

## CONTENTS

*List of Illustrations* ix

*Prologue: Summoning Collaboration* xi

|                                                                                                                     |     |
|---------------------------------------------------------------------------------------------------------------------|-----|
| Introduction: On Collaboration and Co-Production of Knowledge                                                       | 1   |
| 1 Power Imbalances in Research and Failed Collaborations                                                            | 20  |
| 2 Reciprocity, Trust, and Vulnerability in Research Collaborations                                                  | 45  |
| 3 “Mountains Like Pancakes”: More-than-Human Collaborations, Strategies, and Collective Responses to Climate Events | 61  |
| 4 Topography of Unrecognized Collaborations: Guided Research, Silenced Knowledge                                    | 87  |
| 5 “Trails of Collaboration”: Modeling Knowledge Co-Production and Generative Coupling                               | 113 |
| 6 On More-than-Human Mediation, Epistemic Diplomacy, and Facilitative World-Making                                  | 139 |
| 7 Fostering an Ethics of Listening, Reimagining Research Relations                                                  | 162 |

*Acknowledgments* 183

*Notes* 187

*Glossary* 195

*Bibliography* 197

*Index* 211

# Introduction

## ON COLLABORATION AND CO-PRODUCTION OF KNOWLEDGE

COLLABORATION BETWEEN distinct domains of expertise and diverse population categories has increasingly been advocated as essential for achieving enhanced outcomes and accelerated impacts across educational, scientific, and public institutions. This advocacy is especially pertinent amid escalating environmental degradation and the threatening dynamics of climate change, necessitating collaboratively designed and enacted action plans. Nevertheless, institutional acknowledgment of collaboration's importance remains sluggish, frequently impeded by institutional resistance, entrenched meritocratic measures of prestige, and broader systemic reluctance to embrace transformative change.<sup>1</sup> Consequently, the genuine sharing, solidarity, and comprehensive cooperation essential for meaningful collaborative action are seldom fully realized.

In academic research contexts, collaboration commonly serves as a means to produce a final outcome, specifically co-produced knowledge.<sup>2</sup> Co-production of knowledge involves intricate processes that converge divergent onto-epistemological formations—distinct modes of knowing and being—to facilitate deeper comprehension of particular issues. The broader and more inclusive the methodological, disciplinary, and epistemological diversity applied, the more effective the collective articulation, examination, and resolution of the research problem by multiple expert parties. Nevertheless, the convergence of disparate onto-epistemological positions to address complex methodological and interdisciplinary challenges presents profound difficulties, anchored in expansive socioeconomic, political, historical, ethical, and philosophical domains.<sup>3</sup>

Given such intricacy, this book seeks to trace potential areas where perspectives from diverse intellectual traditions or knowledge paradigms might converge, complement each other, and materialize in practical application. Specifically, the analysis will focus on identifying the prerequisites and challenges that influence the successful staging of encounters between differing knowledge systems. Central to this exploration is the conceptual configuration of “coupling,” a process whereby inherently divergent intellectual trajectories and ways of understanding coalesce to complement each other without diminishing critical differences or eroding original coherences.<sup>4</sup> I propose the staging of such encounters as deliberate endeavors requiring the skilled intervention and mediation of specialized facilitators—mediators or “human interfaces”—experienced in converging distinct fields of expertise in adherence to socially established protocols of mediation, diplomacy, and translation. Consequently, this book accords special emphasis to the facilitator’s pivotal role as an enabler and catalyst in these encounters, alongside a rigorous exploration of coupling processes facilitating the co-formation and co-production of new knowledge.

Social scientists have extensively outlined multiple pathways, conditions, and prerequisites primarily addressing ethical, epistemological, and relational dynamics conducive to effective collaboration, most notably within human relational domains.<sup>5</sup> They have particularly emphasized the necessity for openness toward symmetric dialogues and a horizontal ethos in which each participant, embodying a distinct intellectual trajectory or tradition, is equally valued as a critical perspective-holder and bearer of unique, trajectory-informed expertise.<sup>6</sup> Despite this normative ideal, genuinely symmetric dialogues remain uncommon in practice. Prevailing modes of performing, disseminating, communicating, and representing expertise often restrict authentic participation, thereby limiting productive exchanges that facilitate interaction and mutual enrichment across diverse perspectives.

Facilitating such processes is no easy task. Working across and between disciplines and distinct fields of expertise involves dealing with individuals trained in specific disciplinary traditions, each with its own culture, hierarchy, and established interaction norms. These divergent cultures of training and acquiring expertise can be particularly pronounced in the ways specific problems are approached and understood. For example, permafrost scientists, who collect samples from the ice grounds and analyze data in laboratories, develop their expertise through a laboratory-based approach grounded in measurement and technical devices. While this approach meets the requirements of permafrost studies informed by the Enlightenment paradigm, it does not cultivate

perceptiveness and appreciation of the diversity of expertise(s) required for research collaboration with Indigenous communities.

My professional experience on numerous international review panels and several international collaborative research projects has demonstrated that this limitation is especially true in the natural sciences, where scientists are unable to connect their experiences and perceptions of environmental change to Indigenous knowledge. If they see a connection, the latter often stems from within the conventional scientific paradigm, which subsequently devalues or invalidates the sociocultural processes that have shaped this knowledge.<sup>7</sup> The lack of required perceptivity, the inability (and unwillingness) to connect, and the continuous devaluation and invalidation of the processual nature of Indigenous expertise heavily complicate and hinder the kind of cooperation and partnership that collaborative research demands. Often, claims of collaboration fail to go beyond performative gestures. Instead of genuine partnerships, these engagements often resemble consultancy, in which Indigenous experts are invited to share their perspectives, which are then treated as supplementary or alternative views on a problem rather than as foundational insights integral to the research itself.

In these scenarios, Indigenous views are often evaluated separately and selectively incorporated into scientific discourse dominated by institutionally affiliated academics. Local people are often asked to participate in “co-developing” new knowledge by documenting their environmental concerns through methods such as participatory action research (PAR) or community-based participatory research (CBPR). However, in practice, these local leaders and designated individuals are often treated not as knowledge producers but as consultants or informants, which sharply contradicts the collaborative claims of the research. As a result, the needs addressed by such research are those of the scientists (subsequently, primary and single knowledge producers), not the Indigenous communities, with only the former deriving direct socioeconomic and political benefits from this work.

Ostensible co-production or collaboration between scientific hosts and Indigenous invitees turns out to be a standard one-way reproduction of scientific data-collection practices. Genuine co-production, in contrast, requires all involved scientists to step out of the comfort zone of their disciplinary fields, open their mindsets to Indigenous knowledge, and engage in genuinely symmetrical knowledge co-production. By the process of “opening up,” I refer to a gradual withdrawal from rigid forms of disciplinary silos and methodological “nationalism.” “Opening up” constitutes an onto-epistemological challenge, as very few

scientists are ready to (un)discipline themselves and engage in fundamental rethinking of the disciplines in which they were trained. The advancement of collaborative research and science in general requires those who propose or are about to propose collaborations aimed at the co-production of knowledge to engage in a critical, self-reflexive exercise of identifying the obstacles and limitations posed by disciplinary habits that prevent and work against true collaborations.

### On the Terms “Indigenous” and “Western”: Categories, Imaginaries, and the Work They Do

In this book, the terms “Indigenous” and “Western” are used not as self-evident descriptors but as historically produced, relational, and politically charged categories whose meanings emerge through specific encounters, institutions, and struggles. “Indigenous” gains its analytic force not from cultural or social homogeneity but from coercively and colonially produced asymmetry: It names peoples whose relations to land, governance, and language have been repeatedly disrupted by colonial and settler projects of extraction, dispossession, and erasure.<sup>8</sup> This formulation aligns with widely shared scholarly understandings of indigeneity as a social and political condition shaped by long-standing relationships to land, collective histories of dispossession, and community-recognized forms of kinship, descent, and governance.<sup>9</sup> These perspectives highlight that indigeneity is neither an identity available through individual self-designation nor a symbolic repertoire that can be adopted through narrative alignment alone. Rather, it is grounded in collective continuities and obligations, affirmed through relationships of accountability to communities, territories, and ancestors.

