Transformative Transdisciplinarity

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An Introduction to Community-Based Philosophy

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Preface

When the two of us began collaborating eight years ago, we did not anticipate a learning journey that would lead us to a monograph on community-based philosophy. On the contrary, our initial collaboration had a much more restricted focus on philosophy and ethnobiology. Ethnobiologists study how people relate to the biological world, often with a focus on Indigenous and local knowledge. Both of us were puzzled that philosophy of science had largely ignored the intellectual challenges emerging from ethnobiological research. Many philosophical questions arise when recognizing that biological expertise is not exclusive to academic researchers but globally distributed across communities with vastly different practices, values, and worldviews.

While we initially focused on developing a "philosophy of ethnobiology" (Ludwig and El-Hani 2020), our research aims and methods gradually transformed through our collaboration with the Brazilian fishing communities of Siribinha and Poças. Charbel first established this collaboration for a much more restricted project on ethnobiology and science education, but synergies with our wider philosophical interests soon became apparent. A thriving team of master's students, PhD candidates, and postdocs joined us in the communities to explore philosophical questions about a wide range of issues from epistemology to ontology to political theory. While there was a lot of intellectual progress, there were also many challenges that we had not anticipated and that we were not prepared for. Doing philosophy in Siribinha and Poças meant leaving the safety of philosophical thought experiments or secondary data. Doing philosophy in rural and disenfranchised communities in Bahia situated us in daily livelihood practices and community struggles regarding economic exploitation, environmental destruction, and conservation measures enforced in a top-down manner.

The humbling experience of doing philosophy in fishing communities far away from the philosophical armchair puts a spotlight on many limitations of academic philosophy. Philosophers are trained to talk *about* people, not to talk *with* people. And they are usually even less prepared to work with people in creating something valuable together. Even when philosophers

address issues at the center of community struggles such as climate change, economic exploitation, food security, or public health, they often opt for abstract framings that are not informed by local realities and may therefore mislead about places like Siribinha and Poças. We're not pointing out these limitations to criticize academic philosophy from the outside. On the contrary, these limitations have been very much our own limitations.

When trying to explore local epistemologies and ontologies in Siribinha and Poças, the practices of our research team inevitably mirrored our academic training. We always showed up with new philosophical questions and new methods for data collection. Sometimes community members were exhausted by our interview questions and workshops. Sometimes they were suspicious about our intentions and what we would do with all this information. And, to be completely honest, many of these suspicions were justified. Even with all of our critical reflections and good intentions, the data still often served our own goals: finishing master and PhD theses, publishing articles, and completing "work packages" of our grants. Indeed, philosophical reflection and ethnographic documentation of local epistemologies and ontologies can still remain deeply extractive in treating communities as a source of data for academic consumption rather than as an equal partner in the collective struggle for a better future. Our learning journey in Siribinha and Poças has therefore led us on an unexpected path that turns back toward us and the very ways we are doing research.

Transformative Transdisciplinarity is the result of this learning journey that has changed how we see ourselves as philosophers and how we see the role of science in society. At the core of the book is an optimistic message about philosophy and its significance in a messy world of intersecting environmental and social crises. Addressing such crises requires transdisciplinary research that brings diverse actors together: anthropologists, artists, biologists, economists, engineers, community elders, extension workers, farmers, fishers, medical practitioners, policymakers, science communicators, social activists, teachers, union workers, and so on. Collaboration among such actors, however, is commonly marked by epistemological tensions between different ways of knowing, ontological tensions between different ways of being, and political tensions between different agendas and positions of power. Insofar as philosophers can help to navigate this thicket of intricate relations, they have a fruitful role to play in transdisciplinary research and societal transformation.

Acknowledgments

While philosophers have a lot to offer to transdisciplinary research, they also have a lot to learn. Mediating between epistemologies, ontologies, and values requires diverse skills. Philosophers tend to be good at conceptual analysis and critical reflection but often lack other empirical and interpersonal skills that are essential for successful mediation. Transformative transdisciplinarity challenges philosophers to diversify their skill sets. Even more importantly, however, it challenges philosophers to collaborate. Co-creation with people who have different skills is at the heart of any successful transdisciplinary practice.

This book is the outcome of a collaborative learning journey, and our account of "community-based philosophy" is itself the product of collective rather than solitary thinking. We are thankful to the communities of Siribinha and Poças for the invaluable collaborations and friendships that have been growing for nine years and continue to flourish. The constant dialogues and mutual learning with community members have made this book possible. This also includes the communities of Forikrom, Koro, and Coração de Maria/Retiro, who made diverse contributions to the studies discussed in the book. In approaching philosophy as community-based practice, we have been extraordinarily fortunate to be able to learn from a brilliant community of scholars and practitioners who inspired us, co-developed ideas and articles, co-organized fieldwork and events, and commented on our draft writing. Without any claim of completeness, we would like to thank Nana Kwa Adams, Emmanuel Adu-Ampong, Sara Alam, Ulysses Paulino de Albuquerque, Rosiléia Oliveira de Almeida, Júlia Stifelman Freire Alves, Deborah Apgaua, Beatriz Demasi Araújo, Daniel Faabelangne Banuoku, Paride Bollettin, Birgit Boogaard, Adriana Ressiore Campodonio, Beatriz Lopes Cerqueira, Clara Kalil Dourado Coelho, Thaís Ferreira da Silva Costa, Gabriela Vanegas De La Rosa, Abigail Nieves Delgado, Rafael Piedade Félix, David Fletcher, Juliana de Oliveira Fonseca, Matthew French, Mariana García Medina, Fabio Gatti, Giorgia Giudice, Bernard Yangmaadome Guri, Anita Hardon, Jéssica da Hora, Taiala Viviane Menezes de Jesus, Matthias Kramm, Catherine Kendig, Marisa dos Santos Lisboa, Diana Lopez

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In the book, we included results from different research projects that have undergone ethical clearance according to the laws of the countries where they have been carried out. The project by the Federal University of Bahia (UFBA) research team has been approved by the Committee for Ethics in Research from the Nursing School of Federal University of Bahia, Brazil, under n. 2.937.348, and followed the Brazilian laws concerning ethical research procedures. It was also registered in the National System for the Management of Genetic Heritage and Associated Traditional Knowledge (SisGen) under n.A 053F57. Ethics approval for different parts of the "Global Epistemologies and Ontologies" (GEOS) project has been provided by the ethics board of the Social Sciences (SSG) at Wageningen University and Research.

Concerning confidentiality and anonymity, as ethical practices designed to protect the privacy of human subjects, it was approved that in cases in which revealing the identity of the community participants was not detrimental or brought visible risks to them, and/or was beneficial for the community, and/or was needed for giving due credit for their own knowledge, recognizing that they are the holders of views or statements we present in our papers, we could reveal their identity, provided that they were informed and gave specific consent in this regard. In the case of some studies included in the book, the identity of community members is therefore revealed, while in other cases the criteria mentioned above were not fulfilled, and they were anonymized.

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1

Introduction

Global Challenges, Local Struggles

1.1 Modernity: The View from Siribinha and Poças

The communities of Siribinha and Poças are located on a narrow stretch of land between the Atlantic Ocean and the Itapicuru River estuary in the northeast of Brazil (Figures 1.1 and 1.2). Fishing constitutes the main economic activity in both communities as their location provides access to rich fishing grounds in the brackish waters where the river meets the sea. Until the late twentieth century, the communities were reachable only by boat. Fishers took their boats upstream to the municipal center of Conde to sell their catch at the market while otherwise living in relative autonomy from Brazilian society.

In the 1990s, the construction of a road became a catalyst of change in Siribinha and Poças. The unpaved road connects the communities with Conde while winding through sand dunes, coconut farms, and wetlands of the peninsula. Although the road is bumpy and floods can occasionally make it unpassable, it has established a regular exchange of commodities that has transformed economic and social realities in both communities. Not only commodities but also people now travel along the road. It has brought tourists from surrounding cities to enjoy the beaches near the mouth of the Itapicuru River. It has brought new residents who are attracted by low real estate prices for vacation houses. The road has also brought us, Charbel and David, as members of a research team that has collaborated with the communities for the past nine years in addressing educational, environmental, and social issues.

While Siribinha and Poças are changing, transformation is not as rapid or violent as in other parts of Bahia that have been more severely affected by mass tourism. When Charbel started working on ethnobiology in the late 1980s, he worked in Boipeba, and later, in the 2000s, in Praia do Forte, which have both been fundamentally transformed to meet the needs of the tourism

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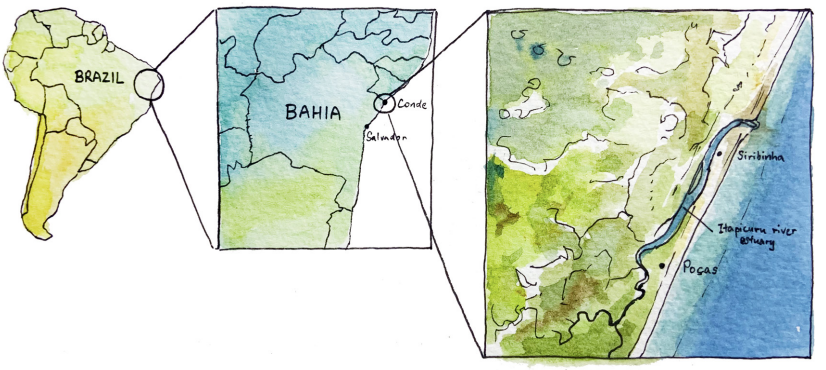

Figure 1.1 Location of the fishing communities Siribinha and Poças in the state of Bahia in Brazil. (Illustration by Raphael Q).

Figure 1.2 The communities of Siribinha (left) and Poças (right). The photos show the villages between the Atlantic Ocean and the estuarine environments of the Itapicuru River. (Photographs by José Amorim Reis Filho).

industry. Fishing culture has virtually disappeared in Praia do Forte as the village has been turned into a resort town where most homes of fishers have been replaced by hotels and vacation houses. Sustainability exists primarily as a heavily marketed tourist attraction of a turtle conservation project with its own entertainment park and chain of souvenir shops. Boipeba has thus far avoided large hotel complexes, but the economy is dominated by an ever-growing number of small guest house *pousadas* for island tourists seeking idyllic beaches and tropical nature. Fishing has gradually declined to a secondary economic activity since most locals are now working as cleaners, cooks, guides, receptionists, or waiters in the tourism sector.

In Siribinha and Poças, change is coming more slowly. Located near the northern edge of Bahia and only accessible through a somewhat cumbersome road, most tourists opt for destinations more easily accessible from the state capital of Salvador. The communities have therefore managed to preserve to a large extent their *Jangadeiros* fishing culture, typical of the northeast of Brazil and named after the rafts (*jangada* in Portuguese) used for fishing (Diegues 1999). Synthesizing African, Indigenous, and Portuguese influences, the livelihood practices of both Siribinha and Poças revolve around small-scale fishing and the collection of shellfish such as the *Aratu* crab (*Goniopsis cruentata*) in the mangroves.

Jangadeiros culture plays an important role in the conservation of the local ecosystems, including mangroves, wetlands, and shrubby thicket-like forests growing on sand dunes known as *restingas* (Tng et al. 2021). Not having been replaced by more intensive forms of fishing or tourism yet, *Jangadeiros* culture has left estuarine environments well-preserved, as reflected in the abundant presence of species sensitive to environmental impacts, including the rufous crab-hawk (*Buteogallus aequinoctialis*), a top predator locally known as *Gacici*, a near-threatened species. Other rare and threatened species are found in these environments, including a critically endangered capuchin monkey, *Sapajus xanthosternos*, locally known as *macaco-prego*, and the

Figure 1.3 Two fisherwomen, Erica and Estrela, and PhD candidate Juliana Fonseca fishing on the Itapicuru River. (Photograph by David *Ludwig, 2023*, reproduced with permission of the people shown).

endangered grey-breasted parakeet, *Pyrrhura griseipectus*, locally called *periquito-da-cara-suja*, *cara-suja,* or *periquito-cigano* (Félix, Sampaio, and El-Hani 2022).

While the preservation of biological and cultural diversity is remarkable in Siribinha and Poças, so is the fragility of its biocultural balance in the face of external disruption. Although tourism remains at a relatively small scale, many fishers see it as an existential threat to their way of life, as *Jangadeiro* fishing cannot economically compete with the tourism industry. Tourism brings not only money but also new labor relations to the communities. While hotels are often externally owned, and work in the tourism sector increasingly comes in the form of wage labor, in Siribinha and Poças most tourism facilities still belong to the community members, and the *Jangadeiros* fishing culture is still fiercely independent. Traditionally carried out in small boats that are owned and operated within families, artisanal fishers are no one's employees or employers (Figure 1.3). While the introduction of larger fishing boats in Poças has necessitated the hiring of entire crews, tourism in Siribinha is still a driving factor of changing work realities that risk transforming *Jangadeiros* fishers into a cheap labor force.

Tourism is far from being the only external disruption that threatens the biocultural balance of the Itapicuru River estuary. In late 2019 and 2020, an oil spill swept across some 3,000 kilometers and 1,000 beaches in Brazil, with devastating impacts on marine ecosystems, fishing, and tourism. In one of the most severe environmental disasters ever recorded in tropical coastal regions, hundreds of tons of crude oil reached the Brazilian shore (IBAMA 2020). The Itapicuru River estuary was heavily affected, severely damaging the livelihood of its communities. Although the source of the contamination is still uncertain, it is suspected to have resulted from offshore vessel discharge as either illegal dumping or accidental release (Zacharias, Gama, and Fornaro 2021).

In both Siribinha and Poças, the oil spill continues to be a source of anger and trauma, as well as an experience of abandonment in the face of an existential crisis. When the oil reached the shore of the communities, it covered the beaches, polluted the mangroves, and poisoned the fish. In a matter of moments, everything that secured the livelihoods of the communities had become covered in toxic waste. The intestines of fish were often filled with oil, and even the ones without visible contamination contained unknown toxicity. Fishers could not sell their catch in the market of Conde anymore.

Tourism came to a halt as oil was swept into the estuary and covered the river beaches that usually attracted weekend visitors from nearby cities.

Help was promised but rarely delivered. Community members collected oil in buckets from beaches and mangroves without protective equipment. A few weeks after the oil spill, the Brazilian army appeared on the main beach of Siribinha and picked up some of the most visible patches of oil while the remaining beaches and mangroves remained contaminated. The communities' sense of betrayal was heightened as the federal and state governments took little interest in addressing the existential crisis caused by the oil spill that poisoned local sources of food while simultaneously bringing the two main sources of income, fishing and tourism, to a standstill. While access to basic food staples such as beans and rice became a pressing concern in the communities, government support remained largely symbolic. Emergency relief was promised but never actually made it to Siribinha and Poças. Rather than providing compensation payments, food, or toxicological support, federal actors downplayed risks and encouraged the communities to eat the local fish. Many in the community followed because there were no alternatives. While the communities lacked trust in government recommendations, there was also no other food available. Long-term health effects in the communities remain unassessed while anger and broken trust with the municipality and state remain a constant theme in conversations.

In Siribinha and Poças, modernity often arrives in the form of violence that is externally imposed and erodes traditional community structures without creating positive alternatives. The struggles in Siribinha and Poças are not unique but exemplify mechanisms of disenfranchisement and dispossession that affect countless rural communities that are assimilated into global economies from food production to tourism, vulnerable to environmental degradation from biodiversity loss to soil erosion, and externally governed from land ownership to conservation policy. Community struggles are therefore not only about the loss of local traditions but also about the violent structures of exploitation that are created in their place. Communities that remain in rural spaces become sources of cheap labor—whether it is as precarious workers in industrialized food production or as service workers in the tourism industry. Where local labor has become expendable, rural communities are often turned into urban underclasses as prominently reflected in the intertwined histories of rural outmigration and growing *favelas* across urban centers of Brazil (Fonseca et al. 2015).

In academic debates, communities like Siribinha and Poças are commonly positioned in developmentist narratives about the fruits of modernization and counternarratives about "post-development" alternatives to modernity. In these contestations of modernity, academics are vocal partisans in creating both types of narratives. Countless researchers in fields such as agronomy, civil engineering, development economics, or plant breeding have devoted their careers to bringing benefits of modernization to rural communities in the Global South (Baranski 2022; Curry 2019; de Oliveira 2014). At the same time, countless academics in fields such as cultural anthropology, critical development studies, peasant studies, and political ecology have mobilized communities as key witnesses for the failures of development and for "Indigenous," "traditional," or "peasant" alternatives to a hegemonic modernity (Banerjee 2023; Demaria and Kothari 2017; Malunga and Holcombe 2017).

In Siribinha and Poças, we found little enthusiasm for a generalized debate about modernity and tradition. Indeed, developmentist promises of the corporate and political establishment in Brazil are detached from the material realities of local fishers in the Itapicuru River estuary. From declining fishing stocks to fenced mangroves to toxic waste to dispossession of land to external property investments, it is plainly obvious that Brazilian modernity has not been made for the *Jangadeiros* fishers of Siribinha and Poças. While many community members worry about the effects of tourism, overfishing, and pollution, there is also little appetite for rejecting modernity. On the contrary, Siribinha and Poças very much claim their right to have a place in modern Brazil. *Jangadeiros* culture is not an immutable tradition defined by the past but a dynamic livelihood practice that is increasingly powered by small outboard motors, sonars, and GPS satellite navigation. The fishers of Siribinha and Poças do not aspire to return to a time when their communities were disconnected from the communication, electricity, and transportation networks of the rest of Brazil. On the contrary, many frustrations in the communities relate to disadvantaged access to these infrastructures of modernity from frequent power outages to lack of sanitation to limited mobile network coverage in the estuary.

Viewed from Siribinha and Poças, the issue is not a simple choice between modernity and tradition but rather a struggle about the communities' control over their own future: community control over material resources and means of production as independent fishers become dependent service workers in the tourism industry; cultural self-determination as local *Jangadeiros* culture

blends with new external influences from evangelical churches to social media; and control over decision-making processes as community members often find themselves confronted with externally imposed actions by municipal, state, federal, or global actors.

Addressing futures in Siribinha and Poças requires knitting together local struggles and global challenges. While struggles over increasing tourism, declining fishing stocks, or environmental destruction are very much local, they are also the product of national and global structures that are forced onto the communities. Communities of mixed African and Indigenous ancestry like Siribinha and Poças have long histories of colonial and racial exploitation in Bahia that remain clearly reflected in the structure of the Brazilian tourism industry (Malta and da Silva Barcelos 2020). Investment typically comes from outside while precarious labor is largely local. Environmental threats like the oil spill or overfishing also demonstrate the entanglement of local struggles with global structures of domination, as silhouettes of large fishing trawlers on the horizon serve as a daily reminder that the fate of the estuary and the local fishing culture is not merely locally determined.

Local struggles for a better future are therefore inevitably entangled with global challenges and resistance against external exploitation (Guzmán 2015; Shah et al. 2021; Tzul 2014). They call not only for local action but also for challenges to global policy regimes and the very ways in which we think about "development," "growth," "modernization," and "progress." In Latin America, the Zapatista call for "a world in which many worlds fit" (EZLN 1996; see also De la Cadena and Blaser 2018) has become a mobilizing slogan for connecting local struggles across heterogeneous geographic contexts. A world in which *Jangadeiros* worlds fit cannot be taken for granted and requires challenges of the status quo of Brazilian modernity.

1.2 Transdisciplinarity: The View from Forikrom

Contestations of modernity are not unique to Siribinha and Poças but common when local communities become "collateral damage" of global capitalism and international development. Consider Forikrom, a community that invited David Ludwig for several stays through a collaboration with the Ghanaian Center for Indigenous Knowledge and Organizational Development. Forikrom is located in the Bono East Region of Ghana, part of

the "transition zone" between the dry savanna climate of the north and the tropical climate of the south of the country.

While livelihoods in Siribinha and Poças are based on a rich *Jangadeiros* fishing culture, Forikrom is most clearly characterized by its Indigenous farming traditions. Farmers in Forikrom cultivate a large variety of crops for local consumption, such as beans, cassava, cocoyam, plantain, and yam, while also growing diversified cash crops like cocoa, cashew, and tomatoes. Immigration from the north of Ghana has further increased crop diversity by introducing, for example, sorghum and millet into the local landscapes. Forikrom is only a short drive from the regional capital Techiman, an important trading center for agricultural commodities and home to the largest market in West Africa. Located in a region that has often been identified as the "Food Basket of Ghana" (Boafo and Lyons 2022), Forikrom's identity revolves around its rich agricultural heritage.

In Ghana, the preservation of agricultural heritage largely depends on Indigenous governance structures that coexist alongside modern state institutions. Traditional chiefs, locally called *Nanas,* maintain cultural and social practices that safeguard agrobiodiversity and Indigenous knowledge beyond market-driven commodity production. In Forikrom, Nana Adams is heading the Abrono Organic Farming Project (ABOFAP), which aims to increase the resilience of smallholder farmers while ensuring stable access to healthy food in the community. Entering Forikrom on the road from Techiman, one first passes by ABOFAP's headquarters in an abandoned cashew factory and its demonstration field (Figure 1.4). The site is a source of constant Indigenous innovation—from educational programs for the youth to the construction of a seed bank for Indigenous crops to experimentation with organic fertilization and pest management.

Forikrom is a place of agricultural abundance: abundance of cultivated and wild vegetation; abundance of crop varieties and food; abundance of agricultural knowledge and pride in farming traditions. However, Forikrom is also a place of struggle. Just as the *Jangadeiros* fishing culture in Brazil is threatened by the expansion of tourism and large-scale commercial fishing, Indigenous farming culture in Ghana is threatened by large-scale commercial agriculture. Just as environmental pollution and overfishing are casting doubt on the future of artisanal fishing in the Itapicuru River estuary, climate change and soil erosion threaten the Indigenous farming practices of the transition zone around Techiman. From Brazil to Ghana, modernization

Figure 1.4 The agroecological demonstration field in Forikrom (left) and Nana Adams at the ABOFAP headquarters (right) giving a speech on "Celebrating Women Farmers, Indigenous Seeds, and Local Food for Community Resilience in the Post-Covid Era," during World Food Day. (Photographs by *David Ludwig, 2022* and *2021*).

often turns local communities into frontiers of exploitation and dispossession in the pursuit of cheap labor and cheap nature (Harvey 2004; Moore 2015).

When David returned to Forikrom in October 2022 for a project on community resilience (see section 5.2.4), a crisis of Ghana's food system was rattling the country. The national currency, *cedi*, had collapsed, having lost half of its value compared to the US dollar since the start of the year. At the same time, prices of many agricultural commodities were rising on international markets that had not recovered from disruptions caused by Covid-19 and were already experiencing their next major crisis through the Russian invasion of Ukraine in February 2022. As Kwakye et al. (2023, 5) put it: "increased prices exacerbated poverty and food insecurity in Ghana. Simulations suggest that in 2022 nearly 850 thousand Ghanaians were pushed into poverty due to rising prices and the loss in purchasing power. Simultaneously, the food security situation in the country is believed to have worsened considerably. Compared to the last quarter of 2021, the number of food insecure

Ghanaians jumped from 560,000 to 823,000 individuals in the last quarter of 2022."

While people in the urban centers of Accra and Kumasi were struggling to afford food, the farmers of Forikrom were struggling to sell food with even slight profit margins. Reliance on food imports from international commodity markets made urban centers vulnerable to disruptions such as the currency crises, war, and pandemics, but it also destabilized national commodity chains between rural producers and urban consumers. Small farming communities like Forikrom cannot outprice poultry farms in the Netherlands, rice farms in Vietnam, or wheat farms in Russia. While some perishable staple crops such as cassava and plantain are overwhelmingly produced nationally, neoliberal policies of President Nana Akufo-Addo and his predecessors pushed Ghanaian farmers into a global competition for the cheapest commodity production. Indigenous communities like Forikrom can rarely compete with industrial monocultures, and this waning profitability has been accompanied by a cultural devaluation of the allegedly "backward" and "tribal" character of farming in Ghana. As the organizer of an agricultural workers union in Ghana put it in conversation with David: "Poor people farm and old people farm. It's the last thing young people want to do because you don't make enough money and others look down on you."

Rather than accepting its fate as a "backward" or "tribal" frontier of modernization, Forikrom has developed an alternative agenda of Indigenous innovation for safeguarding and revitalizing local farming traditions. Many activities focus on celebrating Indigenous farming and the benefits of local agrobiodiversity. In a place of abundant agrobiodiversity like Forikrom, local farming ensures food security. No matter what happens to wage labor or a cash crop harvest, Indigenous crop diversity ensures stable availability of food. As a workshop participant put it: "If you live in Forikrom, you do not need to know hunger. Food is all around you." Food security therefore depends on food sovereignty in the sense of community control over a food system, including the distribution of resources but also biocultural effects from culinary traditions to landscaping (Noll and Murdock 2020; Patel 2009). Agriculture in Forikrom is not merely about providing sufficient calories but ensuring community control over healthy food, culturally meaningful labor, and community life.

Questions of food security and food sovereignty shift epistemological attention to Indigenous knowledge. If the goal is to maintain biocultural

diversity and support community livelihoods, many of the most important experts are farmers and other community members rather than academic researchers. And indeed, many activities in Forikrom revolve around Indigenous knowledge about local crop varieties, culinary traditions, soil conditions, pest management, fertilization, microclimates, ecosystem change, and so on. Developmentist appeals to modernization in Ghana frame Indigenous knowledge as "backward" and part of a premodern condition that needs to be overcome in communities' inevitable choice to industrialize or perish (Sumberg et al. 2017). In Forikrom, Indigenous knowledge is therefore at the center of struggles against a modernist dystopia that dismantles community structures and offers industrialized monocultures as the only viable future for rural spaces.

The recognition and revitalization of Indigenous knowledge are at the center of developing alternatives to violent forms of modernization in Forikrom. In contrast to a simplistic dichotomy between scientific modernity and Indigenous tradition, however, embracing Indigenous knowledge does not mean rejecting scientific knowledge. On the contrary, Forikrom exemplifies a more complex agenda of social change that mobilizes a "return to the source" (Cabral 1974) of Indigenous knowledge while simultaneously embracing externally produced and modern knowledge, insofar as it actually supports community life and community livelihoods.

For example, consider the Indigenous seed bank that is under construction in the former cashew factory that also hosts the organic farmers association ABOFAP. When David visited Forikrom in October 2021, first steps toward the construction of a seed bank were taken, in the form of a local celebration and exhibition of seed diversity that focused on Indigenous knowledge about crop diversity, culinary uses, and suitability of seeds in the local environment. Celebrating Indigenous knowledge, however, did not mean rejecting academic knowledge. After the celebration of the World Food Day, the seeds were collected in plastic bottles and brought to the defunct cashew factory. Bern Yangmaadome Guri, the director of the Center of Indigenous Knowledge and Organizational Development (CIKOD) in Forikrom, started filling out a spreadsheet with local names of the plants, information about their period of planting, proper storage, economic use, and so on (Figure 1.5). While much of this was based on Indigenous knowledge, Bern also emphasized the importance of linking local names to academic nomenclature in developing the seed bank. Only through the identification of formal taxa would it become possible to complement locally available

Figure 1.5 Documenting local seeds in Forikrom after the celebrations of the World Food Day. (Photograph by David *Ludwig, 2021*).

knowledge about the seeds with knowledge that is externally available and may help the farmers in developing more resilient farming practices.

Forikrom can teach many lessons for what we call *transformative transdisciplinarity*—bringing together diverse actors with diverse knowledge to co-produce systemic change. Transdisciplinarity recognizes that interdisciplinary collaboration within academia is not sufficient, as many real-life problems require expertise of actors outside of academia. Indigenous farmers in Forikrom are experts on a wide range of issues, including seed diversity, soil conditions, ecosystem dynamics, and community life, that are crucial for the success of agricultural innovations. Furthermore, relevant actors in Forikrom are not only academic researchers and Indigenous farmers. They also include representatives of traditional governance structures like *Nanas,* who maintain social and cultural practices in which Indigenous farming is embedded; school teachers and educators who transmit Indigenous and modern farming knowledge between generations; migrant farmers from the north who bring new seeds and practices to smallholder farming in the community; agroecological activists and union workers

who connect farmers' interests with national and international struggles; or boundary organizations like CIKOD that mediate between actors. Far from being isolated, Indigenous knowledge becomes, therefore, an integral part of transdisciplinary coalitions of knowledge co-production.

Forikrom is a place not only of transdisciplinarity but also of transformation. Transdisciplinary research that is organized in academia commonly reinforces rather than challenges inequalities between collaborators (Ludwig and Boogaard 2021). "Knowledge integration" often means that academics are integrating while communities are being integrated. While academics typically remain in charge of defining goals and methods of transdisciplinary projects, Indigenous communities have to prove that they have something to contribute to academic goals and that their knowledge can be validated through academic methods. Bringing Indigenous knowledge into such asymmetrical collaborations often serves legitimization rather than transformation of dominant frameworks. While academics access Indigenous knowledge and showcase their inclusivity through multiracial "stakeholder diversity," frameworks of collaboration remain under tight academic control rather than being co-produced in the light of community struggles.

In Forikrom, transdisciplinarity plays a very different role. The question is not what Indigenous knowledge can contribute to academic research but what academic research can contribute to Indigenous livelihoods. While transdisciplinarity highlights that academics can make a positive difference in coalition with other actors, transformation reflects that such a contribution requires *doing science differently*. Too often, science arrives in communities like Forikrom as an agent of violence, enabling cheap commodity production without consideration of community well-being through "scientific agriculture" that involves new chemical inputs and machines as much as new methods of quantification and standardization. Transformative transdisciplinarity does not mean integrating Indigenous knowledge into these processes but rather mobilizing both Indigenous and academic knowledge in the service of community well-being.

1.3 Why Community-Based Philosophy?

What does it mean to do philosophy in a world of interlinked crises, from biodiversity loss to climate change to economic inequality to viral pandemics? One possible answer is that philosophy provides contemplative escape. As

humanity is stumbling through failed promises of perennial growth and progress, philosophy offers an escape to the truly perennial questions—from ontological questions about the basic building blocks of the universe to epistemological questions about the nature and limitations of knowledge. After his 1930s visit to interwar Europe, Ernest Nagel captured this spirit by describing the emerging field of analytic philosophy as providing "quiet green pastures for intellectual analysis, wherein its practitioners can find refuge from a troubled world and cultivate their intellectual games with chess-like indifference to its course" (1936, 9).

This book articulates a radically different vision of philosophy as publicly engaged practice. We do not approach epistemology and ontology as spaces of contemplative escape but rather as tools for critical engagement with social and environmental realities. We think of philosophy as intervention, as acting in a world traversed by many intersecting crises. Global challenges require reflexive action for more equitable and sustainable futures. Reflexive action, however, requires epistemological and ontological depth. Who are the relevant experts in responding to social and environmental crises? What disagreements arise between heterogeneous experts from Indigenous farmers to computational biologists? How are epistemic practices related to different worldviews, ideologies, values, and ways of being in the world? How do different ontologies shape relations to nature and approaches to environmental conservation or social policy? How do livelihoods and community struggles relate to academic knowledge production? What methodological and political challenges arise when navigating this diversity of perspectives and practices?

By recognizing the urgency of such questions, we think of philosophy as a space that connects transformative practice with foundational questions about interlinked social and environmental crises. At the same time, academic philosophy is often woefully unprepared to connect theory and practice in responding to global challenges (see also Kitcher 2023). Indeed, academic philosophy remains strikingly peripheral in wider debates, from the Anthropocene to decoloniality to multispecies relations to transdisciplinarity to science governance. In all of these debates, intellectual innovations have largely come from scholars outside of the institutionalized mainstream of academic philosophy. There are many reasons for this disconnect: the tendency to marginalize publicly engaged philosophy as "merely applied" and intellectually secondary to work on perennial questions of contemplative escape; lack of engagement with the complexity of social and

environmental systems in favor of general statements about how the world works; failure to account for the complexity of empirical inquiry in favor of idealized debates about knowledge and science; a tendency to derive normative statements from idealized scenarios of limited relevance for interdisciplinary and transdisciplinary processes; and an artificial distance from social struggles through depoliticizing norms of academic neutrality.

Be that as it may, the goal of this book is not to complain about the state of academic philosophy but rather to develop a positive community-based perspective. While global challenges highlight the urgency of taking action, local struggles demand methodological reflexivity in taking action. When philosophers approach global challenges, they often position themselves as an intellectual authority that articulates norms for everyone else. Abstract normative frameworks—no matter whether deontological, utilitarian, or something else—can seduce philosophers into assuming authority in telling the rest of the world how it should divide resources or set global priorities. But communities like Siribinha, Poças, or Forikrom do not need philosophers to tell them how to live, how to produce knowledge, or how to struggle. In fact, there is little reason to assume that philosophers have any particular authority in addressing these issues and setting global priorities (Mills 2015). Global challenges look quite different for ethics professors in Oxford or Yale compared to fishers in Siribinha or Poças. If philosophical discussions are not grounded in the daily realities of communities, they will often simply reproduce dominant perspectives of academia while obscuring epistemic domination through the promise of an impartial and "effectiveness-based approach to global prioritisation" (Greaves at al. 2020).

Community-based philosophy provides an alternative to the philosophical paternalism of allegedly neutral weighing of global priorities. Philosophers do not have the authority to be the final judges of everyone else, but that does not mean that they have nothing relevant to contribute. On the contrary, transdisciplinary research is full of epistemological, ontological, and political tensions that need to be navigated (Caniglia and Vogel 2023; Eigenbrode et al. 2007; O'Rouke and Crowley 2013). Rather than presiding over a distant court of reason, community-based philosophy situates itself as a collaborator in transdisciplinary practice. Normative evaluation is still crucial, but normative authority is recognized as distributed across collaborators rather than exclusively assigned to philosophers (Ludwig and Koskinen 2021). Thinking of philosophers as equal collaborators instead of external judges opens opportunities for philosophical tools to become relevant in messy

realities that are shaped by contested claims to knowledge, diverging values, and unequal positions of power.

Community-based philosophy in the sense of this book has been articulated in different intellectual traditions, such as Freire's (1970) dialogical philosophy of liberation, Cabral's (1979) community-driven theorizing of unity and struggle, Smith's (2021) program of decolonizing research methods through community engagement, or Wylie's (2022a) integration of feminist standpoint epistemology with Indigenous archeology, among others. More recently, "field philosophy" (Bedon et al. 2021; Dekeuwer and Henry 2019; Rozzi et al. 2023; Silva and Céspedes 2023) has become a framework for synthesizing qualitative community engagement with philosophical reflection. At the same time, community-based practice remains strikingly peripheral in academic philosophy. It also constitutes a complex methodological challenge to philosophers who are usually trained to talk *about* people rather than *with* people (Fulford, Lockrobin, and Smith 2020). This book invites philosophers to rethink philosophical practice by engaging with the local materializations and negotiations of global challenges.

Rather than focusing on abstract arguments for community-based philosophy, we aim to showcase its practice through our own journey of community engagement. Our goal is to demonstrate that community-based philosophy becomes fruitful for both community action and philosophical reasoning. On the one hand, we intend to show how philosophy can enrich transdisciplinary research by supporting the negotiation of epistemic, ontological, and political tensions in collaborative practice. On the other hand, we wish to demonstrate how community engagement informs novel approaches to core issues in philosophical debates, from epistemic diversity to epistemic injustice to natural kinds to objectivity to ontological pluralism to social ontology.

1.4 The Structure of This Book

Transdisciplinary practices challenge disciplinary comfort zones: philosophers getting their hands dirty in the field before sunrise, farmers being confronted with the formalized and technical models of scientists, empirically oriented researchers engaging with the normative frameworks of philosophers. Transdisciplinary practice is challenging, often leading to misunderstandings and failures (Fam and O'Rouke 2020;

Milberg-Muñiz, Ludwig, and El-Hani 2024). We have written this book both for philosophers and for transdisciplinary practitioners. For philosophers, we want to outline a transdisciplinary alternative to the philosophical armchair. Rather than complaining about the lack of practical relevance of armchair philosophy, we articulate a positive vision of philosophy in transdisciplinary practice that addresses core issues in epistemology, ontology, and political theory. At the same time, this book is also written for a wider community of transdisciplinary researchers. Rather than exclusively discussing philosophy for philosophers, we want to contribute to a wider conversation with empirical researchers who are confronted with complex questions of epistemic and ontological diversity in transdisciplinary practice.

Chapter 2, "On Transdisciplinarity and Transformation," outlines the contours of a transformative approach to transdisciplinary research. The first section (2.1), "The New Politics of Knowledge," explores methodologies of knowledge production through the triad of paternalism, diversity, and decolonization. Transdisciplinarity challenges paternalistic modes of knowledge production that frame communities as passive beneficiaries of scientific knowledge without epistemic agency of their own. Transdisciplinary research shifts the focus from epistemic paternalism to epistemic diversity by promising a broader knowledge basis as well as more inclusive modes of knowledge production. Decolonial scholarship complicates this narrative by exposing inequalities in transdisciplinary research that often benefit dominant actors rather than foster transformative change. While the move from diversity to decolonization highlights tensions beyond a harmonious picture of "letting a thousand epistemologies bloom," it also raises new questions about the very possibility of constructive collaboration and dialogue in the face of inequality and oppression. We therefore advance a "new politics of knowledge" in which appreciation of epistemic diversity and critique of epistemic inequality interact in the articulation of a transformative perspective on transdisciplinarity.

Section 2.2, "The Partial Overlaps Framework," outlines our general approach to navigating the complex landscape of paternalism, diversity, and decolonization in transdisciplinary practice. On the one hand, the approach emphasizes overlaps between epistemologies, ontologies, and value systems that provide common ground for intercultural dialogue and transdisciplinary collaboration. We show how cross-cultural similarities in biological reasoning create opportunities for mutual understanding among academic researchers and local communities. On the other hand,

we emphasize that these overlaps always remain partial and therefore point toward the need for serious engagement with disagreements and tensions between knowledge systems. This dialectic of overlaps and partialities not only creates ground for transdisciplinary collaboration but also allows for transformative approaches that recognize tensions between epistemologies, ontologies, and value systems.

Departing from this general characterization of community-based philosophy, the following chapters focus on the more specific domains of epistemology, ontology, and political theory. Chapter 3, "Community-Based Epistemology," first develops a framework of "Partially Overlapping Epistemologies" in section 3.1 that contrasts demarcationist and relational approaches in philosophy of science. While the former aims to distinguish between science and nonscience, the latter mobilizes partial overlaps to explore intricate relations between epistemic practices. Although a relational approach embraces the benefits of epistemic diversity, it also recognizes tensions between standpoints. Standpoints are often not related through collaboration and mutual learning but rather through exploitation and oppression. Section 3.2, "Epistemologies in Action," takes this relational approach into practice through our work on causal explanations in the fishing communities of Siribinha and Poças. Fishing expertise in these communities challenges a simplistic divide between the alleged "holism" of traditional knowledge and "mechanism" of modern science. As our work with fishing communities demonstrates, fishers are perfectly capable of explaining complex causal dynamics in local environments. A relational approach, therefore, highlights the opportunities of connecting epistemic tools of communities and academic researchers while also recognizing substantial differences in their reasoning about ecological dynamics.

Chapter 4, "Community-Based Ontology," departs from a general framework of "Partially Overlapping Ontologies" in section 4.1. While the "ontological turn" has rapidly gained prominence across the social sciences and humanities, it has framed "ontology" almost exclusively through difference, as reflected in claims of "radical alterity" and "incommensurability" of ontologies. We contrast the focus on difference in the ontological turn with a focus on similarity in cognitive anthropology and cognitive science more broadly. Mobilizing debates in philosophy of science, we develop an alternative model of partially overlapping ontologies that demonstrates how complex relations between ontologies emerge from both similarities and differences in representational needs and relational practices of actors.

Section 4.2, "Ontologies in Action," addresses relations between ontologies through community perspectives from farmers' ontologies of agricultural pests to seed classifications to fish taxonomies to the Amerindian forest entity *Caipora.* We show how ontological diversity in the communities requires a pluralist understanding of representations and relations that become expressed through diverse ontologies.

Chapter 5, "Community-Based Politics," begins with section 5.1, "On Community Struggles," and their relations to academic research. We show that co-production of knowledge often emerges from community struggles but becomes co-opted through dominant institutions that capture the benefits of transdisciplinary processes. Instead of supporting the livelihoods of communities and transformative change, transdisciplinary research therefore commonly produces institutional legitimation through merely symbolic appeals to "inclusion" and "diversity." Taking these challenges into practice, section 5.2 focuses on "Communities in Action." Community-based research on conservation policy, science education, and farming practices provides avenues for creating transformative change. We show how community-based research can (but also often fails to) support community struggles while navigating tensions with institutional realities of academic research.

Finally, Chapter 6, "Another (Philosophy of) Science Is Possible," situates transformative transdisciplinarity in wider debates about the interface of science and society. We depart from the slogans "science must be defended" and "science must fall" to develop two common narratives. First, we articulate the idea that science is under attack by an anti-intellectualist populism that undermines evidence-based policy on global challenges such as climate change. Second, we discuss the counternarrative that institutionalized science has mostly served capitalist and colonial exploitation and is therefore deeply implicated in the production of global challenges and inequalities. Both narratives convey relevant insights about the interface of science and society. Rather than choosing between them, we position transformative transdisciplinarity as a case for rethinking the roles of science in society. Science is indeed indispensable for addressing global challenges, but its ability to contribute to more equitable outcomes depends on systemic change of academia. Transformative (philosophy of) science, therefore, needs to turn transformative ambitions on itself by articulating disruptive visions of academic research and its relations to society.

