (2018): 230, <https://doi.org/10.1016/j.enpol.2018.04.056>.

What is Value?

D.T. Cochrane

“[T]he ideas of economists, [...] both when they are right and when they are wrong, are more powerful than is commonly understood.”

This assessment was made in 1936 by John Maynard Keynes (widely considered the founder of macroeconomics).¹ The power of economists has increased exponentially since then, as those trained in economics are found in every major corporation and government institution. Further, the scope of ideas and methodologies that comprise mainstream economics has significantly narrowed since Keynes.

With each installation in this series, I have examined a fundamental concept of economics: economy, market, growth, innovation, price. The examination followed the concepts as they circulated among: 1) the theoretical edifice of marginalist economics, 2) the practical operations of powerful commercial entities, and 3) popular economic discourse. I hope to offer insights supporting the suspicion of most critical thinkers that economics is a dangerous ideology masquerading as a science. I have tried to highlight both how these concepts are constructed to serve an ideological function and the effects of their deployment. Overall, these concepts are deeply implicated in the climate crisis and have to be critically analyzed as part of addressing this crisis.

In the opening installment, “What is The Economy?” I noted Margaret Thatcher’s famous quote: There is no such thing as society. However, the idea actually goes back to Jeremy Bentham, the progenitor of utilitarianism, the basis of marginalist value theory.² According to the theory, economies are simply the outcome of individuals calculating what resources to expend to maximally service their selfish desires. In 1898, Thorstein Veblen ridiculed the individualist conception of humans that is the basis of utility value theory:

The hedonistic conception of man [sic] is that of a lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area but leave him intact. He has neither antecedent nor consequent.

He is an isolated, definitive human datum, in stable equilibrium except for the buffets of impinging forces that displace him in one direction or another. [...] When the force of the impact is spent, he comes to rest, a self-contained globule of desire as before.³

As discussed in “What is The Market?” marginalist theory analyzes markets as a mechanism singularly capable of ensuring a just, optimal outcome, in which every individual has maximized their utility. We are left unaffected by our transactions: we remain self-contained globules of desire as before. With social relations ejected from economic theory, history is largely eliminated—there is no basis for questioning unequal purchasing power. We cannot ask where our desires come from. Nor can we consider how our participation in different social collectives affects either our desires or our purchasing power.

The one thing that marginalist value theory gets right is the subjective component of value. However, by treating subjectivity as individual, it developed a theory that bears no relation to actual economic process, as subjectivity is socially constituted.

An under-considered aspect of value—within all value debates—is the process of *evaluation*. Evaluation is best considered as a quasi-objective, inter-subjective process. On the one hand, there is an objective material component to evaluation, and on the other, evaluation involves subjective assessment and decision-making. However, and importantly, the objective and subjective are folded into each other.

Consider diamonds, which are difficult to mine and also popular expressions of wealth, power, love, and commitment. Part of the diamond narrative is based on the perception of the stones as rare. While the sources of natural stones are becoming more remote and costly to access, there is a massive stock of diamonds distributed among consumers. The De Beers diamond cartel has also exploited the durability of diamonds in its slogan “A diamond is forever”; however, that durability also means that, in theory, every diamond ever extracted has the potential to be

recommodified. This poses a huge risk. Should a sizeable second-hand market emerge, it could undermine the prevailing high price of diamonds.

The value assigned to a diamond is not a distinct or complete representation of the objective and subjective facets of diamonds. That value feeds back into the entangled mess comprising the diamond assemblage. Consider the security needed for jewellery stores. Those security measures are a product of the value of diamonds, but also become an aspect of the evaluation of diamonds. The mark-up a jewellery store puts on diamond jewellery must cover the costs of security. At the same time, securing diamonds is part of the popular narrative, as seen in the use of diamond heists as a film trope.

Despite this complication, every diamond, as it moves through the supply chain, will come to bear multiple values emerging from numerous shifting evaluations. All of these values, to quote Marx’s Aristotle—as described in “What is Price?”—are “makeshift for practical purposes.”