Although Indigenous peoples continually renew political worlds, epistemologies, and modes of belonging, scholars have emphasized that such dynamism unfolds within recognized, historically situated amalgamations of community authority. This distinction is especially important in light of documented concerns about self-indigenizing claims or newly formed groups whose assertions lack grounding in established community lineages or land-based relationships.<sup>10</sup> Attending to these debates helps prevent the inadvertent conflation of legitimate processes of cultural and political renewal with forms of strategic appropriation. In this sense, emphasizing the relational, emergent qualities of indigeneity draws attention to historical depth, collective validation, and situated responsibilities, rather than suggesting a fluid category open to individual reinvention. At the

same time, recognizing these grounded forms of continuity does not preclude an understanding of indigeneity as mobile and responsive. Rather, these entwined dimensions—condition, consciousness, and process—affirm that indigeneity is never static: It circulates, intensifies, and transforms through transnational exchange, activism, and the continued need to respond to colonial infrastructures that remain materially and ideologically present.<sup>11</sup>

Alongside these dynamics, “Indigenous” is also an imperfect but often necessary political and analytical category. In many contexts—from UN climate negotiations to courtrooms deciding the fate of lands and waters—it represents the minimum grammar through which colonial institutions are willing to hear claims to continuity, stewardship, or sovereignty.<sup>12</sup> Strategic deployments of indigeneity, including the crafting of shared vocabularies and imaginaries across continents, do not flatten difference; rather, they create conditions for coordinated resistance, comparison, and mutual recognition across diverse colonial histories. Such emergent global indigeneity complicates any assumption that Indigenous peoples occupy a single ontological position or hold a unified political agenda. Instead, they navigate and rework multiple modernities, world-making projects, and epistemic traditions, often drawing simultaneously on place-based obligations and global articulations of rights, such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).<sup>13</sup>

Conversely, “Western” is used to denote a widely analyzed assemblage of institutional, epistemic, and technopolitical formations consolidated through colonial expansion and the global organization of scientific and bureaucratic expertise. Scholarship on coloniality shows how modern state rationalities, scientific conventions, and developmental imaginaries traveled with imperial projects, becoming embedded in durable infrastructures of colonial governance.<sup>14</sup> Historians and theorists of science further demonstrate that what is often labeled “Western science” is constituted not by civilizational universals but by particular regimes of standardization, objectivity, and bureaucratic order.<sup>15</sup> Political ecologists and anthropologists likewise track how expert systems, property regimes, and development bureaucracies circulate transnationally, reproducing institutional templates far beyond Europe and North America.<sup>16</sup> From this perspective, “Western” is best understood as a heterogeneous, mobile, and historically sedimented assemblage—one that continues to interact with, appropriate, and often marginalize Indigenous epistemologies in ways documented across anthropology and related fields.<sup>17</sup>

Yet “Indigenous” and “Western” do not function here as fixed categories opposed in binary terms. The analytic aim is to show how both are continually

remade in practice, how they interpenetrate within collaborative projects, and how they become entangled in converged vocabularies, shared dilemmas, and uneven terrains of authority: political, ideological, and epistemic. Indigenous negotiators translate kin-centric obligations into the idioms of international law not to adopt Western ontologies but to open legal and political space for altering or preempting extractive futures.<sup>18</sup> Likewise, anthropologists and Indigenous scholars co-produce conceptual tools—sometimes collaboratively, sometimes in tension—to contest inherited infrastructures of erasure and to imagine futures that exceed the constraints of Western epistemic frameworks. Such relational, historically contingent epistemologies emphasize that collaborations can unsettle the singularity of Western expertise without presuming a unified or homogeneous Indigenous counterpart.

In short, to clarify the underlying methodology, the book deploys “Indigenous” and “Western” as dynamic, porous, and politically situated analytic terms: precise enough to track asymmetries of power, yet flexible enough to accommodate the complexities, contradictions, and negotiations that characterize collaborative climate research.

### “Make-Believe” Collaborations

Recognizing the contingent, political nature of these terms also allows us to see how they are mobilized within institutional settings that often claim, but do not substantively achieve, reciprocity. It is within this tension that the phenomenon of “make-believe” collaborations emerges. Superficial or insincere collaborations have increased in recent years, driven largely by institutional and funding body mandates that prioritize academic partnerships with Indigenous communities directly affected by climate change. Typically, these partnerships are motivated by an “impact acceleration” agenda rather than the actual needs and priorities of Indigenous communities. Such agendas, rooted in academic institutions located in imperial metropolises, often—even if unintentionally—reinforce the performative nature of research collaborations. By prioritizing institutional objectives over genuine engagement, this sanctioned drive for “collaboration” obstructs potentially transformative pathways toward meaningful and urgently needed partnerships. Consequently, the promise of fostering methods that bridge diverse epistemologies—such as natural and social sciences or scientific and Indigenous knowledge systems—and support Indigenous self-determination in research often goes unrealized. Instead, these collaborations frequently default to conventional scientific methodologies centered on quantification and

measurement, leaving little room for methodological innovation. The performative nature of these research partnerships has led to skepticism and, at times, outright refusal by Indigenous experts to engage in collaborations with natural scientists and other academics based in imperial metropolitan centers.<sup>19</sup> This growing mistrust points to the need for a fundamental reevaluation of how such partnerships are conceptualized and enacted.<sup>20</sup> Although collaboration is currently viewed as an ethical alternative to solitary research and is broadly encouraged, the current trend does not automatically prevent hidden neocolonial agendas from influencing collaborative work.

In the context of the rapid increase in the frequency of unexpected, unpredictable, and unthinkable events, and under conditions where contemporary systems of knowledge production are characterized by the consistent cultivation of distrust and alienation among Indigenous experts and communities, any plan for collaborative research should show evidence of rapport and an initial understanding of the power imbalance between Indigenous and Western perspectives. This imbalance must be acknowledged and unpacked from the outset. Building rapport and trust in the aftermath of centuries of colonial violence, land dispossession, and subjugation is a challenging task that requires serious consideration from funding bodies, along with an understanding of the ongoing impact of colonial violence. The persistence of colonial agendas within knowledge production and the absence of a genuinely ethical approach to research with traditionally marginalized communities exacerbate these challenges. CBPR and PAR do not critically consider these obstacles to epistemological convergence. For instance, proponents of CBPR often cite institutional constraints as an excuse for inadequacies in aligning community and academic intentions during the collaboration process.<sup>21</sup> As Heather Castleden et al. note, funding bodies do not permit researchers to spend the “first year drinking tea.”<sup>22</sup> This metaphor trivializes the importance of building rapport and demonstrating appreciation for Indigenous knowledge. Institutional agendas centered on output measures and funding cycles often impose constraints on collaborative research, reducing most projects labeled as “collaborative” to mere brief consultations.<sup>23</sup> Here, claims of collaboration serve as another convenient tool for exercising economic pressures and epistemological domination, ultimately benefiting neocolonial powers at the expense of Indigenous sovereignty.

By nominally fulfilling the institutional demand for virtue-signaling collaborations designed to cover their bases, institutions often fail to push further or critically audit their own practices to assess the genuine impact on the ground, revealing the incomplete nature of their efforts. It is frequently sufficient for

applicants to use code phrases, such as “collaboration with Indigenous communities,” to secure substantial grants. This reflects a fundamental misunderstanding of what genuine collaboration entails. Institutions are less concerned with ensuring that collaboration with Indigenous communities is meaningful and effective than with securing indirect costs.

Additionally, these institutions impose a range of constraints—from the hyper-bureaucratization and excessive policing of researchers to the obstruction of partnerships with nonacademic or community-based experts—that inhibit the development of meaningful collaborative work. Researchers, in turn, often invoke these restrictions as a convenient rationale for avoiding the slow, careful processes required by genuine collaboration. The demands of funding cycles and the corporate drive for measurable productivity further discourage thorough ethnography and sustained community engagement. Together, these pressures undermine precisely the forms of collaboration that are most needed.

## Co-Production and the “Black Box” of Indigenous Knowledge

Given the drive for scalability and transferability of research, the convergence of Indigenous knowledge with mainstream Western knowledge has increasingly come to be framed as a pathway to co-produced knowledge. However, this approach often fails to specify how Indigenous knowledge should be handled by natural scientists, who typically lack the necessary experience in engaging with Indigenous onto-epistemologies and have not been trained in collaborative research methods. These scientists frequently exhibit a reductive approach to Indigenous knowledge, treating it as mere data to be extracted and integrated without understanding or respecting its rich, complex, and context-dependent nature.

Institutional enthusiasm for “impact acceleration,” “scalability,” “transferability,” and the expansion of the “scopeability” of research outcomes can obscure the processes through which findings based on Indigenous knowledge are re-framed within externally imposed discourses, ultimately rendering them irrelevant to the communities from which the knowledge originates. The pursuit of scalability especially facilitates well-established practices of intellectual property appropriation, often serving the agendas of dominant colonial societies and profit-driven corporations. Moreover, the managerial insistence on ensuring transferability leads to flawed study designs that may undermine the positions of Indigenous communities in crucial political debates over land conflicts and

sovereignty, while also exacerbating poorly informed understandings of Indigenous experiences and expertise.<sup>24</sup>

Given that collaboration can lead to harmful impact, this book seeks to explore the forms of interpersonal, interdisciplinary, interinstitutional, and cross-boundary relationships needed to ensure that collaborative research involving Indigenous communities genuinely centers and empowers their environmental expertise. These methods have been developed by multiple generations of Indigenous scholars, including Linda Tuhiwai-Smith, Aileen Moreton-Robinson, Audra Simpson, Brendan Hokowitu, Karla Williamson, and many others.<sup>25</sup> Indigenous research methodologies are crucial to fostering critical awareness of how to address the power imbalances inherent in mainstream knowledge production and the politics surrounding it.