2
On Transdisciplinarity and Transformation

2.1 The New Politics of Knowledge

2.1.1 The Promise of Transdisciplinarity

From biodiversity loss to public health, global challenges destabilize disciplinary boundaries as they highlight the complexity of problems that require expertise from natural to social sciences. Addressing biodiversity loss, for example, requires the expertise of natural sciences such as ecology and pedology but also social sciences such as economics and education. The rising prominence of transdisciplinarity reflects the view that interdisciplinary integration of academic expertise alone is not sufficient. Addressing biodiversity loss in Siribinha or Poças, for example, requires academic knowledge but also the expertise of fishers who often have more nuanced knowledge about local ecosystem change. Furthermore, teachers in Siribinha and Poças are usually most qualified to design educational initiatives while elders and community leaders are often best positioned to assess the feasibility of other societal interventions. Complex social-environmental systems demand not only interdisciplinary expertise of diverse academic actors but also transdisciplinary inclusion of nonacademic expertise (Keitsch and Vermeulen 2020; Lawrence 2023; Schmidt 2021; Thorén, Nagatsu, and Schönach 2021; Vienni-Baptista and Klein 2022).

Far from being an isolated claim about Siribinha and Poças, the emphasis on diverse forms of expertise has become part of a wider shift in scientific practice that is reflected through ubiquitous appeals to "interdisciplinarity" and "transdisciplinarity," but also by means of many other buzzwords such as "citizen science," "civic science," "co-creation," "co-production," "collaboration," "community-based research," "community-driven development," "community science," "communities of practice," "intercultural dialogue," "multistakeholder approaches," "multistakeholder platforms," "participatory

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design," "participatory research," "responsible research and innovation," "science-society dialogues," "open science," "upstream engagement," and so on (e.g., Blok 2023; Caniglia and Russo 2024;Leonelli 2023; Ludwig and Boogaard 2021; Maurik Matuk et al. 2023; Turnhout et al. 2020; Weisberg et al. 2023). While all of these concepts have different historical legacies and connotations, they converge in highlighting the inclusion of diverse actors in a broader transdisciplinary trend of rethinking knowledge production in the context of global challenges.

Transdisciplinary research is driven by intertwined epistemic and political promises. The *epistemic promise* of transdisciplinarity is to generate more robust research by bringing the expertise of diverse actors together. Expertise about complex social-environmental issues such as biodiversity loss is widely distributed, and scientific research can greatly benefit from the expertise of nonacademic actors, including local communities who are intimately familiar with local ecosystems. In Siribinha and Poças, for example, we explore the expertise of fishers regarding a wide range of issues, including ecosystem dynamics (sections 3.2.3–3.2.7) and local varieties of fish (section 4.2.4). While it remains difficult to operationalize expertise in transdisciplinary contexts (see Story 2.1), there can be no doubt that nonacademic actors often hold knowledge that is of utmost relevance for better understanding socioenvironmental systems.

The epistemic promise of transdisciplinarity is intertwined with a *political promise* of generating not only more robust science but also more just interventions. Transdisciplinary research not only benefits epistemically from diverse forms of expertise but simultaneously includes actors who are usually excluded from academic discourse. This political promise of transdisciplinarity is especially salient in the Global South, a space that is not merely geographically defined but rather concerns global patterns of economic exploitation and epistemic domination (e.g., Dwivedi 2001; Levander and Mignolo 2011; Ludwig et al. 2024). Transdisciplinary research in the Global South is commonly mobilized with the promise of creating more equal practices of knowledge exchange, beyond a mere export of dominant science and technology from the Global North into "the rest of the world."

This political promise of transdisciplinarity can also be located in a wider landscape of concepts that highlight the importance of "Indigenous knowledge," "local knowledge," "traditional ecological knowledge," "peasant knowledge," "farmers' knowledge," "folk knowledge," "tacit knowledge," "embodied knowledge," "situated knowledge," "knowledge brokering,"

"standpoint epistemology," "epistemic injustice," "epistemic oppression," "epistemic violence," "epistemicide," and so on. Integrating diverse academic and nonacademic forms of knowledge promises not only epistemically more robust but also socially more just interventions that overcome epistemic inequity and are adapted to local contexts.

The aim of this book, however, is not simply to preach the gospel of transdisciplinarity. Many promises of transdisciplinarity require a critical reality check (Steen et al. 2018; Turnhout et al. 2020). As "diversity" has become an administrative tool of academic bureaucracy and "inclusivity" turns into corporate rainbow branding, transdisciplinary frameworks need to be evaluated through actual practices of knowledge exchange rather than lofty promises (De La Rosa et al. 2024; Milberg Muñiz et al. 2024). And indeed, many of the epistemic and political promises of transdisciplinarity do not match a reality in which knowledge diversity is often strategically mobilized to support the interests of dominant actors rather than the struggles of local communities.

For example, consider the current boom of debates about "Indigenous and local knowledge" (ILK) as well as "traditional ecological knowledge" (TEK) in conservation and sustainability studies. While there is a busy cottage industry of discussing ILK and TEK in academia (which we are part of; see El-Hani et al. 2022; Ludwig and El-Hani 2020; Ludwig and Poliseli 2018), their incorporation in conservation and sustainability practices remains often highly fragmented and without the institutional backing to actually transform global governance structures. Recent controversies (Canfield et al. 2021; Coutinho et al. 2021; Vijayan et al. 2022) about the 2021 United Nations Food Systems Summit illustrate this dynamic. While the Summit highlighted diversity and inclusion in food systems, it largely confined Indigenous and local actors to symbolic participation, leaving actual decision-making to the dominant industry and state actors in the global food system. As agroecological and Indigenous movements mobilized for a boycott, the contradiction between discursive inclusivity and corporate decision-making became a focal point of the Summit. As the Summit aimed to legitimize dominant actors through symbolic diversity (Táíwò 2022), it simultaneously marginalized organizations and movements that actually represent the interests of disenfranchised and dispossessed communities (Alliance for Food Sovereignty in Africa 2021; La Via Campesina 2021).

Corporate diversity management has its epistemic complement in a tame pluralism that recognizes Indigenous knowledge primarily as

supplementary data for academic consumption (Ludwig and Boogaard 2021). Acknowledging that Indigenous peoples have useful knowledge that can be accessed through transdisciplinary research does not always translate into political support for Indigenous peoples and their struggles for self-determination. Indeed, a growing body of scholarship (Alcoff 2022; Grosfoguel 2016; Kimmerer 2012) highlights the risks of "knowledge extraction" or "knowledge mining" that actually reinforces unequal relations between those who are integrating knowledge and those whose knowledge is being integrated. Especially decolonial and Indigenous scholarship (Chilisa 2019; Smith 2021) therefore reaches beyond generic appeals to diversity by instead questioning the very relations between knowledge systems and actors.

One of the core insights from decolonial scholarship is that epistemic justice requires more than tame diversity exercises for integrating marginalized forms of knowledge into dominant academic frameworks. Decolonization is not about a more diverse body of knowledge being integrated into existing academic frameworks that already define relevant questions, methods of validation, and intended impacts. Instead, decolonization articulates a more fundamental ambition of overcoming these frameworks and developing alternatives. In this sense, transdisciplinarity needs to be transformative and requires the disruption of dominant forms of knowledge production (Caniglia et al. 2021; Ludwig and Boogaard 2021). Rather than integrating diverse knowledge systems into predefined frameworks, academics need to negotiate the epistemological, ontological, and value assumptions upon which their frameworks are built and evaluated.

Transformative transdisciplinarity addresses the complex dynamics between diversity and decolonization: Without critical scrutiny, transdisciplinary practice risks reducing to tame diversity exercises that not only fail to make positive contributions for disenfranchised actors but actually produce legitimacy for dominant frameworks and actors. However, there is also an inverted risk of decolonial theory without transdisciplinarity becoming an abstract intellectual radicalism that does not provide any positive visions of collaboration. For example, recent discontent with the state of decolonization debates among African philosophers (Ramose 2020; Táíwò 2022)—to which we will return later in this book—highlights that an exclusive focus on colonial domination in epistemic processes leaves little room for positive visions of intercultural exchange and knowledge co-production.

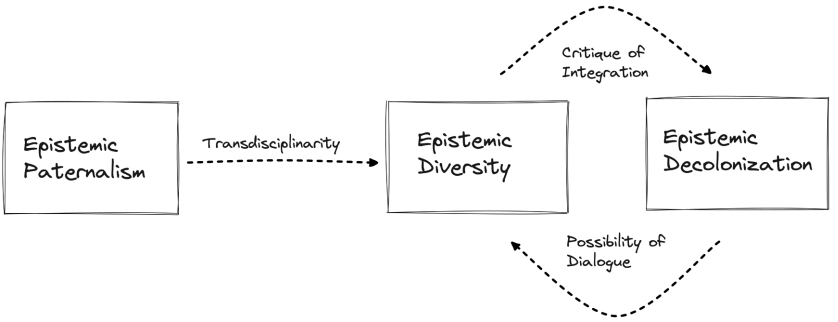

Figure 2.1 Transdisciplinary critique of paternalism leads to productive tension in debates between diversity and decolonization.

Transformative transdisciplinarity responds to this "new politics of knowledge" between optimistic appeals to diversity and critical appeals to decolonization. The new politics of knowledge emerges from a shared critique of epistemic paternalism that underlies many debates about development and modernization. For example, international development projects are often deeply paternalistic by assuming that science and technology of the "developed world" should be simply exported into the "underdeveloped world," where they are imagined to generate economic growth and societal progress (see section 2.1.2). Diversity has become widely embraced in an attempt to overcome the paternalism of mainstream development through the transdisciplinary integration of diverse forms of academic and nonacademic knowledge (see section 2.1.3). Decolonial scholarship responds to the limitations of integrationist diversity by emphasizing differences, tensions, and power differentials between different forms of knowledge. As an exclusive focus on difference would undermine any prospects of positive collaboration, however, the new politics of knowledge also leads back to questions of knowledge diversity and dialogue (see section 2.1.4). As summarized in Figure 2.1, we situate transformative transdisciplinarity in attempts to move beyond an epistemic paternalism that relies exclusively on academic knowledge. This transdisciplinary move leads to a productive tension between discourses on epistemic diversity and epistemic decolonization. While the latter becomes limited if focused only on the critique of integrationism, the former leads back to questions of diversity in order to incorporate the possibility of dialogue between knowledge systems.

Story 2.1: Who Counts as a Fishing Expert?

Vitor Renck

Back in 2018, I was conducting research in ethnobiology and ethnotaxonomy with the fishers from Siribinha for my PhD at the Federal University of Bahia. I realized that it would be important to identify experts in the community in order to account for their specialized knowledge about fish, shellfish, and birds. We began by creating preliminary criteria elaborated by us, the researchers: Experts would be fishers who were at least 30 years old and had a high fishing frequency, meaning ≥4 days a week, in combination with a peer nomination criterion from members of the community using a snowball sampling procedure. In 2022, when I began my postdoctoral research at Wageningen University in the Global Epistemologies and Ontologies (GEOS) project, I became increasingly interested in the artisanal fishing expertise in the Itapicuru estuary, also expanding the research to the neighboring fishing community, Poças. One issue that has challenged us ever since is whether the criteria that we created in the past were actually adequate and reflected the perspectives of the ones we considered to be traditional experts in the first place. We found that our preliminary assumptions created unexpected frictions with community perspectives. There was much intracultural diversity and a lack of cultural consensus, as we found in Siribinha regarding fish classification and categorization (Renck et al. 2022). But what was more interesting is that around half of the interviewees would attribute fishing expertise also to younger fishers, and their reasoning was rather straightforward. The younger generation is more knowledgeable about using technologies such as GPS or sonar and is also able to check the weather forecast and sea conditions on specific websites. As for fishing frequency, there was no default answer either. Some of the fishers would agree that the longer you fish, the more experience you will have. However, some of them would say that it doesn't take too long to learn how to fish—and that once you do it, everybody is pretty much at the same level.

2.1.2 Epistemic Paternalism

International development has been shaped by an epistemic paternalism that aims to export the scientific knowledge of the "developed world" into the "underdeveloped world" without recognizing the epistemic agency of the latter. This narrative of "epistemic development aid" has been constitutive of the rapid metamorphosis of European colonists into development workers during the Cold War, as it created political distance from colonial science without questioning its epistemic hierarchies. Paternalistic science of international development differs from colonial science of the empire through a framing focused on benefits for all of humanity rather than the imperial interests of colonial control. At the same time, paternalistic science remains very much in the epistemic tradition of the "civilizing mission" of colonial science by highlighting the expertise of the (former) colonizers while treating the (formerly) colonized as passive beneficiaries without relevant epistemic agency.

While paternalistic science has long intellectual roots, its dominance in international development is closely related to the political restructuring of the Cold War era that required at least rhetorical distance from colonial science in the midst of collapsing European empires and competition for political alignment of the so-called third world. Harry S. Truman's 1949 inaugural speech has often been hailed as the birth of the modern development era. Arguing that the "old imperialism—exploitation for foreign profit—has no place in our plans," Truman promised a new phase of global progress that makes "the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas" (see Binns 2014, 80).

Truman's vision of a scientifically and technologically driven era of development reflects a wider shift in postwar imagination about the relation between science and society. In 1945, Vannevar Bush, the architect of the National Science Foundation in the United States, published his landmark report *Science, the Endless Frontier: A Report to the President on a Program for Postwar Scientific Research*, which described science not only as a "pacemaker of technological progress" (1945, 19), but also as the "essential key to our security as a nation, to our better health, to more jobs, to a higher standard of living, and to our cultural progress" (1945, 2). These fruits of modern science, however, required research to be sheltered from direct political and societal influence, as famously articulated in Merton's universalist

and politically detached "norms of science" (Merton 1979/1942) that were formulated just a few years before Bush's report. As Reisch (2005) argued, philosophy of science followed this wider trend of depoliticization when émigré logical positivists found new institutional homes in the United States during the anticommunist persecution of the McCarthy era. Anglophone philosophy of science became an increasingly technocratic and socially disengaged field in which fundamental philosophical questions about the nature of science appeared unrelated to the social functions of the scientific system and its interface with policy.

These postwar trends converged in combining a supposedly depoliticized "front-end" of science (through disinterestedness, universality, objectivity, neutrality, and value-freedom) and a political "back-end" of societal benefits (through development, growth, modernization, and progress). The international development regime exemplifies this dynamic by promising to elevate the "underdeveloped world" out of hunger and poverty, while positioning science and technology of the "developed world" as an allegedly neutral tool for achieving this goal.

The Green Revolution arguably constitutes the most iconic example of this model of paternalistic science by promising to feed an undernourished world through improvement of modern agricultural sciences and technologies. The machinery of agricultural modernization—new seeds, fertilizers, pesticides, machines, and value chains—did indeed lead to a rapid increase of agricultural productivity and became celebrated as one of the greatest humanitarian achievements of modern science and technology. When the term "Green Revolution" was coined in 1968 by William Gaud, head of the United States Agency for International Development, it was firmly situated in the promise of economic progress and poverty alleviation through global development: "Record yields, harvests of unprecedented size and crops now in the ground demonstrate that throughout much of the developing world . . . we are on the verge of an agricultural revolution. . . . It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution" (Gaud 1968). When Norman Borlaug, the "father of the Green Revolution," was awarded a Nobel Peace Prize in 1970, his acceptance note stressed "two opposing forces, the scientific power of food production and the biologic power of human reproduction. Man has made amazing progress recently in his potential mastery of these two contending powers. Science, invention, and technology have given him materials and methods

for increasing his food supplies substantially and sometimes spectacularly" (Borlaug 1970).

While the Green Revolution has been celebrated as a remarkable humanitarian achievement of science and technology, it has also become challenged through counternarratives that framed it as a symbol of brutal modernization. Shiva's (1991) iconic *The Violence of the Green Revolution* inverts the narrative of a humanitarian breakthrough that has freed much of the third world from hunger and poverty. Written under the impression of the Bhopal disaster and a decade-long armed conflict in Punjab, Shiva's book provides a powerful alternative to the humanitarian narrative by describing how "two decades of the Green Revolution have left Punjab ravaged by violence and ecological scarcity. Instead of abundance, Punjab has been left with diseased soils, pest-infested crops, waterlogged deserts, and indebted and discontented farmers. Instead of peace, Punjab has inherited conflict and violence" (1991, 11). According to Shiva, the web of economic, environmental, social, and religious conflicts in Punjab is not simply a failure of policy but was co-created by a scientific system that "offers technological fixes for social and political problems, but delinks itself from the new social and political problems it creates" (1991, 19). Shiva argues that the violence of the agricultural sciences is obscured by a tendency to take credit for their societal benefits while externalizing negative and destructive impacts as mere issues of misguided application and policy: "The tragic story of Punjab is a tale of the exaggerated sense of modern science's power to control nature and society, and the total absence of a sense of responsibility for creating natural and social situations which are totally out of control" (1991, 21).

The contested status of the Green Revolution illustrates the emergence of a new politics of knowledge centered on the contradictory effects of modern science and technology. Indeed, scientific contributions to agricultural development—for example, from agronomy, chemistry, engineering, genetics, hydrology, plant breeding, and soil sciences—have revolutionized agricultural production, dramatically increased yields, and decreased rates of hunger in the second half of the twentieth century. Indeed, any critical commentary on the role of science and technology in society needs to incorporate their crucial role in addressing core livelihood concerns such as food security (Horton 2017).

At the same time, generic appeals to decreasing rates of hunger tell only one part of a much more complex story. Most directly, food insecurity has actually been on the rise again since 2014 and spiked since the Covid-19 pandemic

in the light of reinforcing effects of "climate, conflict, zoonotic diseases and pests, as well as economic shocks" (World Bank 2021). Scientific research not only has failed to mitigate this trend but also contributed to deepening this crisis through cash crop monocultures that are vulnerable to economic and environmental disruption and through unsustainable production systems that contribute to droughts, loss of biodiversity, soil erosion, and other environmental factors that drive food insecurity (La Via Campesina 2020; Pingali 2012). As the Covid-19 pandemic has been intersecting with the Russian invasion of Ukraine, devastating effects on food security in Africa have been exposing the lack of resilience of the dominant agricultural system and its millions of victims (La Via Campesina 2021). Both Covid-19 and the Russia-Ukraine War demonstrate that food security is not merely about the amount of food that is produced but also about the resilience of food production and distribution in the face of external disruption.

Furthermore, rates of food insecurity are only one relevant indicator that is not always positively correlated with other relevant indicators, such as rates of poverty (Gentilini and Webb 2008). A science-led increase of agricultural productivity often comes in the form of "technological packages" of large-scale intensive agriculture that produce cheaper commodities through new seeds, fertilizers, pesticides, machines, seeding techniques, value chains, and so on. Even where these interventions have increased the availability of cheap food, they have often simultaneously driven land-grabbing of peasant farms, rural unemployment, crumbling of local community structures, and the explosion of urban underclasses (Sumberg, Thompson, and Woodhouse 2012). Societal contradictions are therefore deeply embedded in processes of agricultural modernization. Moreover, despite providing more affordable food, intensive agriculture has paradoxically contributed to high levels of malnutrition, particularly among poor people, for which, despite the increase in overall calorie consumption, dietary diversity decreased and micronutrient malnutrition persisted (Pingali 2012). In this sense, agricultural modernization links spaces of poverty (rural spaces for creating food commodities as cheaply as possible, urban spaces of expendable peasant labor) and spaces of richness (concentrated ownership across food value chains, affluent consumer markets) on a global scale (Ploeg 2018, 93).

The case of agricultural development reflects the entanglement of political and epistemological dimensions of the relation between science and society. Listening to scientists is of crucial importance. Listening *only* to scientists reinforces biases of corporate and state perspectives as well as technocracy

in political decision-making. In fact, exclusive reliance on the expertise of external researchers has often proven to be deeply harmful to both peoples and environments (Scott 1998). The epistemic hierarchies constitutive of top-down development therefore become a vehicle for the creation of material inequalities.

Lansing's (2009/1991) case study of rice farming in Bali provides a striking illustration of the link between epistemic paternalism and material inequality. When the Green Revolution swept Indonesia in the 1970s, it encountered an intricate system of rice farming organized around water temples that regulated the flow of water to *subaks*, systems of terraced paddy fields, through religious rituals. Green Revolution engineers not only failed to recognize the functions of religious practices but dismissed the system as a whole as inefficient and in dire need of modernization through tighter watering scheduling, more efficient rice varieties, and application of pesticides. Lansing (2009/1991, 115) summarizes this attitude by quoting a "frustrated American irrigation engineer" who claimed that "these people don't need a high priest, they need a hydrologist!"

The result of the modernization program turned into an ecological and socioeconomic disaster. As Lansing (2009/1991, 114) puts it: "The threat of legal penalties against anyone failing to grow the new rice led to continuous cropping of Green Revolution rice. Religious rituals continued in the temples, but field rituals no longer matched the actual stages of rice growth. As soon as one crop was harvested, another was planted, and cropping cycles began to drift apart. During . . . the dry season, the supply of irrigation water became unpredictable. Soon, district agricultural offices began to report 'chaos in the water scheduling' and 'explosions of pest populations.'" Lansing and Kremer's (1993) computational modeling of water flows showed that the synchronization of irrigation and fallowing schedules managed through the practices organized around the water temples was more efficient than the system introduced by the Green Revolution engineers, highlighting two crucial functions of the temples (see also Lansing 2009/1991). First, the rituals distributed water as a scarce resource by ensuring that *subaks* downstream would still receive sufficient water during the dry season. Second, the rituals carried out in the water temples controlled pest populations through synchronized watering and cropping schedules over hundreds of hectares. While Lansing and Kremer's model suggests that the religious rituals led to an optimal balance of these two factors, the interventions of the Green Revolution engineers led to a breakdown of this system with the consequence

of water shortages and pest outbreaks. The role of the water temples was entirely overlooked in the search for "modernization" of rice production, as there was no recognition of the traditional system of irrigation and cropping coordinated through the temples (Lansing and Kremer 1993).

2.1.3 Epistemic Diversity

The rising prominence of transdisciplinarity reflects a "new politics of knowledge" that shifts from epistemic paternalism to epistemic diversity. Diagnosing this shift should not be misunderstood as the claim that epistemic paternalism has been overcome. The relation between science and society often remains deeply paternalistic, especially in the domain of international development. For example, consider Boogaard's (2021) analysis of a livestock development project in Mozambique that shows how epistemic paternalism continues to be deeply entrenched in development projects that fail to recognize the agency of communities.

The livestock project brought different actors of the Mozambican "goat sector" together with the aim of collectively identifying problems and finding solutions (see also Story 2.2). Boogaard explores three dimensions in which the project remained deeply paternalistic despite its appeal to inclusive collaboration. First, it provided training on allegedly improved livestock practices that focused on academic knowledge transfer while ignoring local expertise about animal husbandry. Second, the project imposed goals of commercialization and modernization on rural goat keepers without considering local practices of mutual aid and their tensions with market-based thinking. Finally, local participation was based on a project design in which wider goals and methods had already been predefined by the academic actors. In this sense, the project reproduced paternalistic practices that included other actors such as goat keepers but excluded their epistemic agency.

The shortcomings of the livestock project in Mozambique exemplify the paternalism of many development projects that aim to be inclusive by producing outputs *for* marginalized communities rather than producing them *with* marginalized communities. From public funders to philanthropists to development NGOs, the relations between science and society often remain deeply paternalistic when situated in communities in the Global South. External actors define the goals (say: increasing agricultural productivity or access to electricity), the intervention (say: new

crop varieties or solar panels), and the evidence for determining success (say: quantifiable indicators of yield per hectare or number of solar panels installed). Communities continue to be positioned as passive beneficiaries rather than actors who make decisions based on their own epistemic resources and practices.

While the persistence of epistemic paternalism is striking in the development industry, it would be a mistake to assume that nothing has changed. Academic debates in international development studies have become increasingly reflexive about their paternalistic legacy, highlighting the need for new approaches that recognize the expertise of diverse actors. Indeed, it is difficult to find major players in the development industry—from the World Bank to the Gates Foundation to USAID to Oxfam to CGIAR—who have not in some way adapted to this shifting politics of knowledge by adopting narratives of "stakeholder diversity," "community engagement," or "public participation."

These shifting narratives in international development reflect a wider transformation of academic discourses that appeal to the diversification of knowledge production through various methods from citizen science to multistakeholder platforms to participatory research. The notion of transdisciplinarity provides an umbrella term for this push for more inclusive knowledge production that has become increasingly institutionalized since its introduction at the International Conference on Interdisciplinary Research and Education more than 50 years ago (Jantsch 1972). For example, a recent Organisation for Economic Co-operation and Development (OECD) report celebrates transdisciplinarity as a "paradigm shift in research practice" (2020, 9) that has oriented research and policy toward diversity and inclusion while providing an entry point for addressing global challenges such as climate change, food security, global health, and sustainable energy production.

As the notion of transdisciplinarity often remains ambiguous and vague, it commonly functions as an umbrella term for knowledge production that brings academic and nonacademic expertise together and, therefore, goes beyond multidisciplinary dialogue or interdisciplinary integration of different academic disciplines. Along these lines, the OECD (2020, 15) defines transdisciplinary research as the "integration of academic researchers from different disciplines with non-academic participants in co-creating new knowledge and theory to achieve a common goal," while it also "calls

for better integration between natural sciences and social sciences and humanities, a more direct relationship between science and society, and the inclusion of non-scientific stakeholders in research processes at all stages."

Transdisciplinary knowledge integration promises to align epistemic and political concerns of knowledge production. Epistemically, transdisciplinarity promises to address complex challenges that require diverse forms of expertise of both academic and nonacademic actors. For example, preserving an ecosystem requires expertise from both natural and social sciences as well as local communities that are intimately familiar with local biodiversity and ecosystem dynamics.

The epistemic promise of transdisciplinarity is intertwined with a political promise of overcoming paternalistic structuring of the relation between science and society. Recognizing the knowledge of diverse actors allows for more contextualized but also more equitable interventions that take the needs, perspectives, and values of heterogeneous actors into account. Especially when working with disenfranchised communities, transdisciplinarity therefore integrates epistemic and political ambitions of overcoming paternalism through inclusive knowledge production.

It is helpful to connect these epistemic and political ambitions of transdisciplinary research with debates about epistemic and social diversity in philosophy of science. Often framed in opposition to ideals of unified science, pluralism has become mainstreamed in postpositivist philosophy of science (Ludwig and Ruphy 2021). While much of the earlier pluralist literature highlighted disciplinary plurality of the sciences and the limits of reductionism without much attention to the social organization of science (e.g., Fodor 1980; Suppes 1978), links between epistemic and social diversity have grown into a major theme of philosophy of science.

The intellectual legacy of this intersection between epistemic and social diversity in philosophy of science is complex. It involves the influence of heterodox philosophers of science, such as John Dewey, Paul Feyerabend, Michel Foucault, and Donna Haraway, but also wider intellectual trends such as the growing influence of science and technology studies (STS) and the radical science movement emerging in the late 1960s (Taylor and Patzke 2021). Despite this complex intellectual legacy, there can be little doubt that feminist philosophy has been most influential in changing agendas of philosophy of science and turning epistemic and social diversity into a major research theme of the field.

The work of Helen Longino (1990, 2002) exemplifies this shifting focus toward diversity, as it is clearly influenced by social studies of science but also addresses distinctly philosophical concerns about objectivity, theory choice, and values. Longino understands science as a social practice in which diverse perspectives and values inevitably shape the course of knowledge production and scientific theorizing. "It is, of course, nonsense to assert the value-freedom of natural science" (1990, 4), declares Longino, highlighting that her understanding of science is incompatible with the exclusion of values in the name of scientific neutrality. But even if values inevitably permeate scientific practices, their roles are not always innocent. Echoing discourses of the radical science movement, Longino addresses the power of oppressive values in shaping scientific practice and misleading scientific theorizing. In the case study of the evolution of sex differences, for example, Longino shows how patriarchal values structure background assumptions, hypothesis formation, and data selection. First, Longino discusses how androcentric perspectives shape hypothesis formation that assigns key innovations such as human tool use exclusively to "man-the-hunter" with little attention to "woman-the-gatherer." Second, Longino argues that the very assumption of a strict sexual division of labor in which the women complement an exclusively male domain of labor is often a much clearer reflection of heterosexist norms among contemporary researchers than driven by reliable empirical evidence about hunter-gatherer societies.

Given the inevitable value-ladenness of science and the oppressive functions of dominant values in science, Longino appeals to epistemic and social diversity as remedies for scientific objectivity. Rather than structuring science through the values of whomever is in power, Longino's account proposes four norms for the social organization of science. First, science needs to institutionalize recognized venues for critical exchange such as conferences and journals. Second, it needs to ensure uptake instead of merely toleration of criticism in these venues. Third, it needs to provide public standards for exchange and evaluation of criticism. Finally, it needs to involve equality of intellectual authority for all participants in such venues (Longino 2002, 130–133). Inspired by Habermas's (1981) theory of communicative action, Longino specifies this last demand as "tempered equality" that does not assume everyone to have equal expertise but insists on equal access for participation in critical exchange. According to Longino, tempered equality can foster objectivity of scientific inquiry through the inclusion of diverse

perspectives and values across all social groups irrespective of class, gender, or race. The social stratification of science is a social injustice by excluding oppressed social groups from equal participation, but it can also undermine the objectivity of science when dominant perspectives and values are not scrutinized through critical exchange. It is in this sense that the "exclusion of women and members of certain racial minorities from scientific education and the scientific professions constitutes not only a social injustice but a cognitive failing" (Longino 2002, 132).

While Longino focuses largely on epistemic and social diversity internal to science, her framework extends rather straightforwardly to concerns about transdisciplinarity. When it comes to complex socioenvironmental problems such as biodiversity loss, food security, soil erosion, or toxin exposure, the perspectives and values of both academic and nonacademic actors matter. In the example of the Green Revolution in Bali, for example, the exclusion of local farmers and priests led to epistemic failures of misunderstanding a complex social-environmental system, resulting in water shortages and pest outbreaks. Not only the knowledge but also the values of Balinese farmers remained excluded from agricultural interventions, leading to a biased preference for external technologies of modernization and the suppression of sustainable local practices. And just as in Longino's cases studies of sexist science, epistemic and social failures are intertwined with backfiring on the actors whose perspectives have been excluded. It is not just that the perspectives and values of Balinese farmers remained excluded; they also had to pay the economic price of epistemic failure through destruction of their harvest.

Although there is little interaction between formative texts of feminist philosophy of science and transdisciplinarity in the late twentieth century, this situation is changing rapidly following the trailblazing works of standpoint feminists like Harding (1998) and Wylie (2008). A new generation of feminist philosophers is thoroughly engaging with epistemic diversity beyond academia and providing sophisticated philosophical grounding for the promises of transdisciplinary research (e.g., Eigi-Watkin and Koskinen 2023; Koskinen and Rolin 2019; Sinclair 2020). Transdisciplinary research and feminist philosophy of science therefore most clearly illustrate how the politics of knowledge is shifting from paternalistic knowledge production for marginalized groups toward embracing diversity as a productive feature in knowledge production together with marginalized groups.

Story 2.2: At Sunrise

Birgit Boogaard

With a broad and friendly smile, he looks in my direction. Deep wrinkles in his skin. His hands are rough, the result of working on the land for a lifetime. He's almost blind but nevertheless has radiant eyes. His fellow villagers told me he's almost deaf as well. He sits on a chair under the shade of a tree. My translator and I sit on a wooden bench in front of him. Because of his deafness we sit much closer to each other than usual in an interview. We have to lean forward with every question so that he can hear us, which creates an intimate sphere.

People in this country reach an average age of barely 60 years, but this man must be around 80. There is something in his storytelling that makes me realize that this old man has great wisdom about rural life in Mozambique. He has experienced so much: the independence war against the Portuguese, the violent civil war, the period of reconstruction, floods, cyclones, and food shortages—to name a few. But his wisdom and experience will not be reflected through my well-planned questionnaire. I decide to let go of my questions and surrender to his stories.

He talks about goat keeping and working on the land. In addition to practical wisdom, he also shares spiritual wisdom. He tells stories of which my Mozambican colleagues said I wouldn't hear as an outsider. For example, stories about communication with ancestors, who—like the living—form part of social life.

I could continue listening to him for hours. He doesn't appear tired yet and seems to enjoy telling his stories. Nevertheless, after more than one and a half hours I decided to stop. It feels difficult to let him go—I somehow feel connected to him, but we probably won't see each other again. I ask him how long he has to walk to get home. He responds: "I don't know. I only know that I left very early at home. At sunrise." The sun came up around six o'clock and our interview started around nine o'clock. This friendly, wise, old, and almost blind and deaf man walked three hours for an interview with me. I feel humble. He puts on his hat, picks up his stick, stands up, and starts his way back home in contentment. I offer him some cookies for the journey, which he accepts gratefully. Then he turns around and walks away.

As I stand there, I wonder about the assumptions of the livestock development project I'm working on. In this research project, we try to

"develop" rural Mozambicans by reducing "poverty" and contributing to "food security" through improved goat keeping practices and marketing. My research is supposed to "develop" the goat sector, and our household surveys generate data on issues such as the number of goats per household, main types of feed and trading practices, breeding techniques, and goat shelters. But after this interview, there is only one question that occurs to me: Who is actually developing whom? This wise man had just shown me "development" of a different category: lessons in life about subsistence, spirituality, contentment, and letting go. I feel an intense gratitude but also a growing discomfort with the knowledge we are including and the knowledge we are excluding in a research project based on predefined choices of how "proper methods" and "proper research" in agricultural development are supposed to look.

2.1.4 Epistemic Decolonization

Transdisciplinary research and feminist philosophy of science converge in emphasis on diversified knowledge production that promises epistemically robust and socially just research. These promises, however, often clash with academic realities and their tendency to assimilate diversity in superficial ways for managerial and legitimizing purposes (De La Rosa et al. 2024; Milberg Muñiz et al. 2024). The shift from epistemic diversity to epistemic decolonization (Chilisa 2019; Grosfoguel 2007; Rivera Cusicanqui 2010; Smith 2021) reflects the risk of a tame pluralism in which epistemic diversity becomes the intellectual equivalent of toothless diversity management (Ahmed 2012; Lopez and Ludwig 2021). Tame pluralism is the result of aiming to increase the diversity of "knowledges," "perspectives," "stakeholders," or "values" without challenging the institutional structures in which they are embedded. People of all classes, genders, and races are supposed to come together as equals to create a better world together. Even if this cliché of "one happy family" is driven by sincere aspirations, it often lacks political credibility, given the material conditions of global inequality and their roles in shaping the institutional reality of academia.

Turning to epistemic decolonization puts the limitations of such a tame pluralism in the spotlight. Rather than increasing diversity within dominant frameworks, epistemic decolonization targets these very frameworks. In this sense, epistemic decolonization is not about supplementing dominant

epistemic practices with diverse knowledge but rather about challenging oppressive modes of knowledge production (see also Cruz 2018; Escobar 2016; Moraes Gomes 2012; Mungwini 2017a). The contrast becomes most salient when addressing ideological and material structures of the global science system. Decolonial scholarship commonly targets "the Western university" (Grosfoguel 2012) as an institution that has been shaped by European colonialism and still constitutes an infrastructure of global exploitation and oppression. This decolonial challenge can be understood by interpreting the global science system through three entangled lenses of political economy, political epistemology, and political ontology of science.

Political Economy of Science: As infrastructures of colonialism, universities played a central role in establishing and maintaining the modern economy of racial capitalism. They provided ideological resources for dehumanizing allegedly "primitive people" or "natives" who are not capable of meaningful self-determination and are therefore in need of the "civilizing mission" of colonialism. They trained the colonial workforce—scientists organizing resource extraction in mines and plantations as well as technocratic managers running the bureaucracies of colonial empires. They engineered tools of colonial control from communication to transport to military technologies, and they accumulated wealth from colonial resource extraction, deepening material inequality between epistemic infrastructures of colonial "centers" and its colonized "peripheries." Racial capitalism did not disappear with the collapse of European empires but continues to structure the global economy (Bright et al. 2022; Robinson 2020). As Winant (2001, 35) points out, the effects of linking race and capital remain pervasive on a global scale: "Pick any relevant sociological indicator—life expectancy, infant mortality, literacy, access to health care, income levels—and apply it in virtually any setting, global, regional, or local, and the results will be the same: the worldwide correlation of wealth and well-being with white skin and European descent." The effects of racial capitalism are salient not only in sociological indicators but also in the structure of the global science system where colonial histories remain predictive for the distribution of material, intellectual, and reputational resources. The commodification of academia (Radder 2010) proliferates metrics that highlight this stratification of the global science system along colonial lines: global university rankings and reputational surveys, bibliometric analyses and impact of research output, number of Nobel Prize winners and highly cited researchers, global mobility of foreign students and researchers, size of national science budgets and of

industry funding. Little is to be gained from a tame pluralism that celebrates "Indigenous knowledge" in Cambridge or "Black excellence" at Harvard without addressing the political economy of science that remains structured by racial capitalism at a global scale.

Political Epistemology of Science: Denying the knowledge of the oppressed has always been foundational to practices of oppression (Freire 1970). The myth of a "civilizing mission" is built on imagining the colonized as ignorant and in need of education by colonial knowledge holders, whether they are missionaries or scientists. When colonists transformed into development workers in the second half of twentieth century, epistemic hierarchies remained by treating allegedly underdeveloped countries as passive beneficiaries of externally imported scientific and technological solutions (Ludwig, Gatti, and Milberg Muñiz 2024). Even when academics challenge these colonial and paternalistic narratives, they continue to structure the epistemic infrastructures of academia. Reliance on the languages of the European colonizers (and, in particular, English as the academic *lingua franca*) provides a straightforward example of the persistence of such epistemic infrastructures even in critical academic discourses that embrace epistemic diversity. Language has therefore become one prominent site of debates about epistemic decolonization, as prominently reflected in the work of African philosophers such as Kwasi Wiredu (1997) and Ngũgĩ wa Thiong'o (1986). Wiredu defines conceptual decolonization as "the elimination from our thought of modes of conceptualization that came to us through colonization and remain in our thinking owing to inertia rather than to our own reflective choices" (1997, 56) and recommends that "African philosophers . . . try to think philosophically in their own vernaculars, even if they still have to expound their results in some Western language" (1997, 56). Wiredu's call for conceptual decolonization does "not require the disavowal of all foreign sources" (1997, 54), as it explicitly aims at creating intercultural dialogue between African and European philosophical traditions. Instead of a simple rejection of the latter, Wiredu argues that the articulation of African philosophy is suppressed by the linguistic norms of academia, leading to superficial engagement with African thought, or even becomes misconstrued through debates about the very existence of philosophical thought in African traditions. A tame pluralism that embraces diversity within current structures such as linguistic and publishing norms will not solve this problem, as conceptual decolonization of academic philosophy is needed for adequate articulation of thought and dialogue across different linguistic traditions.

Political Ontology of Science: While economic and linguistic stratifications of the global science system are rather straightforward products of colonialism, the notion of "ontology" leads to fuzzier territories that will be the focus of later parts of this book. Still, coming to grips with decolonization requires ontological considerations that question hegemonic assumptions, categories, and practices of science. For example, consider our collaborations with Thomas Rickard, whose dissertation at the Universidade Federal de Minas Gerais focused on ontological exclusion along the Rio Doce, the site of the largest single environmental disaster in the history of Brazil (Rickard and Ludwig 2024; Rickard et al., 2024). When the Samarco Fundão Dam broke in November 2015, 60 million tons of toxic mining waste covered towns, ecosystems, and territories of the Indigenous Krenak people along the 600-kilometer length of the river. "Integrated Water Resource Management" in Brazil promises inclusive environmental governance by centering on diverse stakeholders and their participation. In the case of the Rio Doce, however, participation not only failed to prevent the disaster but was conditional on participants adopting the scientists' framing of the river as a "natural resource system." Ontologies of the Krenak who relate to the Rio Doce as a home and as their living ancestor "Watú," for example, had no place in these participatory events that had already defined "what a river is" in terms of technocratic management concerns. The case of Rio Doce illustrates how even well-meaning appeals to inclusion and participation remain deeply exclusionary when making participation contingent on hegemonic ontologies. In contemporary academia, diversity often follows a similar logic: eager to showcase inclusion of "marginalized groups" while simultaneously requiring proof that they are "ready" to be included by adopting hegemonic assumptions, categories, and practices of mainstream science.

Epistemic decolonization challenges a tame pluralism that celebrates superficial forms of inclusion without addressing infrastructures of exclusion that continue to shape the global science system. This challenge matters for philosophy of science and transdisciplinary research, as both vocally call for epistemic diversity but have at best an awkward relationship with debates about decolonization. On the philosophical side, recall Longino's (1990, 2002) ideal of venues for critical exchange that involves a broadly Habermasian ideal of equal access to these venues across all social groups irrespective of class, gender, or race. Decolonial scholars have commonly challenged Habermasian political philosophy as "blind to colonialism" (Mignolo 2002), questioning the political function of ideal theories that highlight

equality in a non-ideal world marked by deeply entrenched inequalities (see also Allen 2016; Mills 2017). A generalized ideal of equality is often toothless at best when "hegemonic actors . . . establish highly successful mechanisms for minimizing, invisibilizing, and misrepresenting the points of view of colonized people even under conditions of well-meaning dialogue" (Kramm et al. 2024, 607).