Participation in evaluation is not evenly distributed. As described in “What is Innovation?”, our economy is based on the principle of “one dollar, one vote.” The more financial resources an evaluator commands, the greater their ability to determine values. If the aggregate evaluation of the current state of an economy is greater than the evaluation of the previous state of that economy, then the economy is said to have grown, as argued in “What is Growth?”

Value is a function of power. Under capitalism, wealth—and therefore, power—is heavily concentrated among the ownership class. Evaluations done by, and on behalf of, owners are largely informed by their need to preserve and expand their power, which has broad social and ecological consequences. These evaluations, for example, have led to the displacement of Indigenous populations,⁴ the homogenization of crops,⁵ the increased predictability of Hollywood,⁶ the securitization of our data,⁷ and the global climate crisis. Meanwhile, mainstream economic theory makes power disappear with its theorization of atomistic individuals maximizing their utility via market competition.

Evaluation should not be abdicated to markets or owners—and wealth redistribution would redistribute power, which would alter evaluations. There is no given, necessary, or objective basis for value. As such, there can be no true value. Instead, value is what we make it to be, it is a social responsibility. And indeed, what values would democratic evaluation produce?

The Blue Dot Movement: The Fight for a Healthy Environment in Canada

Ciara Weber

As more and more of the Earth’s natural environment is being endangered during our ongoing environmental crisis, many in Canada have begun to fight for environmental rights—especially in light of the fact that Canada does not recognize the right to a healthy environment. Environmental health as a fundamental right is in fact not a new concept, as environmentalist Rachel Carson first suggested it while testifying before President John F. Kennedy’s Scientific Advisory Committee in the early 1960s. Carson’s suggestion was formally articulated in the United Nations’ 1972 Stockholm Declaration, which put forth twenty-six principles linking human rights, economic development, and the environment.¹ In its legal articulation, a healthy environment includes the right to a clean water source, clean air, and safe food. These three principles are pillars for a growing movement that has built on past successes to enshrine the right to a healthy environment in national laws around the world.

Whereas support for the conservation and preservation of natural areas is widely agreed-upon by Canadian governments at all levels, the federal government has no specific reference in the Charter of Rights and Freedoms that individuals can call upon to protect their right to a healthy environment. The Blue Dot Movement is a national campaign striving to amend the Charter to include the right to a clean environment in Canadian law. This campaign would benefit all Canadian citizens, but Blue Dot Movement proponents note its distinct urgency for Indigenous nations who are regularly denied the right to clean water.

The Blue Dot Movement has partnered with numerous organizations to advance their cause. One such partner, Ecojustice, is no stranger to the environmental loopholes of the current laws, as they have fought for environmental rights and responsibilities in the Canadian legal system for the last twenty-five years. Partnering with Ecojustice has empowered Blue Dot to gain professional legal advice that sets them on a proven path to amending the Charter. In suggesting what to ask for, how to speak to MPs or partners, and how to proceed from a legal standpoint, Ecojus-

tice serves as an essential partner to the movement. This legal footing allows for any signatories to the petition to feel comfortable signing and volunteering for the cause, as they know their legal rights to a healthy environment are a top priority. Any individual who signs the petition at events, online, or at Blue Dot community discussions is asked to share their knowledge of the movement with others, thereby gaining more citizen support to advance this legal battle.

With the increasing pace of climate change being manifest in droughts, heatwaves, floods, and forest fires, Blue Dot’s push comes at a key moment of national necessity. The urgency of the crisis is deepened by the fact that Canadian citizens continue to maintain the seventh-largest per-capita ecological footprint in the world.² Blue Dot’s work in Canada draws its legal framework from Norway and Costa Rica, two nations that have already successfully amended their constitutions. At the provincial level across the country, Canada currently does uphold procedural environmental rights: the right to information about decisions impacting the environment, the right to participate in decision-making, and judicial rights in cases where rights have been violated. However, the federal government still excludes substantive rights to clean air, clean water, and safe food. With a strong pairing of procedural and substantive rights, the Blue Dot Movement believes a state-led legal entrenchment of human and environmental health, alongside a population who can monitor and engage with decision-making processes, will ultimately ensure government accountability.