This book will examine the trends—whether intentional or unwitting—that can undermine the potential for genuine, inclusive collaborations.<sup>26</sup> Having reviewed numerous natural science research proposals, I have concluded that Indigenous knowledge is often treated as a superficial addition, essentially a light garnish atop a heavily conventional physical science framework. Co-production is frequently portrayed as a form of community-led research based on partnerships between scientists and Indigenous peoples, with the claimed longevity of such partnerships often invoked as evidence that the prerequisites for meaningful collaboration have already been met.<sup>27</sup>

I have observed two models used in projects involving Indigenous research partners, namely, conversion and extraction. Both models are masterfully masked as activities aimed at co-production of knowledge. In the conversion model, Indigenous participants are trained by scientists in scientific data collection methods to prepare them for carrying out research tasks set by these same scientists. This is done with the aim of interpreting science for the Indigenous community members so that they can understand what the scientists are trying to do. The aim is to assimilate Indigenous collaborators into the epistemic order of conventional science and thereby render them “equal research participants.” This may indeed give the impression of collaboration. The trouble is that measurement-driven projects that prioritize physical data and quantification perpetuate the structural exclusion of Indigenous perspectives, reinforcing the dominance of natural science methodologies. Initiatives that aim to train Indigenous youth in Western methods can become vehicles of epistemological subjugation if they fail to acknowledge the conceptual richness of Indigenous worlds.<sup>28</sup> Hence, the model of conversion ends up reinforcing mainstream scientific standards rather than genuinely co-producing knowledge that reflects

Indigenous perspectives and priorities. Instead of opening pathways of collaboration, this colonially inflected conversion tends to close down any dialogue in which Indigenous expertise is a transformative force and not just an auxiliary contribution.

For its part, the extraction model of collaboration tends to obscure crucial dimensions of scientists' engagement with Indigenous knowledge. Rarely do project documents specify which aspects of Indigenous knowledge have been examined in depth, which specific findings inspired the proposed collaboration, or what insights from previous engagements motivate the proposed next steps. Indigenous knowledge is instead frequently treated as a black box, presumed accessible through an Indigenous intermediary selected and appointed by outside researchers.

Once this initial stage of "knowledge delivery" is complete, the team typically proceeds to a new phase: attempting to demonstrate a convergence between scientific and Indigenous knowledge. At this juncture, a curious shift often occurs. The scientists step back from participating directly in the design and implementation of the co-production process, instead proposing that Indigenous community members should lead the entire endeavor. In practice, the ostensible affirmation of Indigenous sovereignty and self-determination transfers the core labor of co-production onto Indigenous participants, who are expected to carry out the project's central intellectual and organizational tasks.

This move not only displaces responsibility but also muddles the very notion of co-production, which requires sustained, reciprocal engagement rather than a mere handover of obligations. A gesture presented as deference thus risks undermining collaboration altogether, obscuring the underlying dynamics of power and responsibility. Meanwhile, the benefits of such research—publications, grants, career advancement—are typically reaped first and foremost by scientists, while the promised impacts for Indigenous communities are delayed by systemic inefficiencies or, in many cases, never materialize at all.

In short, lack of training and limited awareness of how to work effectively with Indigenous knowledge holders can seriously damage relationships with Indigenous communities, fostering distrust toward outside researchers, the ways they engage with and interpret Indigenous knowledge, and the purposes for which that knowledge may be mobilized. This harm is particularly evident when Indigenous experts see their participation and expertise tokenized to serve neocolonial agendas of extraction and exploitation. Thus, such extractive practices sustain unchallenged systems of knowledge production that rely on outdated methods ill equipped to engage rapidly changing worlds.

## Situating the “Multiple Worlds” Approach

Some readers may feel uneasy with what has come to be described as the “multiple worlds” perspective, especially if it appears to replace a familiar “one world, many interpretations” stance with a more radical claim about the existence of separate ontologies. In this book, however, I deploy the “multiple worlds” approach primarily as a methodological and relational orientation—one grounded in decolonial, collaborative, and more-than-human approaches—rather than as a doctrinaire metaphysical assertion to which all readers must subscribe. The book foregrounds this orientation from the outset, to make clear that I resist treating “Indigenous” and “Western” as monolithic, homogeneous categories and seek to demonstrate why collaborative projects premised on singular, universalist assumptions so often falter in the kinds of encounters examined here.

Following Arturo Escobar, the pluriverse is understood not as a static plurality of sealed-off worlds but as a shifting terrain of encounters marked by friction, mistranslation, and asymmetry.<sup>29</sup> These frictions are themselves historically structured, shaped by colonial dispossession, uneven distributions of authority, and the differential recognition of knowledge. Escobar’s project of *Transiciones*—a call for a poli-ontology aimed at displacing the “One-World world”—invites us to imagine collaborative spaces where no single world story dominates and where many forms of sense-making may coexist.<sup>30</sup> As the Zapatistas famously put it, the pluriverse aims toward “a world where many worlds fit.”<sup>31</sup> And so this book treats the pluralist orientation as methodologically generative for understanding how knowledge is expressed, validated, and transmitted across different traditions. In collaborations with Indigenous communities, the capacity to recognize the centrality of both verbal and nonverbal Indigenous forms of expression is essential for sustaining meaningful symmetry in the research process.<sup>32</sup>

Conventional modes of data collection and representation—especially those oriented around measurement, quantification, and digital abstraction—tend to stutter when they encounter the plural, intersecting, and fluid lifeworlds that shape collaborative climate research.<sup>33</sup> Recognition of this plurality does not imply an argument for radically separate worlds; rather, it acknowledges that collaborative methodologies cannot afford “one-worldist” assumptions.<sup>34</sup> Approaches influenced by pluriversal world-making foreground how divergent epistemologies and ontologies converge—often uneasily—to craft interpretations, strategies, and orientations toward the future.<sup>35</sup> In the contexts explored in this book, collaboration unfolds across fragile and transient networks of

relation(s).<sup>36</sup> Such moments demand methodological sensitivity to uncertainty, indeterminacy, and emergence. Engaging uncertainty here means attending to the multiplicity of epistemic practices that arise through unpredictable collaborative trajectories. Rather than smoothing over difference or aspiring to singular, determinate futures, I explore how uncertainty can become a resource for solidarity, humility, and resistance to deterministic climate imaginaries that foreclose possibility.

Importantly, the book does *not* seek to lock collaboration within a rigid “different ontologies” debate in which a Western paradigm extracts epistemic resources from Indigenous worlds to revitalize its own theories.<sup>37</sup> Such an approach risks reinscribing the very asymmetries it seeks to diagnose and unmake. Instead, the aim is to identify conditions under which genuine collaboration can emerge—conditions urgently needed in the context of accelerating climate change, environmental degradation, and the necessity of collective preparation and reparation.

A commitment to plural worlds and more-than-human modes of attention unsettles conventional institutionalized forms of knowledge and representation. Yet it is precisely this unsettling that enables more ethical, generative, and future-oriented forms of working together. The ontological orientation adopted here is therefore best understood as a practical, relational, and ethically driven approach: a way of keeping open the space in which collaborative climate research might unfold more justly and imaginatively.

## Coupling

In this book, the concepts of *nyamnín* (togetherness), *bilaek* (interconnectedness), *nimadun* (sharing), *djuluchen* (forerunner) and *haeket* (convergence) will serve as multiple roadmaps that adapt to the shifting configurations of relationships, research partners, and intellectual dynamics. They will offer pathways intended to foster generative forms of collaboration with Indigenous communities, focusing on the conceptual prerequisites for “coupling” discussed in more detail in chapter 5. I shall draw upon the notion of coupling to transcend the conventional understanding of collaboration, which often falls short of capturing the process of conceptual convergence through which distinct worlds come together. Here, I offer coupling as a dynamic conceptual mechanism for addressing the issue of difference inherent in all attempts at collaboration.

The discipline of anthropology has addressed and engaged with the issue of difference—whether cultural, epistemological, ontological, social, interhuman,

intra-human, interspecies, or multispecies—since its inception. Recently, anthropologists have been called upon to critically reflect on their own models of reality and constructions of sameness and difference exercised in method, theory, and practice.<sup>38</sup> This book builds upon the idea of pluriversality as well as the divergencies, mutualities, and worldings it engenders to explore the question of how people might collaborate with each other despite or across differences.<sup>39</sup> When differences are subjected to translations in ways that reproduce sameness, they are often rendered singular for the sake of linearity, coherence, and unity.<sup>40</sup> To deal with the question of difference, of how one might avoid the traps of singularization (or flattening and erasing those differences) in research collaborations, my account will employ the notion of “coupling,” through which new horizons of knowledge could emerge.<sup>41</sup>

In meteorology, “coupling” refers to the interaction between different parts of the Earth’s system, such as the atmosphere, oceans, land surface, and ice. When these components are coupled, they can influence each other’s state and dispositions, leading to new weather patterns and climate phenomena. The coupling dynamic between the land surface and the atmosphere contributes to the formation of varying levels of soil moisture, which affect local temperatures and precipitation patterns in new and unexpected ways.<sup>42</sup> These aspects of coupling from meteorology suggest that coupling amplifies the power of specific natural phenomena. For example, in fire and weather systems, coupling refers to the merging of precipitation and fire, which results in plume-dominated fires.<sup>43</sup>

Adriana Petryna’s exploration of the dynamics of wildfire in New Mexico interprets coupling as the convergence of inherently antagonistic elements, such as fire and water. This interaction generates a powerful and often alarming phenomenon, driven by the unpredictable and uncontrollable dynamics that emerge when multiple potent forces collide.<sup>44</sup> For instance, satellite imagery capturing the interplay between fire and atmospheric conditions vividly illustrates how fire, wind, and rain interact in ways that amplify their combined impact. Such coupling embodies profound potential for the unthinkable and the unexpected—outcomes that transcend existing boundaries of knowledge.<sup>45</sup> In the context of knowledge co-production, the mechanics of coupling distinct elements—analogueous to the interaction between fire and atmospheric forces—highlight the importance of dynamic interactivity. The success of knowledge integration hinges on the ability to co-create elements that will establish productive and adaptive relationships, leveraging their distinctiveness to forge new horizons of knowledge.