Taking these worries into philosophy of science, consider Longino's (2002, 130) appeal to publicly shared standards for the evaluation of theories, hypotheses, and observational practices in science. Even if we aim for an ideal of "tempered equality" in negotiating these standards, decolonial scholarship highlights the non-ideal reality of the global science system in which inequality inevitably structures the articulation of standards. Taking the political economy of science seriously, even well-intentioned venues for critical exchange will be stratified by racial capitalism and exclude the vast majority of epistemic actors in the Global South. The political epistemology of science suggests that procedures for negotiation will remain deeply unequal, for example, by being tied to eloquence in academic English. The political ontology of science points to background assumptions, categories, and practices such as framings of environments as "natural resources" that are so deeply entrenched in academia that they will often remain unquestioned in academic exchanges. From the perspective of epistemic decolonization, the political challenge is not primarily to imagine an ideal science system in which standards emerge from equal participation, but to develop effective strategies for confronting pervasive structures of inequality that continue to shape the science system, including its standards for critical exchange.

Longino is keenly aware of these challenges, writing that "equality of intellectual authority does not come into being because a philosophical argument contends it is a necessary condition of genuine or fully reliable knowledge production. It must be fought for" (2008, 83). As an academic discipline, however, philosophy of science has been largely silent on *how* to fight for equality of intellectual authority at a global scale, and its striking disconnect from debates about decolonization reflects that the field still has a very long way to go.

Shifting from philosophical to transdisciplinary research, it becomes clear how easily appeals to epistemic diversity can backfire if they do not involve serious engagement with epistemic decolonization. While transdisciplinary research highlights epistemic diversity, it also often remains "integrationist" in the sense that nonacademic knowledge is

integrated into academic frameworks that define the terms of integration. Some integrationist programs clearly have positive effects, in the sense that they recognize otherwise marginalized epistemic resources and lead to better interventions based on a richer knowledge basis that includes Indigenous and local knowledge (Byskov 2020). At the same time, transdisciplinary integrationism commonly fails to challenge epistemic and political hierarchies built into its own standards. Indigenous and local knowledge is integrated *into* academic frameworks in the sense that the former become recognized if *and only if* they are relevant for and validated by the standards of the latter. Even if their intentions are laudable, transdisciplinary efforts often overestimate the prospects of integration (Weiskopf 2020) while remaining oblivious about extractivist relations between those who are integrating and those who are integrated (Alcoff 2022; Lopez-Maldonado 2022). As we will expand in our later discussion of elite capture (section 5.1.3), many integrationist projects maintain a clear epistemic asymmetry that is mirrored by the political asymmetry between academic researchers and local communities.

Nadasdy's (1999) critique of the burgeoning literature on TEK highlights the limitations of integrationist transdisciplinarity that has become increasingly mainstreamed in environmental and sustainability sciences without questioning the standards in which academic knowledge production is embedded. In this sense, Nadasdy (1999, 1) argues that "integration, however, contains the implicit assumption that the cultural beliefs and practices referred to as 'traditional knowledge' conform to western conceptions about 'knowledge.' It takes for granted existing power relations between aboriginal people and the state by assuming that traditional knowledge is simply a new form of 'data' to be incorporated into existing management bureaucracies and acted upon by scientists and resource managers."

These challenges of epistemic extractivism illustrate the wider challenge of appealing to epistemic diversity without seriously engaging with epistemic decolonization. Epistemic decolonization is not the same as epistemic diversity—it is not about increasing diversity of participation within dominant frameworks but rather about challenging and transforming these very frameworks. The implications for transdisciplinary practice are profound: While integrationism often leads to a tame vision of transdisciplinarity that increases the diversity of data and stakeholders in academic frameworks, epistemic decolonization suggests deeper ambitions of transforming these frameworks and the standards that underlie them.

Epistemic decolonization challenges narratives of linear progress from epistemic paternalism to epistemic diversity. Appealing to diversity of knowledge often keeps hierarchies between knowledge systems unquestioned and points toward an additional challenge of epistemic decolonization that aims to transform the very frameworks in which knowledge diversity is negotiated. Especially when it comes to relations between academic researchers from the Global North and local communities from the Global South, dominant frameworks commonly remain deeply colonial in character through unequal positions in decision-making processes and access to material resources. Decolonizing transdisciplinarity means centering these inequalities in the development of collaborative practices rather than assuming a "happy family" that lets "a thousand epistemologies bloom" while integrating them under supposed conditions of equality and harmony. Both philosophy of science and transdisciplinary research still have a long way to go in finding compelling answers to these decolonial challenges.

2.1.5 Against Metadualism

The triad of paternalism, diversity, and decolonization identifies an intricate politics of knowledge at the interface of science and society. Epistemic paternalism has become widely criticized in academic discourses about epistemic diversity, and this critique is reflected in a broader institutional shift toward transdisciplinarity, citizen science, community-driven development, open science, participatory methods, multistakeholder approaches, and so on. At the same time, a growing body of decolonial literature moves beyond integrationist promises of epistemic diversity by highlighting the inequalities and power dynamics among actors in transdisciplinary processes.

The case for epistemic decolonization challenges integrationism and instead stresses inequalities and tensions between actors. One consequence of this critique of integrationism is often an epistemological and ontological reorientation toward "radical alterity" (Risjord 2021; cf. Graeber 2015) and "incommensurability" (Darian-Smith 2021; Povinelli 2001). Rather than aiming for harmonious integration, this body of literature centers on difference and domination. In the African context, for example, Mafeje (2011, 36) has called for Africanity as a "combative ontology" that aims to "combat foreign domination and to forge an independent Pan-African identity." In the Latin American context, the concept of a "pluriverse" (Escobar 2018;

Querejazu 2018; Vitória et al. 2022) reflects ambitions of scholar activists to challenge colonial dominance by creating space for different worlds rather than integrating them into one universally shared framework.

The move from diversity to decolonization shifts emphasis from integration to difference, and it constitutes a largely undigested challenge for both transdisciplinary research and philosophy of science. However, this focus on difference—whether expressed through "radical alterity," "incommensurability," "pluriversality," or "combative ontology"—also creates its own challenges. Indeed, knowledge integration often happens on academic terms. Transdisciplinary practices risk sidelining important differences by focusing on "integrable" parts of nonacademic knowledge and therefore need to be challenged by robust notions of epistemological and ontological self-determination. But, at the same time, the shift from integration to difference can also reproduce what Agrawal (1995) has famously called the "divide between Indigenous and scientific knowledge" by creating an artificial boundary through the assumption of two incommensurable knowledge systems. Such a divide not only risks undermining the very possibility of dialogue and transdisciplinarity but also marginalizes Indigenous knowledge by presenting it as generally incompatible with scientific perspectives. In this sense, Agrawal (1995, 433) argues that it "is only when we move away from the sterile dichotomy between indigenous and Western, when we begin to recognize intra-group differentiation; and when we seek out bridges across the constructed chasm between the traditional and the scientific, that we will initiate a productive dialogue to safeguard the interests of those who are disadvantaged."

While Agrawal's critique of a "sterile dichotomy" has been widely discussed (Green 2008; Löfmarck and Lidskog 2017; Ludwig and Poliseli 2018), Indigenous knowledge commonly remains characterized in strict opposition to scientific knowledge and everything that is wrong with Western modernity. For example, Escobar's (2018, 3) critique of modernist and developmentalist programs is often deeply insightful while also sometimes running the risk of creating its own (meta)dualism when stating that "the entire edifice of modern Western civilization (with its particular forms of patriarchy, racism, and capitalist exploitation) is based on this objectivizing operation—on this dualist ontology, as we will call it—because it is based on a strict separation between subject and object, reason and emotion, and many other dualisms." There is a wider challenge here of exposing the violent character of many modernist and developmentalist programs without

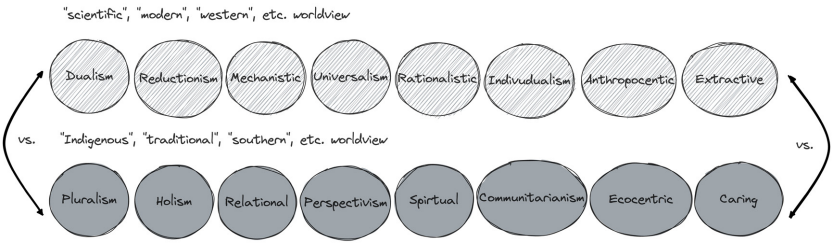

Figure 2.2 Metadualism constructs a simple dichotomy of a dualistic vs. a nondualistic worldview.

creating a new dichotomy between dualist modernity and a nondualist alternative. Articulating alternatives that do not produce such a (meta)dualism requires moving beyond a dichotomy between Western science, which is exclusively characterized as dualistic, reductionistic, mechanistic, universalistic, rationalistic, individualistic, anthropocentric, extractive, colonial, and so on; and an Indigenous alternative, which is claimed to be pluralistic, holistic, relational, perspectivistic, spiritual, communitarian, ecocentric, caring, decolonial, and so on (see Figure 2.2).

Metadualism misrepresents both modern science and Indigenous knowledge by creating the illusion of complete incommensurability. Modern science is a complex epistemic and social system generating heterogeneous practices (Koskinen and Mäki 2016; Ludwig and Ruphy 2021) of which the metadualistic dichotomies shown in Figure 2.2 are at best a caricature. Of course, the development of modern science is deeply entangled with motifs such as "reductionism," "mechanism," "rationalism," "universalism," and so on. Treating all of them as essential properties of all of modern science, however, grossly misrepresents its history and sidelines the many forms of immanent critique of these motifs from within modern science itself. For example, reductionism has always been a deeply contested ideology in the life sciences, from holistic biology of the late nineteenth and early twentieth centuries (Esposito 2015; Harrington 2020) to expansive critiques of reductionism in postwar genetics (Levins and Lewontin 1980; Ruse 1974) to appeals to holism in contemporary ecology (Pierotti 2010) and systems biology (Mazzocchi 2012). To consider another example, universalism and many of its pluralist and relativist critiques have developed within science, from the early days of cultural anthropology (Boas 1887) to sociology of science (Bloor 1991) to feminist science studies (Harding 2015). Reifying modern science through a metadualistic divide not only is deeply ahistorical but fails

to recognize contemporary science as a complex social system generative of heterogeneous ideologies and practices.

The metadualistic divide is not only descriptively misleading but also politically harmful. Indeed, modern science is deeply implicated in social-environmental crises. As we explore in detail in other parts of this book, modern science has been central to both appropriation of nature and exploitation of people. Rather than being a politically neutral actor, modern science remains central to destructive forms of resource extraction and oppression. However, science is equally central to any serious project of addressing social-environmental crises and articulating emancipatory alternatives. The dichotomy of the metadualistic divide not only obscures positive visions of transformative transdisciplinarity but makes the very possibility of emancipatory science incomprehensible.

Metadualism misleads not only about the complexity of modern science but also about the complexity of Indigenous knowledge through its generic characterization as a holistic other (Ludwig and Poliseli 2018). Of course, the metadualistic divide captures some relevant insights about Indigenous epistemologies and ontologies. Often, Indigenous perspectives are indeed holistic, relational, and spiritual in ways that contrast with academic perspectives on the same subject matter. Furthermore, these aspects become sidelined in integrationist approaches that treat Indigenous knowledge as additional data for academic consumption rather than engaging it on its own terms.

At the same time, a simple metadualistic divide risks reducing communities to stereotypes of "holistic natives" who are located outside of modernity rather than engaging with the epistemological, ontological, and political complexity of their lifeworlds. For instance, community perspectives in Siribinha and Poças can be described as holistic in some ways, but our work with fishers in the community also highlights that understanding of ecological mechanisms is not exclusive to academic biology. Fishers are perfectly capable of not only understanding complex causal dynamics and mechanisms but also incorporating this understanding into their daily fishing practices (El-Hani et al. 2022). Positioning fishers in Siribinha and Poças as the holistic other to mechanistic science simply does not do justice to their complex epistemic resources.

Furthermore, metadualism misrepresents not only the epistemic but also the political complexity of community relations with processes of modernization. Indeed, the communities of Siribinha and Poças have seen many of

the destructive sides of modernization: the devastating oil spill of 2019–2020 that covered the main livelihood of the community in toxic waste, climate change and overfishing that reduce fishing stocks in the estuary, and tourism turning independent fishers into exploited service workers of externally owned hotels. While Brazilian modernity has often arrived as a violent imposition in Siribinha and Poças, it would also be misleading to describe the situation along a metadualistic divide where the communities have to play the role of holistic natives living in harmony with nature while resisting any intrusions of modernity (see section 1.1).

Relations to modernity in Siribinha and Poças are more complex than suggested by the metadualistic divide because community struggles are more complex. Indeed, the local *Jangadeiros* culture shapes intricate relations between fishers and estuarine ecosystems beyond their technocratic understanding as a resource system and has been central to the conservation of the mangrove and local biodiversity. At the same time, not all local fishing practices are sustainable, and many community members are very vocal about their right to better access to infrastructures of modernity, from communication to transportation to sanitation. Interpreting the communities through a metadualistic divide not only risks misrepresenting them through academic clichés of antimodern, holistic, and sustainable natives but also risks misframing them politically by expecting them to conform to clichés arising from academic imagination, instead of highlighting the centrality of self-determination of communities in defining their own relations to modernity through local control of means of production, cultural practices, and decision-making processes.

The inadequacy of a simple metadualistic divide adds another layer of complexity to the dynamics of paternalism, diversity, and decolonization. We have argued that the move from paternalism to diversity can lead to an overly integrationist narrative that assimilates Indigenous and local knowledge into academic frameworks. As such, transdisciplinary integrationism often fails to engage sufficiently with deeper epistemological and ontological tensions that become centered in the move from diversity to decoloniality. At the same time, emphasis on difference and conflict between knowledge systems also risks getting stuck in a metadualistic dichotomy of "radical alterity" and "incommensurability" that obscures the very possibility of collaboration and dialogue. It is from this complex constellation that our perspective of transformative transdisciplinarity and partial overlaps emerges—recognizing both common ground between actors and deep differences that

generate tensions. Liberatory dialogues in the sense of Freire (1970) require both entry points for mutual understanding and friction for transformation of all actors involved. Metadualism obscures the possibility of liberatory dialogues while, at the same time, tame versions of epistemic diversity avoid friction through assimilation and integration of community knowledge into academic frameworks.

2.1.6 Has Decolonization Lost Its Way?

In 2022, we co-organized a seminar series, Epistemic Decolonization—From Theory to Practice, together with Azita Chellappoo, Abigail Nieves Delgado, and Sahana Rajan. As we thought about potential speakers for the series, Mogobe Ramose was one of our first choices. Ramose's work on *ubuntu* has moved beyond mere theory by showing how African philosophical traditions can be mobilized in developing transformative perspectives on a wide range of societal practices and problems. As *ubuntu* has become increasingly discussed as a framework for shaping intellectual and material life in Africa, it appeared as a particularly apt example of taking decolonization from theory to practice (Kashindi 2019).

Ramose politely declined our invitation, pointing out that he had grown increasingly uncomfortable with the very label of decolonization. Sharing one of his recent publications, Ramose explained that "backed by the philosophy of *ubuntu*, we would rather opt for *mothofatso* [humanization] and not 'decolonial' " (2020, 271). While Ramose's discomfort with the notion of decolonization is multifaceted, two concerns are particularly striking: First, Ramose argues that centering around decolonization conceptually still prioritizes coloniality rather than *ubuntu* philosophy's own intellectual standing. In this sense, Ramose asks, "why should 'decolonial' return to Africa not only as a reminder that there were colonies in the continent but also as the harbinger of a purportedly new epistemic paradigm to deal with the already challenged epistemological paradigm" (2020, 302). Second, Ramose suggests that centering on coloniality as the dominant frame of interpretation risks mispositioning African philosophy by leading to a solipsism that fails to recognize the very "condition for dialogue. In the dialogical encounter, it is possible to assume the point of view of the 'other' in the quest to understand and change reality" (2020, 284). Ramose argues that this

ambition of mutual dialogical understanding becomes undermined if the "other" becomes exclusively framed as a colonial oppressor.

Despite the influence of African philosophers and revolutionaries like Fanon (1961), Nkrumah (1963), Ngũgĩ (1986), Sankara (1988), and Wiredu (1995) in shaping discourses of decolonization, Ramose is not the only African philosopher who is critical of its current state. Olufemi Táíwò's (2022) *Against Decolonisation. Taking African Agency Seriously* stands out in not only echoing many of Ramose's worries but also formulating them in much sharper terms. According to Táíwò, decolonization has lost its way (Táíwò and Reza 2022, 22) by turning "colonialism into the only framework for plotting life and thought in Africa." Táíwò suggests that the notion of decolonization should be reserved for the national independence from colonial empires that was largely achieved in the twentieth century rather than being ambiguously extended into the twenty-first century.

Táíwò illustrates his critique of contemporary decolonization discourse with examples such as the work of Nigerian composer Fela Sowande, whose piece *Akinla* was chosen by Nigerian writer Wole Soyinka to be played at his presentation of the Nobel Prize in Literature. While reflecting Sowande's training in classical European music, *Akinla* is also grounded in African melodies and rhymes and thereby also becomes a musical expression of "Sowande's appreciation of Nigerian culture and his strong belief in cultural nationalism" (Omojola 1995, 37). According to Táíwò, Sowande's compositions and Soyinka's writing exemplify the complex reality of African cultural production that is deeply intercultural but misrepresented by decolonial discourses that frame any external influence as a continuation of colonialism and as a form of oppression that needs to be resisted. When using colonialism as the only frame of analysis, Soyinka's use of the English language and Sowande's use of classical European instruments becomes framed as internalized colonial violence that contributes to an "epistemicide" (Táíwò 2022, 58), that is, to destroying local cultural and epistemic traditions. According to Táíwò, such a frame of analysis misrepresents the past, as African history is also the outcome of productive intercultural encounters. It misrepresents the present, as the aspirations of young Africans are strikingly cosmopolitan while challenging many aspects of traditional societies, such as "child marriage, polygyny, caste systems, oppressive rule under native hierarchies denominated largely by chieftaincy, gender oppression, ethnic chauvinism and so on" (2022, 32). It also misrepresents the future of Africa

that needs to embrace its own modernity rather than misunderstanding modernity as colonialism (Táíwò 2014).

Our discussion of "metadualism" in the interplay between diversity and decolonization resonates with some of Táíwò's and Ramose's concerns: if decolonization discourses conceive cross-cultural relations exclusively through oppression, no positive vision of epistemic diversity and intercultural dialogue remains. Frameworks from transdisciplinary research to philosophy of science such as Longino's (2002) tempered equality may be rejected without any constructive alternative emerging. At the same time, we disagree with Táíwò's strategic move from embracing interculturality to rejecting decolonization. Táíwò is right that cultural and political realities of Africa (or Latin America, for that matter) are too complex to be exclusively interpreted through colonial oppression. Clearly, there needs to be space for positive intercultural encounters and dialogue. At the same time, the effects of colonialism on Africa (or Latin America) are far too severe to be cast aside in a depoliticized praise of intercultural cross-fertilization that is strategically silent about inequalities of intercultural encounters.

Táíwò's wholesale rejection of current decolonization discourse is based on a distinction between what he calls decolonization$_1$ and decolonization$_2$. Decolonization$_1$ is about the political struggle of national liberation of colonized people from their colonial oppressors. Decolonization in this first sense has been achieved across almost all of Africa. Decolonization$_2$ extends from national liberation to "any and every cultural, political, intellectual, social and linguistic artifact, idea, process, institution and practice that retains even the slightest whiff of the colonial past" (2022, 19). Decolonization$_2$ is Táíwò's main target, as an intellectually confused and politically misleading concept. The failure of decolonization$_2$ leaves us with decolonization$_1$ only in the sense of flag independence. But for the vast majority of Africans, decolonization$_1$ has already been achieved. Therefore, there remains no legitimate use for the concept of decolonization. Or so Táíwò wants us to believe.

The core problem with Táíwò's argument is that the simple dichotomy between a narrow definition of decolonization$_1$ and a broad definition of decolonization$_2$ does not do justice to decades of African (e.g., Chilisa 2019; Mbembe 2013; Mbonda 2021; Ndlovu-Gatsheni 2018) but also Asian and Latin American (e.g., Maldonado-Torres 2007; Moosavi 2020) decolonial scholarship. Deriving a narrow definition of decolonization from the rejection of a broad definition relies on a questionable premise that Táíwò never makes explicit: There are no viable spaces in between these

uncompromisingly minimalist and maximalist interpretations of decolonization. Think of concepts such as "patriarchy" or "racism." Just as with "colonialism," both concepts can become overstretched. If anything and everything in society become explained as an effect of the patriarchy or of racism, the concepts lose any explanatory power and political use beyond being symbolic markers. While both concepts can become overstretched, the alternatives are clearly not artificially narrow definitions according to which the patriarchy ended with the women's suffrage movement and racism ended in the US with the Civil Rights Act of 1964. Such narrow definitions would clearly be explanatorily inadequate in masking the continued causal importance of patriarchal and racialist mechanisms in shaping social structures. They would also be politically counterproductive in obscuring core factors that need to be addressed in any struggle for social equality.

The situation is not so different in the case of decolonization. Restricting ourselves to the excessively narrow notion of decolonization$_1$ would be explanatorily inadequate for engaging with social mechanisms and structures across Africa as well as Latin America. There is a certain irony in Táíwò accusing decolonial theory of "just chasing shadows and incorrectly identifying causality" (2022, 2) while failing to acknowledge the rather trivial point that solid causal explanations of social realities across Africa often need to trace effects of colonialism far beyond flag independence. Consider one of Táíwò's own examples of growing up in Nigeria: "A contingent of students from another high school in Cotonou, Dahomey (now Benin), had come to our city for a seven-day trip, lodging with us in our dormitories at my boarding school. For the week we were all together, my schoolmates and I spent our time trying to practice our French language skills, while the students from Cotonou did the same with their English. It was not till the eve of their departure that we all discovered, doubtless to our chagrin, that they and we were all, mostly, Yorùbá. That is, we could have had more meaningful, even deeper, conversations in our shared original tongue and primary culture" (2022, 5).

While this story takes place after flag independence of Nigeria and Dahomey, it clearly cannot be understood without colonialism constituting a major part of the explanation. The language preferences of the students were not a cosmic coincidence, nor is what Táíwò describes as a risk of "deepening fossilization" of African languages that motivates "the drive to rescue future generations from this fate [and] its terrible implications for a coherent, intellectual identity and for high-quality scholarship" (2022, 18).

But if the causal relevance of colonialism is so strikingly clear, why does Táíwò resist appeals to colonialism in explanations of social realities up to the point that he wants to eliminate any talk of decolonization beyond flag independence? Táíwò appears to think that decolonization discourse somehow commits to treating colonialism as the *only* frame of analysis, to relying on "monocausal explanations" (2022, 58) of social phenomena in terms of colonialism.

The current state of philosophical debates about causation in the social sciences (e.g., Kaiser et al. 2014; Reutlinger 2017; Woodward 2005), however, suggests a more complex picture than Táíwò's equivocation of the causal importance of colonialism and claims of monocausality. As Illari and Russo (2014, 32) point out, what "we call 'causes' are in fact components of sufficient causes, and are not sufficient in themselves. For instance, the measles virus is said to be the cause of measles, but in fact the 'complete sufficient cause' of measles also includes lack of immunity to the virus and exposure to the virus." Along similar lines, it is entirely consistent to highlight colonialism as a cause of social phenomena such as language preferences without suggesting it is alone sufficient or that there are no other relevant causal factors.

Consider a causal explanation in a simple example such as a house being on fire. Identifying an arsonist as the cause of the fire does not mean that there were no other relevant causal factors—for example, the house being constructed with flammable materials, negligence by the owner in not following rules for fire extinguishers, the tenant falling asleep rather than noticing the fire early on, a week of dry weather without any rain, and so on. When we highlight the arsonist as the cause of the fire, we are not committed to the claim that no other factors played a causal role, and we may even hold people responsible for some of them, such as lack of fire safety.

The situation is not so different for many decolonization debates, including Táíwò's own anecdote of linguistic and educational practices in West Africa. While it seems almost trivial that colonialism is an important causal factor for understanding Táíwò's anecdote, this does not mean that it is somehow the only causal factor. It also does not mean that Africans cannot hold their politicians or educators responsible for implementing educational policies that safeguard local cultural and linguistic diversity. Táíwò is entirely correct to demand that decolonizers "make clear the causal lines between the phenomena they wish to decolonise and . . . colonialism" (2022, 38), but he is wrong to think that these causal lines are somehow so difficult

to establish that decolonization should be abandoned altogether. Even when not constituting the only causal factor, colonialism remains crucial for understanding many social mechanisms and structures across Africa that need to be adequately incorporated in any empirically adequate and epistemically robust explanation.

Eliminating colonialism as a relevant explanatory factor through a wholesale rejection of decolonization not only fails to ensure empirical adequacy in cases such as Táíwò's own anecdote of school exchange, but it also becomes an easy target for political misuse. Táíwò's call to "take African agency seriously" is so easily misread as "blaming Africans for not pulling themselves up by their bootstraps" because it obscures colonialism as a causal mechanism through the conceptual dichotomy of decolonization$_1$ versus decolonization$_2$.

One of Táíwò's recurring examples of African agency is "the youths and democratic forces in Eswatini, the only surviving absolute monarchy in Africa, who are defying death and imprisonment" (2022, 48). And to be fair, social struggles in Africa can revolve around challenging traditional governance structures and oppressive traditional practices. At the same time, it is clearly misleading to think of the political dynamics of Eswatini as representative for all of Africa, and Táíwò conveniently fails to even mention how much of African political agency continues to be expressed through decolonial frames. From protesters in the streets of Bamako challenging French neocolonialism in Mali to students in the streets of Cape Town demanding that "Rhodes must fall," decolonization continues to provide concepts and practices for mobilizing against oppressive realities and envisioning more just futures across Africa. While Táíwò is clearly right that not everything is always about colonialism, brushing aside the continuing role of "decolonisation as self-recovery" (Mungwini 2022) turns the case for African agency into a one-sided polemic instead of the articulation of a viable alternative for engaging with African political life.

At the same time, the state of the decolonization debates suggests a rather straightforward alternative. Sure, decolonization can be misinterpreted through a nativism that considers any external influence a form of colonial violence that needs to be resisted. However, serious engagement with decolonial practice demonstrates a rich conceptual landscape far beyond Táíwò's options of "everything is still colonialism" (decolonization$_2$) and "nothing is colonialism anymore" (decolonization$_1$). Most importantly,

Táíwò's dichotomy lacks empirical credibility when engaging with decolonial activism in Africa beyond exclusive academic debates.

Let us illustrate this with a short anecdote from our empirical work and collaboration with the Center of Indigenous Knowledge and Organizational Development (CIKOD) in Ghana (see Story 2.3). In October 2022, David joined CIKOD and other colleagues in co-organizing a workshop on Indigenous knowledge and agricultural sustainability in the community of Forikrom, near Techiman in the Bono East Region of Ghana. The workshop mobilized the language of decolonization and celebrated Indigenous traditions in Forikrom as a key for safeguarding food security and self-determination. During the community celebrations, for example, the local student theater praised intercropping of traditional plants like cocoyam, cassava, and beans while ostracizing GMOs and NGOs for pushing unhealthy food, poisonous inputs, and environmental destruction onto the community. The community weaved together decolonial challenges of destructive forms of modernization with celebrations of Indigenous knowledge and practice. This did not mean, however, that the community embraced a nativist rejection of everything external or modern. Yes, traditional dances of the Ashanti, Dagara, and Krobo peoples were performed and celebrated as cultural expressions of self-determination. But in between traditional dances, the DJ also played the recent Afrobeat hits from Accra and Lagos while sampling them with North American hip-hop classics like KRS-One's "Sound of da Police." No one in the community seemed to be afraid of modernity even when resisting specific expectations of how to modernize along the visions of President Nana Akoufo-Addo, the International Monetary Fund, or the Gates Foundation. From the perspective of community-based practice, there simply is no need for the dichotomous choice that Táíwò demands: it is entirely consistent to embrace decolonization and Indigenous traditions as tools in the struggle for a better and self-determined life while embracing external and modern influences whenever they actually support those goals (or at least come with a good beat).

While the community celebrations expressed fruitful coexistence of decolonial mobilization and interculturality through dance and music, our agroecological workshops with farmers highlighted the same dynamic on the epistemic side. Yes, the workshops revolved around the depth of Indigenous knowledge about issues such as soil health, crop rotation, seed diversity, pest management, climate change adaptation, nutritional safety, and culinary traditions. Yes, this crucially involved peasant associations and unions

that resist dominant models of agricultural modernization due to deeply destructive effects on people and environments. No, the consequence was not a rejection of everything external or some simple nativism. The vision of a decolonized agricultural system relied on local Indigenous practices as much as insights from agroecology as an internationalist movement that draws from all kinds of modern epistemic resources, including recent advances in academic fields from agronomy to ecology to plant breeding to soil chemistry. The internationalist spirit of agroecology was very much present in Forikrom, as an international group of researchers joined local Ghanaian participants in the workshops and dialogues.

None of these insights from Forikrom are particularly novel, as the fruitful interplay of decolonization and interculturality has always been a crucial part of African political life. The work of Amílcar Cabral, for example, exemplifies an unapologetically internationalist attitude that embraces modern science (Cabral 2016, 123) while simultaneously advocating for a "return to the source," in which Indigenous tradition becomes central and "national liberation is necessarily an act of culture" (Cabral 1974, 48). For Cabral, external borrowing and returning to the source are both crucial in the articulation of African agency. Taking African agency seriously, as demanded by Táíwò, reveals a historical and contemporary reality that is far more complex than the dichotomous choice between decolonization$_1$ and decolonization$_2$, a reality in which effects of colonial and neocolonial exploitation extend far beyond flag independence (Nkrumah 1965) without calling into question the usefulness of external influences or preventing the possibility of fruitful intercultural encounters (Sankara 1986). Of course, there remain plenty of tensions between endogenous and exogenous influences, between decolonial confrontation and intercultural cooperation. But these tensions are an inevitable and productive part of African public life that is misrepresented by narratives that demand a wholesale rejection of either decolonization or interculturality (see also Kramm et al. 2024).

It is in this context that the project of transformative transdisciplinarity constitutes an alternative to Táíwò's attempt to force a choice between decolonization$_1$ and decolonization$_2$. Indeed, transdisciplinary collaboration is crucial and requires that dialogue is not precluded by some nativist misinterpretation of decolonization. However, dominant forms of collaboration and dialogue remain causally shaped by colonial and neocolonial structures, from access to material resources to epistemic recognition. Transdisciplinarity needs to be transformative in challenging these structures. Dialogue and

decolonization are therefore not only compatible but depend on each other for any transformative vision of transdisciplinarity: Dialogue without decolonization will become blind to its social hierarchies and produce deeply distorted forms of collaboration that legitimize dominant actors. Decolonization without any dialogue risks undermining the very possibility of collaboration in complex social-environmental settings. Táíwò is wrong in trying to force a choice because both are needed.

Story 2.3: CIKOD and the Sankofa Bird

Daniel Faabelangne Banuoku

Twenty years have passed since we created the Center of Indigenous Knowledge and Organizational Development (CIKOD) out of a sense of deep frustration with the state of development in Ghana. Our frustrations emerged from participating in large development projects and returning to the communities a couple years later. The research reports had been written, and the international development organizations had moved to their next project. Nothing meaningful remained in the communities. We asked ourselves: Why does this always happen? Who is actually participating in whose development? Are development practitioners and governments participating in the peoples' development, or are the people participating in the development agenda of some external institution? Those were our questions.

Back in 2003, we created CIKOD with the goal of actually participating in peoples' development. From our conversations, it became clear that we needed to rethink development as an endogenous process. People need to be able to set their own goals. They have their resources, and they have their own practices. Endogenous development means becoming part of these processes and strengthening their capacities rather than imposing our own agendas.

The lens of endogenous development changed our whole conversation. Development is often approached as a simple input-output relationship. It suppresses issues of culture, of social life, of spirituality, of community relations. In contrast, endogenous development made us question the dominant narratives of knowledge: what it is, where it is, and who has it. We still get a lot of pushback for that, especially for including community spirituality, for going from the physical to the metaphysical. In Africa, we

are increasingly taught that life is about modernization. Check your bank account. Get a degree. Work hard on a career. Get a new car. Modernize your lifestyle without appreciating the value of what you already have. Questioning that narrative makes you "antiprogress," challenging the *status quo* makes you "antidevelopment." For example, we were fighting the plant breeders bill in Ghana that aimed at corporate capture of agriculture and food systems. The dominant narrative was that the bill was going to solve all the problems of the people by modernizing agriculture in Ghana, so we were declared to be antidevelopment. But the reality was that the bill was going to colonize our seeds, disconnect spirituality from our agriculture, force farmers to pay for their seeds, ensure that the people remain poor, and make us lose our seed diversity.

Decolonizing mindsets is not about breaking ties with the knowledge of the universities. It's not about pitching one knowledge system against the other. Instead, it's about how we bring them together. There is a lot of knowledge at the universities. But there was also a lot of knowledge with my father when he took me to the farm and explained to me how we grow yam. He was excellent at this.

Our symbol at CIKOD is the Sankofa bird. Sankofa is a traditional symbol of Akan culture, a bird that is moving forward while looking back. There is a story of two brothers who are leaving for a very long journey. They rush out of the house and only realize later that they forgot water bottles that are essential for their journey. One brother is anxious to progress and refuses to walk back. The other brother returns home before restarting his journey. In the end, only the brother who returned to pick up the water bottle succeeds in completing the journey. *Se wo were fi na wosankofa a yenkyi*—"It is not wrong to go back for that which you have forgotten," as the traditional Akan proverb puts it. At CIKOD, we represent our approach to development through the Sankofa bird. Sometimes we move so fast in our desire to progress that we forget the most fundamental components that are essential ingredients of life. That's how our everyday lives have become in Ghana. Racing and chasing without reflection about what we need for a good life. The Sankofa bird reminds us that it is not too late to look back. But the Sankofa bird also reminds us that it is not only about looking back and staying in the past. It is about looking back to successfully go forward into the future. Endogenous development is not about rejecting progress but about participating in the progress of the people instead of racing blindly forward.

Figure 2.3 The Sankofa Bird as represented by CIKOD. (Photograph by Luana Poliseli).

2.2 The Partial Overlaps Framework

2.2.1 Navigating Between Inclusion and Exclusion

Transdisciplinary practice requires navigating a complex politics of knowledge between diversity and decolonization. We have argued that the shift from epistemic paternalism to epistemic diversity creates spaces for

transdisciplinary engagement. Instead of a one-directional export of modern science and technology "from the West to the Rest," the move toward epistemic diversity highlights the plurality of relevant knowledge systems and the need to integrate them in responding to complex social-environmental challenges, from climate change to food security to public health. Rather than treating communities in the Global South as passive beneficiaries of academic knowledge production, the emphasis on epistemic diversity centers on the plurality of epistemic agents whose knowledge needs to be recognized and integrated. As such, the move from epistemic paternalism to epistemic diversity converges with the move from disciplinary to transdisciplinary practices that harness the epistemic resources of diverse actors in addressing global challenges.

At the same time, we showed that epistemic diversity has been challenged by a move toward decolonization that centers on inequalities between actors and knowledge systems. Knowledge integration tends to merge nonacademic knowledge with academic research, of Global South knowledge with Global North frameworks, of Indigenous knowledge with non-Indigenous projects. One side is being integrated; the other is doing the integrating. Epistemic decolonization challenges these unequal forms of knowledge integration by aiming to overcome dominant frameworks and to establish emancipatory alternatives beyond deeply entrenched colonial inequalities.

While decolonial scholarship reflects the need to move from integrationist to transformative transdisciplinarity, it also creates novel challenges for navigating heterogeneous knowledge systems. Much of the critique of integrationism emphasizes "radical alterity" and "incommensurability" between actors, in such a manner that it can obscure the very possibility of transdisciplinarity and dialogue. The challenge for transformative transdisciplinarity is, therefore, to be honest about the politics of deep epistemological and ontological differences while fostering positive outlooks on more equitable dialogue and knowledge co-production (Macnaghten, Shah, and Ludwig 2021).

In a series of previous publications (El-Hani, Ludwig, and Poliseli 2022; Ludwig 2016b; Ludwig and El-Hani 2020; Renck et al. 2022a), we developed a framework of "partial overlaps" for navigating the complex politics of relating knowledge systems. The notion of partial overlaps recognizes that intercultural communication always requires substantial grounds of mutual understanding. This requirement of grounds for mutual understanding is both philosophically and ethnographically justified. From the philosophical

side, there is a wider point that Wittgenstein (1971) famously expressed when writing, "If a lion could speak, we could not understand him." Understanding requires commonalities; disagreements require a much broader basis of agreements in order to be intelligible in the first place (Davidson 1973). Recognizing overlaps between knowledge systems is therefore a requirement for any intelligible disagreement in transdisciplinary practice and for meaningful negotiation of knowledge diversity. For example, academic and Indigenous actors may disagree on protecting a threatened species by banning certain hunting practices in a specific segment of the forest. In order to understand this disagreement, however, there already needs to be sufficient common ground to ensure joint reference to the same species, the same hunting practices, and the same segment of the forest. Without substantial common ground, disagreements cannot even be articulated in collaborative practice.

Beyond these philosophical arguments, there is also a more direct ethnographic case for the importance of overlaps. In our work with the communities of Siribinha and Poças, for example, partial overlaps between knowledge systems are ubiquitous in epistemological encounters. In collaborations between academics and the fishers of Siribinha and Poças, questions of radical difference can play an important role, as we will discuss in detail in section 4.2.5 when considering the *Caipora*, a broadly circulating concept among Amerindian peoples referring to a master of animals that is responsible for the regeneration and maintenance of animals in the forest. As such, *Caipora* has no place in the ontologies of academic researchers, and, thus, when considering *Caipora* in conversations with the fishers, ecologists will be delving into radical differences.

But radical differences are not all that matters in addressing intercultural relations. Many of the grand claims of incommensurability vanish in the background of daily community interactions, as we increasingly recognized in Siribinha and Poças. These interactions involve countless cases of mutual understanding when talking about fish, plants, ecological dynamics, livelihood challenges, interpersonal relations, daily struggles, and so on. They also involve many important but rather mundane cases of difference that do not hinge upon radical alterity, such as taxonomic differences that emerge when comparing how ecologists and local fishers classify animals from the Itapicuru estuary. When collecting crabs or watching birds together, for example, observations are constantly shared, and so are thoughts about wider regularities and their meaning. There is plenty of agreement and many

differences that do not involve radical alterity. For example, local fishers recognize two kinds of birds, *maçarico-grande* and *maçarico-pequeno* (large and small sandpipers) while academic researchers will distinguish between eleven different bird species in this case. And where academic researchers see a single species, *Centropomus undecimalis*, local fishers will recognize at least three different kinds, *Robalo comum/normal/verdadeiro*, *Robalo espalmado/espada*, and *Robalo suvela* or *Robalão*. Plenty of differences emerge in these exchanges, but they emerge from a basis of mutual understanding and are far from being cases of radical alterity.

Recognizing overlaps between knowledge systems is crucial for transdisciplinary collaboration. An exclusive focus on overlaps, however, leads back to earlier concerns about an integrationism that recognizes Indigenous and local knowledge only if it is sufficiently similar to academic knowledge to be integrated into dominant academic frameworks. In this sense, exploration of overlaps always needs to be combined with a careful exploration of their partiality. For example, transdisciplinary encounters in Siribinha and Poças have also been marked by substantial differences across epistemological, ontological, and value dimensions. Partialities not only are causes of tension but can also become sources of collaborative learning beyond mere agreement. The partiality of overlaps challenges ontological, epistemological, and value assumptions and can open up new ways for learning from questioning what we assume—often tacitly—about ourselves and our experiences. Transdisciplinary integrationism tends to sidestep such partialities by focusing on nonacademic knowledge that sufficiently overlaps with academic knowledge. Rather than downplaying differences, the partial overlaps framework centers them as crucial junctions for the development of transdisciplinary practices that can transform existing frameworks dominated by academic background assumptions. Highlighting partiality without denying overlaps provides, therefore, an entry point for navigating what we called the "new politics of knowledge" between diversity and decolonization. Explicating common ground for collaboration needs to be complemented by reflexivity about differences and tensions in transdisciplinary practice.

Identifying both overlaps and partialities are acts of intercultural translation that involve indetermination and ontological relativity (Quine, 1960, 1969). To find an overlap between knowledge systems—along ontological, epistemological, value dimensions—is an interpretive intercultural move, as we cannot simply leave our own perspective and compare categories from

a neutral point of view. When striving to develop functional relations between different knowledge systems, dialogue and negotiation processes are necessary and involve intercultural translation and meaning-making on all sides of the interaction (El-Hani 2022; El-Hani and Ludwig 2024). As the holders of distinct knowledge systems try to understand each other, mutually translating their perspectives along the shared experience of collaborative work, their understandings do not remain the same but rather are transformed through the very process of mutual translation. An intercultural translation process can generate deep learning once every participant allows it to challenge and transform their own conceptual and practical repertoires, a learning that may not be possible from within their own knowledge systems. And these transformations and learning processes open up a space for both mutual understanding and tensions that need to be reflected upon during transdisciplinary practice.

2.2.2 The Plurality of Local Biologies

In our previous publications (El-Hani et al. 2022; Ludwig 2016b; Ludwig and El-Hani 2020; Renck et al. 2022a), we developed the partial overlaps framework by exploring intercultural relations between different forms of biological knowledge. Focusing on the intercultural diversity of biological knowledge provides a seemingly inexhaustible source of lessons about overlaps and their limitations. For example, cross-cultural comparisons of biological classifications often reveal patterns of striking similarity as well as difference. Ethnobiology, which has become institutionalized as the "study of dynamic relationships among peoples, biota, and environments" (Society of Ethnobiology 2021), is the major field inquiring into local classifications and other aspects of biological knowledge systems. However, this definition should not be misunderstood as indicating a unified identity of the field. On the contrary, ethnobiology brings together researchers with vastly different agendas from the natural and social sciences and has more recently also caught the attention of philosophers (Borghini et al. 2020; Kendig 2020; Lequin 2022; Massimi 2022; Nieves Delgado et al. 2023; Popa 2020; Villagómez-Reséndiz 2020; Weiskopf 2020).