Across Canada, Indigenous communities are disproportionately affected by the lack of federal recognition of environmental rights. Thousands of Indigenous people on reserves nationwide either lack access to clean water, or face continuous boil-water advisories due to contaminants in their water supply.³ Six Nations of the Grand River, just one hour from Mississauga and close to Canada’s most densely populated areas, is a local example among the many Indigenous communities that deal with this issue every day. The right to

water and sanitation is both just and enforceable, yet about four out of five homes on Six Nations reserve territory do not have access to clean water, meaning they must buy it from off-reserve providers.⁴ Blue Dot’s legal struggle aims to change the conditions of water and food insecurity in Canada, which will support Indigenous communities’ ability to call for accountability from the federal government. If the movement proves successful, Canada would be legally bound to ensure the right to safe drinking water, and third parties who endanger water supplies could be held accountable. Blue Dot’s proposed amendment to the Charter would empower Indigenous communities to protect their waters and lands through Canadian law.

By amending the Charter to include the right to a healthy environment, Canada would join over 140 nations, such as Egypt, Iceland, Libya, Norway, and Sweden that enjoy the constitutional liberties to clean air, safe water, fertile soil, and healthy ecosystems.⁵ The Blue Dot Movement is actively informing citizens of their lack of rights and leading them to advocate for a better environment. With over 100,000 petition signatories (including more than 100 MPs and 174 municipalities), the Blue Dot has already garnered major support. Constitutional change is becoming closer to reality with the advancement of party platform commitments to federal environmental rights, and the Liberal party’s resolution to support the federal Environmental Bill of Rights.⁶

In their most recent bid, Blue Dot led a campaign to amend the Canadian Environmental Protection Act, with the right to a healthy environment as one of their 87 recommended Act revisions. The federal government ultimately denied all recommendations and decided not to amend the Act. Blue Dot’s campaign was still a major success, however, as Environment and Climate Change Canada first officially acknowledged that the right to a healthy environment will likely be recognized in its future plans and in the upcoming election.⁷ With this recent success, Blue Dot’s campaign demonstrates growing momentum for advancing environmental protections and human rights in Canada.

Part six of a serial column on the fundamental concepts of commerce and exchange as driving forces that propel climate change.

Issue 01: What is the Economy?
Issue 02: What is the Market?
Issue 03: What is Growth?
Issue 04: What is Innovation?
Issue 05: What is a Price?
Issue 06: What is Value?

Books, 1997 [1936]), 383.

2 Jeremy Bentham, *An Introduction to the Principles of Morals and Legislation* (Kitchener, ON: Batoche Books, 2000 [1781]).

3 Thorstein Veblen, “Why Is Economics Not an Evolutionary Science?” *The Quarterly Journal of Economics* 12, no. 4 (1898): 389–90.

4 See Shiri Pasternak, *Grounded Authority: The Algonquins of Barriere Lake against the State* (Minneapolis: University of Minnesota Press, 2017); Stuart Kirsch, *Mining Capitalism: The Relationship Between Corporations and Their Critics* (Oakland, CA: University of California Press, 2014); Anna Lowenhaupt Tsing, *Friction: An Ethnography of Global Connection* (Princeton, NJ: Princeton University Press, 2005).

5 Etienne Turpin, “Biomonotony,” in *Broken Nature: XXII Triennale Di Milano* (Milan: Electra, 2019).

6 James McMahon, “Is Hollywood a Risky Business? A Political Economic Analysis of Risk and Creativity,” *New Political Economy* 24, no. 4 (2019): 487–509.

7 Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (New York: PublicAffairs, 2019).

1 See David R. Boyd, *The Right to a Healthy Environment: Revitalizing Canada’s Constitution* (Vancouver: UBC Press, 2012).

2 Ibid.

3 While the current government has prioritized removing boil-water advisories, recent data show that few

have been eliminated. Indigenous Services Canada reports that seventy-eight advisories have been rescinded since November 2015, but there remain more than thirty new advisories from the past few years, and over sixty-two long-term advisories that remain outstanding. See Matthew McClearn, “Liberal Cut Reserves’ Boil Advisories, but Water-system

Problems Linger,” *The Globe and Mail*, 28 January 2019, <https://www.theglobeandmail.com/canada/article-ottawa-says-its-on-track-to-end-drinking-water-advisories-on-reserves>.