The concept of coupling is useful because it treats difference as essential to the formation of new knowledge, rather than seeking to transcend it. Hard sciences, lacking methodologies for addressing ontological or epistemological difference, are particularly ill-suited to the task of coupling. To be sure, researchers, institutions, and funding bodies may find the conceptual shift I propose here challenging to engage with. To help them do so, I introduce here the Eveny idea of *haeket*—conventionally translated as “northern lights” but more aptly understood as a form of convergence or generative coupling—which offers a way of understanding modes of relation that mirror the interactive, connective dynamism of the aurora borealis. I regard *haeket* as particularly compelling in its capacity to encapsulate the intricate processes through which distinct elements—solar wind, magnetic fields, and electrically charged particles—interact and converge. Convergence occurs at the nexus of their movements, with each element mutually informing and amplifying the others. The dynamism of this interaction is vividly displayed on clear winter nights in the Siberian Arctic, often at extreme temperatures nearing  $-50^{\circ}\text{C}$ . Under such conditions, Eveny reindeer herders witness a breathtaking spectacle of celestial coupling, as waves of light, energy, and color intertwine in a symphony of movement and sound. This interplay not only reveals the physical mechanics of *haeket* but also evokes a profound sense of interconnectedness and emergent complexity inherent in such natural phenomena.

My discussion of coupling will draw together the five conceptual threads developed across this book—*haeket* as generative coupling, *nyamnin* as symmetrical problem-solving, *bilaek* as merciful interdependence, *nimadun* as obligatory sharing, and *djuluchen* as anticipatory heedfulness—in order to advance five guiding principles for future collaborative practice. Each principle will function both as a conceptual synthesis and as a practical invitation, sketching pathways toward collaborations resilient enough to sustain a pluriverse of more-than-human relationships under conditions of intensifying climatic uncertainty.

*Haeket*, the Eveny idiom that names the dynamic processes of coupling, stands at the center of this account. The term allows for an understanding of collaboration not as the piecemeal addition of discrete knowledges but as a generative interference pattern in which every participant contributes to, and is reshaped by, intersecting currents of energy and meaning. Such coupling thus recalibrates the entire configuration, opening unforeseen trajectories for co-produced knowledge and foregrounding the accompanying ethical and epistemological responsibilities. Unlike conventional models of collaboration—which typically absorb incommensurable elements into a linear system that remains

essentially unchanged—*haeket* insists on a reciprocal, transformative entanglement. This model of facilitative coupling suggests a deeper, integrative process wherein the interacting elements reshape and inform one another, creating something entirely new. This approach thus informs my discussion of co-production as an active, dynamic interplay rather than a simple aggregation of knowledge. This model thus allows co-production to be understood not as the aggregation of discrete knowledge forms, but as a generative process of mutual transformation.

## Decolonizing Research Collaboration

This book highlights the critical role an Indigenous scholar may play in fostering meaningful collaboration necessary for genuine progress. Building on the discussion of co-production prerequisites, I stress the imperative to decolonize entrenched paradigms of knowledge production. The concept of coupling, involving convergence and co-articulation, particularly demands the skills, perceptivity, voice, and insight of an Indigenous scholar, who serves as the crucial human interface for this process. Their presence ensures that such coupling aligns directly with decolonization goals. Yet because the broader decolonization movement often encounters considerable inertia, I focus here on a more delimited arena—academic knowledge production collaborations between Indigenous communities and Euro-American scholars—where the stakes and implications of this alignment can be examined more concretely.

Coupling between distinct knowledge systems resembles interactions between heterogeneous forces prone to rejection. For example, Linux and Windows require interfaces for mutual decoding; similarly, Indigenous and scientific knowledge systems need interfaces that facilitate coupling. This comparison is apt, as coupling in knowledge co-production is neither automatic nor linear but regularly experiences tension, rejection, and resistance. Such rejection has significantly characterized colonial and neocolonial practices, notably through the suppression and epistemic decoupling of Indigenous knowledge transmission. For instance, colonial boarding schools forcibly disrupted Indigenous knowledge transmission, aiming for assimilation and epistemicide. The coercive separation of children from their parents at an early age subjected children to colonial social engineering processes and epistemicide across nearly all Indigenous communities and throughout the entire Fourth World.

In Indigenous Siberia, shamanic knowledge experienced intense colonial suppression.<sup>46</sup> Despite this, shamanic knowledge remains crucial, embodying

valuable insights into human-nonhuman relations and multidimensional environmental coupling. Had it not been violently suppressed, many contemporary crises might have been better managed or prevented. Therefore, awareness of epistemicidal colonial practices aimed explicitly at decoupling generations from ancestral knowledge systems should inform contemporary collaborative co-production endeavors.

The experience of the late Nikolai Neustroyev, son of a renowned Eveny shaman, offers a clear example of epistemological decoupling in Indigenous knowledge transmission. When I asked why he never assumed his father's vocation, Nikolai replied that he simply could not, as it was too hard to do so. From his perspective, Soviet schooling had created an epistemological barrier fundamentally out of sync with the perceptual openness a shaman must cultivate. To use the computer system analogy, his mind had been formatted by a Windows operating system, whereas his father's shamanic expertise ran on Linux: proximate yet mutually unintelligible. Among the Eveny, apprenticeship in shamanism requires prolonged physical, emotional, and moral attunement, as well as a cultivated receptivity to nonhuman persons and spirit worlds. Because Nikolai lacked that training milieu, the channels through which shamanic power is ordinarily transferred remained closed to him. Lost transmission, however, is not lost knowledge.

As Mvskoke scholar Laura Harjo reminds us, Indigenous lifeways generate a "spiral to the stars"—a process that "reimagines kinship connections, empowers and recuperates community, and places us in a process of futurity."<sup>47</sup> In the Siberian North, Eveny reindeer herders enact their own spirals through the ordinary work of herding, hunting, sewing fur garments, beadwork, storytelling, and dance. These practices feed families, but they also renew reciprocity with more-than-human kin and keep ancestral cosmologies in motion. Thus, even when formal shamanic lineages falter, everyday skills remain an animating force that sustains cosmological vitality. Indigenous knowledge persists less as a fragile archive than as a living capacity to imagine, relate to, and sustain worlds—perpetually adapting, yet resiliently oriented toward Indigenous futurities.

Collaborative knowledge co-production thus requires ensuring that research collaborations empower Indigenous scholars and community experts as leaders. Indigenous scholars, acutely aware of their communities' historical contexts, are best positioned to productively and ethically engage Indigenous perspectives and needs. Their leadership is crucial to prevent assimilationist practices inherent in colonial methodologies and ensure genuine onto-epistemological

coupling. Therefore, Indigenous scholars are best situated to ethically guide collaborative exchanges, particularly in contexts involving environmental crises or disasters. Serving as intermediaries, Indigenous experts manage complex positionalities and intersecting knowledge flows, navigating entrenched colonial practices that often threaten meaningful knowledge production. Coupling becomes productive only when explicitly guided by a decolonial agenda aligning with Indigenous knowledge systems and learning methods.

This book, based on field material collected over the course of fifteen years, will also consider several interrelated areas that could inform projects aimed at enabling and supporting the co-production of knowledge. Broadly, these areas include: (a) recognition of the histories of colonial violence that have detrimentally obstructed the trajectories through which knowledge(s) could productively converge; (b) co-leadership to prevent the reproduction of colonial practices that may intentionally or unintentionally instigate the domination of natural science over Indigenous knowledge; (c) the cultivation of ethically sound research principles necessary to protect Indigenous subjects participating in knowledge co-production; and (d) the empowerment of Indigenous knowledge holders through the establishment of networks of Indigenous solidarity and reciprocity. These areas may not be exhaustive in leading to the desired outcomes; however, they must be considered if we wish to address the colonially informed distributions of power, resources, and knowledge that could prevent the development of decolonial methods for the co-production of knowledge.

Further investigation of solidarity within research collaborations will consider how co-producing knowledge can advance both de-siloing and decolonization; how the institutional authority of scientific expertise might be diffused and more symmetrically shared, empowering Indigenous knowledge holders; and how far collaborative, decolonizing methodologies can reshape the entrenched structures of colonial authority and credibility. I link the concepts of *nyamnín* and *bilaek* to rare moments of social solidarity among permafrost scientists—moments in which they set aside the reflex to guard their own interests and join reindeer herders' rescue efforts. Such experiences become transformative when researchers confront the frustrating limits of conventional knowledge paradigms—limits that block genuine collaboration and the authentic participation of Indigenous experts. The point at which they begin to question the status quo marks the start of true transformative coupling.

In an era of mounting unpredictability and environmental crisis, the stakes for meaningful collaboration could not be higher. True coupling demands humility, patience, and the courage to challenge entrenched paradigms—especially

from within. This book therefore offers a vision grounded in a commitment to transformative change. Drawing on projects in which I have been directly involved, it identifies obstacles to be overcome and maps strategies for shaping genuinely collaborative research practices. The journey is rarely straightforward; it compels us to reckon with difficult questions about power, privilege, and the social role of research. Yet the potential rewards—for knowledge itself and for the well-being of human and more-than-human communities—make the effort indispensable.