The institutionalization of ethnobiology in the second half of the twentieth century can be situated in a wider shift from epistemic paternalism to epistemic diversity in academic engagement with Indigenous knowledge

(McAlvay et al. 2021). Anthropology has a long history of legitimizing colonial projects and their "civilizing mission" by questioning epistemic capacities of the colonized (Mungwini 2017b, 17). In the biological domain, this legacy fed into a "utilitarian perspective" of treating Indigenous knowledge of nature as limited to practical needs without deeper intellectual concerns and reasoning. As Malinowski infamously put it in his *Magic, Science and Religion* (1948, 44): "The road from the wilderness to the savage's belly and consequently to his mind is very short. For him the world is an indiscriminate background against which there stands out the useful, primarily the edible, species of animals and plants."

The emergence of ethnobiology as an institutionalized academic field is closely related to an intellectualist counterprogram that documented the wealth of local knowledge about animals, plants, and ecosystems. Conklin's (1954) dissertation is widely regarded as a watershed moment in ethnobiology, as it provided a detailed systematics of Hanunoó plant classifications and included countless taxa that bore no resemblance to Malinowski's utilitarian "savage." As Conklin summarized his results: "Hanunoó classify their local plant world, at the lowest (terminal) level of contrast, into more than 1800 mutually exclusive folk taxa, while botanists divide the same flora—in terms of species—into less than 1300 taxa" (1954, 426).

The work of Brent Berlin (1966, 1992) represents the peak of classical intellectualism in ethnobiology, mobilizing a large amount of ethnotaxonomic data and sophisticated cognitivist theorizing to make the case for Indigenous expertise about the biological world. At the same time, Berlin's work is also emblematic of the limitations of intellectualist ethnobiology that grew increasingly hostile toward acknowledging cross-cultural difference in its pursuit for a universalist framework that integrates academic and Indigenous knowledge. For example, Berlin and Berlin's *Medical Ethnobiology of the Highland Maya of Chiapas* (1996) not only provides detailed documentation of a specialized body of local knowledge but is also based on the assumption "that the ethnobiological knowledge of traditional peoples conforms in many respects to basic scientific principles" (1996, 3).

Formulated through the lens of the partial overlaps framework, classical Berlinian ethnobiology puts emphasis on overlaps that allow for recognition of Indigenous expertise and provide common ground for collaboration. Indigenous expertise is framed as surprisingly similar to academic expertise and characterized by recognition of the same biological structures as described in academic biology. While classical ethnobiology can therefore

be interpreted in pushing from epistemic paternalism to epistemic diversity, it also reflects the shortcomings of truncated diversity that is disciplined through assimilation into academic standards. Highlighting the overlaps between Indigenous and academic knowledge in classical ethnobiology comes at the price of downplaying partialities through a general hostility toward cross-cultural difference as an expression of "relativism." Most clearly articulated in the work of Berlin (1992), classical ethnobiology, therefore, recognizes Indigenous knowledge but pays the price of a philosophical universalism that takes Indigenous perspectives seriously if *and only if* they are sufficiently similar to academic perspectives.

The lack of recognition of deep cross-cultural difference became the main angle of critique in ethnobiological scholarship of the twenty-first century that increasingly focused on cross-cultural heterogeneity in classifying, reasoning, and interacting with nature. The hotly contested case of the Maya International Cooperative Biodiversity Group (ICBG) constitutes a case study of these changing dynamics and the increasingly contested politics of Indigenous knowledge. In the footsteps of Berlin's universalist program of highlighting overlaps between Indigenous and academic knowledge, the ICBG aimed at gathering Indigenous knowledge about biodiversity and ethnopharmacology in Chiapas, Mexico (Feinholz-Klip et al. 2004; Lucas et al. 2013). Aside from complex questions about informed consent in sharing this knowledge, critics accused the Maya ICBG more broadly of obscuring uniquely local knowledge that resists integration efforts, of doing "violence to Indigenous meanings of nature, medicine, and property," and of objectifying "part of their culture to conform to the consumption desires of outsiders" (Nigh 2002, 466).

The ICBG controversy illustrates a deep shift in ethnobiological engagement with both Indigenous knowledge and Indigenous livelihoods. The Berlinian school of ethnobiology had challenged paternalistic caricatures of Indigenous knowledge as superficial and exclusively practical. Making the case for Indigenous knowledge, however, largely amounted to making the case for universal convergence of knowledge systems—for example, by Indigenous people allegedly identifying universal natural kinds that could be validated against the standards of academic taxonomy. A new generation of ethnobiologists challenged this universalizing move by highlighting the cultural heterogeneity of biological knowledge and the ways in which local knowledge practices support local livelihoods independently from their validation by academic researchers. Nabhan's *Ethnobiology for the*

Future (2016, 27) clearly summarizes this wider development when arguing that ethnobiologists need to focus on "the anomalies, the unique cultural expressions, and the collisions of dissonant taxonomic structures."

Putting this development of ethnobiology in the wider interpretative frame of this book shows how the move from overlaps to partiality is connected to a politics of knowledge that pushes from diversity to decolonization. Recognizing the diversity of epistemic actors is important but not sufficient if Indigenous knowledge is recognized only insofar as it is sufficiently similar to academic knowledge. A focus on partialities helps us understand how Indigenous expertise is often embedded in practices and ontologies that substantially differ from those of academic researchers, including ethnobiologists. Therefore, taking the decolonial challenge seriously in ethnobiology means not only validating Indigenous knowledge but fostering a transdisciplinary exchange that leaves room for difference and for questioning unequal relations in knowledge exchange. Along these lines, McAlvay et al.'s (2021) call for decolonial ethnobiology emphasizes the need to recognize knowledge systems beyond asymmetrical validation exercises: "While ethnobiologists are well situated to facilitate exchange and dialogue between different knowledge systems . . ., the use of one knowledge system as the yardstick to measure the value or accuracy of another perpetuates the dominance of the former."

2.2.3 Partial Overlaps in Epistemologies, Ontologies, and Value Systems

The previous sections outlined a new politics of knowledge through the three modes of paternalism, diversity, and decolonization. Academic perspectives on marginalized communities are often rooted in paternalistic narratives about development, growth, modernization, and progress that treat them as passive beneficiaries of science and technology without epistemic agency of their own. Transdisciplinary research challenges this paternalistic relation through emphasis on heterogeneous actors and knowledge systems. However, the reality of transdisciplinarity is complex, and we highlighted tensions emerging from appeals to epistemic diversity and epistemic decolonization. While the former can lead to a truncated integrationism that downplays differences between knowledge systems, the latter is challenged to avoid a "metadualism" that focuses exclusively on differences, without

providing a positive account of more equitable and just forms of knowledge co-production. Transformative transdisciplinarity responds to this complex constellation by embracing the transdisciplinary appeal to co-production while reflecting on the need to transform deeply entrenched inequalities in co-production processes.

The notion of partial overlaps provides our starting point for a transformative approach to transdisciplinarity through recognition of overlaps that establish common ground for collaboration while simultaneously emphasizing partialities that demand recognition of deep differences. In a previous article (Ludwig and El-Hani 2020), we elaborated the partial overlaps framework through epistemology, ontology, and values as three philosophical domains in which both overlaps and partialities can be located (Figure 2.4). It is important to stress from the beginning that the role of looking for overlaps is not to validate nonacademic knowledge through academic methods but rather to inquire into overlaps and their partialities as a way of understanding similarities and differences in the epistemological, ontological, and value domains without any commitment to hierarchizing knowledge systems.

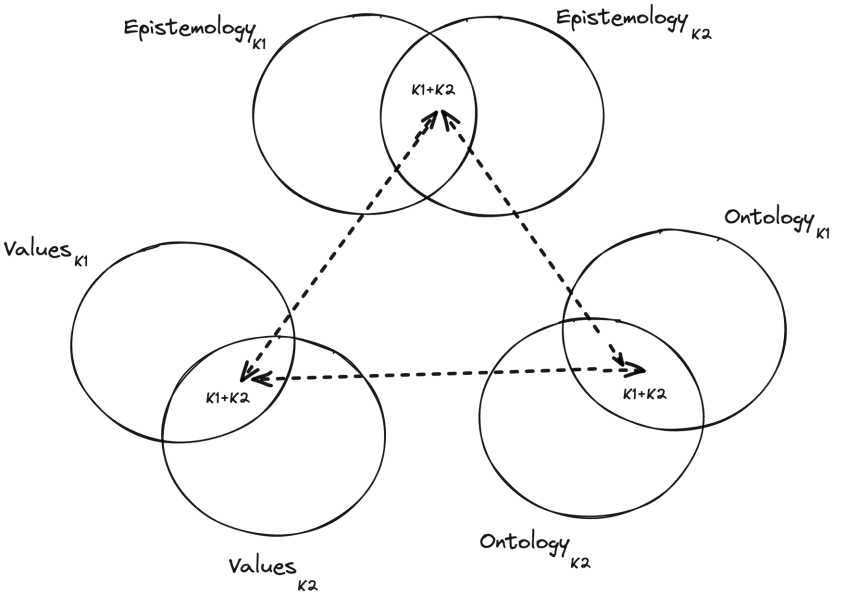

Figure 2.4 Two knowledge systems (K1 and K2) partially overlap in epistemological, ontological, and value dimensions. Each of these dimensions affects the other, as represented by the dotted arrows.

Partial Overlaps in Epistemology: Science is a complex epistemic and social practice that is not distinguished by a singular scientific method but, rather, by heterogeneous strategies, practices, and tools for investigation (Andersen and Hepburn 2015; Lacey 1999; Laudan 1983). Recognizing this plurality of scientific practice (Ludwig and Ruphy 2021) means that a comparison of academic and nonacademic knowledge systems cannot depart from the question of whether nonacademic knowledge satisfies some unified definition of "the scientific method." Instead, substantial overlaps exist in the epistemic tools that are employed by academic and nonacademic actors. Collaborative practices in ethnobiology provide vivid illustrations of these overlaps, as joint engagement with the biological world would simply not be possible without a common basis for observing and reasoning about biota and environments. But even if collaborative approaches in ethnobiology presuppose shared epistemic resources, they are also often confronted with deep and unexpected differences. For example, consider Marlor's (2010) study of the tensions between Canadian biologists from the Department of Fisheries and Oceans and clam diggers of the Kwakwaka'wakw First Nation. As Marlor describes in detail, tensions were at least partly grounded in different methodological standards. Academic researchers assessed clam abundance through randomly selected sample areas of the beach that were standardized through straight perimeters and assessed through an equally standardized procedure of digging clams. In contrast, Kwakwaka'wakw assessed clam abundance through harvest outcomes that were not standardized but rather were affected by different individual styles and contexts of clam digging. Marlor is careful in elaborating a nuanced picture of the epistemic virtues and vices of both strategies. The standardized academic method had drawbacks, such as being inapplicable to certain areas (e.g., rock walls with high clam abundance that did not allow the required straight perimeters) and excluding individual expertise of experienced clam diggers, but also had epistemic virtues that were important for academic researchers, such as facilitating replication and ensuring transparency. The Kwakwaka'wakw method had limitations regarding replicability and transparency but could account for clam abundance in areas in which the academic method could not be applied as well as for the superior sampling efforts of experienced diggers. Taking such complex relations into account, the framework of partial overlaps highlights the intricate web of both similarities and differences between standardized academic and Kwakwaka'wakw methods.

Partial Overlaps in Ontology: The "ontological turn" in anthropology and related disciplines (Holbraad and Pedersen 2017; Paleček and Risjord 2013; Turska and Ludwig 2023) highlights the importance of partial overlaps beyond the domain of epistemology. From the perspective of transformative transdisciplinarity, one core motivation for an ontological perspective is the need to address how complex epistemic relations are embedded in wider ontological relations and assumptions about the world. Integrationist transdisciplinarity often presupposes the ontologies of academic research as the basis for collaboration and thereby excludes knowledge that is entangled with ontological assumptions that do not integrate with academic frameworks. Much of the ontological turn's focus on "radical alterity" emphasizes such instances of deep difference, from the lack of a nature/culture divide in many Indigenous communities (Descola 2005; Viveiros De Castro 1998) to ontological perspectives that radically extend the boundaries of personhood beyond the human (Kramm 2020) to spiritual ontologies that challenge the ontological comfort zone of academic researchers (Boogaard et al. 2023). Transformative transdisciplinarity needs to engage with such cases of deep ontological difference and with the tensions they create. At the same time, ontology is not exclusively a domain of difference and tension. Positioning cases of radical alterity next to ethnobiological research provides a helpful starting point for exploring the complexity of ontological relations that range from cross-cultural convergence in the recognition of biological species to deep divergences in conceptualizing the biological world. As the following chapters will discuss, such an exploration of partial overlaps allows navigating ontologies beyond simplistic assumptions of "incommensurable worlds" or paternalistic characterizations of "one world" in terms of dominant academic concepts and frameworks (Law 2015).

Partial Overlaps in Values: Applying the framework of partial overlaps to epistemologies and ontologies generates a complex picture of how actors represent and interact with the world. Furthermore, both epistemological and ontological perspectives turn out to be entangled with the values of actors, which also exhibit partial overlaps. This entanglement has become widely reflected in debates about "science and values" in philosophy of science, as neither epistemologies (Douglas 2009) nor ontologies (Ludwig 2016b) of science can be understood as value-free. These lessons become especially urgent in the context of transdisciplinary practices that directly affect interventions and livelihoods. For example, consider the notion of "sustainability" (Nagatsu et al. 2020) that dominates many academic discourses and

is often linked to Indigenous values (Watene and Yap 2015). The notion of sustainability became mainstreamed through the 1987 Brundtland report *Our Common Future* from the World Commission on Environment and Development, which already stressed that tribal and Indigenous "lifestyles can offer modern societies many lessons in the management of resources in complex forest, mountain and dryland ecosystems" (WCED 1987:12). The notion of sustainability is therefore commonly mobilized to highlight overlaps in the values of actors who want to create livable futures in which biodiversity remains conserved for coming generations. Although there is certainly some truth in emphasizing such shared values and aspirations, the case of sustainability also demonstrates the need for recognizing partiality. The concept of sustainability is a distinct product of modern capitalism that treats nature as a resource frontier while increasingly facing the exhaustion of resource systems that are appropriated in the pursuit of what Moore (2015) calls "Cheap Nature." Indeed, Indigenous and local practices can very much appear "sustainable" to external observers in the sense of nondestructive resource use, but they also strongly diverge from valuations of "nature as a service provider" (Sullivan 2009) and the promise of "sustainable development" that claims to reconcile the pursuit of infinite growth with the material reality of a world with finite resources (Watene and Yap 2015). As later chapters will explore in detail in relation to the Amerindian concept of *Caipora*, Amerindian perspectives overlap with sustainability discourses in valuation of biodiversity but ground this valuation in very different moral orders that highlight the intrinsic value of nature rather than its instrumental value as a resource frontier for commodity production. Recognizing both overlaps and partialities, therefore, becomes of key importance in relating value systems and negotiating them in transdisciplinary practice.

2.2.4 Three Modes of Epistemic Marginalization

One of the major benefits of the partial overlaps framework is that it increases descriptive accuracy in relating knowledge systems beyond contrasting caricatures of seamless knowledge integration and insurmountable incommensurability. Furthermore, a descriptively more accurate account of the relations between knowledge systems also contributes to navigating the politics of knowledge in transdisciplinary settings. Returning to the triad of paternalism, diversity, and decolonization, a focus on partial overlaps allows us

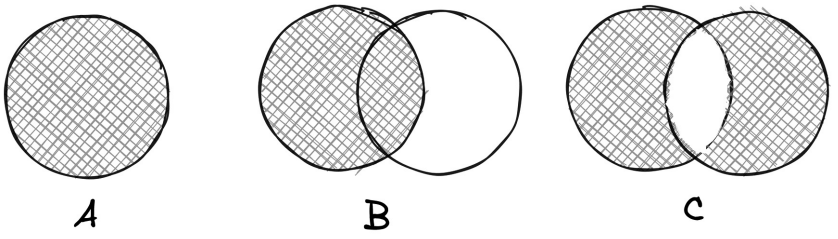

Figure 2.5 Three modes of epistemic marginalization in relations between knowledge systems. The circles represent two knowledge systems, the filled parts represent knowledge that is recognized. (A) only one knowledge system is recognized; (B) a second knowledge system is recognized, but only insofar as it overlaps with the first one, (C) two knowledge systems are recognized, but only in their differences without overlaps.

to distinguish between three different modes of epistemic marginalization (Figure 2.5).

Consider the relation between two knowledge systems, represented by the circles in Figure 2.5. Figure 2.5A represents paternalistic modes of knowledge production in which only one knowledge system is recognized as relevant. This paternalistic mode is deeply entrenched in colonialism and developmentalism that promised—and still often promise—to elevate the "uncivilized world" and later the "underdeveloped world" out of hunger and poverty through the import of external knowledge and technology. This paternalistic mode implies epistemic marginalization in straightforward ways, as communities are exclusively treated as passive beneficiaries without relevant knowledge and technology of their own. In this sense, Figure 2.5A recognizes only one knowledge system that is under exclusive control of modern science and technology.

Second, the move from epistemic paternalism to epistemic diversity creates spaces for the acknowledgment of multiple knowledge systems. However, it can also lead to an integrationism that recognizes only those aspects (epistemological, ontological, and/or values) that are sufficiently similar to dominant standpoints (Figure 2.5B). We argued that this tendency of recognizing overlaps without partiality is clearly exemplified in much ethnobiology of the twentieth century, insofar as it often highlighted the knowledge of communities that was convergent with the knowledge of academic biologists. For instance, Berlinian ethnobiology emphasizes that Indigenous communities recognize the same natural kinds as academic

biologists but minimizes Indigenous knowledge that diverges from academic perspectives.

Third, the move from diversity to decolonization highlights domains of knowledge systems that do not seamlessly integrate with dominant forms of knowledge and, therefore, resonates with the critique of integrationist projects employing overly narrow and instrumental accounts of Indigenous and local knowledge. While this move shifts attention toward partiality, an exclusive focus on difference, "incommensurability," or "radical alterity" can create an inverted problem of failing to recognize overlaps and the very possibility of common ground in transdisciplinary practices (Figure 2.5C). In its most radical formulation, such an account treats epistemologies, ontologies, and values only as incommensurable perspectives in conflict—a perennial "clash of civilizations" without any positive prospects for more equitable forms of co-production or emancipatory dialogues.

From the perspective of the partial overlaps framework, relating different knowledge systems can therefore lead to three distinct modes of epistemic marginalization: (1) failure to recognize the very existence of local knowledge systems, (2) exclusive recognition of overlaps between knowledge systems, and (3) exclusive recognition of partiality between knowledge systems. Navigating between these modes of epistemic marginalization is the aim of transformative transdisciplinarity, which demands recognition of marginalized knowledge systems (*pace* Figure 2.5A), recognition of points of overlap (*pace* Figure 2.5C), and recognition of their partiality through difference (*pace* Figure 2.5B).

The remainder of this book aims at better methodological and political strategies for relating knowledge systems. The following two chapters—"Community-Based Epistemology" and "Community-Based Ontology"—focus mainly on the methodological side. We explore how community-based philosophy constitutes an entry point for recognizing local knowledge systems in their epistemological and ontological complexity. We show how our collaborations with the communities of Siribinha and Poças provide a rich picture of both overlaps and partialities in daily practices and knowledge. Community-based methods, therefore, not only constitute an apt entry point for understanding the intricate relationships between knowledge systems but also open up new avenues for transforming transdisciplinary practice in equitable ways.

However, not all challenges of transformative transdisciplinarity are methodological. Methodological sophistication is not enough, as

transformative research often fails because of its embedding in academic structures that incentivize co-optation and exploitation rather than equitable collaboration. The latter chapters of the book address these political challenges: Chapter 5, "Community-Based Politics," focuses on community struggles and their tensions with the institutional reality of transdisciplinary research. We show how transdisciplinary processes become captured by institutional elites and thereby sideline both agency and livelihood concerns of communities. At the same time, we highlight the positive potential of transformative perspectives on transdisciplinarity from negotiations of policy to intercultural education. Chapter 6, "Another (Philosophy of) Science Is Possible," situates our project of transformative transdisciplinarity in wider debates about the public function of philosophy and science. We argue that science is indispensable for addressing global challenges, from climate change to food security, but is simultaneously a key actor in producing many of these crises and deepening global inequality. Instead of a generalized defense or critique of academic research, we argue for community-based methods and highlight the potential of the philosophy of science to develop emancipatory perspectives on the relations between science and society.

3

Community-Based Epistemology

3.1 Partially Overlapping Epistemologies

3.1.1 Transformations of Epistemology

Epistemology, as an institutionalized field of academic philosophy, is undergoing a process of sustained transformation and broadening of research agendas. Much of twentieth-century epistemology employed socially decontextualized methods to address a narrow set of issues, such as competing definitions of knowledge, theories of justification, or the existence of *a priori* knowledge. The mainstreaming of social epistemology (Fricker et al. 2019; Fuller 2002; Goldman 2019; McKenna 2023) has created vibrant debates with a much broader focus on both social dimensions of epistemic processes and epistemic dimensions of social processes. More recently, the emergence of political epistemology (Broncano 2020; Edenberg and Hannon 2021; Hannon and De Ridder 2021; Haslanger 2021; Vogelmann 2022a) reflects further broadening of the field in recognizing epistemological issues not only as socially negotiated but also at the heart of political life in controversies about issues such as expertise, climate policy, digitalization, international development, fake news, populism, or public health.

This broadening of philosophical agendas makes epistemology an important conversation partner in debates about transdisciplinarity. The need for an epistemology of transdisciplinarity is especially salient in the context of contested global challenges. Addressing issues from biodiversity loss to public health requires epistemic resources from heterogeneous actors such as community elders, natural scientists, engineers, science communicators, schoolteachers, medical practitioners, conservation managers, farmers, fishers, policymakers, policy scholars, social activists, sociologists, ethicists, lawyers, and so on. Social and political epistemology can play an important role in understanding the complex dynamics of collaborative knowledge production that often remain insufficiently reflected in transdisciplinary practice.

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The aims of this chapter are two-fold. The first part develops an epistemology of transdisciplinarity through the framework of partial overlaps. Building on feminist standpoint epistemology, we outline an approach that relates knowledge systems beyond an exclusive focus on either integration or confrontation between standpoints. In contrast with demarcation exercises that aim to draw a clear boundary between science and nonscience, we show that a focus on partial overlaps provides more fine-grained resources for relating epistemic practices. Through this focus on relation instead of demarcation, we develop the notion of epistemic toolboxes to analyze how transdisciplinary collaborators can employ epistemic tools that are sometimes quite similar and sometimes wildly different from each other. While the focus on overlaps highlights the potential of transdisciplinary exchange between different epistemic practices, their partiality reflects the need to pay equal attention to limitations of knowledge integration and the often political choice of prioritizing certain epistemic tools over others. In this sense, the framework of partial overlaps grounds an epistemology of transdisciplinarity that emphasizes the potential of bringing heterogeneous forms of knowledge together while recognizing inequalities and tensions in practices of knowledge co-production.

The second part of the chapter moves from the epistemological foundations of transdisciplinarity to the practice of community-based epistemology through our work with the fishing communities of Siribinha and Poças. We show how an epistemology of transdisciplinarity becomes relevant for a transdisciplinary epistemology that contributes to practices of knowledge co-production. Community-based epistemology bridges critical reflexivity and applied intervention and therefore aims for a synthesizing perspective on theory and practice. This synthesizing perspective provides a novel entry point for political epistemology in the sense of normative engagement with political structures of transdisciplinary knowledge production. Community-based epistemology can identify mechanisms of epistemic injustice and oppression but also contributes to the articulation of positive visions of more equitable forms of knowledge (co-)production.

3.1.2 Integrationist Pluralism or Standpoint Theory?

The mainstreaming of transdisciplinarity has come with the promise of a "paradigm shift in research practice" (OECD 2020, 9) by bringing diverse

epistemic resources together for tackling complex real-world problems. Despite these revolutionary promises, philosophers of science have long neglected transdisciplinary research. Philosophical engagement with science has historically prioritized "basic" over "applied" science—for example, evolutionary biology, quantum physics, or cognitive neuroscience instead of agriculture, engineering, or sustainability sciences. It has also often been focused on grand discoveries of scientists like Newton, Darwin, or Einstein instead of collaborative research teams that address seemingly mundane real-world problems. Times are changing as the neglect of applied and collaborative research has been challenged by broad intellectual trends such as "philosophy of science in practice" (Ankeny et al. 2011; Boumans and Leonelli 2013; Poliseli et al. 2022). However, transdisciplinarity still remains an underexplored topic in philosophy of science and has only recently become an issue of active debate (Al-Rodhan 2023; Kiyashchenko 2017; Koskinen and Rolin 2022; Krohn et al. 2017; Poliseli and Leite 2021; Schmidt and Grunwald 2005). Despite the lack of a robust philosophical debate about transdisciplinarity, philosophers have developed relevant intellectual resources for engaging with knowledge diversity in science. In this section, we build on feminist philosophy of science to outline core elements of an epistemology of transdisciplinarity. Standpoint theory constitutes a particularly fruitful entry point for philosophical engagement with transdisciplinarity, as it provides a critically reflexive account of the relations between different actors and epistemic practices. More specifically, we argue that standpoint theory challenges a tame integrationist pluralism that depoliticizes the relations between standpoints by ignoring hierarchies and tensions in epistemic plurality.

In feminist philosophy of science, standpoint theory is often characterized as involving a thesis of situated knowledge and a thesis of epistemic advantage (Intemann 2010; Toole 2022; Wylie 2003). The first thesis is most influentially articulated by Haraway's (1988, 583) "argument for situated and embodied knowledges and an argument against various forms of unlocatable, and so irresponsible, knowledge claims." Rather than assuming that science can be characterized in terms of an absolute and nonsituated "view from nowhere" (Nagel 1989), standpoint theorists highlight that knowledge is shaped by the social positioning of actors and their embodied experiences.

In transdisciplinary practice, this situatedness of knowledge is often salient and uncontroversial. For example, consider transdisciplinary approaches to biodiversity conservation. Conservation projects usually involve a large

diversity of actors whose knowledge is clearly situated and embodied—whether they are botanists, farmers, fishers, Indigenous communities, policy experts, local politicians, environmental activists, ecological modelers, union leaders, government technicians, NGO workers, sustainability scientists, soil scientists, or sociologists. Even if the ideal of one objective "view from nowhere" may still have some appeal in some areas of basic science, it is clearly misguided in transdisciplinary contexts of researching and intervening in complex social-environmental systems. There are many experts on many different aspects of complex systems who differ substantially in their epistemic and nonepistemmic standpoints. This situatedness does not undermine but often supports claims to knowledge. For example, Indigenous communities are experts about local biodiversity, ecological systems, and community dynamics precisely because of how their knowledge is situated in them. Moving away from the ideal of one disembodied and purely objective "view from nowhere" opens up spaces for recognizing different knowledge systems that are situated in heterogeneous ways.

The second thesis, that of epistemic advantage, adds a distinctly normative component to standpoint theory. Rather than promoting a generic pluralism of equally valid knowledge systems, standpoint theorists highlight that different forms of situating knowledge create distinct insights and blind spots. Many examples of feminist standpoint theory come from critical engagement with patriarchal dynamics of knowledge production. Feminist historians and sociologists of science have developed empirically rich case studies, from medical research to primatology, about how research becomes biased through the exclusion of women in scientific practice (Haraway 1984; Harding 2015; Keller 1984).

The thesis of epistemic advantage has sometimes been misinterpreted and ridiculed as the implausible idea that women somehow generally know more or better because of patriarchal oppression. Standpoint theory, however, does not embrace "the notion that just being the victim of something will enlighten you" (hooks 1996, 47). Instead, the thesis of epistemic advantage is often rather straightforward and empirically grounded. For example, research communities that are dominated by men will be more likely to miss out on crucial aspects of women's health—in identifying priority areas for research, formulating research questions, designing surveys, identifying participants, formulating interview guides, defining codes for interview analysis, selecting criteria for data analysis, and so on (Harding 2015). There is nothing mysterious in male-dominated research teams missing out on

issues or introducing biases that can be more effectively mitigated in diverse research teams that include the embodied experiences of women.

As Indigenous standpoint theory (Foley 2003; Paradies 2018; TallBear 2014) has forcefully shown, questions of epistemic advantage are not limited to gender. For instance, Indigenous peoples are experts about environments, and their expertise can complement the expertise of mainstream environmental scientists about issues such as locally important crop varieties, forest management, or sustainable hunting (Albuquerque et al. 2021). Indigenous peoples are also often uniquely positioned to identify blind spots and to anticipate unintended social-environmental consequences of mainstream approaches to conservation as their epistemic resources remain marginalized in environmental science and governance (Chilisa 2019; Hernandez 2022; Whyte 2013).

Presenting standpoint theory through these two core theses—situated knowledge and epistemic advantage—allows for different strategies of connecting with transdisciplinarity. In particular, it allows for what we call "integrationist" and "confrontational" attitudes toward standpoint diversity. The integrationist attitude highlights the epistemic potential of bringing a diversity of standpoints together through transdisciplinary practice. After all, transdisciplinary research on complex and multidimensional problems requires the expertise of different actors that need to be harmonized in a broadened epistemic toolbox.

The integrationist interpretation of standpoint theory converges with mainstream transdisciplinarity and its emphasis on epistemic diversity in bringing heterogeneous stakeholders together. As pluralism has increasingly become a new orthodoxy in philosophy of science (Ludwig and Ruphy 2021; Veigl 2022), it also aligns with wider intellectual and philosophical trends of emphasizing the importance of epistemic and social diversity in science. At the same time, the integrationist interpretation fails to recognize an important element of the legacy of standpoint theory. Historically rooted in Marx's critique of the epistemic ignorance of the ideology of the ruling class (Marx and Engels 1932), standpoint theory often highlights the need to confront tensions and inequalities between standpoints rather than to merely appeal to harmonious knowledge diversity and cooperative integration.

For example, Harding's (1986) classic *The Science Question in Feminism* contrasts an integrationist "Woman Question in science" with a "more radical Science Question in feminism." While the former focuses on "how women can be more equitably treated within and by science, the [latter

asks] how a science apparently so deeply involved in distinctively masculine projects can possibly be used for emancipatory ends" (Harding 1986, 29). Harding's project is not to simply integrate marginalized and dominant standpoints into a harmonious whole but rather to challenge and transform the latter. This confrontational legacy of standpoint theory is equally clearly expressed in Collins's program of "Afrocentric Feminist Epistemology," which aims not only to articulate the validity of marginalized knowledge but also to challenge "institutions, paradigms, and other elements of the knowledge validation procedure controlled by elite white men" (Collins 1990, 49). The point is not that Black women should become integrated into racist and patriarchal institutions but rather to challenge the very structure of these institutions.

Analogous dynamics are salient in many debates about epistemic decolonization that do not merely make the case for the validity of knowledge in the Global South but rather emphasize its struggle with dominant colonial modes of knowledge production. In the Brazilian context, for example, Gonzalez's groundbreaking essay "Por um feminismo afro-latino-americano" (1988) does not merely challenge the invisibilization of Black standpoints through the Brazilian myth of racial democracy. Instead, Gonzalez challenges the appropriation of Afro-Brazilian culture as an exotic commodity rather than a source of resistance against racial structures in Brazilian society. Again, the point is not merely integration of Afro-Brazilian standpoints but rather their mobilization to confront oppressive standpoints that can be reinforced by simplistic stories about standpoint integration.

Standpoint theory can therefore be read through two different "integrationist" and "confrontational" lenses that highlight either complementarity or tensions between standpoints. The integrationist interpretation often becomes dominant as it assimilates standpoint theory into wider discourses about "gender mainstreaming," "diversity management," "scientific pluralism," or "epistemic diversity" that are becoming increasingly internalized in the bureaucratic machinery of academia (Ahmed 2012). At the same time, the integrationist interpretation fails to acknowledge the critical and distinctly feminist legacy of standpoint theory. As feminist philosophers of science have pointed out, generic appeals to diversity and plurality risk legitimizing sexist, racist, classist, or otherwise anti-egalitarian practices if they do not specify *what kind of* plurality is epistemically or politically desirable (Crasnow 2013; Hicks 2011; Kourany 2010; Van Bouwel 2009; Von Bretano 1971). And indeed, standpoint theory moves beyond integrationist

pluralism that advocates for standpoint diversity by confronting oppressive standpoints beyond promises of happy coexistence.

Interpreting standpoint theory through a confrontational rather than integrationist lens provides an entry point for understanding not only complementary but also oppressive relations between epistemic actors. Given such a confrontational reading, standpoint theory challenges integrationist appeals to epistemic diversity that focus solely on complementarity and the benefits of cooperation. This reading of standpoint theory also converges with wider agonistic debates about the limits of consensus and dialogue. As Dutilh Novaes (2021, 884) puts it: "argumentation that takes the form of resistance and contestation in contexts of social injustice and oppression should indeed be adversarial, in the sense of containing vigorous critiques of the status quo. Attempts to eliminate conflict from argumentation entirely may in fact end up favoring the status quo."

This does not mean, however, that a focus on confrontation is sufficient. If relations between standpoints are exclusively understood as oppressive, it becomes unclear how collaborative and dialogical inquiry among heterogeneous actors could succeed at all. Indeed, an exclusive focus on confrontation would undermine not only integrationist transdisciplinarity but *any kind* of transdisciplinarity by identifying only relations of oppression in collaborative practices. In its most uncompromising interpretation, such a confrontationist reading would vindicate Ramose's (2020) and Táíwò's (2022) worries about a breakdown of any fruitful intercultural encounters (see section 2.1.6).

Integrationist narratives have limitations and can be strategically misused to legitimize dominant standpoints. At the same time, many social-environmental challenges require collaboration between actors, such as academics and Indigenous communities. When it comes to transdisciplinary challenges, such as the design of a conservation plan or an agricultural intervention or a public health initiative, it would be epistemically and politically misleading to reject any role of academic experts only because they are in politically dominant positions. It is a false dichotomy to think that there needs to be a choice between an exclusively "integrationist" or "confrontational" reading of standpoint theory. Instead, a recognition of its complex legacy provides the ground for a more complex epistemology that can account for the fruitfulness of bringing heterogeneous standpoints together as well as the deeply political character of relations between them. This is why transdisciplinarity needs to be both embraced and challenged

to be transformative. Rather than simply endorsing the promises of knowledge integration, transformative transdisciplinarity highlights the dual need of embracing epistemic diversity while simultaneously challenging and transforming how standpoints become related to each other.

3.1.3 Epistemic Injustice and Material Inequality

Standpoint theory shifts epistemological attention from disembodied theories of knowledge to complex and often unjust relations between epistemic actors. Rather than assuming that epistemic diversity always generates harmonious complementarity, standpoint theorists have emphasized tensions and oppression as characteristics of many relations between standpoints. In social epistemology, much of these concerns have become articulated through the notion of "epistemic injustice." Even though concepts such as Spivak's (1988) "epistemic violence" had been around for a while, Fricker's 2007 book *Epistemic Injustice: Power and the Ethics of Knowing* triggered an academic trend in analytic philosophy, producing a seemingly endless stream of articles with the formula *x as epistemic injustice*: "Gaslighting as epistemic injustice," "Mansplaining as epistemic injustice," "Lookism as epistemic injustice," "Ideal theory as epistemic injustice," "Trans youth panics as epistemic injustice," "Labeling students as a form of epistemic injustice," and so on.

Many distinctions that have emerged from the epistemic injustice literature have clear applications in transdisciplinary contexts. For example, consider Fricker's (2007) discussion of testimonial and hermeneutical injustice. While debates about the exact definition of these different forms of epistemic injustice can become quite technical, the core ideas are rather straightforward. Testimonial injustice is characterized by an unfair distribution of attributed credibility, for example, when members of oppressed social groups are generally treated as being less credible than members of oppressing social groups. Hermeneutical injustice is characterized by unequal epistemic resources for interpreting social life, for example, when the dominant discourses lack concepts for articulating experiences of oppressed groups.

Turning this distinction to the relations between academic and nonacademic actors, international development provides particularly striking cases of both testimonial and hermeneutical injustices (Boogaard

2021; Cummings et. al 2023; Leeuwis 2021; Malavisi and O'Rourke 2023). Our previous discussion of the dynamics between epistemic paternalism, epistemic diversity, and epistemic decolonization illustrates how both forms of epistemic injustice have structured mainstream development. Top-down development projects that implement external solutions *for* local communities are most clearly steeped in testimonial injustice. The design of many development interventions simply presupposes that external researchers (say: agronomists, economists, engineers, conservation biologists, public health researchers) and development actors (say: international NGOs, philanthropic funders, state governments) are the relevant experts, while community members are treated as passive beneficiaries without sufficient epistemic credibility to be in charge of interventions that shape their own communities.

While top-down development interventions clearly illustrate testimonial injustices, we highlighted quickly growing debates about "co-creation," "co-production," "participation," "multistakeholder approaches," "transdisciplinarity," and so on that shift attention from paternalism to diversity. Framed in terms of epistemic justice, many of these debates can be interpreted as aiming for mitigation of testimonial injustices by bringing the knowledge of marginalized actors to the table. Transdisciplinary methods are motivated by recognition of diverse actors with credible expertise, who have to be included for both epistemically robust and socially just interventions.

Although transdisciplinary projects challenge testimonial injustices, we have argued that they often remain deeply unequal as they integrate nonacademic knowledge into academic frameworks that define the terms of nonacademic participation. The credibility of nonacademic actors is recognized only insofar as it contributes to academic concerns, can be translated into academic languages, and is validated by academic methods. Many of these limitations of mainstream transdisciplinarity can be formulated in terms of hermeneutical injustice. For example, recall our earlier example of "Integrated Water Resource Management" of the Rio Doce in Brazil that promises inclusion of local knowledge and values to environmental governance, but presupposes the framing of the river as a "natural resource" while excluding local understandings of the Rio Doce as a home or as Watú, the living ancestor of the Indigenous Krenak people (Rickard and Ludwig 2024). Read through the lens of the epistemic injustice literature, the case illustrates how participatory projects often remedy testimonial injustice (e.g., by emphasizing the credibility of local experts) while maintaining

hermeneutical injustice (e.g., by requiring their expertise to be expressed through academic rather than local concepts).

While community-based and transdisciplinary research can be couched in the vocabulary of epistemic injustice scholarship, we do not think of them as just another domain of application. On the contrary, transdisciplinary approaches can also help to identify and address limitations in the current state of epistemic injustice debates. The quick career of the notion of epistemic injustice has not always been met with excitement. Mitova (2024, 11), for instance, has diagnosed "recent misgivings about the liberatory potential of the scholarship on epistemic injustice," pointing to Gordon's (2020) characterization of the epistemic injustice literature as "white people stuff."

One common source of frustration is what Dotson (2014) calls the "rhetoric of beginnings," when analytic philosophers "discover" issues at the intersection of epistemology and politics without paying attention to the many preceding debates from critical race theory to interdisciplinary feminism to postcolonial studies. Much of the current debate about "epistemic injustice" is aware of this risk and aims to mitigate it through active engagement with a broader range of scholarship (Dotson 2014; Mitova 2024; Pohlhaus 2017). Transdisciplinary research in the Global South can further diversify the theoretical foundations of epistemic injustice scholarship, especially by pointing toward contributions outside of US academia from Freire's (1970) work on liberatory dialogues in Brazil to Shiva's (1991) analysis of violent scientific paternalism in India to Wiredu's (1997) account of conceptual decolonization in Ghana.

Community-based and transdisciplinary philosophy can also contribute to epistemic injustice scholarship by linking it to local livelihoods and practices of political negotiation. One pressing reason for doubting the "liberatory potential of the scholarship on epistemic injustice" (Mitova 2024, 11) is the risk of isolating questions of epistemic recognition from wider struggles about the material conditions of exploitation and oppression. The problem of a superficial "politics of recognition" has been pointed out by scholars and activists across a wide range of issues. Whether it is celebrations of Indigenous culture in national states that continue to dispossess Indigenous communities (Coulthard 2014) or emphasis on "Black excellence" in racially stratified societies that continue to disenfranchise the vast majority of Black people (James 2014)—a hollowed out "politics of recognition" often centers on cultural practices of celebrating diversity and

inclusion at the expense of addressing "material inequality that no one is seriously trying to fix" (Bright 2023, 11).

The risk of a superficial politics of recognition is pressing for epistemic injustice scholarship and requires an explicit strategy for linking epistemic justice to material conditions of social justice, including questions of economic distribution. Emphasis on epistemic recognition combined with silence on the material conditions of social justice risks creating dynamics that Bright (2023) has described as "white psychodrama": culture wars centering on symbols and symptoms of racialized societies without any concentrated efforts to address their underlying socioeconomic structures and mechanisms of exploitation.

Without a clear strategy for linking epistemic and social justice, epistemic injustice scholarship invites suspicions that it constitutes just another site of white psychodrama: dominated by well-meaning and progressive academics who want to contribute to a better society but are ultimately more comfortable with talking about "epistemic reparations" (Lackey 2022) than advocacy for material reparations; more at ease with talk about "Indigenous knowledge" (Ludwig 2017) than land reform that returns stolen land to Indigenous peoples; more engaged with "citational justice" (Smith 2022) in academic publications than institutional restructuring of academia for egalitarian access to higher education.