4 See Maude Barlow, *Boiling Point: Government Neglect, Corporate Abuse, and Canada’s Water Crisis* (Toronto: ECW Press, 2016).

5 Boyd, *The Right to a Healthy Environment*.

6 Personal correspondence with Elizabeth Sarjeant, Ontario Organizer for the Blue Dot Movement, Environmental Rights, 27 May 2019.

7 Ibid.

1 John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (Amherst, NY: Prometheus

Local Useful Knowledge: Resources, Research, Initiatives

The University of Toronto Mississauga's **Evolutionary Ecology Lab** (EvoEco Lab) is directed by Professor Marc Johnson of the Department of Biology. Johnson is the Canadian Research Chair for Urban Environmental Science, and Director of the Centre for Urban Environments, whose vision it is to discover how to make cities healthier for all life. The Lab's work draws on diverse techniques from genetics, evolution, ecology, and chemistry to address broad research questions such as the consequences of asexual plant reproduction, and the effects of evolution on soil ecosystems. The Lab is currently spearheading the GLUE (Global Urban Evolution) Project, which invites research participants to gather samples of the common herbaceous perennial, White Clover, from urban and semi-urban environments. Through its global scope, this project is centered on two questions: Does urbanization cause convergent evolution around the globe? And what are the features of cities and climates that determine whether or not plant populations adapt to urban environments? GLUE Project participants collect local data and upload their findings to contribute toward a large-scale collaborative paper on the topic. Underpinning all of EvoEco Lab's work is the desire to understand the interplay between the evolution and ecology of species interactions, especially plant-animal interactions—including how human activity shapes these relationships.

The **Healthy City Stewardship Centre** (HCSC) is a volunteer-led agency established by the Trillium Health Partners hospital network in 2004. The HCSC works in healthcare centres and Mississauga communities to promote "Quality of Place" as their foundational philosophy. Quality of Place advocates for safety and inclusivity, and supports people in mind, body, and spirit. The HCSC works to encourage optimal health, community safety, equal access to information and health services, sustainable local environments, and community confidence in healthcare. In support of its goals for community health, the Centre has worked to develop or improve public transit, walking trails, bike paths, and sidewalks. The HCSC's expanded vision includes the promotion of neighbourliness among residents, affordable post-secondary education, and youth employment opportunities as key indicators of the holistic emotional, mental, and physical health of individuals and the community at large.

Next Hydrogen is a Mississauga-area manufacturer of water electrolyzers, which provide large-scale clean hydrogen for energy storage. Hydrogen gas acts as an energy storage solution to compensate for the intermittence of green energy technologies. For example, wind power generated during off-peak hours necessitates a storage solution, to ensure power generation is not squandered. Water electrolysis technology is currently the most flexible and tenable solution to store renewable energy on a large, long-term scale. Using excess renewable electricity, electrolyzers split water into hydrogen and oxygen in their respective gaseous states. Hydrogen gas can then be used as a clean fuel for vehicles such as forklifts, trucks, and cars, for industrial processes, or even for electricity generation when demand increases during on-peak hours. Next Hydrogen's water electrolyzers respond rapidly and automatically to sudden changes in power, and have the operational flexibility to make more hydrogen faster when electricity is least expensive. Through their uniquely designed and patented on-site hydrogen generators, Next Hydrogen aims to green industrial processes, transportation systems, and energy systems.

The **Social Planning Council of Peel** (SPCP) is a non-profit organization that promotes social justice through the facilitation and encouragement of citizen participation. Emerging from the Peel Rotary club in 1965, the SPCP addresses social issues through community-based collaborative action, operating on principles of equal access and participation in government decision-making processes. The SPCP's education program analyzes data on Peel's demographics, social issues, and existing social services, considering best practices in addressing inequality, and developing new social change models. The SPCP also offers financial support and organization services for community groups and emerging non-profits; their recent programs have prioritized capacity-building and fiscal sponsorship for these groups. Working with community groups, committees, and task forces, the SPCP bolsters initiatives with a research-driven approach and decades of experience in the non-profit sector.