The chapters that follow present detailed case studies, illustrating how natural scientists can think alongside Indigenous modes of collaboration that span human and more-than-human domains. These cases, ranging from climate-change adaptation to decolonial research design, demonstrate how Indigenous and Western knowledge traditions can converge to meet complex challenges. By examining these examples closely, the book clarifies the conditions that foster successful collaboration—and the obstacles that must be negotiated along the way.

For readers coming from the natural and physical sciences, I offer a brief guide to navigating the book's structure. Chapter 1 engages most directly with debates in anthropology, Indigenous studies, and STS, while chapters 2–4 weave these conceptual discussions through ethnographic case studies of collaboration, hazard prediction, and permafrost research. Chapters 5 and 6 integrate the conceptual and the practical, outlining how *haeket*-inspired facilitation and Indigenous scholarly leadership reshape the architecture of co-production. Readers seeking methodological insight may find chapters 2 and 4 a helpful entry point, whereas those looking for theoretical grounding may begin with chapters 1 and 5. Although the chapters build cumulatively, they have been written so that readers from diverse disciplinary backgrounds can move through them selectively according to their own interests.

## The Order of Chapters

The chapters trace a movement from critique to praxis. Chapter 1 examines the sociocultural and epistemological terrains of co-production, showing how collaborations that aspire to equity often re-entrench colonial hierarchies and extractive logics. Chapter 2 turns to the Eveny practice of *nyamnín*—coordinated togetherness—as a lens for understanding why outwardly similar projects produce radically uneven outcomes, highlighting that collaboration succeeds not through institutional slogans but through the everyday choreography of reciprocity and vulnerability.

Chapter 3 explores hazard prediction in the Siberian North, juxtaposing Eveny techniques of multispecies attunement with the limits of technosolutionist approaches; it also proposes a cosmo-political pragmatics attentive to the partial authority of every knowledge form. Chapter 4 grounds these arguments historically by tracing the unacknowledged collaborations that have long underpinned permafrost science, foregrounding *nimadun*, the ethic of unconditional sharing, and *bilaek*, the web of merciful interdependence.

Chapters 5 and 6 then reframe collaboration as a practice of facilitative world-making. They do so by examining the role of the interdisciplinary or Indigenous facilitator, introducing *haeket* as a model of generative coupling, and mapping the institutional, ethical, and infrastructural conditions required for such coupling to take hold. The concluding chapter brings these trajectories together, arguing for research architectures that embrace iterative, relational, and pluriversal modes of collaboration capable of meeting the challenges posed by a rapidly changing cryosphere.

Taken together, these chapters open into the book's first task: a critical examination of how co-production is currently practiced, and why its promises so often fall short. It is to this terrain that chapter 1 now turns.

## INDEX

- Aboriginal Australians, 104  
academic capitalism, 21  
academic conversations, bringing  
    Indigenous thought into, 150  
academic labor, 50–51  
academic publications, 53  
academic rigor, 166  
academy-as-fort, 155–56  
accountability, 87  
adaptive responsiveness, 114, 175  
Adycha River, 98  
agreements, violation of, 38  
Ahmed, Sara, 53, 55  
Alaska, research in, 27  
algorithms, 79, 83  
alliances, fragility of, 55  
Amazonians, 36  
American Indian metaphysics, 140  
Amerindian perspectivism, 35  
“AND” relationship, 125  
animacy, 147–50, 177, 180  
animal double, 95  
animals, 31, 35, 163. *See also* reindeer  
animist ethics of place, 68  
Anishinaabe law, 155  
Anthropocene, 36, 37–38  
anticolonial sciences, 155, 156  
Araweté, 35, 36  
Arctic, as commodity, 104  
atlas, 144  
auroral couplings, 175–76. *See also* coupling  
authority, racialized distribution of, 53  
avalanche, 62–69  
Basso, Keith, 68–69, 98  
bears, 110–11, 149, 173  
bear-stone pedagogy, 150–51  
***bilaek*** (interconnectedness): bears and, 111;  
    coupling and, 115–16, 120, 122, 137, 176;  
    defined, 113, 195; ethics of, 126, 147, 156;  
    ethos of, 112; fire in, 108, 109; fresh water  
    safeguarding and, 131; function of, 158;  
    human non-exceptionalism in, 110;  
    knowledge from, 160; as merciful  
    interdependence, 14, 169, 178; overview  
    of, 106–10, 115–16; practice of, 103;  
    project attuned to, 150; reciprocity and,  
    139; relational obligations and, 146;  
    relation and, 149; research protocols  
    under, 147; as roadmap, 12; social  
    solidarity and, 17; as white possessive  
    counterpoint, 112  
Blaser, Mario, 78, 102  
blending, 47  
blizzard, listening into, 162–64  
Bodenhorn, Barbara, 145  
Bolgityala, 98  
bolt-on approach, 125  
***borichen***, 96  
Borisov, Semen, 74–75  
bowhead whales, 145  
bridgings, institutionalization of, 83  
Cadena, Marisol de la, 69, 86, 88, 99–100,  
    101, 123, 124  
Callison, Candis, 155, 156, 159  
Canadian Inuit, 98–99

- carbon cycle interactions, 114
- cartographic practices, 93–94
- Castleden, Heather, 7
- Castro, Viveiros de, 34–35, 99–100, 101, 137, 154
- catching up, 75
- Cervidae family, 100
- cesium, 147
- Cetina, Knorr, 47
- circle and drum concept, xiv
- Civic Laboratory for Environmental Action Research (CLEAR), 155
- climate change: environmental disasters
  - associated with, 26, 63; evolving impacts of, 63; expertise and, 47; forms of insight for, 56; full disclosure regarding, 131; Indigenous performance on, 42–44; Indigenous perspective on, 37; reporting of, 156; tribulations of the animate planet and, 65
- climate-induced shifts, calendar changes and, 69
- climate models: accessibility of, 81; comparison of, 80–81, 85; function of, 80, 156; importance of, 172; intuition of, 82; limitations of, 79–80, 85, 136, 172; mapping potential for convergence and, 80–82; reliability of, 81; requirements of, 80; shoulder blade rituals and, 78–79; uncertainty of, 82
- climate science, reorienting the pace of, 176–77
- climate systems, coupling and, 114
- co-creative research design, 144
- codependency, 59
- co-evolution, 151
- co-labor, 125–26
- co-leading, 57, 59, 125–26
- co-learning, 59
- collaboration: bogus, 21, 37–44; characteristics of, xiii–xiv; equitable, 165; as essential, 1; extraction model of, 10; failures of, 21–22, 42; gained trust in, 38; incorporation and, 141–42; insincere, 6; institutional priorities of, 21; knowledge co-production from, 1; launching of, 38; lessons from previous, 170–71; make-believe, 6–8; with mixed results, 47–56; non-collaborative side of, 20; obstruction of, 33; pathways for, 2; as precondition, 47; reopening dialogue for, 144–47; requests regarding, 26–27; into shared world-making, 164–67; as strategic asset, 21; superficial application of, 6, 33; symbolic, 21; unrecognized, 173; value of, 21; as well-intentioned, 21
- collaborative futures, moving toward, 136–38
- colonial agendas, persistence of, 7
- colonial boarding schools, 15
- colonial deafness, 153
- coloniality of knowledge, 24–25, 54
- colonial violence, 33
- community-based participatory research (CBPR), 3, 7, 50
- community harms, 175
- conjunction, 124–25
- conjunction of worlds, 124
- contemporary infrastructures, 171–72
- controlled equivocation, 99–100, 102, 122, 123, 154, 176–77
- conversion model, 167
- Cook, James, 104
- Cook-Lynn, Elizabeth, 144
- co-production: barriers to, 84; black box of Indigenous knowledge and, 8–10; coupling and, 15, 136, 175; epistemic, 120; function of, 47; genuine, 3; *haeket* and, 120; integrative capacity and, 48; ostensible, 3; portrayal of, 9; as process before product, 175–76; process of, 56; relations in, 157; requirements for, 56; research future of, 161; shoulder blade rituals and, 82–84; vocabulary of, 167. *See also* knowledge co-production
- coupling: adaptive responsiveness of, 114; as analytic of co-production, 175; auroral, 175–76; benefits of, 113; *bilaek*