We do not think that epistemic injustice scholarship inevitably leads to a superficial politics of recognition. However, links between epistemic and social justice need to be actively established rather than taken for granted. It is against this risk of epistemological window dressing that Cabral's warning from *The Revolution in Guinea* (1969, 70) still resonates today: "Always bear in mind that the people are not fighting for ideas, for the things in anyone's head. They are fighting to win material benefits, to live better and in peace, to see their lives go forward, to guarantee the future of their children." While epistemic justice may be of "intrinsic" (Fricker 2007) value and an "end in itself" (Lackey 2022), it becomes crucial to show how it becomes an effective instrument for wider struggles about the material condition for social justice.

Taking concerns about epistemic justice into community-based and transdisciplinary research provides tools for establishing these links by connecting struggles for epistemic recognition with daily struggles about community life and livelihoods. As the more applied chapters of this book illustrate, our transdisciplinary collaborations are very much about challenging epistemic (and ontological) injustices, but also about working with

the communities on their struggles for social justice. In Forikrom, for instance, attention to epistemic justice is directly driven by concerns about the material conditions of social justice. For CIKOD (see Story 2.3) and ABOFAP (see Story 3.1), epistemic justice has emerged as a core concern precisely because Indigenous knowledge paves the way for ensuring community control of means of production, of cultural practices, and of political processes of decision-making. In this sense, epistemic justice becomes not an end in itself but rather a tool for defending livelihoods that are threatened by the external imposition of industrial monocultures in the name of "development," "modernization," and "progress." Centering on local knowledge and challenging its misframing as "backward" and "primitive" is therefore at the center of developing alternative visions for a just food system in Forikrom (Boogaard et al. 2024) and has led to a range of initiatives, such as the construction of a community-driven seedbank that aims to change the material conditions of farmers.

In Siribinha and Poças, our own learning journey reflects not only the importance but also the complexity of linking epistemic and social justice in empirical practice. Substantial parts of our research in the communities have focused on fine-grained documentation of local knowledge, from ecological dynamics (sections 3.2.3 to 3.2.5) to fish taxonomy (section 4.2.4). While we still consider academic research on local knowledge important, we have also become increasingly reflexive about the risks of self-congratulatory claims of establishing epistemic justice. What are the communities really gaining from us publishing journal articles highlighting their ecological or taxonomic expertise? The idea that benefits for Siribinha and Poças will somehow "trickle-down" from our interventions in academic discourse is either naive or insincere (section 5.2.1). Community benefits need to be actively established rather than assumed to appear by themselves from academic debates about epistemic justice, Indigenous knowledge, epistemic decolonization, and so on.

At the same time, our transdisciplinary collaborations in Siribinha and Poças also illustrate how such benefits can be actively established. Rather than centering on epistemic justice in isolation of other social justice concerns, transdisciplinary practice allows connecting epistemological concerns to material conditions of community life, as later discussions of issues such as fishing policy (section 5.2.2) and education (section 5.2.3) illustrate. In Siribinha and Poças, our emphasis on local expertise is therefore

not merely an "end in itself" or a topic of academic curiosity. Instead, it has increasingly become an instrument for building better futures together, from the co-design of conservation plans to challenges to fishing policies to educational programs to the political organization of the communities.

Our cases from Brazil and Ghana illustrate a wider dynamic of how philosophical debates about "epistemic injustice" become mobilized to develop positive visions of "epistemic justice" in international development, usually with little reception from the mainstream of academic philosophy. For example, Cummings et al. (2023) develop an "action-oriented framework of epistemic justice" that centers on the demands of addressing structural and systemic injustices across a wide range of domains, from agriculture to health care. Arango-Quiroga et al. (2023) explore epistemic justice as a guiding vision for water management in La Mojana, Colombia, highlighting its potential to challenge structural injustices affecting environmental governance and land tenure conflicts. Masaka (2019) develops a positive vision of epistemic justice for decolonization of the educational curriculum in Africa, arguing "that epistemic justice ought not to be seen as an end in itself, but that it lays the foundation for a curriculum that educates learners to have the agency by means of which to determine their own destiny" (2019, 300). As we will describe in detail later (section 5.2.3), similar motivations drive our collaborative work with local teachers in Siribinha and Poças for designing and investigating teaching approaches for intercultural education that opens up space for artisanal fishing knowledge in the classroom, in dialogue with school knowledge, and creates conditions for raising the self-esteem of the children from the fishing villages. This is a way of conjoining the struggle for epistemic justice with the struggle for social justice.

Rather than thinking of these positive and action-oriented visions of "epistemic justice" as mere applications of epistemic injustice scholarship in academic philosophy, we highlight their potential in addressing concerns about a superficial politics of recognition that obscures the material conditions of social justice. A political epistemology exploring the dynamics of epistemic justice matters for wider social justice struggles insofar as it does not become divorced from political economy and political ecology but rather shows how epistemic recognition can drive redistribution of political power and material resources. In other words, action-oriented transdisciplinarity shows that epistemic justice can become more than an "end in itself" by turning into an instrument for wider social justice struggles.

Story 3.1: The Story of ABOFAP: Finding a Path Toward Epistemic Justice

Branwend Peddi and Nana Kwa Adams

It is a sweltering day in Forikrom, Ghana, and I am standing with Nana Adams at his organic mango farm. It is May 2023, and the rains have come in heavy this year, yet not as frequently as usual. The heat of the day is a hopeful foreboding of rains to come. Meanwhile, Nana Adams is explaining to me how he maintains his mango farm. He is wearing his farm outfit, a change from the traditional attire he wears when performing his duties as *twafohene*, or subchief, of Forikrom, and is carrying a bag to take some fallen mangoes back to the house. Despite his important role in the community, he is decidedly modest and speaks with a gentle voice. He talks of the weeds and grasses he allows to grow under the trees, which control erosion and capture water. As we continue our walk down the path alongside different farms, he explains how the lands bordering his farm are also farmed organically and prevent cross-pollination. He tells me there is a small forest a bit farther down with the promise of shade, and I try to keep up with him as he walks ahead.

In the forest, we encounter a small stream. "The only source of drinking water long ago," he says. It reminds him of the origin story of ABOFAP, or the Abrono Organic Farming Project. Its story begins in the late 1970s, when he was still a young man. He was working for the government in Accra back then and had not taken up his function as *twafohene* yet. Upon returning to his hometown of Forikrom, the community was in conflict over the Asunkatia stream, which was drying up. Traditional worship taboos in the community dictated that women could not fetch water from the stream on Tuesdays, a norm that another religious group in Forikrom had not followed. The case even went to court, before Nana Adams decided to partner with the Forestry Commission to investigate the matter. They uncovered that a small forest at the very source of the stream had been cut down, which had caused the drying of the stream. This spurred Nana Adams to join forces with United Nations Development Programme to reclaim the land around the stream's source and reforest it, after which they resolved the issues the community was facing. As Nana Adams told me, this was a key moment for him in several ways. He learned to appreciate the coming together of diverse perspectives to come up with solutions and the immense importance of maintaining the environment

for the community—not just as a resource but as a way of preserving sociocultural practices. This led to the founding of ABOFAP, a community-based organization bringing farmers together to exchange knowledge on organic farming practices, but to also give a space for farmers to voice their needs.

ABOFAP brings together over 150 farmer groups in 20 different communities near Forikrom. It spearheads community seed fairs and initiates collaboration on a community seed bank for the preservation of locally important crops. ABOFAP develops multiple experimentation plots for farmers to try out organic farming methods and innovate together. Yet, at the heart of their mission is finding a path forward, one that questions which knowledge and practices are preserved for the generations to come. Farmers reflect upon this when engaging with ABOFAP's activities. Which seeds should be included in the seed bank? How do we ensure access to cultural foods? How do we provide nutritious food for the community? In this sense, Nana Adams has laid the foundation not only for ABOFAP but also for the organization's contributions to *epistemic justice*. Through ABOFAP, a growing number of farmers are able to articulate their vision of the future, come together, and take action to shape those futures. After all, *twafohene* (translated literally as "pathfinder") is the traditional leader of the community who is tasked with shaping community development. Although the path to epistemic justice is not straightforward, thanks to Nana Adams, ABOFAP and their initiatives, farmers in Forikrom are gradually finding their way.

3.1.4 The Myth of Two Knowledge Systems

Debates about standpoint theory and epistemic injustice point toward a transformative transdisciplinarity that challenges ideals of harmonious knowledge integration but does not give up goals of collaboration and dialogue. The framework of partial overlaps provides an entry point for developing such a transformative approach by recognizing common grounds between knowledge systems without neglecting many tensions and inequalities in transdisciplinary processes.

A substantial account of partial overlaps between knowledge systems needs, however, careful articulation of what it means to talk about a "knowledge system" in the first place. We understand knowledge systems as

involving three aspects. First, they are built by epistemic communities interconnected by social relationships through which they dynamically combine doing, learning, and knowing (van Kerkhoff & Szlezák, 2016), eventually establishing practices that mediate knowledge production, transference, and use (Cornell et al., 2013). Second, they show a determinate degree of internal and practical coherence, derived from their development along generations of epistemic actors dealing with situations embedded in the natural and social circumstances in which they carry out their cognitive and practical actions. Third, they contain claims about the world that show content and pragmatic value in relation to situations and actions influencing their development.

Without careful specification, the notion of a knowledge system can easily obscure complex relations between epistemic practices by suggesting what we call "the myth of two knowledge systems"—the idea that there is one "scientific knowledge system" that can be analyzed in a unified way and separated from another knowledge system that is characterized with labels such as "local," "Indigenous," "manifest," or "traditional."

The myth of two knowledge systems is so pervasive because it is mobilized by ideologically opposed positions that we will label "scientism" and "romantic holism." While the scientistic myth of two knowledge systems comes in many variants, Sellars's (1963) classic distinction between a "scientific image" and a "manifest image" may have been the most influential in shaping professional philosophy. In its most uncompromising formulation, the scientific image is taken to approximate an absolute description of "the world as it is in itself" while the manifest image is presented as a faulty misrepresentation of the structure of reality. Eliminative materialism has often been positioned as a philosophical articulation of this uncompromising contrast by arguing that "folk" accounts of feelings, thoughts, and other mental states are just crude misrepresentations of brain processes and are "wrong or mistaken about its inventory of what actually exists in the world" (Hutto 2022, 178). In a less confrontational interpretation, the dichotomy of a scientific and a manifest image is not employed to characterize the latter as fundamentally mistaken but rather as fundamentally "practical" and therefore not in competition with scientific knowledge. For example, Pigliucci (2021) accepts that Indigenous knowledge is practically useful for Indigenous peoples while insisting on the need for a heavily policed boundary "between local knowledge and universal [scientific] statements about how the world works" (2021, 224).

The scientistic legacy of a strict divide between the scientific and manifest images is mirrored by a "romantic holism" that takes general aim at the alleged reductionism and universalism of modern science and appeals to Indigenous knowledge as a holistic alternative. This latter variant of the myth of two knowledge systems has been thoroughly criticized by Agrawal (1995) in his article "Dismantling the Divide Between Indigenous and Scientific Knowledge." Agrawal is challenging not only the scientistic devaluation of Indigenous knowledge but also the reproduction of the same divide among "neo-indigenistas" who aim to challenge Western science: "neo-indigenistas remain committed to the same kind of dichotomous classification that dominated the world view of the modernization theorists in spite of their seeming opposition to the idea that indigenous institutions and knowledge are obstacles to the march by the Angel of Progress. Both groups of theorists seek to create two categories of knowledge—western and indigenous—relying on the possibility that a finite and small number of characteristics can define the elements contained within the categories" (1995, 419).

Despite the influence of Agrawal's critique, the divide very much remains alive and has arguably been even further reinforced in the wake of the so-called ontological turn that often mobilizes a simple opposition of modernity and indigeneity (Wilson and Neco 2023). As the divide has expanded from epistemology to ontology, Indigenous and scientific communities are assumed not only to hold different knowledge but also to live in different worlds. The myth of two knowledge systems therefore grounds what we have described as "metadualism" in section 2.1.5: While Western science is accused of being "dualistic," this framing itself employs a hard (meta)dualism; on the one hand, there is supposedly one unitary scientific knowledge system that is claimed to be mechanistic, modernist, rationalistic, reductionistic, secular, universalistic, extractive, and so on. On the other hand, there is supposedly one alternative Indigenous knowledge system that is claimed to be holistic, perspectivist, relational, spiritual, traditional, caring, and so on.

The myth of two knowledge systems is deeply misleading, whether it is framed through a scientistic devaluation of Indigenous knowledge systems or through a romantic holism that rejects modern science. The initial appeal of this myth often exposes a deeper flaw in conceptualizing knowledge systems as abstract collections of theories rather than embodied practice. Think of science in terms of propositions made in a scientific article and Indigenous knowledge in terms of propositions made in an ancestral narrative about origins. Given such practice-detached perspectives on the

relations between theories about the world, the myth of two knowledge systems indeed has some initial plausibility. Shifting to actual cases of interaction between knowledge systems, however, leads to a rather different picture. Transdisciplinary interactions do not support generic claims of a divide between two knowledge systems but rather reveal intricate relations between epistemic practices and stances (Kusch 2021). To be sure, these interactions involve plenty of tensions, but there is often also a lot of common ground and mutual understanding. Understanding transdisciplinarity, therefore, requires moving beyond the myth of two knowledge systems toward an epistemology that can address the complex partial overlaps between epistemic practices.

3.1.5 Individuating Knowledge Systems

While the myth of two knowledge systems often misleads theorizing about both science and Indigenous knowledge, it is most successfully disrupted through the reality of transdisciplinary practices that reveal complex landscapes and transgress epistemic boundaries (Caniglia and Vogel 2023; Wals 2015). In our work in Siribinha and Poças, for example, it is simply not credible to appeal to a unitary "scientific image," as collaborations involve scientists from diverse disciplines, from cultural anthropology and science education studies to conservation biology and taxonomy, with wildly different methods, methodologies, theories, background assumptions, ambitions, concerns, political commitments, and so on. The idea of one unitary "manifest image" also loses credibility in practice. Among community members in Siribinha and Poças, we found a lot of variability in knowledge (El-Hani et al. 2022; Renck et al. 2022a), challenging the idea of "cultural consensus" as a phenomenon that is often falsely projected onto communities by external scientists. The idea of "one manifest" image becomes even less convincing when including other nonacademic actors, such as government technicians, policymakers, rangers, medical practitioners, or schoolteachers, who bring differentiated forms of expertise into transdisciplinary practices.

From the vantage point of transdisciplinary practice, it may seem obvious that there is not something like "the scientific image" or "the manifest image" in singular. However, such lessons from practice can easily get lost in theoretical debates that treat "knowledge systems" as abstract objects for philosophical contemplation. Such misunderstandings become further

reinforced through general terminologies that condense heterogeneous epistemic practices into abstract objects such as "local knowledge," "Indigenous knowledge," or "traditional knowledge" that become positioned as the *other* of "scientific knowledge."

General labels are sometimes unavoidable, and this book is admittedly not free of generic talk about "local," "Indigenous," or "traditional" knowledge. That being said, the use of such labels needs to be critically reflexive about the risks of reinforcing misunderstandings along the myth of two knowledge systems. Contrasting local and scientific knowledge can invoke the myth through its implicit suggestion of the nonlocality of scientific knowledge, and this suggestion of nonlocality commonly interacts with colonial and paternalist tropes that contrast the merely local character of community knowledge with the celebration of scientific knowledge as universal.

One option for subverting a simple contrast between local and scientific knowledge is reflected in Turnbull's (1997) suggestion to talk about "science and other local knowledge traditions." There is certainly some appeal to this move: taking the reality of scientific practice means seriously recognizing that academic knowledge production is also local. Whether it is about understanding the success of an invasive species in a particular ecosystem, the prevalence of a disease in a certain geographical area, or the socioeconomic causes of a specific political crisis, much science is decisively local rather than focused on formulating universal laws. But recognizing the locality of science does not mean that "everything is local" (Radder 1992). In comparing epistemic practices of academics and communities, there often remain relevant differences. For example, the conceptual resources of a community may be adapted to a particular ecosystem while scientists often develop decontextualizing strategies at larger scales and across diverse local ecosystems (Lacey 2016). However, it would be a mistake to assume that scientists always aim to get to universal or general statements or that local communities never aim to make general statements about how the world works. The assumption of a sharp divide between the universality or generality of scientific knowledge and the locality of community knowledge simply misrepresents the complexity of scientific and especially transdisciplinary practice.

Addressing locality is important, but "local knowledge" is not a particularly helpful contrast to "scientific knowledge" in comparative debates. Locality and nonlocality cut across the knowledge systems of academic and nonacademic actors. Given these limitations, one may shift from the

general label of "local knowledge" to other labels such as "traditional knowledge." Especially in the form of "traditional ecological knowledge" (TEK), the characterizations of communities as traditional has become widespread in transdisciplinary contexts (Berkes 2017; Molnár and Babai 2021; Whyte 2013).

The label "TEK" is often driven by laudable motivations—highlighting the ecological expertise of communities that remain marginalized in academic knowledge production and emphasizing their crucial role in conservation management. At the same time, the characterization of communities as "traditional" raises similar concerns about their characterization as "local." The implicit characterization of science as "nontraditional" can be just as misleading as its characterization as "non-local." All epistemic practices—scientific or not—are shaped by their traditions in one way or another. Talk about traditional knowledge, therefore, reinforces characterizations of science that are detached from historical and social contexts while these contexts are assumed to define all other "traditional" knowledge systems. Furthermore, the emphasis on tradition can also reinforce stereotypes about nonacademic knowledge being "stuck in the past" while only academic knowledge is dynamically evolving. Nothing could be further from the truth (Peddi, Ludwig, and Dessein 2022). For example, Indigenous knowledge is often highly dynamic, adapting to changing socio-ecological conditions rather than being fixed by an immutable tradition. This becomes even clearer when recognizing the hybridity of most nonacademic knowledge systems that are shaped by social processes like migration and urbanization as well as by technological change such as digital media. In most contexts, the contrast between a dynamic scientific knowledge system and a static traditional knowledge system is a misleading caricature of the contributions that heterogeneous social actors bring to transdisciplinary processes.

Despite these limitations, labels such as "traditional ecological knowledge" have also been mobilized to emphasize the epistemic and political value of local traditions in areas such as nature conservation. In conservation management, traditional knowledge systems have become increasingly valued because of their adaptation to local contexts. Moreover, the appeals to tradition have been translated into various laws that protect the rights of diverse communities, empowering resistance processes that can also erect barriers to neocolonial projects disguised as integration efforts. For example, the concept of tradition is put to use in the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, the

1992 Convention on Biological Diversity, or the 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions. It is not surprising, then, that one of our colleagues once witnessed an Indigenous leader resisting the criticism of the term "traditional" by an academic, defending the use of the term as a way of ensuring or at least favoring access to valuable rights by Indigenous communities (Viviane Souza Martins, pers. comm. 2018).

This political function becomes even clearer in the shift from "local" or "traditional" to "Indigenous" as a designator for knowledge systems. Indeed, the category "Indigenous" is deeply political and globally embraced by disenfranchised and dispossessed communities in struggles for rights, resources, and recognition (Portela 2011). Just as the designation of the land of a community as Indigenous land can reconfigure the political dynamics of its use and exploitation, so can the designation of knowledge of a community as Indigenous knowledge. In this sense, "Indigenous" often turns out to be politically preferable over "local" or "traditional." For example, characterizing a knowledge system as Indigenous can help to highlight the right of a community to rely on its own epistemic resources rather than demanding that it integrates with or assimilates into academic knowledge production.

While talk about "Indigenous knowledge" comes with political opportunities in debates about epistemic justice, it is hardly a general substitute for talk about "local knowledge." Indeed, the political connotation of "Indigenous" also makes it deeply contested what knowledge counts as Indigenous. The use of "Indigenous" strongly varies between geographic and linguistic contexts. In Brazil, for example, "Indigenous" tends to be used as an ethnic label of communities that self-identify with Indigenous culture while these very communities have been challenging its use instead of more specific designations they use themselves to refer to their identities and cultures. However, the use of this label led to only 0.4% of the Brazilian population being classified as Indigenous in the 2000 census (De Oliveira Martins Pereira et al. 2009), excluding the vast majority of rural peasant populations with mixed Indigenous, African, and European ancestry. In Siribinha and Poças, for example, it would be both misleading and against the self-understanding of the communities to employ the label "Indigenous." More broadly, transdisciplinary processes often involve the expertise of nonacademic actors who are clearly not Indigenous, such as urban communities or general citizen panels. While Indigenous knowledge is of crucial importance for the project of transformative transdisciplinarity, it

should not be misunderstood as providing a neat division of knowledge systems into a scientific and an Indigenous half.

None of the terms "local," "traditional," or "Indigenous" provide innocent resources for individuating knowledge systems. The wider lesson is that individuating knowledge systems in general is not a neutral process. Especially when it comes to comparison of academic and nonacademic knowledge systems, general labels of local, traditional, and Indigenous can reinforce a simple divide that masks the epistemic heterogeneity of transdisciplinary processes.

Doing better requires both conceptual and methodological reflexivity. At the conceptual level, general labels such as "local knowledge" or "Indigenous knowledge" are sometimes unavoidable. While they come with risks of oversimplification, they also create opportunities for coalition building, as most clearly reflected in the use of "Indigenous" to relate disenfranchised communities across vastly heterogeneous contexts. That being said, engagement with particular communities demands engagement with the particularities of their knowledge systems. For example, this book is shaped by our interactions and collaborations with the fishing communities of Siribinha and Poças. Rather than assuming that the fishers in these communities represent "local," "traditional" or "Indigenous" knowledge in general, our starting point is to take them seriously as experts in their own right. Expertise among fishers in Siribinha and Poças is in many ways highly specialized and formed by the particular fishing practices of the communities as well as the particular ecological characteristics of the Itapicuru River estuary (Renck et al. forthcoming). Some characteristics of this expertise resemble the expertise of other artisanal fishing communities in Bahia, in Brazil, or even on a global scale. Other characteristics are unique to those particular communities. This is a reason for specifically referring to the knowledge of Siribinha's and Poças's fishers whenever it is not necessary to use some general label. Links between knowledge systems are worthwhile to explore, but the starting point of serious transdisciplinary practice needs to be the particular constitution of the knowledge of particular actors rather than the assumption that they are representatives of generic labels such as "local knowledge," "traditional knowledge," or "Indigenous knowledge."

Beyond the need for conceptual reflexivity, the heterogeneity of nonacademic knowledge systems also provides an important methodological lesson that leads back to the framework of partial overlaps. Generic characterizations of knowledge systems reinforce misleading questions

about their relations, such as the question of whether Indigenous knowledge constitutes science. Both affirmative and negative answers to this question lead to oversimplified characterizations of epistemic practices. Nonacademic actors produce knowledge in heterogeneous ways with complex relations to academic knowledge production. As we will show in later sections, there are substantial overlaps—for example, fine-grained causal explanations of ecological phenomena among fishers in Siribinha that can complement academic ecology (sections 3.2.3 to 3.2.6). As we will also discuss in later sections, there are substantial differences that demonstrate the partiality of such overlaps—for example, the role of spiritual practices and ontologies that shape knowledge production and practices. Moving beyond generic characterizations of "local knowledge," "traditional knowledge," or "Indigenous knowledge" allows us to explore such partial overlaps and their importance for transdisciplinary knowledge production.

3.1.6 From Demarcating to Relating Knowledge Systems

Transdisciplinary practices can easily become obscured through generic labels such as "local," "traditional," or "Indigenous" knowledge. Problems also arise with generic talk about "scientific" knowledge. It has become widely accepted in philosophy of science that there is no universal scientific method that could be used as a demarcation criterion between scientific and nonscientific knowledge (Andersen and Hepburn 2015; Laudan 1983). While there are methods and practices used across many scientific fields, such as experimentation, modeling, mathematization, or observation, none of them provide necessary and jointly sufficient conditions for a practice to qualify as scientific. Sciences from cultural anthropology to quantum physics are just too diverse to be captured in a general and still substantive definition.

Philosophy has a long tradition of thinking about "the structure of science" (Nagel 1961) in singular, which has incentivized the formulation of general demarcation criteria for distinguishing science from nonscience. However, as most philosophers of science have come to accept that the structure of science in singular does not exist, it has also become increasingly common to endorse variants of pluralism that recognize science as "a complex epistemic and social practice that is organized in a large number of disciplines, employs a dazzling variety of methods, relies on heterogeneous conceptual

and ontological resources, and pursues diverse goals of equally diverse research communities" (Ludwig and Ruphy 2021).

The demarcation problem has become one of the victims of this turn from unified accounts of "the structure of science" toward recognition of the plurality of scientific practices and structures. As Laudan puts it in his famous critique of the "demarcation problem":

> It is probably fair to say that there is no demarcation line between science and non-science, or between science and pseudo-science, which would win assent from a majority of philosophers. Nor is there one which should win acceptance from philosophers or anyone else (Laudan 1983, 112).

While the idea of one general demarcation criterion has lost much of its credibility in philosophy, the question of what counts as proper science remains contested in both policy (Collins et al. 2017) and education (Erduran and Dagher 2017; Irzik and Nola 2011), motivating some philosophers to advocate for the continued relevance of the demarcation problem (Fernandez-Beanato 2020; Pigliucci and Boudry 2013). Even philosophers who advocate for the relevance of demarcation, however, tend to abandon the idea of one unified demarcation criterion and accept more flexible frameworks such as family resemblance approaches (Irzik and Nola 2011; Pigliucci 2021). The notion of family resemblance is often explained with Wittgenstein's (1971) classic example of "game." There is no precise definition of "game" and consequently also not a strict demarcation criterion on what counts as a game. At the same time, it is usually easy to identify heterogeneous games—say: chess, football, Tetris—and to distinguish them from other practices—say: cleaning, cooking, showering—that are not games. This is not because all games have one or more essential properties in common but because games resemble each other along different dimensions.

Using the notion of family resemblance provides an entry point for recognizing the plurality of science without assuming that what counts as science becomes arbitrary (Parke and Hikuroa 2021). There are a lot of typical features of science: from methods of data collection to experimentation to mathematical modeling to publication practices to institutional embedding in research institutes. None of these features are necessary conditions, but they make it often reasonably easy to identify cases of science and cases of nonscience (Grantham 2004; Hacking 1996; Sarukkai 2012). From this

perspective, there is no monolithic definition, but rather a cluster of related features that characterize science.

The appeal to family resemblances provides a helpful reminder that the designation of epistemic practices as "scientific" is not merely arbitrary. Just as it would be a misunderstanding of the word "game" to exclude volleyball but include phytology, it would be a misunderstanding of the word "science" to exclude phytology but include volleyball. Recognizing such family resemblances, however, does not mean that demarcation provides a fruitful entry point for thinking about the relations between knowledge systems in transdisciplinary practice. Instead, demarcation exercises fail transdisciplinary practices on (1) pragmatic, (2) epistemic, and (3) political levels.

(1) From a pragmatic perspective, the demarcation problem is often simply irrelevant to transdisciplinary concerns. In our case of Siribinha and Poças, for example, there are many actors, including ecologists, anthropologists, fishers, politicians, government technicians, ecotourism guides, philosophers, museologists, schoolteachers, and university students. Dividing this heterogeneous group into a "scientific" and a "nonscientific" part would be at best an odd intellectual exercise that would contribute little to facilitating transdisciplinary practices. Local community members like fishers or shellfish gatherers have no interest in claiming to be scientists, and it is unclear what could possibly be gained from asking whether their knowledge is "scientific." It certainly does not answer the question of whether they deserve epistemic trust. Even if fishers from Siribinha and Poças do not claim to be scientists, they are still often trustworthy experts for understanding local ecosystem dynamics and evaluating interventions. The pragmatically important question is how to relate these different forms of expertise rather than to ask which one should be classified as "scientific."
(2) Demarcation exercises are often not only pragmatically irrelevant but also epistemically misleading in transdisciplinary contexts. Think of the fishers in Siribinha and Poças who are experts about ecosystem dynamics in the Itapicuru estuary but whose knowledge also differs substantially from academic ecology. Affirming the status of fishers' expertise as "scientific" can be misleading by obscuring many important differences that need to be navigated in transdisciplinary

practice—for example, different forms of producing, validating, interpreting, representing, and using knowledge about ecological dynamics. Declaring the status of fishers' expertise "nonscientific" can be equally misleading as it not only obscures common ground and potential for transdisciplinary collaboration but also lumps fishers' expertise together with epistemically corrupt "pseudoscience" in a binary science versus nonscience divide. Any epistemically productive form of thinking about the relation between forms of expertise in transdisciplinary practice needs more fine-grained intellectual resources than provided by one demarcation line.

(3) Finally, demarcation exercises reproduce a simple divide between science and nonscience that is vulnerable to political misuse. The focus on demarcation risks delegitimizing epistemic practices that are not sufficiently similar to institutionalized science even if they clearly embody expertise, such as those of farmers, fishers, health practitioners, schoolteachers, and so on. In this sense, the focus on demarcation often serves as a political tool of epistemic paternalism as described in the introduction to this book: only the knowledge of institutional science is treated as legitimate to inform policy and decision making. For example, Pigliucci's article "Is Indigenous science pseudoscience?" (2021) shifts from epistemological analysis to political mobilization when claiming that "the future of generations of students, and therefore of the entire nation, is at stake" (2021, 211) through the alleged danger of Indigenous "pseudoscience." Dawkins (2023) even frames questions about Indigenous knowledge and language as a new frontier of culture wars against what he calls "self-righteous virtue-signalling, bending a knee to that modish version of Original Sin which is white guilt." Rather than providing an epistemology of complex transdisciplinary dynamics, demarcationism therefore often not only misframes Indigenous knowledge but becomes a political tool for its delegitimization.

However, the family resemblance account does not have to be used for demarcation. Rather, it can be useful when relating different knowledge systems, whether they are labeled as "scientific" or not. Rather than assuming that science can be characterized by one core feature, such as "the scientific method," family resemblance accounts allow us to look at a variety of features of epistemic practices that may or may not overlap. Some widespread features

of academic knowledge production are also common among nonacademic actors. For example, farmers typically rely on careful experimentation for creating knowledge, as shown in detail by Hansson (2019, 32), who argues that "in farming, experimentation is a necessity, not a luxury. This is because nature changes and evolves. Due to natural evolution, pests and weeds never cease to pose new challenges. The properties of cultivated soil change significantly over the years, often as a result of the farmer's own actions." Our ethnographic fieldwork in Siribinha and Poças points in similar directions. For example, the second part of this chapter shows in detail how fishers rely on causal explanations to make sense of ecosystems, and how these practices show substantial overlap with explanatory strategies in academic ecology.

This does not mean that farmers and fishers think like academic researchers, or even that they always use similar tools to understand and intervene in nature. On the contrary, there are countless differences, from the creation of knowledge to its validation to its use to its embedding in very different practices and ontologies. Approaching knowledge systems through the angle of family resemblances allows for addressing both overlaps and partialities in such practices through a more fine-grained lens.

Adopting such a fine-grained lens comes with both epistemic and political benefits. In most transdisciplinary contexts, including Siribinha and Poças, there is little to be learned from formulating a general demarcation criterion and sorting actors along a scientific versus nonscientific divide (even if this had the attention of one of us in the past; see El-Hani and Bandeira 2008). In contrast, it is epistemically fruitful to address the complex relations among knowledge systems across their various family resemblances and differences that provide both common ground for collaboration and tension in transdisciplinary negotiation.

3.1.7 Relating Epistemological Toolboxes

We have argued for a shift from binary demarcation between science and nonscience to a focus on the partial overlaps between knowledge systems. Demarcationism is commonly rooted in a "myth of two knowledge systems" that obscures the heterogeneity of epistemic practices in and beyond academia. In transdisciplinary contexts, demarcation exercises are therefore often pragmatically irrelevant, epistemically misleading, and encourage political misuse. In contrast, a focus on the complex web of similarities and

differences between knowledge systems allows for fine-grained perspectives that can identify both common grounds for collaboration and tensions that are created through epistemic divergence.

However, highlighting the importance of partial overlaps between epistemic practices raises the methodological question of how to study them. Our answer to this question is largely ethnographic: Understanding the complex relations between epistemic practices can benefit from both experimental and quantitative methods (for example, see section 4.2.4) but crucially requires ethnographic immersion, including participatory observation, semistructured interviews, focus groups, and other methods of qualitative research.

Our methodology for community-based epistemology takes inspiration from Poliseli's (2018, 2022) ethnographic study of explanation and understanding in ecology. Working on an ecological research project as an "embedded philosopher of science," Poliseli—in collaboration with the ecologist Jeferson Gabriel da Encarnação Coutinho—does not identify one unifying epistemic strategy but rather an epistemic toolbox of related heuristics. For example, Poliseli et al. (2022) identify heuristics such as "phenomenon characterization," "mechanism sketches," "operational components distinctions," and "changes of operational components" as epistemic tools for the creation of understanding in ecological research practices.

Expanding this approach beyond academic research in ecology, Ludwig and Poliseli (2018) employ the metaphor of "epistemic toolboxes" to compare epistemic practices of academic and nonacademic experts on ecological phenomena. Academic experts such as conservation biologists and nonacademic experts such as experienced fishers have a diversity of epistemic tools at their disposal to make sense of those phenomena. When comparing these toolboxes, some tools will be very similar while others will be radically different from each other (Figure 3.1).

To further explicate this metaphor of toolboxes, consider salient cases of similarity and difference. General cognitive abilities, such as visual perception and inductive reasoning, constitute obvious examples of similarities between epistemic tools that are shared among academic and nonacademic actors. For instance, if a local hunter and an ornithologist try to assess the status of a local bird population, they will both rely on observations of birds and make inductive generalizations from these observations.

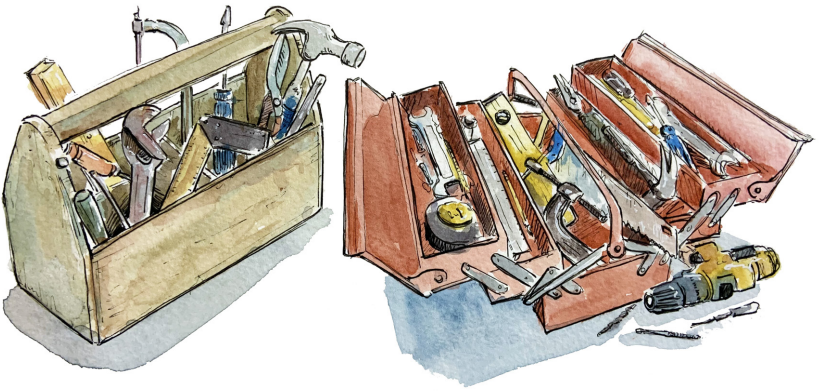

Figure 3.1 A metaphor of knowledge systems as including toolboxes with diverse epistemic tools. If we compare the toolboxes, we will find that some of the tools are very similar (e.g., hammers), some are broadly related (e.g., rulers), and some are unique to one toolbox (e.g., drill). Instead of making generalized claims of commensurability or incommensurability of knowledge systems, the metaphor suggests the need for a more fine-grained analysis that can create space for both epistemic toolboxes. (Illustration by Raphael Q).

To illustrate differences between epistemic toolboxes, consider how epistemic traditions are shaped in historical and cultural traditions. In the modern life sciences, for example, one dominant epistemic tradition is mathematization (Dijksterhuis 1950), which becomes reflected in the extensive use of practices such as computational methods or "data-centric biology" (Leonelli 2016) and contrasts in salient ways with knowledge production in Indigenous and local communities.

Differences between epistemic tools are also salient if we look at the epistemic traditions of Indigenous communities, which are often the result of many generations of adaptation and coevolution with local environments (Albuquerque and Ferreira Junior 2017; Berkes 2017; see, however, Chellappoo 2022 for limitations of adaptationist framings). As our later case studies on pest management (section 4.2.2) and Indigenous seed systems (section 4.2.3) illustrate, local communities often rely on epistemic tools that are very different from those working in academic research.

The metaphor of epistemic toolboxes allows for recognition of substantial differences without resurrecting a simple divide between Indigenous and scientific knowledge that is reflected in many demarcation debates. For

example, consider some of our earlier work (El-Hani, Ludwig, and Poliseli 2022; Ludwig and Poliseli 2018) on dichotomous characterizations of science as "mechanistic" and Indigenous knowledge as "holistic" (Aikenhead and Ogawa 2007). While these characterizations convey some important insights, they also risk presenting caricatures of both Indigenous and scientific knowledge. Indeed, such characterizations feed what we called "metadualism" in the previous chapter: the wholesale characterization of science as mechanistic, dualistic, reductionistic, universalistic, rationalistic, individualistic, extractive, and so on, and the wholesale characterization of Indigenous knowledge as holistic, relational, pluralistic, antireductionistic, spiritual, communitarian, caring, and so on.

Our proposal to relate different epistemic toolboxes converges with wider developments in philosophy of science that highlight the plurality of scientific practices rather than aiming for one unified characterization of "the scientific method" or "the nature of science." Philosophers of science have become increasingly critical of characterizations of science as approximating one "absolute conception" of "the world as it is independent from our experience" (Williams 1985, 139), which ultimately approximates a "view from nowhere" (Nagel 1986) free of any subjective elements. As Massimi (2023, 9) puts it, such a characterization "puts science on a pedestal as the source of certitude" and "flies in the face of the historically and culturally situated nature of scientific knowledge."

While philosophers of science have been vocal critics of absolutist characterizations of science, they have also proposed pluralist alternatives that focus on the epistemic productivity of heterogeneous concepts, methods, ontologies, and theories in scientific practices. A wide variety of scientific pluralisms have emerged in recent decades (see Ludwig and Ruphy 2021). Some approaches take a distinctly metaphysical starting point, departing from what Dupré (1993) calls the "disorder of things" or from Cartwright's (1999) diagnosis of a "dappled world." Other accounts build on epistemological or methodological considerations about different "styles of reasoning" (Hacking 1994), a "pluralist stance" (Kellert, Longino, and Waters 2006), "foliated pluralism" (Ruphy 2013), "normative pluralism" (Chang 2019), or "perspectival pluralism" (Massimi 2022) in scientific practice.

While there are substantial philosophical differences between these positions, they are allied in embracing plurality as an alternative to an absolutist conception of unified science. Collins (2021) suggests the apt metaphor of "science as craftwork" for capturing this general sentiment. Scientists

use diverse tools that are shaped by cultural and social contexts rather than separated from them. Such tools are not infallible but provide fruitful and often robust techniques for generating knowledge about the world. Such an understanding of science as situated craftwork undermines what we have called the "myth of two knowledge systems" by acknowledging diversity within science, but it also provides a positive perspective on relating diverse epistemic practices for generating knowledge about the world.

As Mitchell (2002) highlights, pluralists need to avoid an isolationism that fractures science into unrelated epistemic projects without dialogue and interaction. While scientists use different repertoires (Ankeny and Leonelli 2016), including different concepts, instruments, methods, ontologies, skills, and theories, they are not isolated from each other but interact in ways that create "trading zones" (Galison 1997) with opportunities for mutual learning. Mitchell proposes an integrative pluralism in which "explanation becomes, among other things, the location for the integration of diverse models" (2002, 55). Massimi, in turn, develops a complementing account of diverse scientific perspectives that "methodologically intersect with one another in the production of knowledge. No particular community can sanction the reliability of their own claims of knowledge or justify such reliability by their own lights. Typically, a number of epistemic communities (and their situated scientific perspectives) are at play in producing any piece of scientific knowledge" (2023, 3). Mol and Hardon (2020) propose an epistemology of interdisciplinarity involving mediation processes that acknowledge divergences instead of aiming for completeness. According to them, interdisciplinary research needs to embrace tensions in multiplicity rather than conceptualizing disciplinary knowledge as puzzle pieces that add up to one harmonious interdisciplinary picture. Our characterization of partial overlaps complements these accounts while pushing beyond the interdisciplinary recognition of different academic fields toward the transdisciplinary recognition of epistemic communities beyond academia.

Whether framed in terms of "integration" (Mitchell 2002), "intersection" (Massimi 2023), "mediation" (Mol and Hardon 2020), or "overlap" (Ludwig and El-Hani 2020), pluralist philosophy of science has moved beyond the mere diagnosis of plurality toward complex accounts about relating diverse epistemic practices and tools. Rather than aiming for one demarcation line between science and local knowledge, such frameworks allow us to explore the epistemic benefits of collaboration in "trading zones" that involve heterogeneous actors (Bursten and Kendig 2021).

Beyond the epistemic benefits of collaboration between diverse epistemic communities, there are also political opportunities. For example, Massimi (2022, 11) identifies epistemic severing and epistemic trademarking as two political challenges. Epistemic severing amounts to the excision of the contributions of particular communities when narrating about scientific knowledge production. In turn, epistemic trademarking corresponds to the subsequent fencing as well as merchandising of portions of scientific knowledge as a "trademark" of one epistemic community, while others who have historically contributed to its production are obscured or neglected. Highlighting the plurality of relevant epistemic communities and practices provides an entry point for addressing both forms of epistemic injustice, thereby working toward the creation of more inclusive research communities.

We do not want to suggest that "integration," "intersections," "mediation," or "overlaps" are sufficient for navigating epistemic diversity in transdisciplinary practice. In fact, one of the core messages of this book is the need to complement identification of overlaps with a serious discussion of partialities that point toward differences and tensions between epistemic communities. Without equal attention to partiality, an "integrative pluralism" risks doing more harm than good. For example, a one-sided focus on integration can further entrench inequalities between epistemic communities in the sense that academics are doing the integration while nonacademic actors are being integrated. Such unequal integration often asks how Indigenous knowledge can be useful for academic purposes rather than centering on the question of how Indigenous or academic knowledge can support the needs and interests of Indigenous peoples (Whyte 2018). In many cases, the result is that epistemic diversity is only recognized insofar as it fits into academic frameworks while Indigenous knowledge remains marginalized when it does not fit into the agendas of dominant actors.