South Peel Naturalists' Club (SPNC) was founded by fifteen enthusiastic naturalists in 1952, and has since expanded to over 150 active members from Mississauga,

Oakville, and surrounding communities. The Club produces a serial newsletter, and hosts weekly activities, monthly meetings, and over twenty field trips annually—encouraging members to enjoy natural areas and expand their environmental knowledge through shared experiences. Special interest groups enable members to learn about specific topics (such as birding or botany) and participate in conservation initiatives. Through the invitation of guest speakers such as local conservationists, animal rescue agencies, and biologists, club members are invited to contribute their observations and knowledge toward ecological studies and projects. SPNC's focus on community-building through social outings and meetings has proven to generate meaningful and sustained citizen engagement on local issues. Their local approach, however, is a starting point; they note that "stopping the global extinction crisis needs to start at home."

Gitigaan Mashkiki, The Toronto and Region Conservation Authority (TRCA)'s **Medicine Wheel Garden**, is located in the Heart Lake Conservation Park in Brampton. It was first envisioned in 2010 by Anishinaabe Elders as a space to practice the principles of the Sacred Medicine Wheel at an outdoor communal site. The garden honours Earth's seasonal cycles and their accompanying ceremonies, and it expresses artistic traditions that acknowledge the interrelation of all beings. As the garden changes seasonally, its health is charted and maintained accordingly, taking special care to use the previous season's growth as a fertilizer for the next. Native wildflower plots, pollinator-friendly nesting structures, and pollinator plants help to restore the broader ecological health of the Conservation Park. Maintained by TRCA staff, volunteers, members of The Indigenous Network (formerly Peel Aboriginal Network), and Four Colours Drumming Circle (FCDC), the Medicine Wheel Garden hosts a variety of stewardship events throughout the year. Through the leadership of The Indigenous Network and FCDC, Gitigaan Mashkiki provides a space for Anishinaabe teachings and ceremonies to be shared and practiced in public, asserting the resilience and relevance of these practices today.

Biographies

The Bureau of Linguistical Reality was established in 2014 by two artists who were at a total loss for words to describe the emotions and experiences they were having around climate change and other Anthropogenic events. **Alicia Escott** is an interdisciplinary artist whose work addresses issues of species-loss, the process of commercial mediation in late-capitalist society, and individual experiences of loss, heartbreak, and longing in the Anthropocene. Her work connects the speed of change today with the speed of change in the geologic history of the planet. **Heidi Quante** is an artist and founder of the non-profit Creative Catalysts, an organization that brings together experts from diverse disciplines to devise innovative ways to raise awareness, inspire dialogue, and spark action on pressing social and environmental issues.

Thirza Jean Cuthand (b. 1978, Regina SK) makes short experimental videos and films about sexuality, madness, queer identity, love, and Indigeneity, which have screened in festivals and galleries internationally. She completed her BFA majoring in Film/Video at Emily Carr University of Art and Design in 2005, and her MA in Media Production at Ryerson University in 2015. A Whitney Biennial 2019 artist, she has performed at Live At The End Of The Century in Vancouver, the Performatorium in Regina, and 7a*11d in Toronto. She is Plains Cree/Scots, a member of Little Pine First Nation, and resides in Toronto, Canada.

Phil De Luna is Program Director of the Materials for Clean Fuels Challenge Program at the National Research Council Canada, where he leads a seven-year collaborative program on CO₂ conversion and hydrogen technologies. De Luna received his PhD from the University of Toronto, where he was awarded the Governor General's Gold Medal. His research on artificial photosynthesis has been published in *Science* and *Nature*. He was included in *Forbes Magazine's* 2019 Top 30 Under 30 list in the Energy category, was an NRG COSIA Carbon XPRIZE finalist, and serves on the board of directors for Carbon Management Canada.