- and, 115–16, 120, 122, 137, 176; in climate systems, 114; co-labor in, 125–26; co-leading in, 125–26; conjunction and, 125; co-production and, 136; defined, 2, 168; as design principle, 170; difference and, 14; divergence in, 121–22; *djuluchen* and, 116–17, 120–21, 122, 176; dynamic, 136; epistemic, 139, 158; facilitated, 124–25; feedback loops of, 114; function of, 47; *haeket* and, 14–15, 118–21, 136–37; inter-epistemological, 132, 134; in knowledge co-production, 15, 115; limits of, 132–34; in meteorology, 13, 115; mutual shaping of, 114–15; as negotiated process, 137; *nimadun* and, 117–18, 120, 122, 137, 176; *nyamnin* and, 116, 120, 122, 125–26, 137, 176; overview of, 12–15, 114–15; potent moments of, 132–34; productivity of, 17; reading the signs of potential, 125–32; reciprocal, 168–70; requirements for, 17–18; technical discernment and, 169; tensions of, 132–34; in wildfires, 13
- cross-boundary work, 55
- cross-cultural translator, 100
- cross-disciplinary studies, 47
- Cruikshank, Julie, 68–69, 83–84
- cryo-formations, 87–88
- cryosphere, 173
- cultural imperialism, 39
- cybernetics, 168
- data collection, conventional modes of, 11
- decoding, 15
- decolonial inquiry, 155
- decolonial model for collaboration, 57–60
- decolonization, 15–18, 20–21, 42, 43, 112
- Deleuze, Gilles, 125
- Delgamuukw proceedings, 153
- Deloria, Vine, Jr., 140, 148–49, 159
- de-siloing, 47–48
- dialogue, recalibrating beyond freeze-frame, 150–52
- difference, 12–13, 14, 136
- different ontologies debate, 12
- diplomacy, 177, 179, 180; epistemic, 159, 180
- disciplinary blending, 171
- distributed spirithood, 75–76
- divergencies, 82–84, 102
- djuluchen* (foreshadowing spirit): as
- anticipatory heedfulness, 14, 178;
  - coupling and, 116–17, 120–21, 122, 176;
  - defined, 85, 113, 195; example of, 133;
  - feedback loops and, 116–17; as forerunner, 169; function of, 158; modeling algorithm and, 83; overview of, 72–78, 116–17, 133; reciprocity and, 139;
  - relational obligations and, 146; as roadmap, 12; in shoulder blade rituals, 82, 85, 117; slowing down and, 135; as way of knowing, 86
- domination, desire for, 59
- drum and circle concept, xiv
- dry snow avalanche (*olakcha imanangga*), 68
- earth beings, as overlooked, 88
- ecological forecasting, modeling for, 79
- ecosystem, 107–8
- eevichan* (rosebay willowherb), 108, 109
- egden durri*, 108
- elders: *aladijy* preparation and, 69;
- collaboration work of, 170; elevation of, 152; research questions and, 157, 179;
  - role of, xi, xii, xiii; in shoulder blade ritual, 74; temperature timeline and, 158
- El Niño–Southern Oscillation (ENSO), 114
- EMER-COM, 70
- emergencies, climate change, 63, 77
- emetic approach, 122–24, 132
- emic (Indigenous) perspective, 122
- empathy, 154
- empowerment, 20
- Enlightenment reason, 141

- environmental matters: environmental change, multiple dimensions of, 83; environmental crisis, origins of, 51; environmental degradation, 58; environmental disasters, 26; environmental forecasting, 79; environmental risks, Indigenous attempts at averting, 61
- epistemic matters: epistemic authority, misallocation of, 148; epistemic calendar, recalibration of, 168; epistemic diplomacy, 159, 180; epistemic disagreement, 55; epistemic frictions, 140–44
- epistemological accommodation, 123–24
- epistemology, 34
- equality, 27–28, 41–42
- equalize-to-neutralize tactic, 40, 41
- equalizing tactics, 39–40
- equivocation: controlled, 99–100, 102, 122, 123, 154, 176–77; ontological, 100–101, 121–22; strategy of, 100
- Escobar, Arturo, 11, 153, 161, 170
- essentialism, 143
- ethical collaboration, 152
- ethics, 31, 157
- ethics of listening: auroral couplings and, 175–76; cultivating, 161; facilitating, 134–36; *haeket* epistemologies and, 164–67; hazard prediction on shifting ground in, 171–73; lessons from previous collaborations in, 170–71; listening into the blizzard, 162–64; mechanics of pseudo-collaboration and, 167–68; reciprocal coupling and, 168–70; relational ecologies of the thaw and, 173–74; reorienting the pace of collaborative climate science and, 176–77; shaping a praxis of relational flourishing and, 177–81
- ethnographic refusal, 25, 33, 34, 151
- etic (scientific) perspective, 122
- Euclidian-Cartesian framework, 147–48
- Evenki community, 111
- Eveny community: adaptability of, 64–65, 84–85, 102–3, 134; ancestral innovation of, 102–3; bears and, 110–11; care of scientists by, 101–2; conference with, xi–xiii; divination practices of, 133; ethnographic research of, 28–32; expeditions of, 94–95; expertise of, 90–92, 103, 104, 113; as indispensable, 173; lack of recognition of, 103–4; mapping and, 96; mountain imagery to, 68–69; navigation by, 96–97, 99; *nimadun* and, 96, 103, 105; *nyamnin* and, 57; research aid by, 90; resilience of, 86; song of, 97–98; spatial knowledge of, 99; technical ingenuity of, 149; wildlife management disputes and, 153; Yup'ik community and, 38. *See also* reindeer herding/herders; shoulder blade rituals (*bihiketchem kaendekich*)
- evidence, as reciprocal currency, 177
- exculpatory tactic, 54
- expert-informant hierarchy, 145
- expertise: compensation for, 179; disciplinary assumptions of, 51; effectiveness of, 77; of elders, 152; of Eveny community, 90–92, 103, 104, 113; hierarchy of, 33; importance of, 72; of Indigenous communities, 124, 126, 145; Indigenous knowledge *versus*, 92; integrative capacity of, 48; of knowledge-keepers, 152; marginalizing of Indigenous, 51, 55; of permafrost scientists, 2–3; in reindeer herding, 82; of scientists, 2–3, 99; singularization of, 122–24; technocratic, 92
- exploration, power imbalance of, 104
- external perspective, judgment from, 26
- extraction modality, 167–68
- extraction model of collaboration, 10
- extractive industries, 65, 130, 131–32
- facilitative ethics, 155–57
- facilitators: ethics of listening and, 134–36; mediation of, 2; role of, 2–3, 126, 132, 134, 136, 138
- feedback loops, 114, 116–17, 133–34, 175

- fire, 108, 109–10. *See also* wildfires
- fire-weather systems, 115
- first year drinking tea metaphor, 7
- fish, 147
- floods, 135
- forests, health of, 108
- fortune-telling, 23
- fractal ecology, 123
- freeze-frame approaches, xi, 150–52
- fresh water, safeguarding, 131
- frictions, epistemic, 140–44
- funding, rewards in, 180
- Fúnez-Flores, Jairo, 24–25, 34
  
- gaslighting, 40–41
- genocidal policies, 33
- geopolitical shifts, 84
- Gitxsan peoples, 153
- glittering bear, 110–11, 149
- governance, 153, 173–74
- grants, 8, 45–46, 49, 54–55, 167
- guardian reindeer (*khaevek*), 95–96.  
*See also* reindeer
- Guattari, Félix, 125
  
- haeket* (northern lights): academic rigor  
 and, 166; acknowledging, 167; approach  
 of, 178; auroral couplings and, 175–76;  
 collaboration into shared world-making  
 and, 164–67; as conceptual roadmap,  
 121; co-production and, 120; coupling  
 and, 14–15, 118–21, 136–37, 178; defined,  
 14, 114, 139, 159, 195; as dynamic  
 coupling, 118–21; emetic approach and,  
 124; epistemologies of, 164–67; ethics of  
 mutual care of, 158; as generative  
 coupling, 14, 178; methodological means  
 of, 167; overview of, 14–15; pace of  
 inquiry and, 179–80; photo of, 119; of  
 reciprocal leadership, 146; recognition  
 of, 167; relational context of, 165; as  
 roadmap, 12; synergy of, 137
- Harjo, Laura, 16
- hazard prediction, 171–73
- heatwaves, 70
- hiakita* (larch), 108
- Hokowitu, Brendan, 9
- holding together, process of, 111
- Holenstein, Elmar, 72
- holomatrix, 75–78, 83, 85
- hope, in uncertainty, 78
- hospitality, Euro-American style of, 28–31
- Hulanya River, 89
- human interface, function of, 122
- humanity: hierarchy of, 148; of Indigenous  
 hunters, 35; as relative, 141
- human non-exceptionalism, 110
- human-nonhuman relations, 106–7, 109, 116
- human-reindeer mobility, 102–3
- humility, 161
- hunting/hunters, 31, 96, 117
  
- ice-albedo feedback mechanisms, 114
- “Idle No More” movement, 149
- ikhlan*, 127, 128–29
- impact acceleration, 6, 8, 21
- implementation, 48
- Imtandya River, 98
- incommensurability, 33–37, 156–57, 169,  
 177, 179
- incorporation, collaboration and, 141–42
- independent research model, 54
- Indigeneity, 142, 143, 144. *See also*  
 Indigenous communities
- Indigenous-centered research ethics, 46
- Indigenous collaboration, reconfiguring  
 governance in, 173–74
- Indigenous communities: climate change  
 performance of, 42–44; colonial  
 boarding schools and, 15; colonial  
 history of, 39; damaged relationships  
 with, 10; data and research findings  
 evaluation from, 40; decolonial thought  
 and, 36; ethnographic refusal and, 25;  
 exclusion of, 34; expertise of, 51, 55, 124,  
 126, 145; gaslighting regarding, 40–41;  
 harms to, 10; humanity of, 35; knowl-  
 edge of, 8–10, 16, 132–33;