As we will explore in the final chapter of this book, there are substantial implications for thinking about the wider relation between science and society. Scientific pluralism can be situated in a wider trend toward what we call "science with a human face." Understanding the human face of science not only challenges the pedestal of absolute certainty and universality but also allows for a more positive vision of science as "craftwork" that is embedded in diverse social realities while still often producing reliable knowledge about the world (Collins 2021). Especially when it comes to contested domains such as climate change or public health, such a perspective of science with a

human face allows us to move beyond both the scientistic message of simply "following the science" and the antiscience populism that fails to recognize the crucial role of scientific knowledge and practices in addressing global challenges.

Humanizing science can play an important role in establishing relationships of trust between science and society (Collins 2021; Oreskes 2021; Wylie 2022b), but it can also reveal abusive, exploitative, and violent aspects of the human face of science. If science involves a "view from somewhere," it will often be the view from commodified research environments that are structured by the agendas of dominant funders. While we will have a lot more to say about the capture of transdisciplinary research by dominant agendas in later chapters, pluralist accounts of diverse epistemic tools still provide fruitful entry points for collaboration and co-creation.

In the second part of this chapter, we will explore some of these entry points through a detailed ethnographic study of fishers' explanations of ecological phenomena in the Itapicuru River estuary. Focusing on epistemological issues surrounding explanation is fruitful because they are often shaped by the assumption of a deep divide between "mechanistic" approaches of academic research and "holistic" framings of Indigenous communities. On the one hand, the assumption of such a divide is commonly mobilized to exclude communities from the "epistemic core business" of science. Even when scientists aim to include communities in decision-making, they often focus on the inclusion of nonepistemic values rather than recognizing communities as epistemic peers with sophisticated explanations of many phenomena. On the other hand, the divide also appears in the attribution of holism to Indigenous worldviews that are assumed to constitute an incommensurable alternative to the mechanistic explanations of scientists.

Our skepticism about this divide initially grew out of literature study and especially from reading Lansing's (1991) classical case study of rice farming in Bali (see Ludwig and Poliseli 2018). Lansing describes a complex system of rice farming that coordinated water flows through temples that ensured water distribution across rice fields and mitigated the spread of pests. As Lansing documents in detail, an externally imposed agricultural modernization program derived from the Green Revolution not only destroyed this local system of rice farming but also had disastrous consequences for local farmers and threatened their livelihoods by leading to water shortages and pest outbreaks.

Like Balinese rice farmers, fishers in Siribinha and Poças are perfectly capable of identifying complex ecological mechanisms and incorporating them into local livelihood practices. Indeed, our fieldwork shows that fishers incorporate fine-grained knowledge about causal relations into explanations of ecological phenomena. Rather than excluding local knowledge from "proper scientific," "causal," or "mechanistic" explanations of academic ecology, our work with the fishers from these villages shows how fine-grained analysis of explanatory practices can lead to mutual recognition of expertise and fruitful exchange about the epistemic tools of different epistemic communities. Before we delve into the empirical details, however, we want to tackle one more general epistemological issue that often stands in the way of serious transdisciplinary exchange: debates about objectivity and the assumption that local knowledge remains insufficiently objective to inform scientific practices in academic research.

3.1.8 What's Left of Objectivity?

In community-based research, issues of objectivity are often simultaneously absent and present. Transdisciplinary collaborations constantly raise epistemological questions in proximity to objectivity. In our work with the communities of Siribinha and Poças, for example, we have encountered contradicting claims about the reproductive period of fish (section 5.2.2) that raise questions about the accuracy of observations and the reliability of predictions of both external researchers and community members. We have aimed to identify biases of diverse actors (including ourselves) that can negatively affect research processes. We have tried to understand how coproduction of knowledge and dialogue can mitigate biases, ground richer explanations, and lead to more successful interventions. In this sense, issues of objectivity can be described as constantly present in community-based research.

However, we have rarely used the term "objectivity," and it never took center stage in discussions in Siribinha and Poças. The lack of an explicit discussion of objectivity is not a mere oversight. Questioning "the objectivity of the community" would often create more confusion than clarity. For example, the following sections will address many epistemological issues related to the fishers of Siribinha and Poças, for instance, about their understanding of causal processes with different degrees of complexity (sections 3.2.3 to 3.2.5).

While these issues can be fruitfully discussed in transdisciplinary settings, it is far from clear what it would mean to ask whether the fishers or their epistemic practices are "objective." Aside from lacking the clarity of discussing more specific epistemological issues, questioning "the objectivity of fishers" may even actively mislead in suggesting an artificial dichotomy between supposedly subjective knowledge of communities and objective knowledge of academic researchers.

One may conclude that "objectivity" is an ambiguous philosophical term that has little to contribute to a fine-grained epistemological and methodological analysis of transdisciplinary knowledge production. Indeed, many scholars have challenged the usefulness of "objectivity" in the analysis of epistemic practices. Most prominently, Hacking (2015) suggests that we should simply stop talking about objectivity. According to him, it is productive to discuss specific epistemic vices while the general term "objectivity" distracts from a nuanced analysis of epistemic practices. Brown (2019, 226) argues that "the concept of 'objectivity' is at best an unhelpful way to express" norms of science once the outdated ideal of value-freedom in science is abandoned. In the domain of statistics, a similar complaint of "unhelpfulness" has been articulated by Gelman and Henning (2017), who advocate substituting talk about objectivity in statistics with more precise terminology that involves "transparency," "consensus," "impartiality," and "correspondence."

One of us (Ludwig 2017) has developed a similar critique of the notion of objectivity in debates about Indigenous knowledge by suggesting its clumsy ambiguity is at best unhelpful for a substantial epistemology of the relations between academic and Indigenous knowledge. Through its ambiguity, the notion of objectivity often obscures that epistemic practices create complex landscapes of epistemic virtues and vices. In the Itapicuru River estuary surrounding Siribinha and Poças, for example, both fishers and academic researchers have substantial bodies of knowledge with unique strengths and limitations. In contrast, focusing on the "objectivity" of the fishers or their practices lacks epistemological specificity to shape collaborations in useful ways. At best, it seems to be of rhetorical value for symbolically embracing or challenging the epistemic authority of actors ("fishers have a lot of objective knowledge too," "the objective methods of scientists remain crucial in collaborations with communities," "the objectivity of corporate actors may be undermined by their economic interests," etc.).

While we could have indeed written this book without ever mentioning "objectivity," there are at least two reasons for engaging with the term. First,

refusing to talk about objectivity could be misunderstood as avoiding crucial methodological concerns about co-producing knowledge with academic and nonacademic actors. Even if "objectivity" is a bloated term, it is commonly used to gesture toward issues of accuracy, bias, impartiality, reliability, robustness, and validity that are of utmost importance for transdisciplinary research. As we take these issues seriously in a community-based epistemology, it is important to be clear about their relation with discourses of objectivity.

Second, many philosophers of science have attempted to save the notion of objectivity by unpacking and clarifying its many meanings (Burch and Furman 2019; Daston and Galison 2007; Douglas 2004; Harding 2015; Koskinen 2018; Wright 2018). These attempts commonly combine a critical and a constructive component. These reformed accounts avoid metaphysical ideals of a "view from nowhere" that ties objectivity to freedom from standpoints, subjectivity, or values. As Paulo Freire already put it in the *Pedagogy of the Oppressed*: "one cannot conceive of objectivity without subjectivity. Neither can exist without the other, nor can they be dichotomized. The separation of objectivity from subjectivity, the denial of the latter when analyzing reality or acting upon it, is objectivism" (1970 / 2000, 50). It has become widely reflected in debates about the relation between science and values (Crasnow 2013; Reiss and Sprenger 2013) that such an objectivism is misleading for understanding complex realities of scientific practice, as even the most successful science is not free from standpoints or subjectivity. An absolutist conception in the sense of what Freire calls "objectivism" is indeed at best irrelevant for understanding the epistemology of science.

However, many philosophers aim to specify alternative notions of objectivity that circumvent the metaphysical troubles of objectivism and instead focus on scientific practice. For example, Douglas (2004) provides a taxonomy of different notions of objectivity in three domains of (1) epistemic processes such as experimentation, data collection, or observation, (2) individuals and their cognitive processes of thought and reasoning, and (3) groups and their social processes of assessing and negotiating epistemic matters. Distinguishing between these three domains allows us to identify more specific epistemic issues than generic and unspecified objectivity talk. For example, one may challenge the setup of an experiment as lacking objectivity by not identifying confounding variables, while highlighting the objectivity of the experimenter as a virtuous scientist who aims to evaluate data in fair and impartial ways. Or one may acknowledge the objectivity of an

individual scientist while also arguing that she is part of a research community that lacks objectivity in its norms of inquiry. In this sense, Douglas's taxonomy provides resources for moving beyond ambiguous characterizations of objectivity toward more specific epistemic features that can be located in knowledge production.

In the case of the first notion of objectivity of epistemic processes, for example, Douglas suggests distinguishing between two aspects. On the one hand, there is "convergent objectivity" that reflects the convergence of results from different areas of inquiry. As Douglas points out, convergent objectivity is found not only in academic research: "In everyday life, when an object continues to appear from a variety of vantage points and using a variety of techniques (e.g., both sight and sound), the possibility of illusion seems remote. As any birdwatcher will tell you, a convergence of evidence from various sources (e.g., bird coloration and song) assists greatly in the objective identification of the species under observation" (2004, 458). On the other hand, there is manipulable objectivity that reflects reliable ways of intervening in the world. Again, Douglas argues that manipulable objectivity is found not only in academic research: "When we can use objects around us, we trust our accounts of their existence and properties as reliable. If I can reach out and drink from the glass of water, and it quenches my thirst, and I can fill it back up again, repeating the whole process reliably, I have good reason to trust the reliability of relevant beliefs about the glass" (2004, 457).

Douglas's specification of different dimensions of objectivity not only makes the notion more substantial for philosophy of science but also suggests some applicability in transdisciplinary contexts. Rather than generic characterizations of transdisciplinary processes or actors as objective (or lacking objectivity), Douglas's criteria lead to more nuanced evaluations of transdisciplinary contexts. Consider Douglas's account of "convergent objectivity." As reflected in our framework of partial overlaps (section 2.2), local communities and academic researchers often converge along epistemological, ontological, and value dimensions. For example, convergence in local and academic taxonomies not only provides ground for mutual understanding but can also ground the assumption that taxonomies reflect objective discontinuities in nature that are salient for very different actors. Along these lines, much of classical ethnobiology has been built around a "convergence metaphysics" (section 4.1.3) that highlights the objectivity of taxonomies by pointing out that very different actors with very different methods come to recognize the same natural kinds. For example, in his

classical discussion of vertebrate categories (*ámana aké*) of the Fore of the New Guinea Highlands, Diamond (1966) argued: "The nearly one-to-one correspondence between Fore *ámana aké* and species as recognized by European taxonomists reflects the objective reality of the gaps separating sympatric species" (1966, 1102).

The case of "convergent objectivity" illustrates how the specification of different dimensions avoids simplistic dichotomies such as generic characterizations of local communities as "subjective" and academic researchers as "objective." Instead, it allows for more targeted evaluations of epistemic practices used by diverse actors. This potential for a nuanced evaluation becomes even more salient in Koskinen's (2018, 2022) risk account of objectivity. While Koskinen accepts that "objectivity" comes with different meanings, she also follows Douglas in arguing that different notions of objectivity remain related by indicating "a shared basis for trust in a claim" (Douglas 2009, 123). Aiming at further conceptual unity, Koskinen suggests that "objectivity" relates not only to shared trust but also to shared endorsement and reliance. According to Koskinen, to call X objective means that "we endorse it: we say that we rely on X, and that others can safely do so too, because important epistemic risks arising from our imperfections as epistemic agents have been effectively mitigated or averted" (2022, 212).

While Koskinen aims to regain unity in fragmented notions of objectivity, her account of epistemic risks is flexible enough to navigate complex epistemic terrains. There are many different epistemic risks, and actors are exposed to them in different ways (see also Biddle and Kukla 2017; Eigi-Watkin 2022). Transdisciplinary interactions between local communities and academic researchers, for instance, require a multidimensional analysis of diverse epistemic risks rather than a linear scale of one actor being more objective than another. For example, academic researchers have many tools for mitigating epistemic risks such as standardized methods of experimentation, thresholds of statistical significance, or peer review procedures. At the same time, academic research can also create novel epistemic risks. In our work in Siribinha and Poças, such risks are often very straightforward. For example, local fishers are intimately familiar with local ecological mechanisms in the Itapicuru estuary that are not known to academic researchers, who may misunderstand causal relations due to insufficient contextual information and reliance on general models of limited contextual validity (Lacey 2016). Rather than creating a simple hierarchy of the

objectivity of actors, recognition of different epistemic risks allows us to understand diverse challenges in knowledge production.

Koskinen's emphasis on the diversity of epistemic risks makes her account useful for an analysis of the complexity of transdisciplinarity, as it becomes especially salient in her discussion of the relation between objectivity and participation (Koskinen 2022). The participation of nonacademic actors can both strengthen and threaten objectivity—often simultaneously by mitigating and increasing different epistemic risks. To understand how participation can increase objectivity, consider Harding's (1995) notion of strong objectivity that is grounded in standpoint theory. As we discussed in relation to standpoint theory earlier (section 3.1.2), the inclusion of marginalized actors can mitigate systematic biases and therefore also epistemic risks in knowledge production. The empirical material from our community-based research illustrates that these epistemic benefits of standpoint diversity can be very straightforward, as expertise in the communities has often corrected and mitigated our biases (section 5.2.2).

At the same time, transdisciplinary practice commonly also creates novel epistemic risks. While it is important to recognize the epistemic benefits of collaborations between academic and nonacademic actors, it would be insincere to pretend that such collaborations do not come with methodological and epistemological challenges. For example, academic research often involves highly regimented standards of data collection that can be subverted when "democratizing data collection" through citizen science or even more substantially collaborative projects in which nonacademic actors co-design research questions or methods (Piña-Romero, Reyes-Galindo, and Vallejo Novoa 2022). As Koskinen (2022) remarks, natural scientists are often concerned about such risks, and the case for transdisciplinarity does not have to be based on their dismissal. Instead, a nuanced account of epistemic risks can show how transdisciplinary and other participatory approaches (Gómez 2016) are epistemically beneficial even if they can simultaneously generate novel epistemic risks (see also Bedessem and Ruphy 2020). Understanding the heterogeneity of epistemic risks allows for a serious epistemological analysis beyond disqualifying nonacademic actors as lacking objectivity or romanticizing transdisciplinary processes in disregard of actual tensions.

Koskinen (2018) and Douglas (2004) illustrate a wider trend toward rehabilitation of the notion of objectivity by stripping it of some of its absolutist metaphysical baggage (see also John 2021; Toole 2022). Indeed, the appeal to objectivity can be misleading if it is grounded in an overly ambitious

metaphysical picture of a subjectivity-free "view from nowhere." It can also become misleading through political instrumentalization that casts doubt on the epistemic standing of Indigenous or other disenfranchised communities by vaguely gesturing at the objectivity of science. We can do better, however, by specifying diverse dimensions of objectivity that clarify a complex epistemic landscape. Acknowledging this diversity provides enough flexibility to navigate epistemic complexity while also highlighting some level of unity that relates "objectivity" to shared trust or reliance rather than an entirely disunified set of unrelated concerns.

It is certainly true that "objectivity" can be a convenient umbrella term for philosophers to talk about issues such as epistemic trust and epistemic risks. At the same time, both Douglas and Koskinen underestimate the baggage associated with the notion of objectivity and how it can lead epistemological analysis astray. These risks become especially salient in transdisciplinary processes that involve epistemic actors whose marginalization has often been justified through their alleged lack of objectivity. For example, consider Douglas's emphasis on convergence in addressing the objectivity of processes of knowledge production. Referring to our account of partial overlaps, we suggested that Douglas's proposal fits some findings of convergences between Indigenous and academic knowledge. For example, ethnobiologists have often noted convergence between Indigenous and academic taxonomies and argued that this convergence constitutes evidence of the objectivity of taxonomies in responding to objective discontinuities in nature (Berlin 1992; Ludwig 2018a).

In the framework of partial overlaps, however, convergence is only one side of the coin. Recognizing the partiality of overlaps is crucial for taking differences between knowledge systems seriously. Indigenous knowledge systems are often epistemically highly successful while diverging substantially from academic knowledge. Indeed, much of the more recent ethnobiological literature has moved beyond the narrow focus on convergence and joined Indigenous scholars in highlighting the need to take Indigenous knowledge seriously when it diverges from academic knowledge (Nabhan 2016; Nieves Delgado et al. 2023). Although not Douglas's intention, connecting objectivity to convergence risks reinforcing pernicious practices of acknowledging Indigenous knowledge if *and only if* it is sufficiently similar to academic knowledge. While Douglas does not embrace an absolutist conception of objectivity as a subjectivity-free "view from nowhere," emphasis on convergence still carries some of this legacy by tying

epistemic authority to invariance across standpoints (see also John 2021). As we will show in detail in chapter 4, which will deal with ontology, this connection between objectivity and standpoint invariance can mislead engagement with Indigenous knowledge because it systematically obscures the epistemic authority of communities as soon as they become "too different" from academic researchers. In the case of taxonomy, for example, Indigenous communities often strongly diverge from academic researchers. This divergence, however, does not mark a lack of objectivity or Indigenous misinterpretation of the structure of the biological world. As we will discuss in detail in the chapter on ontology, taxonomic divergence between Indigenous communities and academic research usually reflects diverging interests that lead to the recognition of different properties and patterns in the world. Tying objectivity to convergence or standpoint invariance risks misunderstanding this taxonomic divergence as a symptom of a supposed lack of objectivity of Indigenous taxonomies.

Koskinen's conceptual unification arguably exacerbates this problem by tying objectivity to the idea that "when we call X objective, we endorse it: we say that we rely on X, and that others should do so too" (2018, 1187). This framing risks further undermining our ability to engage with epistemological and ontological divergence by understanding the legitimacy of practices that we ourselves do *not* rely on. Our discussions of Indigenous taxonomies, for example, make the case for their legitimacy in the context of Indigenous practices. They do not imply endorsement of Indigenous taxonomies across contexts, they do not imply that we rely on Indigenous taxonomies ourselves, and they certainly do not suggest that academic taxonomists should rely on them. That's a core insight into the partiality of overlaps between knowledge systems—epistemic and ontological authority of Indigenous communities is not conditional on academic researchers also relying on Indigenous resources. As we will see, Indigenous communities often have good reasons to develop epistemic and ontological resources that strongly diverge from the resources on which academic researchers rely. Philosophical engagement with transdisciplinarity needs to make sense of these divergences without delegitimizing nonacademic actors simply because they differ from academic actors.

Explaining objectivity through shared reliance is problematic not only when it comes to results but also in relation to processes of knowledge creation. For example, recall Marlor's (2010) discussion of the tensions between the Kwakwaka'wakw First Nation and Canadian biologists of the

Department of Fisheries and Oceans about a transdisciplinary project for assessing clam abundance along the Pacific Northwest Coast. One source of tension was disagreements regarding methods in the clam survey. While Kwakwaka'wakw clam diggers assessed clam abundance through their harvesting process, the academic method "involved mapping the perimeters of the area on a beach in which clams were expected or known to live, randomly selecting a predetermined number of points within the perimeter to dig, digging up all clams within a designated square area around the randomly selected point, and taking the clams back to a lab to weigh, count and measure" (Marlor 2010, 518).

Following Koskinen's suggestion to talk about epistemic risks is helpful in analyzing the situation, as Marlor identifies a number of risks associated with each method. The academic survey was designed to mitigate epistemic risks through randomized samples that clearly did not apply to the Kwakwaka'wakw method. At the same time, the method also increased risks of biased sampling—for example, Marlor points out that uneven rock walls were excluded from marked perimeters in the academic survey, but Kwakwaka'wakw pointed out that they are crucial for assessing clam abundance as they constitute important harvesting spots. In addition to such epistemic concerns about the acceptability of methods, other sources of methodological divergence were more pragmatic. For example, Marlor points out that the randomized and standardized methods were seen as essential by academic biologists in order to make their results acceptable and publishable in the academic context.

Assessing this situation through an analysis of different epistemic (and nonepistemic) risks is helpful and can lead to a nuanced analysis that helps understanding tensions and potential avenues for mitigating them. Trying to squeeze different epistemic risks into a unified notion of objectivity that emphasizes mutual endorsement or reliance is evidently not useful in this case—Kwakwaka'wakw clam diggers and academic biologists did not endorse and certainly did not rely on each other's methods for a range of epistemological and pragmatic reasons. The interesting epistemological work is therefore done by the disunified analysis of diverse epistemic risks, while the addition of a unified notion of objectivity creates philosophical baggage and confusion without advancing the epistemological analysis.

So, what is left of the notion of objectivity? Our transdisciplinary cases suggest that current attempts to reform and rehabilitate the notion of objectivity underestimate its conceptual baggage and the problems of its

intellectual legacy. Of course, "objectivity" can be used as an umbrella term—whether it is for a narrower set of epistemic risks as suggested by Koskinen or for a broader set of both epistemic virtues and vices. If philosophers insist on using "objectivity" to discuss these issues, so be it. We are not the language police. Using "objectivity" (rather than "epistemic risk," "epistemic virtues and vices," "epistemic responsibility," etc.) as the umbrella term of choice, however, creates its own risks that should be clearly explicated.

The problem is not merely that the notion of objectivity does not do substantial epistemological work and that we can instead directly discuss "ground-level questions" such as the accuracy of observations, the mitigation of systematic biases, or the reliability of predictions. Especially in transdisciplinary contexts, the notion of objectivity is not only superfluous but often actively misleading. Indeed, recent attempts to specify the notion of objectivity largely seek distance from metaphysical accounts of a purely objective "view from nowhere" that is approximated by modern science and has often been mobilized to discredit the knowledge of marginalized actors as overly subjective. Even when the "view from nowhere" is substituted by "convergent objectivity" (Douglas 2004), "objectivity as invariance" (John 2021), or "shared reliance" (Koskinen 2018), substantial conceptual and political baggage remains: The knowledge of marginalized actors risks being framed as lacking objectivity for no other reason than it being too different from the knowledge of dominant actors. As we discuss across the case studies examined in this book, Indigenous and local knowledge needs to be recognized as expressing expertise even when strongly diverging from academic knowledge.

We do not mean to suggest that any of the reformed accounts of objectivity intend to cast doubt on the objectivity of Indigenous communities or knowledge. On the contrary, many recent accounts of objectivity aim to broaden the notion and even make it inclusive for nonacademic participation (Koskinen 2022). The unintended consequence of casting doubt on divergent actors and knowledge, however, illustrates that "objectivity" is far from an innocent notion and that its conceptual baggage is not easily offloaded through philosophical attempts of redefinition.

In transdisciplinary contexts, "objectivity" remains a notion with a toxic legacy and questionable pragmatic value. In the remainder of this book, we avoid appealing to objectivity and discuss relevant epistemological issues more directly. And, indeed, there is no shortage of relevant concepts to discuss epistemic issues such as accuracy, biases, expertise, epistemic

risks, reliability, robustness, epistemic virtues and vices, and so on. To be sure, our abandonment of the notion of objectivity has little to do with the ghosts of "postmodernism" or "poststructuralism" that replace generalized claims of objectivity and universality with generalized claims of subjectivity and contingency. On the contrary, it largely follows successful research practices in transdisciplinary contexts. When working with empirical researchers and local communities, we are constantly confronted with complex epistemological questions about accurate and reliable knowledge production. No scientist we have worked with, however, wanted to focus on "objectivity" in the generic and general sense of philosophers. And, indeed, when being immersed in actual practices of transdisciplinary research, epistemic concerns and discussions tend to be much more specific than general philosophical tinkering with the notion of objectivity. Community-based philosophy is probably better off in following this pattern of aiming for epistemological specificity in community-based research.

3.2 Epistemologies in Action

3.2.1 Epistemology Beyond the Armchair

Making epistemology relevant for transdisciplinary practice requires recognition of intricate relations between knowledge systems beyond a simple divide between Indigenous and scientific knowledge. As an alternative to this divide and its underlying "myth of two knowledge systems," we highlighted partial overlaps. Using the metaphor of epistemic toolboxes, we argued that some epistemic tools are strikingly similar across cultural contexts while others are wildly different. Rather than characterizing these epistemic tools as "objective" or "subjective," we argued that they come with differentiated epistemic virtues and vices.

The following sections move from this abstract discussion of epistemological relations to empirical engagement with community-based epistemology. Epistemology that is situated in transdisciplinary practice needs to address relations between knowledge systems in complex empirical settings. In making this step toward transdisciplinary practice, we return to our work with the communities of Siribinha and Poças. Fishers in these communities are clearly experts on many biological and environmental phenomena in the Itapicuru River estuary even if they are not scientists in an institutional

sense of the word. Community-based epistemology aims to address this expertise in its empirical and situated complexity. In the following sections, we exemplify this strategy by engaging with causal explanations of ecological phenomena in Siribinha. Appreciating explanatory practices of fishers through community-based epistemology provides the basis for more equitable transdisciplinary practices that embrace diversity of expertise rather than locating epistemic agency only with external researchers.

3.2.2 Mixed-Methods Philosophy

Philosophical and empirical research methods do not have to be disconnected from each other. Experimental philosophy (Kiper et al. 2021; Knobe et al. 2012; Sytsma and Buckwalter 2016), for example, has developed into an influential research program that addresses philosophical questions by embedding them in empirical inquiry. Rather than relying exclusively on armchair methods when carving up the boundaries of epistemological core concepts such as "knowledge" or "belief," experimental philosophy departs from empirical research on the linguistic intuitions and practices of heterogeneous actors.

Experimental philosophy shares an empirical and cross-cultural orientation with our approach to community-based philosophy. While traditional forms of conceptual analysis are often highly provincial by relying exclusively on the linguistic intuitions or practices of English speakers (Ludwig 2021; Ludwig et al. 2023), experimental philosophy has broadened conceptual analysis through the comparison of concepts across languages and geographical contexts (Machery, Knobe, and Stich 2023; Mizumoto et al. 2018).

Although our methodological approach is partly motivated by these innovations in experimental philosophy, it also aims for an expanded toolbox of methods that moves from "experimental philosophy" to "mixed-methods philosophy." Embracing mixed methods entails recognition of the value of quantitative data for philosophical inquiry. Our discussion of fish classifications in Siribinha and Poças (section 4.2.4), for example, showcases how quantitative data can provide fine-grained insights about local expertise. That being said, many issues in "empirical philosophy of science" (Furman 2021; Hangel and ChoGlueck 2023; Leonelli 2016; Wagenknecht et al. 2015) require qualitative data. Understanding the social lives of concepts and their entanglement with issues such as biodiversity conservation or livelihoods

requires qualitative depth (Kampourakis 2019). Quantitative methods from experimental philosophy or ethnotaxonomy can provide an entry point for geographically situated conceptual analysis but will often have to be combined with qualitative methods, from semistructured interviews to participant observation to focus groups.

From a methodological perspective, our proposal of "mixed-methods philosophy" can be related to wider debates about "conceptual analysis" and "conceptual engineering" in contemporary philosophy (Isaac 2020). While experimental philosophy has proven particularly useful in expanding methods for conceptual analysis, normative debates about the epistemic and social functions of concepts typically require qualitative depth. Prominent debates in conceptual engineering have focused on contested social kinds such as *gender* and *race* (Brigandt and Rosario 2020; Haslanger 2020) while our book also raises questions about the boundaries of concepts such as biodiversity, conservation, development, indigeneity, nature, modernity, and sustainability (section 4.1.2). In all of these cases, quantitative methods can help us understand the contours of contested concepts across different cultures, but they are no substitute for ethnographic (El-Hani et al. 2022), historical (Dutilh Novaes 2020), and participatory (Alexandrova and Fabian 2022) methods that explore and negotiate how these concepts become mobilized and shape social life.

We found qualitative methods particularly helpful for exploring partial overlaps between concepts and knowledge systems. Although experimental philosophy has challenged the geographic provincialism of mainstream epistemology (Mizumoto et al. 2018), its relevance for transdisciplinary research is often limited by its focus on the "universality thesis" (Tsai and Lien 2018) with generalized claims of either universality or relativity (see also Ludwig 2019b). This dominant concern with universality often separates experimental philosophy from transdisciplinary practice where intricate networks of similarity and difference require more nuance than a generalized universality thesis. For example, our ethnobiological research in Siribinha and Poças reveals that explanatory strategies (section 3.2.3 to 3.2.7) and concepts (sections 4.2.4 to 4.2.5) of local fishers and academic researchers resemble each other to varying degrees along various dimensions. The framework of partial overlaps provides a countermodel to debates about the universality thesis insofar as it takes such networks of similarity and difference as the main concern of a globally oriented epistemology, rather than engaging in priority disputes between universalist emphasis on similarity

and relativist emphasis on difference. When we discuss context of the history of ethnobiology (section 4.1.3), such priority disputes not only misrepresent the complexity of ethnobiological data but are also misleading for transdisciplinary practice that always requires careful navigation through an intricate web of similarities and differences (e.g., conceptual, epistemological, ontological, political, value) between actors.

The following sections focus on the case study of causal explanations of ecological phenomena in Siribinha. Data collection relied on naturalistic interviews (Beuving and de Vries 2015) that presented four scenarios as elicitation devices to encourage talk about explanatory practices. These scenarios were based on previous ethnographic work that allowed us to identify ecological phenomena commonly recognized by community members during fishing activities. Scenario 1 presented the periodic disappearance and reappearance of a clam (locally called *Massunim*; scientific name *Anomalocardia brasiliana*) from the Itapicuru River estuary (Figure 3.2). Scenario 2 focused on the periodic occurrence of a phenomenon that some fishers call "*Robalo* water," in which snook (local name *Robalo*, several species of the scientific genus *Centropomus*) become abundant in the estuary, such that fishers concentrate their efforts in capturing them (Figure 3.2). Scenario 3 addresses the phenomenon of the rufous crab-hawk (locally known as *Gacici*; academic name *Buteogallus aequinoctialis*) calling when the tide turns, indicating to

Figure 3.2 *Robalo* (top) and *Massunim* (bottom) are two core species for livelihood practices in the communities of Siribinha and Poças. (Illustration by Raphael Q).

the fishers that they need to retrieve the captured fish from their fishing nets. Scenario 4 concerns the seasonality of fish captured by the fishers.

Each interview addressed one single scenario or at most two scenarios. The same standardized protocol was used in each interview, including a prompt for the fisher to describe the phenomenon (e.g., Last year the *Massunim* clam reappeared, didn't it? For how long it was gone?), an attempt to ascertain its regularity (e.g., Does this usually happen? Does it disappear and then appear again?), an elicitation of an explanation, if any (e.g., Why does the *Massunim* clam disappear? Why does it return again?), and a stimulus for the fisher to say anything else they considered important for understanding the scenario (see El-Hani et al. 2022 for more details on the methodology).

Interpreting responses of the fishers as causal explanations requires reflexivity about intercultural translation. When we identify overlaps, we do not assume that they amount to a straightforward mapping between concepts or referents. As Quine (1960, 1969) argues, every translation is indeterminate, and ontological relativity is inescapable. We are not aiming to eliminate this relativity by pointing to epistemic resources that overlap between knowledge systems. Instead, we are pointing to similarities between epistemic practices that can be *interpretatively* regarded as sufficiently similar to open up a space for taking seriously what local knowledge holders know about the places where they live. Interpreting fishers as providing causal explanations, therefore, requires a methodological attitude committed to what Viveiros de Castro (2004) calls "controlled equivocation." According to him, translation always involves equivocation, in the sense not of "error" but of "univocality." Equivocation is controlled when we remain aware of multivocality, that is, that even when we and others committed to a distinct categorical scheme are apparently saying the same words, we are still saying different things (El-Hani and Ludwig 2024). Yet, translation can be epistemically productive if carried out reflexively, avoiding the uncontrolled imposition of the translator's concepts. In this sense, the identification of causal explanations in Siribinha is an interpretive act, but one that allows recognition of local epistemic practices and their relations with academic explanations.

Interpretatively reconstructing causal explanations in Siribinha is not merely an issue of intellectual curiosity but is rather crucial for enabling transdisciplinary practices in the Itapicuru River estuary. As we will discuss in Chapter 5, this reconstruction is also a matter of sociopolitical decision-making arenas in which the voices of fishers are not heard in policymaking

that affects their own lives. Rather than assuming that complex explanations of causal phenomena are exclusive to academic research, community-based epistemology demonstrates that fishers, as experts in their own right, also build such explanations. It is from this recognition of multiple forms of expertise that new forms of collaboration and co-production can emerge.

3.2.3 Single-Cause Explanations: Periodic *Massunim* cycles

To develop a better understanding of epistemic practices and community expertise in Siribinha and Poças, the following sections provide in-depth case studies of local explanations of ecological phenomena. Our first case study focuses on the *Massunim* clam (see Figure 3.2) that is commonly collected in the communities but periodically disappears and reappears. Asking about explanations for this cycle, we found widely shared causal explanations. Fishers explain the disappearance of the *Massunim* as caused by the increase of rain upstream in the Itapicuru River, which leads to an influx of freshwater into the estuary, usually dominated by brackish water. The *Massunim* lives in brackish water but cannot survive in freshwater. As Waldemir Celestino, a 71-year-old fisherman, explained to us,

> When the river is full / when the flood lasts for long / the *Massunim* dies / . . . when the freshwater rises / if it takes too long / the animal dies / because the *Massunim* generates in the sea. (All the passages from fishers' interviews have been translated from Portuguese by C. N. El-Hani. The original passages in Portuguese can be found in supplementary material to El-Hani et al. 2022.)

Andrea da Conceição Santos, a 37-year-old fisherwoman who also teaches at the local school, offered the same explanation:

> There was a lot of *Massunim* / then there was a flood / the river was full / then the freshwater killed them / then they disappeared / then they reappeared now / they do not survive in freshwater / only in salt water.

When asked how they know that the bivalve dies under the influence of freshwater, they pointed out the fact that they find them dead, with the valves open, in the river bottom. The *Massunim* can reappear, however, because

some individuals remain buried in the mud while the river is dominated by freshwater.

> It [the *Massunim*] disappears if the freshwater dominates / goes below the earth and will reappear only later. (Waldemir)
>
> Not all of them die / I believe / . . . those that do not die they stay buried in the mud / some survive, isn't it? (Andrea)

Community members justify these claims by stating that they find the bivalve if they dig into the mud. Waldemir, one of the older fishing experts, even described how the bivalve probes for the presence of freshwater. When the rain upstream decreases and the freshwater is washed away by the sea water entering the estuary, the *Massunim* reappear from the mud in the river bottom:

> Then when the river emptied / became low / that the salt water . . . / that people say the salty washes, isn't it? / that the salty washed / then the *Massunim* . . . / but it takes long / it takes more or less three / four years for them to return / (. . . .) it takes long / but never ends / . . . if there is no flood it does not end / because the river is all full of *Massunim* / all covered by *Massunim*. (Andrea)

We interviewed four fishers (two men, two women) on this scenario and found converging explanations with little variation among them. However, there was variation in the estimate of the time it takes for the *Massunim* to reappear, and in ascertaining which animals besides *Massunim* experience a cycle of appearance and reappearance depending on freshwater influence.

Our findings indicate, thus, that there is a widely shared causal explanation among the fishers that accounts for the regular *Massunim* cycle. It is, moreover, a single-cause explanation. Both aspects are supported by the interview with Andrea:

> Here in the community we know that it is only because of the freshwater / everyone you ask will say that it is due to the freshwater / it is only this that we know that kills the *Massunim*.

We presented this explanation to José Amorim Reis Filho, a fisheries researcher who collaborates with our team at the Federal University of Bahia, and he argued that it is very plausible that the appearance and disappearance

of the bivalve take place due to changes in the salinity gradient in the estuary. Francisco Carlos Rocha de Barros Junior, a marine biologist from our university, argued in the same direction, but added that, from an academic perspective, the reappearance of the *Massunim* may be due also to recolonization by larvae coming from the ocean, which, as microscopic entities, are not part of the fishers' ontology. By examining the academic literature, we indeed see that the explanation provided by the fishers overlaps with the account offered by academic researchers. *Anomalocardia brasiliana* are sensitive to salinity variations and may experience high mortality due to heavy rains (Mouëza et al. 1999). This case shows thus an overlap in the use of causal explanations by academic researchers and community members.

3.2.4 Multicausal Explanations: Fish Seasonality

Shifting our attention from *Massunim* cycles to fish seasonality, we interviewed six fishers who provided different explanations, showing more variation in how they account for the phenomenon compared to the *Massunim* case. Some explanations of fish seasonality also appealed to a difference in the influx of freshwater into the Itapicuru River estuary. For example, Francisco de Assis da Conceição, a 42-year-old fisherman, explained fish seasonality as follows:

> It changes because in winter a lot of freshwater comes / . . . / then the fish are different / more *Robalos* come / now in this time here we catch more Tainha / *Robalo* / it is very difficult to catch *Robalo* / but with freshwater we catch a lot of mullet / catch other freshwater fish / such as Xira, Piranha, Tilápia / (. . .) / Then when the tide returns again / depending on the flood / one week / two weeks just running down / . . . / in the second week it already begins to come back / it begins to return the fish that are in the sea / it begins to all come back to the river again.

Everaldino Fernandes dos Santos, an 86-year-old fisherman, argued that the same fish are found across all seasons, attributing the presence or absence of some fish in the estuary mostly to tide amplitude. For instance, he mentioned that if the tide amplitude is low, the tide is not strong enough to push the fish into the estuary, through the river mouth. He pointed out, however, that a large snook, locally called *Robalão* or *Robalo flecha* (arrow snook; *Centropomus undecimalis*), is more common in January, while the smaller snooks (for

instance, *C. parallelus*, locally known as *Robalo branco*, or white snook) are more common in August. When asked why *Robalão* is more common in January and the smaller snooks in August, he claimed that it is "because it is their time indeed," but also mentioned that these fish enter the river to lay their eggs during these specific times of the year, providing a different explanation from that given by the other fishers. This indicates that this phenomenon is not equally recognized or explained by all fishers in the village.

Another fisherman, M. (23 years old), explained that fish seasonality is caused by changes in more than one factor, mentioning water temperature and food availability (algae, which he also called "trash"), but focused his argument on a single local taxon, *Caçonete* (a generic name used to refer to small sharks):

> I think it is due to water temperature / which should change / to something / that they begin to appear / because there is always trash in the beach / trash . . . / algae / isn't it? / that then they like to come eat.

G., a 42-year-old fisherman, offered a rather consistent multicausal explanation. He recognized fish seasonality, mentioning that in the summer *Pescada* (weakfish; *Cynoscion* sp.), *Sororoca* (Serra Spanish mackerel; *Scomberomorus brasiliensis*), and Bagres (sea catfish, several species from the family *Ariidae*, such as *Sciades* sp., *Bagre* sp., *Apistor* sp., and *Rhandia* sp.) are more abundant. In turn, *Tainha* (mullet, several species of the genus *Mugil*), *Robalo* (snook), *Curimã* (Lebranche mullet; *Mugil liza*), and *Carapeba* (*Eugerres brasilianus*) are more abundant in the winter. He explained the different seasonal abundances of these species as follows:

> It is because in the summer it is drier / isn't it? / and it is more sea fish / in winter there is more rain / do you get it? / The wind changes / . . . / Then it is when the fish also enter the river / Curimã, Tainha and Robalo.

When asked why more fish enter the river in the winter, he argued that the cause lies in the fact that this is their egg-laying period. Thus, this fisherman offered a multicausal explanation that included the presence of freshwater, egg-laying, as well as a causal influence by strong wind in the winter, which compels the fish to enter the river looking for quieter waters, while in the summer, fish are more abundant in the sea because the waters are quite calm:

> It is because in the summer the wind comes from the north / isn't it? / And in winter the wind is more from the south / very strong wind / . . . / With the strong wind the sea will push them to the river mouth / do you get it? / Then in their passage they will want a quieter place / because the sea in winter will be too violent / . . . When there is south wind / say some three days straight / and it is winter / then the guys soon say / when this wind is over / there will be Curimã and Tainha / it is then that the fish begin to enter / after the wind.

Mario Sérgio Santana dos Santos, a 43-year-old fisherman locally known as Nego, explained the presence of *Cavala* (king mackerel; *Scomberomorus cavalla*), *Sororoca*, and *Pescada* in the summer through two interconnected factors, wind direction and food availability:

> It is in the summer that they appear / because they appear more with the northeast / the northeast wind / when it blows from here / blows from the north / . . . / has to do with the wind / depending on the wind / . . . / because when it blows / then turns the mud underneath / then it turns the shrimp / then Pescada appears / do you get it? / because the food of the fish appears / then the shrimp turns / then they come to eat the shrimp / when we catch them / the belly is full of small shrimp / . . . / a lot of shrimp / they like to eat shrimp / . . . / south wind they do not appear / because it is the wind that comes from here / then it ends it all / then goes burying the shrimp / . . . / the winter wind.

Nego also explained the availability of *Robalos* in the estuary during the rainy seasons (around winter) by pointing to the influx of freshwater, suggesting that they may use different explanations for fish seasonality in the estuarine and sea environments:

> In the winter time it is always common that water comes down / . . . / If freshwater comes down / then Curimã and Tainha all go to the sea / . . . / they do not like freshwater / only saltwater / . . . / Robalo stays / . . . / It is then that more Robalo comes / it is with freshwater.