A member of Serpent River First Nation, Genaabaajing, an Anishinaabe Ojibwa territory on the north shore of Lake Huron, **Bonnie Devine's** work emerges from the storytelling and image-making traditions she witnessed as a child. Her art explores issues of land and environment, treaty and history. She is an artist, curator, writer, and educator. Though formally educated at the Ontario College of Art and Design (OCAD U) and York University, her most enduring learning came from her grandparents, who were trappers on the Canadian Shield. Devine's installation, video, and curatorial projects have been shown in solo and group exhibitions and film festivals across Canada and in the USA, South America, Russia, Europe, and

China, including the Art Gallery of Ontario, the Berlin Film Festival, the National Museum of the American Indian, and Today Art Museum in Beijing.

Dr. Orit Halpern is a Strategic Hire in Interactive Design and Theory and an Associate Professor in the Department of Sociology and Anthropology at Concordia University. Her work bridges the histories of science, computing, and cybernetics with design and art practice. Her recent book *Beautiful Data: A History of Vision and Reason since 1945* (Duke Press, 2015) is a genealogy of interactivity and our contemporary obsessions with "big" data and data visualization. She is now working on two projects: *The Smartness Mandate*, a history and theory of "smartness," environment, and ubiquitous computing; and the tentatively titled *Resilient Hope*, which examines the forms of planetary futures being produced and destroyed through large-scale, high-tech infrastructural projects. Halpern has also published and created works for venues including *The Journal of Visual Culture*, *Public Culture*, *Configurations*, *C-theory*, and ZKM Centre for Art and Media.

Zackery Hobler is a photographer from Southern Ontario whose changing familial structure and frequent moving during childhood led him to develop a thread in his work where he seeks to circumscribe permanence. His most recent work involves a question surrounding optimism and destruction through the burning of grasslands. His work has been displayed in Canada and the USA, most recently in the Art Gallery of Mississauga and Gallery 44 in Toronto. Hobler's interest in photo-books has resulted in the irregularly materializing Toronto Photobook Library, a roving community viewing room aimed at bolstering interest in and discussion on the medium through panels and exploratory programming.

Sarah Pereux is an artist currently living in Toronto. Working primarily in drawing and sculpture, Sarah explores the themes of empathy and the coexistence of humanity and the natural world. She is a fifth-year undergraduate student in the joint Art and Art History program at the University of Toronto Mississauga and Sheridan College. She is also pursuing a certificate in Curatorial Studies at the University of Toronto Mississauga and holds a work-study position at the Blackwood Gallery.

John Paul Ricco is an art historian and queer theorist whose work brings together late-twentieth century and contemporary art and architecture; queer theory on intimacy, pleasure, and eroticism; and continental philosophy. He is Professor in the Department of Visual Studies at the University of Toronto Mississauga, and Associate Director of the Centre for Comparative Literature. He is the author of *The Decision Between Us* (2014) and *The Logic of the Lure* (2003), both published by University of Chicago Press. He is currently

completing two book projects: *The Intimacy of the Outside, Not Beyond*; and *The Collective Afterlife of Things*.

Erin Robinsong is a poet, choreographer, and interdisciplinary artist working with ecological imagination. Her debut collection of poetry, *Rag Cosmology*, won the 2017 A.M. Klein Prize for Poetry and her work has been published in *Lemon Hound*, *Vallum*, *The Capilano Review*, *Counter-Desecration: A Glossary for Writing Within the Anthropocene*, and *Regreen: New Canadian Ecological Poetry*, among others. Collaborative performance works with Hanna Sybille Müller and Andréa de Keijzer include *This ritual is not an accident*; *Facing away from that which is coming*; *revolutions*; and *Polymorphic Microbe Bodies* (forthcoming in 2020). Originally from Cortes Island, Erin lives in Montreal.

Ciara Weber is a recent graduate of the University of Toronto Mississauga, where she earned an undergraduate degree studying criminology, anthropology, and sociology. Learning in a multidisciplinary fashion has strengthened her knowledge of environmentalism, feminism, law, and Indigenous rights. She is an emerging paralegal as she continues her studies at Seneca College, where she hopes to one day work in advocacy for women and children.