- Indigenous communities (*continued*)
  - marginalization of experience of, 33, 151;
  - need for collaborative research partners in, 20–21; overview of, 4–6; personhood of, 35; perspective shift regarding, 37;
  - power imbalance with, 7; requests regarding, 26–27; research of, 27; silencing of, 55; structural conditions of, 51; theories of the Universe of, 37; trust of, 38
- Indigenous epistemologies, extraction and misappropriation of, 151–52
- Indigenous interlocutors, role of, 167
- Indigenous metaphysics, 147–50
- Indigenous negotiators, role of, 6
- Indigenous scholars: alliances of, 176–77;
  - double binds of, 180; as facilitators, 126, 135, 159, 176–77; goal of, 141, 145; interfacing of, 155–57; labor-intensive calibration by, 153;
  - praxis of, 176–77; role of, 15, 16–17, 140–41, 159; threshold of, 140–41
- Indigenous studies, knowledge politics in, 146–47
- Indigenous temporalities, recalibration of epistemic calendar around, 168
- infrastructures, contemporary, 171–72
- innovation, 33, 102–3, 167
- institutional racism, 25–26
- institutional whiteness, 53
- integrative capacity, 47
- interdisciplinarity, 55
- interdisciplinary outreach, 178
- interdisciplinary researchers, 126
- inter-disciplinary studies, 47
- interface design, 145
- interjector, role of, 123
- Iñupiaq whalers, 145, 153
- jaguars, 35
- Jensen, Casper Bruun, 122–23
- Juruna, 36
- Kadarandya Mountain, 98
- kaendaet* (shoulder blade), 73. *See also* shoulder blade rituals (*bihiketchem kaendekich*)
- kaitiakitanga* (guardianship), 145, 160
- Kapferer, Bruce, 83–84
- Kaupapa Māori, 152
- kayury*, 90, 92
- khaevек*, 100
- Khulanyachan River, 98
- kin-centric ecology, 150
- kin-centric map, 141
- kin-centric obligations, 140–44
- know-do gap, 48, 56, 57, 59, 170–71
- knowledge: blending domains of, 47;
  - coloniality of, 54; convergence of, 56;
  - co-production of, 47, 48, 51, 55, 82–84;
  - delivery stage of, 10; difference and, 14;
  - exchange of, 52; Indigenous, 132–33; of Indigenous communities, 8–10, 16; of Indigenous scholars, 126; knowledge/belief divide, 149; local, 143; in mapping, 93; modernity's dominant notions of, 34; paradigms of, 120; place and, 141;
  - from reciprocal relationships, 160;
  - redesigning architectures of, 181;
  - reimagining, 153; removal of everyday context and, 84; responsibility and, 146;
  - returning of, 158; shamanic, 15–16, 118;
  - sharing of, 31; taxonomies of, 141;
  - technocratic expertise *versus*, 92;
  - vulnerability and, 69; white supremacy and, 53
- knowledge co-production: centrality of, 48; coupling and, 15, 115; ethical dimension of, 124; of Indigenous communities, 8–10; Indigenous-led methodologies and, 51; integrated approach for, 47; more-than-human initiators of, 110–12; moving toward, 82–84; potential of, 48; process of, 1; as reorganization, 55; requirements for, 1; research collaborations and, 16–17; unshared returns in, 27–32
- knowledge delivery stage, 10
- knowledge-keepers, 152
- Konstantinovich, Dmitry, 90–93, 95, 96, 98, 99–102, 103, 123, 173, 174
- Kuper, Adam, 142

- landmarks, dynamic elements as, 96
- landscape, 93, 107–8
- landslides, 107
- Leahey, Erin, 47
- Lebedev, Mikhail, 57–58, 90, 92–93, 96–98, 102
- Liboiron, Max, 155, 156, 159
- lichen, 108, 116, 141
- Linux, 15
- listening, ethics of, 134–36
- make-believe collaboration, 6–8. *See also* collaboration
- mapping: cartographic practices of, 93–94; as communicative tool, 97; Eveny appreciation for, 96; Inuit uses of, 98–99; kin-centric, 141; legitimate knowledge in, 93; limitations of, 99–100; as nexus points, 99; scientific-bureaucratic, 141; song of, 97–98; of vulnerabilities, 175
- matter, 145, 147–50
- McGregor, Deborah, 155, 159
- meeting, reciprocal care and, 145
- mercury, 147
- meteorology, 13, 115, 129, 168
- methodological insurgency, 161
- mica, 110–11
- migration, 63, 72, 94, 129, 157
- Mills, Charles, 53
- mining, 65, 110–11, 130, 131
- modaen* (flood), 127
- modernity, understanding of, 34
- more-than-human actors, scientific discovery and, 149
- more-than-human collaboration, reconfiguring governance in, 173–74
- Moreton-Robinson, Aileen, 9, 24, 32, 54, 104–5, 149
- Moscow, personal stories of, 23
- mountains, 68, 123
- mudflows (*batan mon*), 107, 116, 127
- multiple worlds approach, 11–12
- Murphy, Michelle, 155, 159
- mutual shaping, 114–15, 134, 175
- mutual transformation, 161
- naledi*, 129
- narrative integrity, violations of, 24
- narratives, function of, 52
- nativism, 142, 143
- natural disaster, 68–69
- natural science, limitations of, 3
- navigation, 96–97, 99
- navta*, 108
- negotiation, 165
- neocolonialism, 39; neocolonial excess, 37–44; neocolonial utilization, 24
- Neustroyev, Nikolai, 16, 107, 118–19
- neutrality, 27, 39, 41–42
- neutralizing tactics, 39–40
- new materialism, 148
- niamalra* (mosses), 108
- nimadun* (sharing): coupling and, 117–18, 120, 122, 137, 176; defined, 30, 31, 38, 113, 195; engagement of, 38; ethics of, 38, 126; ethos of, 112; ideology of, 32; knowledge sharing and, 31; land as demanding, 105; as obligatory sharing, 14, 169, 178; overview of, 117–18, 178; partnership in, 103; performing, 31; practice of, 96; principles of, 44, 124; relational obligations and, 146; relation and, 149; as roadmap, 12; for scientists, 95–102; sharing and, 105; system of, 32; as white possessive counterpoint, 112
- nonhumans, care for, 93
- non-performative, 55
- nyamnín* (togetherness): collaborative strategy of, 57; coupling and, 116, 120, 122, 125–26, 137, 176; as decolonial model for collaboration, 57–60; defined, 48, 57, 113, 153–54, 172, 195; embracing, 84; ethics of, 129, 139, 156; Eveny spatial knowledge and, 99; features of, 172; function of, 46–47, 154, 158; as guide of work, 171; hazard prediction and, 172; immediate response and, 64; knowledge from, 160; mobilizing, 154; overview of, 116; photo of, 58; principles of, 124; as pro-social strategy, 84; as reciprocal leading, 168–69; redundancy and, 172;

- nyamnín* (togetherness) (*continued*)  
 in reindeer herding, 57, 58–59, 63–64;  
 relational obligations and, 146; require-  
 ments for, 63; rhythm of, 172; as  
 roadmap, 12; in snow avalanche, 62–69;  
 social solidarity and, 17; as symmetrical  
 problem-solving, 14, 178; teaching, 102;  
 uncertainty in, 65; vulnerability in, 59–60
- obligations, kin-centric, 140–44
- Omura, Keiichi, 98–99
- one-world doctrine, 93
- One-World world, 11
- ontology, 34; ontological equivocation,  
 100–101, 121–22; ontological symmetry,  
 of humans and nonhumans, 35;  
 ontological turn, 35–36
- open access, 158; open-access mandates,  
 180
- opening up, process of, 3–4
- open science, 155
- optimal perspective, 72
- Orochen community, 111
- Other, 23, 24, 25, 26
- pace, 175–77
- pancakes for mountains concept, 62–69
- partial luminance, 178
- participatory action research (PAR), 3, 7
- partnerships, research, 48, 171
- permafrost: defined, 105; degradation of,  
 126; description of, 126; experience  
 perspective of, 105–6; feedback loops  
 and, 116; mapping processes of, 93–94;  
 military facilities on, 131; neocolonial  
 treatment of, 87–88; probe of, 157; as  
 shifting, 105–6; significance of, 105; as  
 white possession, 102–6
- permafrost research: complicity in, 104;  
 evolution of, 111–12; open dialogue and,  
 131; overview of, 87–89; solifluction in,  
 127–28; state-led projects and, 131.  
*See also specific aspects*
- permafrost scientists, 2–3, 17
- permafrost thaw: causes of, 65; as changing  
 landscape, 58; conference regarding,  
 xi–xiii; coping with, 62–63; destruction  
 from, 107; feedback loop and, 116;  
*nyamnín* and, 116; relational ecologies  
 of, 173–74; risks of, 62; wildfires and, 71
- personhood, of Indigenous hunters, 35
- perspectivism, Amazonian, 36
- Petryna, Adriana, 13, 72, 115, 120
- phlogopite, 110–11
- pluriversal politics of design, 170
- pluriverse, 11, 152–55, 161
- Poincaré, Henri, 47
- policy conversations, bringing Indigenous  
 thought into, 150
- positionality, of white-majority institu-  
 tions, 54
- power, 104, 152–53
- privilege, 39
- Project A: collaboration model in, 46;  
 differences in, 49–50; diversions in,  
 49–50; expertise in, 48; goal of, 48;  
 individualized research logics in, 56;  
 inequalities in, 50; lessons from, 170–71;  
 motivations within, 49; overview of,  
 45–46, 49–51; proposal stage of, 49; scope  
 of, 48–49; structural dynamics of, 51
- Project B: collaboration as inherently  
 embedded in, 46; expertise in, 48; goal  
 of, 48; lessons from, 170–71; overview of,  
 45–46, 51–53; reminder from, 56; results  
 of, 56; scope of, 48–49; strengths of, 52
- Project C: collaboration model in, 46;  
 expertise in, 48; goal of, 48; individual-  
 ized research logics in, 56; lessons from,  
 170–71; overview of, 45–46, 53–56; scope  
 of, 48–49
- psuedo-collaboration, mechanics of,  
 167–68
- qasgiq*, xi
- racialization, in white possession, 104–5
- Rangifer tarandus*, 100