He also explained the causal connection between tide amplitude and availability of fish in the estuary:

> . . . The very big tide has more strength to pull the fish into the river / . . . / the weak tide / the fish does not have the strength to enter. (Nego)

The same explanation was also given by Everaldino and Israel de Jesus Santos, a 45-year-old fisherman known locally as Galego. In short, most of the fishers we interviewed recognized fish seasonality and provided explanations for the phenomenon. These explanations showed more variation, however, than in the case of the *Massunim*: some fishers explained it as caused by variation in the quantity of freshwater in the estuary, others as dependent on an egg-laying period, while others pointed to multicausal explanations. It also seems that different explanations are used to explain fish seasonality in the estuary and in the sea. To ascertain this difference, however, more investigation will be needed.

3.2.5 Multicausal Explanations: *Robalo* Water

The case of the *Robalo* water demonstrates most clearly that multicausal explanations are also employed by fishers in Siribinha. *Robalo* water occurs when there is an abundance of *Robalo* fish in the river that leads to a good catch. In explanations of the phenomenon, interactions between multiple causes were consistently reported by the seven fishers we interviewed on this scenario, and also appeared in occasional remarks that emerged in interviews concerning the other cases.

The first factor mentioned by the fishers to explain the *Robalo* water was, again, the influx of freshwater into the estuary, which makes the *Robalos* leave their refuges and go to the ocean following patches of plant material, for instance, from *Baronesas* (*Eichhornia crassipes*), which offer them additional protection as they move. The fishers use the term "balsa" (raft) as a metaphor to refer to these large patches of vegetation that float down the river up to its mouth. As Galego told us:

> The Robalo water is generally when the Itapicuru river head is full / . . . / And it is then that the water arrives muddy / it is then that the Robalo leaves the deepest wells / under the rafts as we call them / . . . / and it goes following the water / and it is time for us to catch them / . . . / The raft is like those Baronesas that stay at the river margins / . . . / When a lot of water comes they come loose / . . . / then it really looks / like a raft / . . . /

> The Robalo follows the water / then we catch it also in the river and here in the sea.

The same factor is mentioned by Herculano Celestino dos Santos, a 56-year-old fisherman:

> It is when it rains in the river head / . . . / the water gets dark / muddy / . . . / those rafts begin to go downstream / . . . / those Baronesas / when the river is full / a lot go downstream / . . . / go to the river mouth / . . . / this water is good to Robalo / . . . / It has to be a good rain / that fills the Itapicuru up there / . . . / I think it drags them [the *Robalos*] / the water goes downstream / and then I think it pushes them downstream.

When the freshwater enters the estuary, the *Robalo* juveniles leave the places where they find protection from predators and the fishers—places they locally refer to as "wells" and also the mangrove tree roots—but this is not the only factor affecting the likelihood that they get caught in the nets. As explained by Galego, the muddiness of the water is also important, since it makes it more difficult for the fish to see the nets:

> Generally they stay in these . . . / we call well / isn't' it? / which is the deepest place / that deepest part / he grows there / keeps growing / because generally people do not fish there / because there is more rock / and sticks / . . .it is generally in the slope / . . . / and also here in the river they grow beneath the sticks . . . / they go out into the middle of the river / but with clean water it is hard to catch them / . . . / because they see . . . the gill net / the throw net / the fish do not get caught / . . . / it is because the water is muddy / they don't see the net / it's easier / they don't see the net / in the strength of the water / then we put the gill net / or also the net following the water / . . . / then it hits them / and they get caught.

A third factor mentioned is the "burning water," an expression used by the villagers to refer to the bioluminescence observed in both the estuarine waters and local beaches that they attribute to jellyfish, which are probably ctenophora, commonly found in Brazilian estuaries (Oliveira 2007). This is suggested by the fishers' remark that these jellyfish do not burn the skin, since ctenophores do not have stinging cells. However, there are also microscopic bioluminescent organisms associated with the phenomenon, as shown by the

fact that one can see bioluminescence in the sand from the beaches around the village when the night is dark, by simply rubbing the hand against the sand, with no jellyfish in view. The identification of these microorganisms is yet to be done, but they are likely to be *Noctiluca* sp. Be that as it may, as microscopic organisms, they are not part of the fishers' ontology.

Galego described the relationship between moon phase, jellyfish bioluminescence, and the visibility of the nets to the fish as follows:

> If there is no moon / there is that water we call burning water / there is that thing in the net / there is a jellyfish in the net / if you catch a jellyfish like that / more or less round / it is like a flashlight under the water / lightening in the net / . . . / then they indeed see the net / . . . / In the dark it is when it really brightens the water / . . . / This jellyfish doesn't burn the skin / . . . it makes it easier for them to divert from the net.

Burning water is a common phenomenon in the Itapicuru estuary, especially in the summer, during the spring tides, and when the night is darker. Galego explained the influence of the moon phase on the visibility of the faint jellyfish bioluminescence and the capture of fish like *Robalos*:

> Then with the moon you cannot see / because the moon is taking away its brightness / she does it / but the moon is taking away its brightness.

Therefore, when the moon is full, the causal influence of the bioluminescent jellyfish is smaller than during the new moon. The same explanation is offered by Nego:

> It makes a little difference [between full moon and new moon] because the water is burning / the water burns / then the fish doesn't come / . . . / keeps hailing / drizzling / looking like it's on fire / the sea / the river / . . . / That's when there is no moon / when there is moon it doesn't burn / . . . / it's beautiful beautiful / at night / . . . / sparkling / those sparks / looking like fire sparks are coming out / . . . / it's burning now / soon / let's suppose / one hour from now the moon is out / then they all disappear / . . . / It affects [the fishing] / the fish doesn't come / . . . / because it sees the net / . . . / it doesn't come at all / when there is Tainha / they jump / keep jumping the net / but doesn't get enmeshed in the net.

There are some interesting differences between the explanations given by the fishers. While some of them relate the bioluminescence to jellyfish, others state that it is nature, the river, or the water itself that sparkles. Another difference is that some fishers state that when the moon is out, the sparkling in the water ceases, while others explain that the bioluminescence continues under the moonlight but we cannot see it anymore, because it is such a faint light. Nego also explained that the water does not burn when the muddy freshwaters come— only when the water is clean.

Freshwater has a double effect, both displacing the *Robalos* and turning the water muddy, making it harder for the fish to see the nets. Other factors are also related to the ability of the fish to see the nets. Bioluminescence makes it easier for the *Robalos* to see the fishing nets, but it is most effective when the night is dark, say, during the new moon. The full moon, in contrast, overpowers jellyfish bioluminescence, just like the muddy waters. The interactions among these factors were described by Galego as follows:

> Then it cannot brighten at all / because the water is dirty / it is dark / Generally this dirty water / generally it is water more upstream / it is not water here from the sea / . . . / This muddy water generally is from the rain.

The fishers even give up fishing when the water is burning, as it is not worth the effort since most of the fish will avoid the nets, as Galego told us:

> We come back / don't even go / let's not waste time no / there are times when you hit the paddle into the water you see it brighten / you put the paddle like that / you see brightening down there / brightening is burning / isn't it?

A fourth factor related to the *Robalo* water was mentioned by Nego in the interview on fish seasonality, the variation in tide amplitude:

> Spring tide is good for the fish / for the Robalo / . . . / because more fish appears / . . . / It is because it in fact enters the mangroves / comes inside the mangroves / . . .has space to walk / . . . / more space to enter the mangroves / . . . / The very big tide has more strength to pull the fish into the river / . . . / Weak tide / the fish doesn't have the strength to enter / . . . / it comes / but without the force of the tide it doesn't come well.

This multicausal explanation was reported by the fishers mostly in the same way, suggesting that it is shared among the villagers. Moreover, despite the fact that it was elicited by the *Robalo* water scenario, the same is observed in relation to other fish, as reported by the fishers who described the same pattern for *Tainha* (*Mugil* sp.).

3.2.6 Identifying Epistemic Overlaps

Many accounts provided by local fishers express causal explanations in the sense of standard criteria in philosophy of science. If we look at these accounts from the perspective of Salmon's (1984) work on causal explanation, for example, we can see that they involve an etiological aspect in the sense that an event *E* (say, the disappearance of the *Massunim* or the presence of *Cavala* in the summer) is explained by tracing the causal processes and interactions leading up to *E* (say, the flow of freshwater into the estuary or shrimp availability due to winds coming from the northeast). They also express the constitutive aspect of causal explanation, as they describe the processes and interactions that make up the event itself, showing how the event *E* "fit[s] into a causal nexus" (Salmon 1984, 9). Explaining takes place by indicating, for example, how the disappearance of the *Massunim* (*E*) fits into a causal nexus as shown by the processes and interactions cited in the fishers' account of the phenomenon, which connects freshwater inflow into the estuary with the death of the bivalve. These explanations can include several causal nexuses, showing how an event *E*, say, the presence of *Cavala* in the summer, fits into a chain of causal nexuses connecting wind direction from the northeast with the availability of shrimp for feeding, and then with the presence of predator fish that are commercially valuable, thus raising the fishers' interest in capturing them.

Furthermore, the prevalence of multicausal explanations indicates that local knowledge in Siribinha can also be situated—through a process of intercultural translation—in the burgeoning debates about mechanistic explanations in the philosophy of science (e.g., Glennan 2002; Halina 2017; Machamer, Darden, and Craver 2000). While mechanistic explanations have been widely recognized in scientific research, one may assume they contrast with holistic explanations of Indigenous and local communities. Our findings show the situation is misrepresented by such a simple dichotomy.

There is no consensus on a general definition of "mechanism," but Illari and Williamson (2012, 120) provide a widely used account according to which a "mechanism for a phenomenon consists of entities and activities organized in such a way that they are responsible for the phenomenon." This definition includes three components that can be used to specify ecological mechanisms underlying phenomena such as the *Robalo* water. First, mechanisms require diverse entities and activities such as freshwater influx, muddying of waters, and migration of fish. Second, mechanisms require the organization of these entities and activities into an interacting system. In the case of the *Robalo* water, for example, freshwater influx interacts with muddying of waters and fish migration in increasing fishing success. Third, entities and activities have to be organized so that they are responsible for the target phenomenon. Fishers clearly interpret these factors as producing *Robalo* water: freshwater influx, for example, is not merely assumed to be correlated with *Robalo* water. Instead, it is a causal factor: *Robalos* get caught *because* freshwater influx muddies waters and contributes to fish migration (see Figure 3.3).

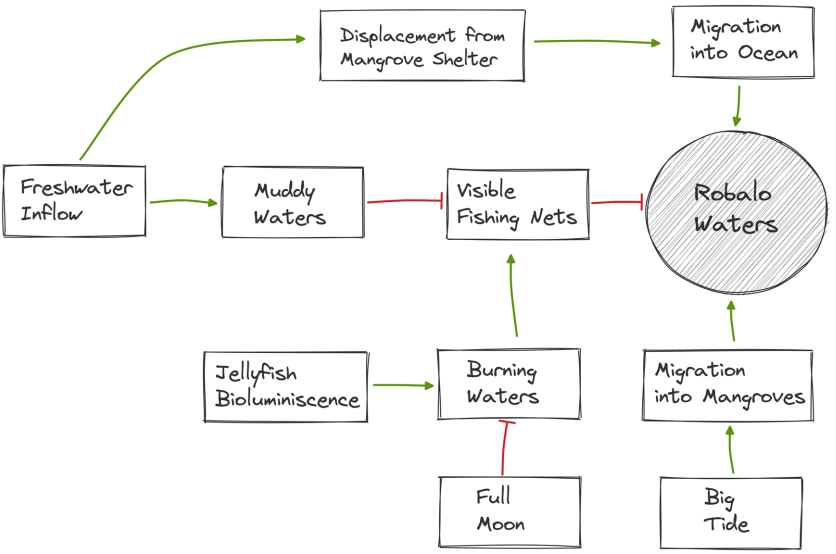

Figure 3.3 Representation of the ecological mechanism that causes "*Robalo* water" in the Itapicuru River estuary, as interculturally interpreted based on fishers' knowledge. Green and red arrows indicate a positive and negative causal effect on the target phenomenon or on other interacting factors, respectively.

The case of *Robalo* water shows not only the prevalence of a complex ecological mechanism in the Itapicuru River estuary but also the detailed local explanations of this mechanism. Rather than incommensurability with causal and mechanistic explanations of the biological sciences, we find an overlap between epistemic tools used by scientists and by fishers in Siribinha, who are often experts regarding local causal systems. We also find that the fishers' knowledge about several phenomena shows not only explanatory but also predictive power, providing a generalized understanding that is effectively used by them to plan their daily fishing activities. For instance, when asked how he decides which specific net he will use to fish on a particular day (to catch *Robalo* or *Carapeba* or *Tainha* or something else), the Siribinha fisherman Ceudes Reis dos Santos (age 43) explains that this is not a random decision:

> When they [fishers] get up in the morning / they go look at the river / how it looks / sometimes he can see that the river . . . / he will look / if the water is dark / If the water is dark / the water is good for Robalo / the net I'm going to take is for Robalo / Then for example / I will fish today with the net for Tainha / I will go in a particular time / for example I will go . . . / The time the tide is rising is . . . / let's suppose 4 p.m. / Then I will go at around 12 p.m. when the tide is emptying / I will go knowing that I will capture Tainha / I will go with the net for Tainha / Then sometimes . . . / For example it will begin now the fishing that uses nets for Carapeba / Then we will go already knowing that we will indeed use nets for Carapeba / . . . / We do not know that there will be Carapeba for sure / but we know it is her time / . . . / May / June.

This result is especially important given the local character of ecological mechanisms as represented in Figure 3.3. The mechanisms responsible for *Robalo* water and other phenomena identified and explained by the fishers are localized in the sense that they grasp an interplay of different causal factors that is unique to the Itapicuru River estuary. Even though relationships within each mechanism may be derivable from general ecological and biological principles, the specific way in which physical (e.g., freshwater inflow, moon phases, tide amplitude), behavioral (e.g., fish responses to bioluminescence in the nets, fish migration patterns), physiological (e.g., bioluminescent responses by jellyfish), and cultural (e.g., fishing artifacts) factors interact is unique to this estuary. Intimate familiarity with this

particular ecosystem is therefore a prerequisite for ascertaining the articulation of entities and activities represented in causal explanations like the one shown in Figure 3.3. At the same time, within that estuary a number of explanatory accounts play a predictive role that is dependent upon the acceptance by the fishers themselves of their generality. Moreover, these explanatory accounts can be found in other estuaries in the region in a similar version, albeit adapted to the local circumstances with which the fishers from different communities are acquainted, and in which they should use the accounts to guide their fishing activities.

The fact that the fishers interpret the factors involved in the production of, say, *Robalo* water or *Massunim* cycle as causal is consequential for understanding the generality as well as the explanatory and predictive powers of fishers' explanations. Consider, for instance, Dewey's distinction between merely predicting from temporal occurrences and making a predictive inference:

> In so far as past occurrences are analyzed sufficiently to furnish the ground for the expectation, the latter partook of the nature of inference. In as far, however, as merely *temporal* occurrences were the ground of the prediction, the latter was *not* inference in its definitive logical sense. It became such inference when certain constant modes of natural operation were ascertained to be the *reason* why certain conjunctions of circumstantial conditions could be used to ground a prediction. (Dewey 1938, 252; emphases in the original)

It is not the case that merely temporal occurrences provide the grounds—in their regularity or recurrence—to the expectations the fishers generate in relation to what fish will be abundantly available to be captured in the estuarine or marine waters. The evidence that there is causal reasoning involved indicates that they are making inferences based on their explanations, such that it is the generality of their statements about processes and phenomena in the natural world that warrants their predictions, the anticipations upon which they base their fishing decisions.

When we depict the explanation offered by the fishers to the *Robalo* water as a mechanistic explanation, we are engaging in intercultural translation, representing what the fishers told us in terms of an academic perspective from ecology and philosophy of science. The possibility of such translations, however, is yet another indication of epistemological overlaps between academic

and community knowledge. We are pointing—from an interpretative perspective—to similarities between academic and community knowledge when it comes to explaining ecological phenomena such as the *Massunim* disappearance or *Robalo* water. Taking such similarities seriously provides an entry point not only for collaboration but also for overcoming what we called the "myth of two knowledge systems" that underlies the marginalization of local knowledge. Fishers in many communities, including Siribinha and Poças, are experts in addressing complex ecological phenomena in the environments where they live and engage with their livelihood practices, and need to be taken seriously in transdisciplinary collaboration.

3.2.7 Identifying Epistemic Partialities

Recognizing epistemic overlaps between fishers and academic researchers can lead to mutual recognition of expertise and provide the basis for transdisciplinary collaboration. At the same time, this overlap remains partial in the sense that the epistemic practices of fishers also diverge from those of academically trained researchers. For example, in some cases the fishers rest contentedly with attending to macro-regularities without trying to uncover underlying causes. The difference here is not that academic scientists will always go beyond macro-regularities and provide underlying causal explanations. Academic scientists may in some cases rest contentedly with macro-regularities, especially when they face limitations in finding causal explanations. The key point is that while academic scientists will be typically driven to look for explanations, often causal in nature, fishers are not equally driven to do so, particularly when they do not identify a practical gain in understanding or explaining. This is, in fact, a simple consequence of the distinct purposes and goals of the epistemic practices of fishers and academic scientists.

One interesting case emerged from our interviews about the near-threatened crab-hawk *Gacici* (*Buteogallus aequinoctialis*) and the local saying *Gacici cantou, a maré vazou* ("Gacici sang, the tide turned"). The regularity is clearly recognized by several fishers, as exemplified by Assis:

> It is because it sings when it is high tide / . . . / it was a sign that the elders had / it was when the Gacici sang / it was close to the high tide / that is / close to the ebb tide.

Despite recognizing this regularity, the five fishermen we interviewed on this scenario told us that they do not know why the *Gacici* sings at that occasion. While the correlation is relevant for the fishers as a warning sign that it is time to check their nets, we did not find any established causal explanations for this phenomenon in the community. It is quite evident that, even though the fishers benefit from knowing about the correlation between *Gacici*'s call and the turning tides, they would not gain anything additional from explaining why this hawk sings when the tide turns.

We also found explanations in the interviews that appealed to supernatural causes that are not part of academic explanations. For example, when we asked Assis why the ebb tide occurs, he answered: "It is a thing from God isn't it? / . . . / A thing from God / because only God can do this isn't it?"

Other epistemic differences concern explanations that are essentialist in character or that at least appeal to the idea of a "natural place" for an organism to be. An example is found in Everaldino's interview on fish seasonality, when he explained that the *Robalão* (*Centropomus undecimalis*) stays in the river after entering with the spring tides because its place is in the river:

> Robalão / that the boys always catch in the neap tide / . . . / if they enter in the spring tide / they stay there / . . . / when they come they don't return to the sea at all / stay there indeed / Robalão has this thing / of not coming back at all / some come back / but most of them stay in the river / . . .stay there in the bottom / . . . / Their place is there / . . . they are from the river / then they have to stay there indeed.

This takes an essentialist form: *Robalão* stays in the river bottom because its place is there, as if by its nature that's where it is meant to be. Thus, despite the fact that causal relations are also mentioned in order to explain the seasonal appearance of this local species, there seems to be also an ontological assumption: the *Robalão* finds its natural place at the river bottom. The same style of explanation appeared when we asked Nego about what makes the water burn: "This is from nature itself / it comes from her really."

The prevalence of essentialist explanations (Gelman 2003) has been widely documented in debates about "folk reasoning" in general and "folk biology" in particular (Atran and Medin 2008; Medin and Atran 1999; Solomon and Zaitchik 2012). The case of essentialism illustrates that knowledge systems of local communities and academic researchers often remain different in important ways even if they converge in a number of epistemic practices.

Moreover, while academically trained researchers may resort to (e.g., physiological) micro-explanations for accounting for phenomena such as bioluminescence, this is not a strategy that fishers in Siribinha adopt (see also Atran 1998 for making this point at the more general level of folk biology). The selective application of complex causal explanations by the fishing community, which overlaps mechanistic explanatory strategies used by academic researchers, has at least in part a utilitarian component: Fine-grained explanations of *Robalo* water reflect the need for an equally fine-grained understanding of individual variables (e.g., amount of rain, bioluminescence, tides, moon phases) affecting the *Robalo* catch and allowing for the fishers to make predictions about the likelihood of capturing particular species in determinate circumstances. In contrast, it is entirely sufficient to consider that the river bottom is a natural place for *Robalão*, as fishing practices do not demand in this case a more fine-grained explanation of why that species stays in the estuarine waters.

Divergences between knowledge systems are not limited to the explanations of fishers and academic researchers but extend to the practices and methods through which these explanations are generated. There are many straightforward differences between the epistemic practices and methods used by fishers in Siribinha and academic researchers. The causal explanations built by the fishers are based on experiential evidence arising from daily interactions with the Itapicuru River estuary and transmitted over the course of several generations, while academic researchers often generate knowledge in much shorter time frames and use more formalized experimental designs.

But there are also important similarities in such practices and methods, as the fishers' causal explanations are based on recurrent observation of the explained processes. Such a reconstruction of patterns resembles what Nickles (1989) described as an "epistemic approach" used in academic research. In the epistemic approach, scientists address processes through past results or events. It is a backward-looking approach in the sense that the justification relies on knowledge about historical processes for supporting explanations. In Siribinha, the patterns reconstructed by the fishers to explain ecological phenomena are twofold: they occur according to the same backward-looking epistemic appraisal, but they also work as counterfactual thinking and are, therefore, also forward-looking. For instance, the truth of a conditional claim such as "if freshwater would enter the estuary in large quantities, *Massunim* would die" can be clearly derived from the explanation

provided by the fishers according to past evidence. The same is true of a multifactorial explanation stating that food availability for fish depends on wind direction—"if the wind was not coming from the northeast and shrimps were not available for eating, then there wouldn't be *Cavala*, *Sororoca*, and *Pescada* to catch." This clearly indicates that counterfactuals reflect on their intentions of action, that is, to go catch or not to go catch. Thus, counterfactual thinking based on explanations elaborated according to an epistemic approach seems central for the Siribinha fishers. After all, counterfactuals are used after particular events in order to formulate plans that are likely to improve the outcome of actions in related scenarios (Byrne 2016), regardless of whether we locate them in Indigenous, local, or academic knowledge systems.

3.2.8 From Epistemology to Ontology

Attempts to relate Indigenous and scientific knowledge can easily get lost in misleading clichés that reproduce harmful practices and policies. One of these clichés is the happy transdisciplinary family that lets "a thousand epistemologies bloom" while addressing grand challenges from climate change to food security through harmonious collaboration and dialogue. The reality of transdisciplinary practice is full of tensions and rarely reflects this cliché of one happy family (Ludwig and Boogaard 2021; Middelveld et al. 2021; Shah et al. 2019). Another cliché is the myth of two knowledge systems that are opposed and in irresolvable conflict with each other. This myth often becomes reflected in the assumption of a strict divide between an Indigenous worldview that is assumed to be holistic and relational versus a scientific worldview that is assumed to be reductionistic and mechanistic (El-Hani, Poliseli and Ludwig 2022; Ludwig and Poliseli 2018).

While there is some truth to these clichés, their simplicity makes them misleading guides for practice. Our work with the communities of Siribinha and Poças demonstrates the risks of superficial epistemological analysis. Projecting some totalizing characterization of holistic and spiritual thinking on fishers in the communities risks obscuring their detailed expertise about causal relations in the ecosystems of the Itapicuru estuary. The risk here is not merely epistemological but also of political failure. Framing fishers of Siribinha and Poças as the spiritual and holistic Other to scientific rationality not only obscures local ecological expertise but can also contribute to

marginalizing this expertise in practice and policy. As we will explore in section 5.2.2, the expertise of fishers in Siribinha and Poças is relevant not only for epistemological analysis but also for concrete interventions, such as the formulation of sustainable fishing policies.

Focusing on the expertise of fishers and its relevance for policy is crucial for effective transdisciplinary practices that take epistemic diversity seriously. At the same time, our arguments should not be misunderstood as suggesting easy complementarity and integration along the cliché of one happy family. The previous section addressed some of the challenges of transdisciplinary integration through reliance on different explanatory styles. Such differences in explanatory styles, however, only scratch the surface of challenges in transdisciplinary practices.

The coming two chapters highlight two core challenges of negotiating knowledge diversity. The next chapter shifts the focus from epistemology to ontology. Ontological difference constitutes one of the most pressing challenges for transdisciplinary practices in global contexts. Many academic debates about Indigenous knowledge avoid engagement with ontological tensions and therefore suggest an overly simple positive vision of knowledge integration. For example, Indigenous communities may be recognized as experts about local biodiversity, and their knowledge may be integrated into ecological research and conservation management. However, such integration often fails to consider that Indigenous knowledge is grounded in ontological assumptions that diverge from those of academic researchers. In turn, not considering this fact contributes to an integrationist transdisciplinarity that leaves those assumptions out of the "integrated" body of knowledge under construction. For example, Indigenous expertise about sustainable forest management may turn out to be deeply entangled with ontological assumptions that are too spiritual for academic comfort zones. Then, while Indigenous knowledge about forests that sits comfortably within academic frameworks gets integrated, those ontological assumptions may be left aside.

Siribinha and Poças can teach profound lessons about the complexity of these dynamics. As we have emphasized in this chapter, fishers of Siribinha and Poças are perfectly capable of understanding complex ecological causal processes and integrating them into their daily fishing practices. As the next chapter highlights, however, fishers in Siribinha also often embrace ontologies that clearly clash with frameworks of academic ecology. As we will explore community relations with the mangrove forest through the Amerindian *Caipora* ontology, it becomes clear that deep ontological

difference constitutes a fundamental limitation for assuming a straightforward integration of knowledge systems.

Ontological difference constitutes one fundamental challenge to knowledge integration. This challenge has become widely discussed in the anthropological literature, which focuses on the "radical alterity" of Indigenous and modern academic ontologies. As the next chapter will argue in detail, critical transdisciplinarity has to come to terms with radical alterity. However, not all challenges of transdisciplinarity are tied to deep ontological differences. Anthropological fascination with radical alterity can easily distract from the wide range of issues of "mundane alterity." As we will discuss in section 5.2.1, many of the most consequential limitations do not emerge from deep ontological tensions related to, say, forest beings that clash with ontologies of academic researchers. Instead, their roots are far more mundane: different economic interests, power differences, limited funding and time for transdisciplinary research projects, academic career concerns, embedding in commodified research environments, bureaucracies of academic knowledge production, or lack of care and intercultural sensibility.

The interplay of radical and mundane alterity points toward both the methodological and political obstacles of making transdisciplinarity work in practice. This chapter has highlighted the expertise of the fishers in Siribinha and Poças. In this sense, it provides a constructive entry point for recognizing diverse forms of knowledge and potential for transdisciplinary collaboration. A political epistemology of knowledge diversity, however, will have to move beyond this diagnosis of transdisciplinary potential and critically ask which epistemic practices actually shape interventions and whose knowledge becomes authoritative in the case of disagreement. As the next chapter discusses, addressing such complex questions requires a better understanding of the interplay between epistemology and ontology.

4
Community-Based Ontology

4.1 Partially Overlapping Ontologies

4.1.1 The Great Ontology Confusion

Few academic terms create more confusion than "ontology." In one interpretation, ontology is a highly specialized subfield of academic philosophy that is concerned with foundational matters of existence. For example, ontologists may wonder whether abstract objects like numbers exist (Falguera, Martínez-Vidal, and Rosen 2022). Clearly, numbers do not exist in the same way as tables, rocks, and other concrete objects. We can touch a table or a rock; we cannot touch the number five. We can locate a table and a rock in space and time while it seems odd to say that the number five exists only in a certain place or only during a certain time period. But if numbers do not exist in a defined space or time, in what sense do they exist?

Another specialized ontological debate is concerned with the existence of concrete rather than abstract objects. Some ontologists have cast doubt on the existence of concrete objects such as tables and rocks by challenging the very idea of object composition (Van Inwagen 1990). Imagine buying planks of wood with the goal of building a table. At what point do these individual planks compose a new object such as a table? Once they touch each other? Once they are arranged in the shape of a table? Once they are glued or otherwise attached to each other? Once they are used as a table? Some ontologists have argued that the whole idea of object composition is flawed and that objects never truly compose new objects. According to this position, composed objects like tables do not *really* exist, and the universe is fundamentally just a vast arrangement of elementary particles.

As an esoteric subfield of philosophy, ontology may stimulate intellectual curiosity but also seems detached from empirical research or even political practice. In fact, one may wonder how the questions of ontology may come into any kind of fruitful contact with the natural or social sciences. An ontologist joining a scientist's laboratory and denying the existence of

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composed objects like microscopes or abstract objects like numbers may be a fun comedy sketch about cloistered philosophers who are oblivious to the world around them. It is clearly not a fruitful basis for interdisciplinary collaboration.

Given the esoteric character of many ontological debates in academic philosophy, it may come as a surprise that ontology has created a huge amount of excitement and even the promise of an "ontological turn" across the social sciences and humanities (Holbraad and Pedersen 2017; Keck et al. 2015; Ruiz Serna and Del Cairo 2016; Uchôa 2017). Following insights from Indigenous scholarship (Todd 2016), cultural anthropology has been the epicenter of this promised ontological turn (Viveiros de Castro 2014). Ontology becomes positioned as the key to a paradigm shift in the field that takes cross-cultural difference seriously rather than tacitly assuming the primacy of Western modernity and its foundational ontological assumptions. The revolutionary promises of ontologically oriented research have transpired from anthropology to countless other fields of research such as pedagogy, policy studies, and sustainability science (Dall'Alba and Barnacle 2007; Fúnez-Flores and Phillion 2019; Yates et al. 2017). In all of these domains, ontology is associated with the promise of challenging unquestioned ontological assumptions of Western modernity and opening up spaces for radical alternatives based on marginalized ontologies (Blaser 2013; Fúnez-Flores 2022).

The high level of excitement about ontology is matched by an equally high level of confusion and annoyance. Many scholars in anthropology and related fields remain skeptical of ubiquitous appeals to ontology and reject it as fashionable theory and pretentious jargon (Graeber 2015; Heywood 2012; Vigh and Sausdal 2014; Wilson and Neco 2023). And indeed, debates about the ontological turn are a bumbling mess, making appeals to ontology often equally confused and confusing. The problem is not merely that anthropologists and philosophers are using the notion of ontology in different ways (Turska and Ludwig 2023). Even within anthropology, ontology has become associated with a large variety of different intellectual projects. Some projects of "ontological cartography" (Ludwig 2016a) turn out to be philosophically quite modest in the sense that they largely amount to the ethnographic documentation of heterogeneous ontological commitments across different geographies. There is nothing mysterious or obscure here: people in different places have very different ideas about how the world is fundamentally structured.

In other cases, the ambitions of anthropologists are not only about documenting but also about making ontological claims. As Kohn (2013, 10) puts it in *How Forests Think*: "Can anthropology make general claims about the way the world is?" Kohn not only provides a positive answer to this question but also sides with the ontology of the Indigenous Runa in the upper Ecuadorian Amazon. Forests *really* think, and Western scientists are wrong if they think otherwise. Instead of merely documenting ontological diversity across different geographies, anthropologists like Kohn want to make ontological claims themselves.

But the confusing diversity of appeals to "ontology" does not stop here. Some anthropologists make the case for ontological multiplicity without committing themselves to one particular ontology. In these cases, anthropologists do not make first-order ontological claims about the world but rather second-order claims about ontologies and embrace some form of ontological pluralism or relativism (Turska and Ludwig 2023). Rather than embracing one particular ontology, the (meta)ontological claim is about the irreducible multiplicity of "different worlds" or of a "pluriverse" that can accommodate different ontologies (Henare et al. 2007; Savransky 2019).

When pressed on the coherence of claims about "different worlds," anthropologists often retreat from metaphysics to methodology. Here, the "ontological turn" becomes about avoiding rather than making ontological claims. In this sense, Hoolbraad and Pedersen (2017, 4–5) suggest that the ontological turn is "a methodological intervention, as opposed to a metaphysical or indeed philosophical one. In spite of its name, the ontological turn in anthropology is, in these terms, decidedly not concerned with what's 'really real,'" but rather a methodological move in which anthropologists create reflexive distance from their own ontological "commitments and assumptions about what things are, and what they could be (including things like society, culture, politics, and power)" (Hoolbraad and Pedersen 2017, 5).

The "great ontology confusion" is the result not only of this diversity of projects but also of their lack of delimitation. As ontology has become fashionable branding for theory production across social sciences and humanities, the term is commonly inserted in ambiguous and half-digested ways. Often, it is not even clear what authors want to achieve when they appeal to ontologies. Is the goal merely to ethnographically describe different ontologies? Is it to endorse the described ontology? Is it to embrace some broader meta-ontological picture of a "pluriverse" or "multiple worlds"? Is it a methodological move to create distance from one's own ontological

commitments? The popularity of the ontological turn often means that authors present fragments of ontological jargon without providing guidance on how to answer such questions. It therefore becomes increasingly unclear what talk about ontology is supposed to convey and how exactly it is different from talk about concepts, cultures, practices, stances, taxonomies, or worldviews.

But it gets even worse as one may wonder whether such lack of clarity masks the lack of any consistent and novel insights in appeals to an ontological turn. Of course, there are consistent ways of talking about ontology. For example, it is entirely consistent to ethnographically document ontological commitments of heterogeneous actors from Indigenous communities to academic researchers. It is also consistent to advise ethnographers to be methodologically cautious in approaching communities without imposing their own ontological commitments onto them. While all of this is fine, it clearly falls short of the revolutionary promises of an "ontological turn." Ethnography of diverse ontological commitments is a well-established part of anthropological research, and methodological modesty in not imposing one's own assumptions is a widely debated challenge of anthropological research at least since Malinowski's (1922) emphasis on the importance of "grasping the native's point of view."

There are other interpretations of the "ontological turn" that clearly propose a radical shift, but these interpretations raise questions about consistency. Most strikingly, appeals to "multiple worlds" can be framed as a radical reorientation: While preontological anthropology assumed that there is one world that is interpreted through multiple cultures, ontological anthropology recognizes that there are in fact multiple worlds. That certainly sounds like a radical claim. At the same time it also sounds very obscure. What does it mean that there are in fact multiple worlds rather than one world that we interpret and engage in different ways? Furthermore, how are anthropologists supposed to study such different worlds? As Vigh and Sausdal (2014, 49) put it: "If anthropology is, as the ontological turn advocates, not a study of multiple 'world-views' but of essentially different 'worlds' altogether, how, we ask, does one approach this methodologically? Put in other words, if we really believe in radically essential, fundamental ontological difference, with what registers can we, then, conceive and describe ontological others in ways that do them ethnographic justice?" In the end, one may worry that the seductive appeal of the ontological turn is that it ambiguously moves between the banal and the implausible. Either it ends up repackaging well-established

practices in cultural anthropology as expressed in the concern that "ontology is just another word for culture" (Carrithers et al. 2010) or it expresses largely inconsistent ideas about different worlds that remain metaphysically and methodologically obscure.

There is a lot to say in defense of ontology in both anthropology and philosophy (Ludwig et al. 2023; Turska and Ludwig 2023), but it is not difficult to see why the notion often provokes strong reactions. In academic philosophy, ontology often seems to be a highly esoteric project with little relevance outside of its own bubble while anthropology appears to employ the notion in so many different ways that it becomes unclear whether there is a coherent ontological project at all.

4.1.2 Why Ontology Matters

Despite all the confusion surrounding the notion of ontology, there are important lessons to be learned from the ontological turn. Linking local struggles and global challenges requires ontological depth. Think of local responses to issues such as biodiversity loss, public health, or economic inequality. Taking local responses seriously requires engagement with diverse ontologies—from Amerindian perspectives on forests as thinking actors (Kohn 2013) to African understandings of communality and its role in social organization (Eze 2008) to the Krenak Indigenous peoples' conception of the Rio Doce in Brazil as both their home and their living ancestor Watú (Rickard and Ludwig 2024).

There is no ontologically neutral ground from which we can intervene on global challenges such as biodiversity loss, public health, or economic inequality without introducing ontological assumptions (Ludwig 2016a). In fact, the very notion of "global challenges" is far from neutral but often emerges from very specific technocratic perspectives on social-environmental crises—not as system failures but rather as "challenges" that can be "solved" through technological innovation (Ludwig et al. 2022). In this sense, "solutions" of corporate and state actors remain ontologically committed to an understanding of nature as a resource system that needs to be sustainably managed but remains clearly separated from cultural spaces of morality and reason.

Understanding such "solutions" as expressions of specific ontological constellations of capitalism and modernity matters both for challenging

dominant social-environmental relations and for envisioning emancipatory alternatives. Political ontology therefore often aims for what Haslanger (2012, 184) calls "unmasking" strategies: demonstrating the contingency of ontological assumptions that have been naturalized as self-evident truths about "the way things are." Haslanger is primarily concerned with unmasking ontological assumptions about gender and race that are commonly taken for granted and whose contestation opens new avenues for challenging patriarchal or racist relations. Global ontological differences indicate that the scope of unmasking projects can be extended much further. For example, they can also include categories such as *biodiversity* (Popa 2022; Sarkar 2019), *conservation* (Büscher and Fletcher 2020; Murdock 2021), *development* (Demaria and Kothari 2017; Ziai 2007), *nature* (Descola 2005; Vogel 2015), or *sustainability* (Fernández-Llamazares and Virtanen 2020; McGregor et al. 2020). Extending the unmasking strategy toward such categories highlights the contingency of dominant ontologies of social-environmental systems and makes them contestable in both local and global struggles.

The contestation of the political functions of dominant ontologies has led to a close association between political ontology and debates about conceptual (Wiredu 1997), epistemic (Grosfoguel 2007), or mental (Ngũgĩ 1986) decolonization. As Fúnez-Flores (2022, 3) points out, ontological and decolonial turns intersect in "their aims to fissure and thus slow down, at the very least, modernity's totalizing discourses and practices intended to erase difference." While challenging totalizing discourses and practices, political ontology also opens spaces for embracing difference and thereby articulating radical alternatives for reconfiguring social-environmental relations. It is in this sense that the notion of the pluriverse (Escobar 2018) has rapidly gained popularity as a counterprogram of political ontology, emphasizing not only the oppressive character of ontological monocultures but also the emancipatory potential of fostering global ontological plurality.

While we embrace political ontology and its pluriversal program of a "world in which many worlds can fit" (EZLN 1996), the following sections first turn to the systematic challenges of consistently articulating ontological pluralism and can therefore be read as *prolegomena* to political ontology. Tackling these challenges is necessary for avoiding simplifications and clichés that Vigh and Sausdal (2014, 56) target as the "ontological turn's fetishization of otherness." Returning to our earlier critiques of "metadualism" (section 2.1.5) and the "myth of two knowledge systems" (section 3.1.4), it is indeed deeply misleading to address ontological difference through a divide

of two clashing worlds in perpetual conflict: on the one side, the oppressive ontology of modernity, capitalism, colonialism, science, reductionism, extractivism, rationality, individualism, and so on; on the other side, the emancipatory ontology of holism, Indigeneity, care, relationality, spirituality, communalism, and so on.

If political ontology is grounded in such simplistic metadualistic clichés, it will often do more harm than good. Even if the metadualistic divide between an oppressive modernity and its emancipatory alternative may sometimes function as a "strategic essentialism" (Spivak 2012) for political mobilization, it fails both complex intellectual analysis and complex political coalition building. Indeed, skepticism toward political ontology among political economists and political ecologists often reflects related worries. In his comparative study of social-environmental conflicts in England and Greece, for example, Bormpoudakis argues that political ontology can mislead through "the *in toto* demonization of conservation and western science" (2019, 547), failing to recognize how "conservation science, and ecology are not *just* in the service of capital and the State, but in fact are often pitted against them" (2019, 557). If political ontology is grounded in metadualism, modern science can only appear on one side of the divide as a complicit enabler of capitalism, colonialism, extractivism, and so on. The very possibility of emancipatory research fades from such a framing just as in any serious engagement with the epistemic success and value of modern science (Knudsen 2023).

Moore is even more dismissive of the state of political ontology and especially its pluriversal ambitions: "Among its foundations is a post-Cold War formulation in subaltern form: the clash of civilizations (Huntington 1993). . . . This abstract pluriversalism, under cover of a seemingly radical critique, recapitulates key elements of Cold War anticommunism and Eurocentrism—above all, the reification of 'Europe'" (Moore 2022, 132). Accusing pluriversalism of historical simplifications, Moore worries about its "flight from world history" that rejects historical materialism and any theorizing beyond local scales as belonging to the "colonial," "oppressive," "Western," "Eurocentric," "modern," and "universalist" side of the metadualistic divide.

Concerns about political ontology and pluriversalism need to be taken seriously. Metadualism does indeed lack resources for complex engagement with science and modernity. It cannot distinguish between their oppressive and emancipatory functions. It also fails to analyze their entanglement across local and global scales. However, neither political ontology

nor pluriversalism need to be grounded in metadualism. It will not come as a surprise that we propose partial overlaps as an alternative approach that avoids metadualism, but also simple claims of universality, through a focus on the interplay between ontological similarity and difference.

Siribinha and Poças taught us important lessons about this interplay. In the previous chapter on community-based epistemology, we argued that fishers in Siribinha and Poças are experts about ecological dynamics such as those involved in the phenomenon of the *Robalo* water. Our claims of a substantial epistemic overlap in causal reasoning about ecosystem dynamics was only possible because it was built on a substantial ontological overlap. Fishers and academic researchers do not live in incommensurable worlds. Transdisciplinary collaboration and mutual learning are possible precisely because fishers and researchers can establish common ground that involves reference to shared phenomena—*Robalo* fish, their abundance patterns, the tide, rainwater, fishing nets, bioluminescence, spawning periods, and so on. Without ontological overlap that ensures joint reference to these phenomena, it would be impossible for fishers and ecologists to understand each other's expertise regarding ecological processes involved in the *Robalo* water. Rather than pluriversal emphasis on different worlds, transdisciplinary practice in Siribinha and Poças often points toward recognition that different actors inhabit the same world in which they establish common ground and learn to collaborate.