Wretched of the Earth is a collective of over a dozen grassroots Indigenous, Black, Brown, and diasporic groups, individuals, and allies acting in solidarity with oppressed communities in the Global South and Indigenous North.

Alize Zorlutuna is an interdisciplinary artist, curator, and writer who works with installation, video, performance, and material culture, to investigate themes concerning identity, queer sexuality, settler-colonial relationships to land, culture, and history, as well as intimacy with the more-than-human and technology. Her work aims to activate interstices where seemingly incommensurate elements intersect. Alize draws on archival as well as practice-based research, and the body and its sensorial capacities are central to her work. She lives and works in Tkaronto.

GLOSSARY

An entangled lexicon for a rapidly changing world

Circular economy: The aspiration for an economic system where inputs (of energy, goods, or services) and outputs are equal, thereby producing no excesses or wastes. Circular economies are premised on creative forms of reuse and recycling (see De Luna, p. 16, and McCallum, *SDUK05*, p. 25), but barriers to their ultimate implementation include unpayable debts (see Xiang, p. 22) and the oversights of economics (see Cochrane, p. 24).

Combustion: A chemical process where a fuel source is combined with oxygen and ignited, producing heat and some form of exhaust. Combustion for energy production—burning coal and natural gas—has profound environmental impacts, and continues to increase despite the so-called turn to post-industrial society (see Diamanti, *SDUK03*, p. 16). On a smaller scale, controlled burns are used in conservation to manage the amount of combustible material in naturalized areas (see Hobler, cover).

Cosmology is the philosophy and science that seeks to understand the structure of the universe. An expansive sphere of thought, cosmology can refer to astronomy and physics, and to mythological, religious, or metaphysical knowledges (see Robinsong, p. 8). A turn toward **eco-cosmology** (as described in Pereux & Ricco, p. 15) considers diverse forms of life in the universe beyond the human, attuned to the interrelations and exchanges between living matter and other entities and things.

Checkpoint: Derived from military vernacular, suggests a congestion or blockage of physical space. By contrast, **loopholes** are conscious or unconscious omissions (often in law), permitting an action normally prohibited. Both terms offer opportunities for exploitation or loss—depending which side you're on. Orit Halpern explains how checkpoints apply to gold mining logistics and supply (p. 10), while the Blue Dot Movement strives to close legal loopholes for environmental protection (Weber, p. 25).

Credit: A relationship where one party trusts another to repay a debt. Despite the complexity of modern finance—where credit enables bets not only on future returns, but on other bets themselves—its purview is nevertheless based in material benchmarks (see Halpern, p. 10), and social relations that determine value (see Cochrane, p. 24). Mississauga's Credit River, known as *Missinihe* to the Mississaugas of the Credit, was named for riverside meeting places where the Mississaugas and French fur traders would trade furs on credit.

Criminalization turns an individual (or an activity) into a criminal (or criminal offense) by making their actions illegal. Criminalization can be subverted by transgressing the law as a form of protest, a common tactic employed by Extinction Rebellion activists. These tactics come at greater risks, however, for

people who are unduly criminalized along lines of race, class, gender, sexuality, and disability (see *Wretched of the Earth*, p. 4).

Debt: A thing owed. Debt can be social, as a debt of gratitude, or financial, as in a monetary debt, though these two categories are often deeply entangled. Debt is marked by imbalances of power (creating the uneasy position of **indebtedness**), which has widespread implications as the wealth of prosperous countries has been extracted at a social and environmental cost to poorer ones (see Xiang, p. 22, and Halpern, p. 10).

Evaluation is a judgement within a given value system: economic, moral, or otherwise (see Cochrane, p. 24). Value systems are held in common, but comprise the choices of individual actors. Evaluation can be achieved through various means, as in Erin Robinsong's characterization of weather phenomena as indicators of value (p. 8), or Alize Zorlutuna's reading of coffee grounds as an evaluation of the present (p. 14).