- rapport, building, 7
- reality, modernity's dominant notions of, 34
- recalibrations, function of, 160–61
- reciprocal-fragility matrix, 175
- reciprocity, 135, 154, 178
- recognition, 48, 88
- reductive approach, 8
- reindeer: as animal double, 95; in blizzard, 163–64; data collection regarding, 157–58; feedback loops and, 116; guardian (*khaevək*), 95–96; health of, 108; ice crossing refusal by, 180; as *khaevək*, 100; leading (*negut*), 154; lichen and, 108; as people too, 89–95; as *Rangifer tarandus*, 100; as relative, 141; significance of, 95; in snow, 175; wildfire effects on, 107. *See also* reindeer herding/herders
- reindeer herding/herders: care in, 92–93; conference with, xi–xiii; *djuluchen* and, 72–78, 85; encampments of, 75; environmental shift monitoring by, 127–29; by Eveny community, 28–32; expeditions of, 94–95, 123; expertise in, 82; extractive industries and, 131–32; human-reindeer mobility in, 102–3; as indispensable, 173; knowledge/belief divide and, 149; lack of recognition of, 88; mastery in, 63; meteorology and, 129; migration alterations in, 63, 72, 129; migration of, 94, 157; more-than-human sociality in, 88; more-than-human stories in, 110; navigation in, 96–97; *nyamnín* and, 57, 58–59, 63–64, 116, 117; ordinary work of, 16; permafrost thaw and, 62–63; perseverance in, 99; photo of, 58, 64, 91, 94; reciprocity of, 154; reliance on, 89–90, 133; sharing and, 96; wildfires and, 70–78. *See also* shoulder blade rituals (*bihiketchem kaendekich*)
- relational flourishing, shaping praxis of, 177–81
- relationality, 147
- relational symmetry, 24
- reparative futures, designing for, 152–55
- rescue operations, in snow avalanche, 66–68
- research / research collaborations: benefits of, 10; complexities of, 50; data collection process in, 157–58; decolonizing, 15–18; decolonizing perspective of, 112; empathy in, 38–39; equality in, 27–28; ethical questions regarding, 52; neocolonial power asymmetries in, 22–27; oversight bodies of, 169; power imbalance in, 104; rewards in, 174; solidarity in, 17; struggles of, 46. *See also specific aspects*
- responsibility, knowledge and, 146
- rigor, 166
- Roskosmos satellite, 72
- Russia, 90–92, 104, 130
- salmon, 35
- Salmón, Enrique, 139, 150
- Same: defined, 23; dichotomy of, 24; enunciating by, 24, 25; evaluation by, 26; flexing of power of, 44; individualistic interests of, 44; on interpretation and reality, 34; lived realities and, 25; neocolonial patterns and, 44; ontological turn and, 36; refusal of, 25
- satellites, 13, 172
- scalability, enthusiasm for, 8
- Schmidt, Gavin, 79–80
- science and technology studies (STS), mutual shaping in, 114
- scientific-bureaucratic map, 141
- scientific discovery, more-than-human actors and, 149
- scientific way, 93
- scientists: adaptability of, 116, 134; domination of, 59; Eveny community's care for, 101–2; expertise of, 2–3, 99; facilitators and, 136; Indigenous partnerships with, 10, 37, 78–79, 86, 92–94; limitations of, 134; natural, 3, 7,

- scientists (*continued*)  
 8, 53, 78–79; needs of, 3; *nimadun* for, 38, 95–102; permafrost, 2–3, 17, 87, 90, 93–94; permafrost degradation explanations of, 126–27; power imbalance of exploration of, 104; reductive approach of, 8; Same and, 34; social, 2, 36, 53; training by, 9; vulnerability of, 106
- scopeability, enthusiasm for, 8
- seal, 147
- Sea of Okhotsk, 89
- security, racialized distribution of, 53
- self-sacrifice, 96
- serendipity, in emergency situations, 77
- shamanic knowledge, 15–16, 118
- Shapin, Steven, 21
- sharing, 31, 96, 105; shared flourishing, 159–61; shared futures, practice of, 157–58; shared world-making, collaboration into, 164–67. *See also nimadun* (sharing)
- shoulder blade rituals (*bihiketchem kaendekich*): accessibility of, 81; benefits of, 85–86; borrowable elements of, 84; climate models and, 78–79; comparison of, 80–81, 85; co-production of knowledge and, 82–84; *djuluchen* and, 82, 85, 117; function of, 80; hazard prediction and, 172; introduction to, 61–62; intuition of, 82; mapping potential for convergence and, 80–82; overview of, 72–78; as relational practice, 78; reliability of, 81; ritual (*bihiken*), 72; shoulder blade (*kaendaet*), 73; slowing down and, 135; uncertainty of, 82; value of, 86; as way of knowing, 86
- Siberia: description of, 89; Eveny community in, 28–32, 38; hazard prediction in, 171–73; mapping of, 89; personal stories from, 23; research in, 27, 89; wildfires in, 70–72; wildlife in, 89. *See also* Eveny community
- signs, observation of, 76
- Silko, Leslie Marmon, 139
- Simpson, Audra, 9, 25, 151
- singularization, 100, 122–24, 137
- slowing down, 135, 137
- snow, 129, 163–64; snow avalanche, 62–69, 135
- social matters: social determinism, 114; social dynamics of solidarity, 48; social ethics, 117; social relations, 27; social transformation, 114
- solidarity, 17, 48, 135
- solifluction, 127–28
- space-time, 148
- spirits, 76–77, 86, 108, 109. *See also djuluchen* (foreshadowing spirit)
- stakeholders, Indigenous partners as, 175
- Stenger, Isabelle, 152
- stone-bear pedagogy, 150–51
- storytelling, model of, 52
- strategic essentialism, 142
- structural asymmetry, 142
- Sumgin, Mikhail, 106
- survival techniques, 101–2
- swans, 23
- systems theory, coupling in, 168
- TallBear, Kim, 146–47, 148–49, 159
- taryn*, 129, 130
- technological determinism, 114
- technological fixes, hazards of, 88
- temperature timeline, 158
- Tenkuli River, 98
- Termo-spots, 70–71, 72
- thaw-detection algorithms, 158
- thermal anomalies, 70
- thermokarst slumps, 158
- thought experiment, Amazonians as, 36
- Todd, Zoe, 144, 147, 155–56, 159
- togetherness, shared sense of accountability and, 87. *See also nyamnín* (togetherness)
- topographic maps. *See* mapping
- Traditional Environmental Knowledge (TEK), 83–84

- transferability, 8
- Transiciones* (Escobar), 11
- translation, 33–37, 153, 154, 178–79
- traveling spirits, 75, 85
- treaties, violation of, 38
- treaty metaphor, 155
- tribal council, 157
- tribulations of the animate planet, 65
- trust, 7, 27, 30, 38, 43, 52
- Tuck, Eve, 151, 159
- Tuhiwai-Smith, Linda, 9
- Tungus-speaking groups, 111
- Turner, Dale, 153, 159
- twin maps concept, 141–42, 179
  
- Ukraine, 130
- ulakë imanda*, 129
- unbelonging, 24
- uncertainty, hope and, 78
- United Nations Declaration on the Rights  
of Indigenous Peoples (UNDRIP), 5, 142
- University of Alaska Fairbanks, xi
  
- value, asymmetric transfer of, 142
- Varia, Upe, 162
- Verkhoyanye Mountains, 28, 72, 110–11
- Verkhoyansk Range, 94
- Viveiros de Castro, Eduardo, 35–36
- vortices of risks, 85, 135
- vulnerability, 59–60, 69, 106, 115–16,  
175–76
  
- water, 115, 155
- web of interdependence, 59
- Western communities, 4–6, 7
  
- Western science, 5
- Western scientific paradigms, 125
- Weston, Kath, 65
- wet snow avalanche (*ulakcha imanangga*),  
68
- Wet'suwet'en peoples, 153
- whales, 145, 147
- white possession: approach of, 104;  
counterpoints to, 112; critical commen-  
tary from, 33; defined, 32, 54, 149;  
manifestation of, 33–34; racialization in,  
104–5; “this is mine” attitude of, 105
- white progressive logic, 24
- white supremacy, 38, 53
- wildfires: in *bilaek*, 108; communal  
responses to, 85; coupling and, 13;  
*djuluchen* and, 72–78; feedback loop  
and, 116; permafrost and, 71; plant life  
following, 108, 116; reindeer and, 107;  
satellite imagery of, 71; spirit of, 109;  
techno-fixing, 70–72; vortices of risks  
of, 135. *See also* fire
- wildlife, co-management disputes of, 153
- Williamson, Karla, 9
- Windows, 15
- Working Group on Indigenous Popula-  
tions, 143
- workshop, function of, 52
- worlding, 81, 86
- worlding grid, 75–76
- worlding process, 78
- world-making, 166
- worlds, conjunction of, 124
  
- Yup'ik peoples, xi–xiii, 38, 153