Exploration commonly refers to travel to new lands, and is thus inseparable from colonial histories of survey and cartography (see Devine, p. 6) and ongoing forms such as mining exploration (see Cochrane, p. 24, DiRisio, p. 23, and Halpern, p. 10). However, colonialism does not exhaust the possibilities latent in exploration—it can be driven by curiosity and interest, directed toward ideas, concepts, emotions, or social relations. What does exploration look like without exploitation?

Fuel is an energy source with some degree of liquidity—that is, an accessible or readily usable product. Whereas fuel colloquially refers to petrochemical products, scientists, engineers, and biologists often think of fuel expansively to include sunlight, water, and wind. Advocates for alternative fuel sources highlight the pollutive effects of burning fossil fuels, while suggesting that harmful byproducts can be replaced with useful ones (see De Luna, p. 16).

The **Global North** and **Global South** designate areas of uneven economic development. The descriptive was coined by the World Bank to update other totalizing designations such as “third world.” These terms can describe states that have historically been negatively impacted by globalization or be used in solidarity with countries who actively resist the globalizing mission. The *Wretched of the Earth* use the latter sense to call for accountability from the Global North (p. 4); while Xiang uses the dichotomy to describe the Global North's predatory lending programs (p. 22).

Gold is a chemical element and precious metal whose value arises from its rarity and capital-intensive mining process (see Halpern, p. 10). Beyond gold's practical uses in jewelry and industrial applications (electronics, medicine, and emerging energy technologies—see De Luna, p. 16), its limited supply means it's stockpiled in reserves to underwrite national central banks, which thereby makes gold crucial to economic theory and policy (see Cochrane, p. 24, and throughout the *SDUK* column series).

Horizon: In a landscape, the apparent line between land or water and sky (see Zorlutuna, p. 14); also, a boundary or separation between spaces (see Devine, p. 6). The **true horizon** is often obstructed by geological formations, forests, and the built environment, barring direct sightlines to an open sky (see Bureau of Linguistical Reality, p. 18). Symbolically, the horizon's breadth and distance have come to denote futurity, hope, attainment, forecasting, warning, foretelling (see Robinsong, p. 8).

Legacy: Something carried over from an earlier time, with multiple and diverse implications: the transmission of knowledge (see Zorlutuna, p. 14), after-effects of environmental destruction (see DiRisio, p. 23; Pereux and Ricco, p. 15), and histories of conflict and settler-colonialism (see Devine, p. 6). Legacy is also often tied to notions of ancestry, kinship, and lineage (see Cuthand, p. 20).

Logistics: Management of the materials and basic functions of any complex operation, commonly in commercial and military applications. Global logistics management organizes the production, circulation, transport, supply, regulation/deregulation, and consumption of commodities worldwide. Increasingly, logistics operations rely on automated computer systems which predict, track, and allocate business resources—from raw materials, to production capacity, to finances (see Halpern, p. 10).

Resource: A material or immaterial asset, commonly a sum of money, raw material, or access to labour (as in **human resources**). Extractive industries require massive reserves of non-renewable resources, such as fossil fuels, metals, and minerals (see Halpern, p. 10; DiRisio, p. 23); and labour from communities that often have little access to wealth generated in the process (see Cuthand, p. 20; Xiang, p. 22).

Sequestration commonly refers to the capture and reuse of carbon dioxide emissions from the atmosphere. Carbon sequestration is an urgent task for green energy technologies (see De Luna, p. 16), but the term can also refer to naturally occurring forms of sequestration threatened by climate change, such as CO₂ released amid thawing permafrost in the Arctic.

Sounding is a process to determine underwater depth, often used to create bathymetric maps of navigable waters (see Devine, p. 6). Sounding historically employed lead weights hung from ropes, but the modern technique of **echo sounding** employs sonar. Sounding originates not from the word “sound” in its aural sense, but from the geographic term denoting an inlet.

Speculation refers to undertaking an investment that holds the risk of loss, but also the potential of sizable gain (see Halpern, p. 10; DiRisio, p. 23; and Cochrane, p. 24 who explore hedging bets on the future values of natural resources). In broader use speculation also includes theorizing, wonder, prediction (see Zorlutuna, p. 14), reflection, and decision-making in the face of uncertainty.