This is not to say that ontologies always overlap; on the contrary, community-based research also teaches about the importance of ontological difference. A challenging case that will return in later parts of the book is *Caipora* and its role in mediating relations between fishers and the mangrove forests. *Caipora* is a concept of very broad circulation among Amerindian peoples (Almeida 2013), which is also found in artisanal fishing cultures in Brazil, due to its emergence from influences of Amerindian, African, and Portuguese cultures. *Caipora* is an important entity in Amerindian ontologies and can be described as a protector of the forest or a master of animals. *Caipora* does not easily translate into any scientific category, and there is also no clear referent to be identified. Still, *Caipora* matters. As Almeida (2021) has argued, *Caipora* plays an important role in mediating respectful relations between humans and their environments in many Indigenous and rural communities across Brazil. *Caipora* demands respect of the forest and animals, but this demand is built on very different considerations than those found in academic

sustainability discourses about nondestructive resource use. As such, *Caipora* becomes part of a different ontological and moral order for engaging with forests beyond their framing as a resource system by academic researchers and conservation managers.

Caipora is by no means an odd exception. Ontological differences between Indigenous and academic perspectives are intertwined with different moral orders, value systems, and embodied practices. Aiming for equitable dialogue in transdisciplinary practice requires taking these differences seriously and cannot avoid ontology. In fact, the neglect of ontological difference is a common source of unequal collaborations that recognizes nonacademic perspectives only insofar as they integrate into academic frameworks. For example, scientists may recognize Indigenous actors as experts about local biodiversity and on issues such as abundance patterns of vulnerable populations, indicators of ecosystem change, invasive species, local crop varieties, or soil management. Considering this expertise only where it integrates into academic frameworks will obscure, however, Indigenous knowledge and practices that are grounded in diverging ontologies and often lead to a quick dismissal of anything that seems "too spiritual" or otherwise "too different." A framework of partially overlapping ontologies aims to account for this complex web of relations, including deep ontological differences that limit integrationist programs.

While an account of partial overlaps takes ontological difference seriously, it is distinguished from a political ontology that *only* considers difference because its intellectual horizon does not extend beyond metadualism. Ontology matters in the way it creates a complex web of relations of both similarity and difference between understandings, perspectives, and practices. In this sense, we disagree with Viveiros de Castro when he suggests that "it is only worth comparing the incommensurable, comparing the commensurable is a task for accountants, not anthropologists" (2004, 11). Reducing the commensurable to a "task of accountants" only works from the perspective of abstract theory that considers messy practices of ontological negotiation and political coalition building too mundane to be deserving of anthropological attention. Encounters, collaborations, and struggles between heterogeneous actors involve intricate dynamics of ontological difference and similarity. An exclusive focus on incommensurability does not provide the necessary tools for navigating this complexity. Instead, ontological analysis needs to be able to build bridges as much as insist on difference. It needs to recognize the regional and global as much as the local.

To develop a robust account of partially overlapping ontologies, this chapter inverts the narrative sequence of the ontological turn. The ontological turn commonly departs from the most striking and radical cases of difference: jaguars turning into humans; thinking forests; spirits of the ancestors; magic, taboos, and totems. Once maximal ontological distance is established, the main challenge becomes to manage this distance in ways that take communities seriously without collapsing into an obscure and unrestricted relativism of disconnected worlds.

In direct inversion of this narrative sequence, the following section starts with ethnographies of ontological similarity. Focusing on ethnobiology, we discuss how Indigenous and academic actors often conceptualize the biological world in surprisingly similar ways, reflecting cross-cultural ontological agreements about the structure of the biological world. While these cases of cross-cultural agreements have motivated a focus on ontological convergence in ethnobiology, we show that this "convergence metaphysics" also has severe limitations in neglecting and obscuring ontological difference. This interplay of ontological convergence and divergence motivates a model of partial overlaps between ontologies. Modeling this complex interplay of partial overlaps creates a robust metaphysical and methodological basis for engaging with ontological difference. As such, it also creates space for political ontology and pluriversality beyond both descriptive and normative shortcomings of metadualism.

4.1.3 The Rise and Fall of Convergence Metaphysics

The ontological turn in anthropology revolves around difference. This section shifts the focus from ontological difference to ontological similarity through cognitive anthropology and its emphasis on cross-cultural convergence. Cognitive anthropology in the second half of the twentieth century was very much an ontological project but built on the emphasis on cross-cultural stability. Rather than assuming incommensurable worlds of radical difference, cognitive anthropologists embraced a "convergence metaphysics" (Ludwig 2018a) of a shared natural world that is interpreted through shared cognitive resources. While there is plenty of cultural variation, we are still all members of the same species who encounter the same world with the same basic cognitive tools. Even if we focus on the differences between us, a Martian anthropologist visiting Earth for the first time would be mostly

struck by the similarities of all human reasoning and practices around the globe. Or so cognitive anthropologists argued.

In exploring the ontological ambitions of cognitive anthropology, we focus on the development of ethnobiology as the most influential "ethnoscience" (Sturtevant 1964; Werner 1966) and its often uncompromising focus on cross-cultural ontological similarity. Ethnobiology of the 1960s and 1970s was deeply steeped in a convergence metaphysics that highlighted "discontinuities in nature" (Hunn 1973) and "the structure of nature itself" (Berlin et al. 1966, 275). Diamond (1966, 1102), for example, argued that correspondence between ethnotaxa "and species as recognized by European taxonomists reflects the objective reality of the gaps separating sympatric species." Bulmer (1970, 1087) suggested that "the hard core of lower order groupings in any taxonomy . . . simply has to be 'general' or 'natural' and consist of multi-purpose, multi-dimensional units which bear a definite correspondence to those applied by the biological scientist." Berlin (1973, 260) argued that "the objective biological discontinuities recognized by primitive man are, for the most part and with explainable exceptions, identical at some level with those recognized by Western science." Dwyer (1976, 440) pointed out that "the folk classifier perceives objective discontinuities in the natural world," which ground convergence with biological species that are recognized in contemporary biology.

Convergence metaphysics in ethnobiology emerged in the late 1960s as a program that synthesized cross-cultural studies of local biological classifications with theoretical developments of the "cognitive revolution" and the "modern synthesis" in evolutionary biology. Despite this complex historical constellation, the basic metaphysical motivation can be illustrated with simple examples such as Berlin's (1992, 9) informal experiment of bird classification: "Museum skins of several species of brightly colored Amazonian birds . . . are dumped from a basket in a heap on a table. . . . A student volunteer is called from the class and asked to simply 'classify' the collection. The student's efforts always result in a series of neatly stacked groups of individual birds, usually lined up in a row. The piles correspond perfectly to the groupings recognized by scientific ornithologists, as well as to those of the Huambisa and Aguaruna Jivaro from whom the specimens were collected." This agreement between untrained students, scientific ornithologists, Huambisa, and Aguaruna Jivaro is clearly an interesting phenomenon that requires explanation. At this point, convergence metaphysicians move from empirical claims about classificatory behavior to a metaphysical *explanans:*

taxonomic convergence can only be explained under the assumption of joint recognition of objective discontinuities in nature.

While the argument is quickly introduced, its influence on the historical development of ethnobiology requires a more complex analysis. Harold Conklin's unpublished dissertation "The Relation of Hanunóo Culture to the Plant World" (1954) is widely hailed as a watershed moment in the development of ethnobiology. Conklin's work was groundbreaking both in its methodological sophistication and in its detailed documentation of "more than 1800 mutually exclusive folk taxa, while botanists divide the same flora—in terms of species—into less than 1300 taxa" (1954, 12). Conklin's study not only exemplified a new "ethnoscientific" program in anthropology but also provided a model for countless studies of ethnobiological classification that followed in the 1960s and 1970s. One may be tempted to argue that this influx of new data was already sufficient to push the young field of ethnobiology toward convergence metaphysics: as researchers returned from different parts of the world with stunningly similar accounts of taxonomic systems, their metaphysical explanation in terms of objective discontinuities in nature was an inevitable consequence.

Indeed, this is Berlin's (1992, 13) narrative when recollecting his first encounter with Conklin's work: "One October morning, after having spent several months of ethnobiological fieldwork in Chiapas, . . . I was pleasantly surprised to receive in the mail a dog-eared xeroxed copy of 'The Relation of Hanunóo Culture to the Plant World.'" What impressed Berlin was not only Conklin's detailed documentation of Hanunóo classifications but also the similarity between the taxa that are recognized by the Hanunóo in the Philippines and the Tzeltal in Chiapas: "I was suddenly confronted with an unlikely problem in culture history: *transpacific ethnobotanical contact between the Philippines and southern Mexico, direction of transmission not yet determinable!*" (Berlin 1992, 13, emphasis in original). Of course, Berlin did not actually assume that there was transpacific contact between the Hanunóo and the Tzeltal but rather concluded that they employ similar taxonomies because they recognize the same objective biological structures.

However, it would be misleading to explain the rise of convergence metaphysics solely as a reaction to novel data. Instead, Berlin's (1973, 7) passionate denouncement of the "relativistic position I once espoused myself" reflected a wider intellectual movement away from relativistic anthropology in the tradition of Boas toward a "universal human nature" as theorized by the so-called "cognitive revolution" and adopted by cognitive anthropologists.

The crucial importance of the cognitive sciences for the development of ethnobiology is widely recognized in the literature (see D'Ambrosio 2014; Hunn 2007; Ludwig 2018b; Sobral and Albuquerque 2016), and the prominence of convergence metaphysics cannot be understood independently of debates about universal cognitive structures that dominated the early days of the cognitive revolution. Universalism constituted a core theme in founding documents of the cognitive revolution, from Miller's (1956) hypothesis of a general capacity of the human short-term memory to Chomsky's (1965) universal grammar. Anthropologists who joined this young movement in the context of an "ethnoscientific" program often aimed for analogous insights about general rules and structures below the "surface" of cultural diversity. For example, Casagrande (1962, 280) argued that anthropologists and linguists share "the task of uncovering the common pattern, or the universal design, that underlies the exuberant variety of the particular configurations that we call cultures and languages." Convergence metaphysics would have been hardly possible without these universalistic ambitions that ethnobiologists shared with their peers in linguistics and psychology: instead of emphasizing the diversity of perspectives in the biological world, cognitive ethnobiology aimed at identifying underlying structures of convergence in classificatory systems.

While the influence of the cognitive revolution on the development of ethnobiology is widely acknowledged, the emergence of convergence metaphysics is equally indebted to a second theoretical development: species realism in the context of the "modern synthesis." Evolutionary biology had often been interpreted as challenging realism about biological taxa, with authors like Burma (1949), for instance, arguing that continuous lines of descent can only be divided arbitrarily, therefore exposing species as "a mental construct without objective existence" (1949, 369). Mayr's (1949) realist response to Burma is illuminating because it mobilizes the convergence of folk classifications and modern biology. In his 1949 exchange with Burma, Mayr writes that the "primitive Papuan of the mountains of New Guinea recognizes as species exactly the same natural units that are called species by the museum ornithologist" (1949, 371). In a later publication, Mayr (1963, 17) remarks: "I spent several months with a tribe of superb woodsmen and hunters in the Arfak Mountains of New Guinea. They had 136 different vernacular names for the 137 species of birds that occurred in the area, confusing only two species. It is not pure coincidence that these primitive woodsmen arrive at the same conclusion as the museum taxonomists, but

an indication that both groups of observers deal with the same non-arbitrary discontinuities of nature."

To sum up, the rise of convergence metaphysics in ethnobiology in the late 1960s was the result of at least three interacting factors: (1) new data about folk classification of unprecedented detail as pioneered by Conklin (1954); (2) the emphasis on universal cognitive structures in the early waves of the cognitive revolution, as we see, for instance, in Miller (1956) and Chomsky (1965); (3) the consolidation of species realism in the writings of Mayr (e.g., 1949, 1963) and other proponents of the modern synthesis. Building on these developments, convergence metaphysics in ethnobiology established itself as a research program that employed cutting-edge methods from different disciplines and captured the zeitgeist of both the human and the life sciences. Throughout the 1970s, ethnobiologists used these methods to generate innovative research such as Berlin et al.'s (1973) general principles, Hunn's (1975) measure of degrees of classificatory correspondence, and Brown's (1977) arguments for universal "life forms."

Convergence metaphysics in ethnobiology tells the story of an alternative ontological turn in anthropology, a turn that was thoroughly built around the idea of ontological similarity and aimed to overcome cultural relativism in anthropology through appeals to universality in both cognitive and biological sciences. Convergence metaphysics developed an ontological vision for anthropology that directly inverts current versions of the ontological turn, which largely center on questions of difference, driven by a deep suspicion about any claim of universality.

While the focus on similarity and universality continues to shape substantial parts of the cognitive sciences (and echoes in experimental philosophy; see Kiper et al. 2021; Mizumoto et al. 2018), it largely failed to reorient anthropology. The rapid rise of convergence metaphysics through the 1970s was followed by an almost equally rapid decline. By the time Berlin published his synthesizing *Ethnobiological Classification* (1992), ethnobiologists had largely given up on his strong metaphysical program while anthropologists had grown increasingly hostile to any consideration of cognitive or cultural universals. This is not to say that research on cross-cultural convergence has disappeared from academia. However, this research has been largely adopted in the cognitive sciences and isolated from cultural anthropology. Despite some scholars trying to foster interdisciplinary exchange at the intersection of culture and cognition (see Ludwig 2018b), there can be no doubt that the overall disciplinary groove has been one of mutual marginalization around

issues of similarity and difference. Cultural anthropologists are often outright hostile to any recognition of cross-cultural similarity as an expression of an intellectually and politically corrupt universalism. In converse, anthropology has largely disappeared as one of the constituting disciplines of cognitive science (Beller et al. 2012). Especially ethnographic explorations of cultural difference are ignored or treated as expressions of a methodologically and metaphysically inconsistent relativism.

While the fall of convergence metaphysics requires a complex historical narrative (see Ludwig 2018a), growing academic interest in Indigenous and local knowledge played a key role in a shifting focus from ontological similarity to difference. The rise of debates about "traditional ecological knowledge" (TEK) in the late 1980s and early 1990s (Berkes et al. 1994; Johannes 1989) provides a salient example of the move away from universals in ethnobiology. Of course, it was not a new discovery in the 1980s that ethnobiology involves cultural difference that shapes local expertise about environments. For convergence metaphysicians, however, the most important task of ethnobiology was to figure out what knowledge systems had in common and not to analyze in what ways they were unique. TEK shifted priorities in rather dramatic ways by emphasizing the importance of distinctly local forms of knowledge about specific environments and their uses for local communities and livelihoods.

While the increased recognition of TEK shifted attention to local forms of knowledge, many of these more specific challenges overlapped with a more general hostility toward universalist projects in cultural anthropology. Partly motivated by Geertz's (1973, 11) famous critique of the ethnoscientific tradition, ethnobiology of the late twentieth century increasingly found itself in heated controversies about postmodernism and poststructuralism in anthropology (Hunn 2007). Much of this literature challenged not only the epistemological foundations but also the political implications of projects that focused on convergence and complementarity. For example, Nadasdy (1999, 7) influentially argued that integration projects will often lead to a marginalization of knowledge that does not meet the criteria of scientists and resource managers: "whole aspects of aboriginal peoples' reality fall outside the established categories of scientific resource management."

In the context of ethnobiological classification, the most bitter controversies developed around Berlin's ethnopharmacological research in the late 1990s and the formation of the "International Cooperative

Biodiversity Group" in Chiapas. Following the general program of convergence metaphysics, Berlin assumed that Maya knowledge about pharmacological properties of plants would turn out to be largely commensurable with Western science and could be used for mutual benefit (Berlin and Berlin 1996). Anthropologists like Nigh (2002, 452) challenged the theoretical assumptions of convergence metaphysics and accused Berlin's program of doing "violence to indigenous meanings of nature, medicine, and property."

Recent decades have seen further fading of convergence metaphysics in ethnobiology as the field increasingly emphasized issues of local livelihoods and the political ecology of negotiating environments and interventions. Recent calls to decolonize ethnobiology further push toward recognition of diversity and difference by highlighting "Indigenous Peoples' right to self-determination in relation to research objectives, agendas, methodologies, and uses of data" (McAlvay et al. 2021, 179). It seems that speculation about universal taxonomic structures has become at best peripheral to ethnobiology that orients itself toward understanding local knowledge and local practices as core parts of Indigenous self-determination. At worst, it seems that universalist ethnobiology is politically antagonistic to decolonization efforts by pushing Indigenous knowledge and ontologies into a frame that obscures difference and undermines self-determination.

One may wonder whether these challenges actually call for a rejection of the entire program of convergence metaphysics. Surely, one could continue to treat cross-cultural convergence as a relevant issue in ethnobiology—and anthropology more generally—without denying the importance of cross-cultural divergence and without marginalizing distinctly local forms of Indigenous knowledge (Albuquerque et al. 2020). And indeed, there have been serious and methodologically sophisticated attempts to navigate this complexity. Ellen (1986), for example, proposed a model for the integration of cognitive and social factors in ethnobiological classification and concluded that "at once the debate between universalists and relativists is seen as the caricature it inevitably must be; an entirely false opposition sustained through ideological mystification and polemic" (1986, 93).

While Ellen's project can be read as a precursor of our framework of partial overlaps, Berlin (1992) was not having any of it. Responding to Ellen's suggestion that the contrast between universalists and relativists is an unhelpful caricature, Berlin insisted that "the debate, both in anthropology in general and ethnobiology in particular, is hardly a caricature" (1992, 11).

While universalists followed "biological systematists who hold that biological species are real" (1992, 12), Berlin argued that the relativist tradition in anthropology had become lost in postmodernist fashions. For Berlin, there remained a choice between two incompatible options: species are either recognized or rejected as universal natural kinds. Any attempt to come up with a compromise is going to blur this contrast between two irreconcilable metaphysical perspectives. Interestingly, the same attitude is found simultaneously in the writings of Douglas (1993) as one of the main proponents of the relativist tradition. Discussing the contrast between ethnoscientific and constructionist approaches in anthropology, Douglas warned about an "eclectic muddle" and continued by arguing that "nature cannot provide the basis of classification systems; there are no natural kinds, or if there are, biological species cannot be included" (1993, 161; see also Ellen 2006, 2).

While there may have been intellectual resources for a synthesis, Berlin's and Douglas's uncompromising attitudes reflect how cognitive and cultural anthropology continued to drift apart both institutionally and ideologically. Ontology beyond polemics about similarity and difference has been one of the victims of this mutual marginalization of cultural and cognitive anthropology. While the failures of convergence metaphysics illustrate shortcomings of an exclusive focus on ontological similarity, many problems of the ontological turn (see Wilson and Neco 2023) emerge from an exclusive focus on ontological difference. Ethnobiology could have provided an empirical entry point for an alternative narrative about complex ontological relations that recognize the interplay of similarity and difference (see also Story 4.1). The institutional and ideological polarization of the human sciences, however, largely prevented the emergence of such a debate. The following section introduces a framework of partially overlapping ontologies that aims to fill this gap in ethnobiology through models of property clusters in philosophy of science.

4.1.4 Understanding Ontological Overlaps

Anthropological debates about ontology have been dominated by polarization about difference and similarity. On the one hand, the ontological turn is grounded in a focus on difference, as expressed in appeals to "radical alterity," "incommensurability," or "different worlds." An exclusive focus on difference creates theoretical and political challenges, casting doubt on the

Story 4.1: Milho, Ixim, and *Zea Mays L.*

Beatriz Lopes Cerqueira

It was Portuguese summer when I traveled to Chiapas, Mexico. Though, up there in the mountains, where I would meet Zapatista Tzotzil communities—and, later, myself—the breeze was cold, and the sun, father, jto'tik, shined only for a few hours in the morning. Up there, in the mountains, te'tik, where the trees abound, I would reconnect with the milho (Portuguese for corn) through the ixim (Tzotzil for corn). Working in the milpa constituted more than removing the weeds for allowing the final stages of the ixim to grow healthy until harvest; it required mastering the skill of breath management to hold the machete and talk simultaneously. The milpa is a place to grow—corn, and relationships, through the sharing of stories, the basis for mutual trust. The Zapatistas trusted me with their stories in that milpa: they shared how they, as descendants from Mayans, were created through k'atajom ixim, one of the *Zea mays L.* landraces from the highlands of Chiapas.

I knew this story. How could I know this story? I shared back: I was created through milho, through a landrace that my grandfather cultivated and preserved year after year, unnamed—but he knew, and I knew afterward. I knew the milho that created me was different from the one I saw coming to my friends' fields, the Monsanto corn. "That is not the milho that created me!," I thought while my tiny feet were getting dirtier from running in my family's 0.1-hectare land; and I shared while my hands were getting dirtier in that milpa. We shared not only our stories, but our common story—the one of people created by ixim/milho, for whom *Zea mays L.* means nothing without our land, our identity; and for whom *Zea mays L.* means everything: our local knowledge, the health of our soils, the respect for our Mother Earth—Jme'tik Balumil / Mãe Terra—our identity. A transatlantic relationship was being created while weeding, one that had been born long before, with our peoples, with our lands, and vice versa. I know we are different—Tzotzil and rural Portuguese, the corn and the people. But we are also the same, united by our origin in a corn so different from the one that came to exploit our lands, our identities. I realized we are different but the same. And that is why we understood each other, we trusted each other, even though we had not shared these stories before, even though our creations were separated by the Atlantic Ocean. Our corns, our lives around the corns, and the knowledges

entangled with our own ways of being were re-created in the highlands of Chiapas, in that milpa. We realized we were not sharing stories of the same corn, but we knew it in similar ways: we knew our corns by heart, we grew up identifying them—and ourselves—through our dirty hands, our suns and rains, our relationships with the lands. Our relationships with the corns united us, and allowed us to understand our differences, and understand life and living entities beyond them. That is one of the best lessons ixim and milho taught me: to grow harmoniously I need to attend and care for the lands I grow with/in/from, and for the lands I do not know but I recognize—as the landraces my grandfather and the Tzotziles cultivate and preserve, year after year, so my and the Tzotzil kids—and peoples—can continue to be created through corn.

very possibility of mutual understanding and generating widespread anthropological frustration with the "ontological turn's fetishization of otherness" (Vigh and Sausdal 2014, 56). On the other hand, convergence metaphysics in cognitive anthropology provides a radical countermodel in structuring ontological considerations through cross-cultural similarities. Convergence metaphysics provided a successful approach in ethnobiology of the 1960s and 1970s, but its tendency to downplay and politically misplace ontological diversity contributed to its demise across social sciences and humanities. In this section, we argue that a framework of partial overlaps can overcome this polarization by accounting for both convergence and divergence of ontologies.

In developing the partial overlap framework, we start with debates about property clusters in philosophy of science (Boyd 1991; Slater 2015; Wilson et al. 2007) to show that ethnobiological ontologies can (a) overlap and create a fruitful basis for dialogue but also (b) diverge and thereby raise questions about ontological self-determination. Later sections will discuss limitations of property cluster models, as not all forms of ontological divergence can be explained as recognition of different patterns of clustering properties. However, the literature on property clusters provides an important entry point because it allows for a precise articulation of partial overlaps in ontology. And despite the somewhat technical term "property cluster," the basic idea of our proposal is straightforward: In contexts of cultural difference, actors will still often recognize similar patterns in the

world. At the same time, different interests and practices can direct attention to different properties and thereby lead to the recognition of different patterns.

Patterns that are sometimes but not always recognized across cultural differences provide an alternative to both universalist essentialism and unrestricted relativism in ontology (Ludwig 2023). For example, it has become widely recognized that essentialism fails in biology in the light of genetic and phenotypic variation (Ereshefsky 2010; Khalidi 2013; Wilson 1999). There is no list of necessary and jointly sufficient properties that define membership to a biological species such as jaguar (*Panthera onca*) (Dupré 1993). Indeed, jaguars share many salient properties, from ethology to morphology to genetics, but they lack essences. None of these salient properties are necessary for an animal to qualify as a jaguar—for example, a jaguar may be born without typical features such as a tail and four legs, or it may lose typical behavioral patterns due to circumstances such as captivity, and it will still be a jaguar. The same is true of variation at the genetic level. When moving from salient macro-properties to genetic micro-properties, there is also no list of necessary and jointly sufficient genes to qualify an animal as a jaguar. Any particular gene may be missing from the genome of an individual without calling into question its status as a jaguar.

Although one may wonder whether the tradition of natural kinds can be saved from these failures of essentialism (for a negative answer, see section 4.1.6), the alternative is not the common caricature of relativism as "anything goes" (Kusch 2020). There is too much intraspecies variation for defining *jaguar* through an essence, but there are still countless similarities between any two individual jaguars. In this sense, a category like *jaguar* is very different from a gerrymandered category like *animal born on a Tuesday*. There is not a whole lot to learn about animals born on a Tuesday other than that they are animals and that they were born on a Tuesday. In contrast, there is a lot to learn about jaguars, for instance, about their evolutionary history, about their behavior, about their morphology and anatomy, about their ecological and cultural significance, about their genetic properties, and so on. Even if there is no jaguar essence, individuals classified as jaguars are phylogenetically closely related and therefore share a lot of properties that make *jaguar* a useful category in science.

Property clustering provides a helpful entry point for thinking about ontological overlaps because it allows for a nonessentialist explanation of why

different cultures often recognize the same patterns in the biological world. For example, *jaguars* are recognized as a distinct kind of animal across the Americas—even if named with different terms, from *Balam* (Tzeltal Maya) to *Panthera onca* (academic taxonomy). The recognition of the same species from different Indigenous and academic perspectives is possible because jaguars share a distinctive cluster of properties, from bone structures and fur patterns to hunting behavior to ecological roles to genomes to phylogenetic histories. Tzeltal Maya and academic zoologists have different epistemic interests and cultural backgrounds, different ways of thinking about jaguars, and distinctive knowledge claims about them, but nonetheless recognize that members of the kind *jaguar* share a large variety of properties that clearly distinguish them from other organisms. Property clusters provide a simple but nonetheless effective account for explaining ontological overlap in the sense of shared commitments to the existence of jaguars.

Property clusters also help to explain how an ontology of *jaguars* is epistemically more productive than an ontology of *animals born on a Tuesday*. While the presence of typical properties does not guarantee that a kind can be cogently postulated (and vice versa), the connection is still stable enough to allow robust inferences. For example, if we know that an organism behaves in certain ways or has a certain bone structure, we can predict that it is a jaguar. Furthermore, if we know that an organism can be classified as a jaguar, we can infer that it will probably behave in certain ways or have a certain bone structure. Finally, probabilistic inferences are also possible from some properties to other properties. For example, knowledge about anatomical properties such as the structure of teeth and bones may allow us to predict types of hunting behavior.

More abstractly, our discussion suggests a picture that is summarized by Figure 4.1. Members of a kind K typically have a number of clustered properties P, Q, R, S, T, U, V, W, X. Some of the properties are only recognized in knowledge system S_1 (P, Q, R—stripes) or S_2 (V, W, X—solid) while others are known in both S_1 and S_2 (S, T, U—stripes and solid). Ontological overlap is generated by both S_1 and S_2 recognizing a sufficient number of properties that allow them to co-identify the cluster K. Knowledge integration in this model can be epistemically productive to the extent that it may lead to a more comprehensive account of the typical properties of members of K. Despite its simplicity, this model works well with a range of case studies that can be understood in terms of partly overlapping ontologies.

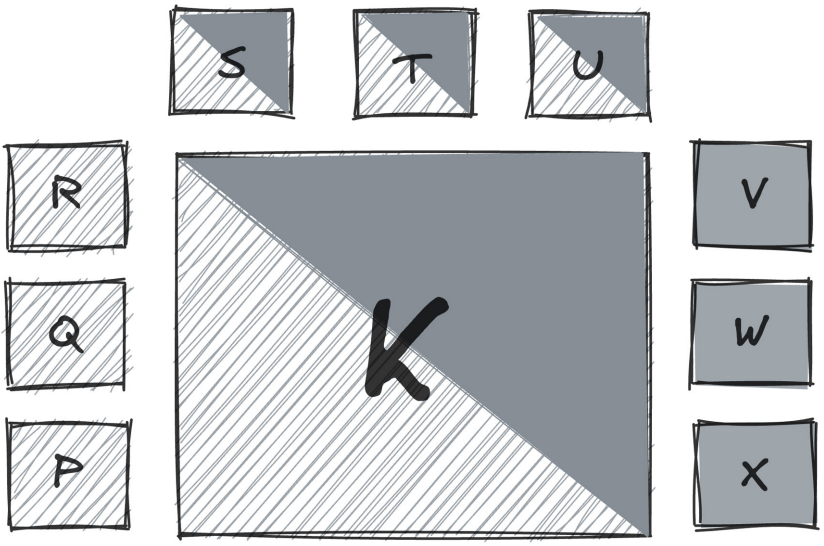

Figure 4.1 A kind K with properties P – X that are partly recognized by knowledge system S_1 (stripes), partly by S_2 (solid), and partly by both knowledge systems (stripes and solid).

Arctic Foxes have a circumpolar distribution in tundra habitats of North America, Asia, and Europe (Gagnon and Berteaux 2009). Although arctic foxes are omnivores and opportunistic feeders that inhabit vast territories, scientific information regarding their winter diet is highly fragmented. A consideration of local Inuit knowledge of the Mittimatalik community in Nunavut, as it turns out, expanded academic knowledge in various areas. For example, members of the Mittimatalik community identified two distinct strategies of feeding (marine vs. terrestrial) in this region as well as differences in fur characteristics depending on the feeding strategy. Members of the Mittimatalik community had fine-grained knowledge about arctic foxes that was previously undocumented by academic researchers. Gagnon and Berteaux (2009) suggest that the case of arctic foxes contrasts with another case study of snow geese because knowledge about the former is locally restricted. While snow geese are migratory birds, arctic foxes adapt locally in their behavior, ecological role, and even morphological properties. In the case of arctic foxes, it is therefore not surprising that members of the Mittimatalik community and academic researchers have different bodies of

knowledge about different properties of the same cluster. Mittimatalik Inuit and academic biologists refer to the same biological kind (which academic biologists call *Vulpes lagopus*) but have knowledge of different properties of this kind. While Inuit have knowledge of properties with local markers such as unique feeding strategies and fur characteristics, academic biologists have knowledge primarily of (e.g., anatomical or phylogenetic) properties that generalize across the large circumpolar habitat of arctic foxes. In this case, transdisciplinary integration proves epistemically fruitful and has the potential to contribute to the development of local conservation strategies.

Common Eider Ducks (Gilchrist, Mallory, and Merkel 2005) are large marine birds that are harvested by local Inuit in Nunavut, Hudson Bay. Eider duck populations are vulnerable, as they do not migrate but rely on polynyas, pockets of open water that are surrounded by ice. After a report of declining populations in the 1990s, academic biologists and Inuit collaborated in a survey that crucially relied on local knowledge such as locations of important polynyas and wintering behavior of eider ducks. While the example of arctic foxes shows that the scale relativity of Indigenous knowledge often allows epistemically productive knowledge integration, the case of eider ducks also illustrates how such a knowledge integration can be valuable in conservation efforts. As Gilchrist et al. (2005, 20) point out, local Inuit knowledge about wintering behavior and polynyas was of crucial importance for documenting a "dramatic population decline [that] would have gone undetected by Western science." Following the proposed integration model, we can describe this case of successful knowledge integration as involving recognition of the same biological kind (which scientists have named *Somateria mollissima*) as well as knowledge about different properties of this kind. Only the integration of both knowledge systems allowed an accurate estimate of the dramatic population decline of 75% and therefore proved crucial for conservation efforts.

Bowhead Whales (Huntington 2000) in Alaska became regulated by a harvest quota after a successful political fight of Indigenous whalers against a general hunting ban in 1977. Establishing an appropriate quota required a census that started with visual counts by academic researchers and led to an initial estimate of less than 3,000 bowheads. The local hunters disputed this estimate and argued that the count missed bowheads that migrate under the ice when the lead (i.e., fracture of sea ice) is closed. A new census that incorporated this local knowledge about migration behavior produced a very

different and more accurate estimate of a bowhead population of 6,000-8,000. Again, the example neatly fits the idea that integrating knowledge about the same kind can be epistemically productive. While academic researchers certainly have knowledge about bowheads that is not available to local whalers, the reverse turned out to be true in the case of local migration patterns. Only the integration of knowledge from both contexts allowed an accurate population estimate. The case of bowhead whales, therefore, complements the example of arctic foxes by showing that transdisciplinary integration can be epistemically productive, and the case of eider ducks by illustrating practical implications for conservation management. Furthermore, it also indicates that knowledge integration can be of direct benefit for Indigenous communities by allowing the development of sustainable hunting quotas. It additionally shows that it is often important for local communities to be knowledgeable about Western scientific approaches so that they can dispute conclusions of studies that affect their livelihoods. This highlights the relevance of the proposal that schooling and other educational processes foster both the understanding of academic scientific ideas, as transposed into school knowledge, and a dialogue between these ideas and those from Indigenous and local knowledge systems. We will return to this topic in section 5.2.3.

Our examples of three different arctic species illustrate ontological overlaps and the epistemic potentials of knowledge integration based on ontological overlaps as explained in Figure 4.1. Both Indigenous and academic biologists recognize clusters of properties that are stable enough to be identified by heterogeneous actors in very different contexts. This ontological convergence can ground productive transdisciplinary integration if different actors have knowledge about different properties of the same kind. In our three examples, Indigenous communities had knowledge about the migration behavior of bowhead whales, polynyas used by eider ducks, and fur patterns and local hunting strategies of arctic foxes, while academic biologists did not. At the same time, academic biologists also have knowledge about these species—for example, about phylogenetic relations—that is not widely available in local communities. While both Indigenous and academic biologists have different bodies of knowledge, integration turns out to be possible and epistemically beneficial because of an ontological overlap that ensures co-reference to the same kinds. This optimistic result is grounded in ontological overlaps in the sense that knowledge integration is made possible

by recognizing the existence of the same kinds. But as the partial overlaps framework emphasizes, it is not always the case that two knowledge systems recognize the same kinds.

4.1.5 Ontological Partiality in Ethnobiology

The previous section showed that ontological overlaps often emerge from the recognition of properties in the same property cluster. We also emphasized that this simple model can explain how transdisciplinary knowledge integration can become epistemically productive—actors have complementary knowledge about the same cluster, and integration therefore generates a richer picture. In this section, we shift from overlaps to partiality by arguing that property clustering not only is useful for explaining successful knowledge integration but can also aid understanding of how knowledge integration is limited by ontological divergence. More specifically, we argue that cross-cultural difference results in the recognition of different property clusters for at least two reasons. First, different goals and practices lead to a focus on different properties and regularities. Second, there are actually different properties and regularities to be found in different domains of inquiry.

Sources of ontological divergence I: Goal dependency. It has become a truism in anthropology that Indigenous accounts of nature are often "holistic." In section 3.1.4, we challenged the simple "myth of two knowledge systems" in which the holism of Indigenous knowledge is contrasted with a cliché of "reductionist Western science." That being said, there are many instances in which Indigenous perspectives are indeed more holistic than the perspectives of academic researchers. For example, Indigenous knowledge about the biological world tends to focus more on relations between plants, animals, humans, and the land, and to a much lesser degree on internal (e.g., anatomical or genetic) properties of organisms. As Atran (1998, 562) puts it in the context of the Itza' Maya of the lowlands of northern Guatemala:

> Historically, the West's development of a worldwide scientific systematics explicitly involved disregard of ecological relationships, and of the colors, smells, sounds, tastes, and textures that constitute the most intimate channels of Maya recognition and access to the surrounding living world. For example, the smell of animal excrement so crucial to Maya hunters, or the texture of bark so important to their recognition of trees in the dark

> forest understory, simply have no place in a generalized and decontextualized scientific classification.

Atran's quote helps to uncover two related drivers of ontological partiality. First, Indigenous communities often recognize different properties and regularities because they focus to a much larger degree on ecological relations and are less concerned with internal properties of organisms. Second, Indigenous communities also often focus on properties such as the texture of bark that are important in supporting local practices but may be considered negligible by academic researchers. The observation that attention to properties and regularities is socially mediated is ubiquitous in ethnobiology but also in other domains (Kendig 2020; Weiskopf 2018). For example, consider ethnopedological research on the classification of soil types (Araujo et al. 2013; Kendig 2024; Ludwig 2017; Salinas 2017). Indigenous and academic classifications of soil types typically overlap in the recognition of some general (e.g., morphological) features of soil but also diverge in cases where accounts are shaped by the specifics of local (e.g., agricultural) practices. These socially mediated differences do not suggest that Indigenous accounts of soil types are oblivious to empirically determined properties of soil. Instead, divergence in accounts of soil types reflects different empirically determined properties and causal relations depending on the practices that these accounts support. For example, Yucatec Maya classifications reflect properties such as soil depth, stoniness, or drainage conditions that are of crucial importance for local agricultural practices but are often ignored by academic soil taxonomies, such as the World Reference Base for Soil Resources (Bautista and Zinck 2010).

These different perspectives cast doubt on a one-sided focus on ontological overlaps in the sense of the previous section. If Indigenous accounts of organisms or soil types are shaped by considerations of different properties such as ecological relations and socially relevant regularities, it is not surprising if these accounts also recognize different kinds. For example, Yucatec Maya and pedologists focus on different properties of soil and therefore recognize different clusters of properties. More generally speaking, the significance of a property cluster cannot be evaluated independently of the epistemic and social goals that shape an ontology.

Many ontological partialities in ethnobiology are also the result of different strategies of taxonomic "lumping" and "splitting": considering a given set of species, splitters name a greater number of distinctions

in the set than lumpers (Berlin, Shilts Boster, and O'Neill 1981; Berlin 1992). In Siribinha and Poças, for example, consider the case of two species of sandpipers recognized in the local taxonomy: the small and large sandpipers (in Portuguese, *Maçarico-pequeno* and *Maçarico-grande*) (El-Hani and Ludwig 2024; Ludwig and El-Hani, 2020). In this case, the fishers are lumpers in relation to academic scientists, who split the fishers' category of small sandpiper into *Actitis macularis*, *Arenaria interpres*, *Calidris alba*, *Calidris pusilla*, *Charadrius collaris*, and *Charadrius semipalmatus*, while the category of large sandpiper is split into *Numenius hudsonicus*, *Tringa melanoleuca*, *Tringa semipalmata*, *Pluvialis squatarola*, and *Limnodromus griseus*. The fishers' taxonomic categories are empirically valid, as these 11 academic species are indeed distributed in two size classes, that is, just as in the case of soil types above, the distinctive categories in the fishers' taxonomy do not mean they are oblivious to empirical properties of the animals being classified, but just that they and the academic researchers focus on distinct property clusters. Moreover, the fishers do not classify sandpipers with the same goals as academic scientists, namely, to inquire into phylogenetic relationships, which leads to a fine-grained classification of sandpiper species.

Of course, the goal dependency of ontologies is not a new claim in philosophy of science; rather, it is commonly defended in the context of ontological pluralism (e.g., Chakravartty 2011; Danks 2015; Dupré 1993; Kitcher 1984; Ludwig 2014; Ruphy 2010) and has more recently become the center of philosophical attention to the value-ladenness of ontologies (Ahn 2020; Brigandt 2022; Ludwig 2016a; Reydon and Ereshefsky 2022; cf. Khalidi 2024). Furthermore, it is not difficult to see how such an ontological pluralism in philosophy of science supports the expectation of ontological divergence in ethnobiology. If diverging goals and values within academic research can lead to the use of different ontologies, we should *a fortiori* expect similar effects in Indigenous and academic communities that have much more pronounced differences in epistemic and social goals (Dupré 1999).

Sources of ontological divergence II: Local clusters. While the goal dependency of biological ontologies provides one reason to expect limitations to knowledge integration, there are also different property clusters to be found in different domains of inquiry. Not only goals and interests but also material realities vary between cultures. Consider the mycological knowledge of the Tzeltal Maya of Chiapas (Lampman 2007), who identify many property clusters that are only locally stable. The mushroom taxon *Tsa'*

wakax appears to identify a stable property cluster within the highlands of Chiapas: members are usually small, of brownish color, short-lived, inedible, having gills, well-developed stipes, thin stalks, they grow on grasslands, shrivel up in the sun, have no cultural use, are found between June and October, and so on. However, there is little reason to believe that this cluster of properties will be stable across a range of environments beyond Chiapas. In a different environment (e.g., Appalachian Mountains), mushrooms that are classified as *Tsa' wakax* may not grow primarily in grasslands and may also be found in a different time of the year. Furthermore, typical features such as being short-lived, having brownish color, and gills may be just as common among mushrooms that do not fall under the taxon *Tsa' wakax*. In other words: *Tsa' wakax* may be a stable property cluster in Tzeltal lands but not in other environments.

The local stability of a property cluster within a specific environment such as the highlands of Chiapas also implies that we should expect some inferences to be only locally reliable. In the last section, we suggested that Indigenous knowledge can ground probabilistic inferences. For example, knowledge that a mushroom is found on grassland in October and has a thin stalk and a well-developed stipe may allow the probabilistic inference that it is *Tsa' wakax*. Knowledge that a mushroom is found on grassland in October and has a thin stalk may also be sufficient to predict that it is not edible, and so on. However, these predictions appear to be local in the sense that they are only reliable in a restricted domain. Knowledge about certain properties of a mushroom may be sufficient to infer that it is probably not edible in the highlands of Chiapas, but knowledge about the same properties may not be sufficient to make this inference in the Appalachian Mountains.

The example of *Tsa' wakax* illustrates that a kind can qualify as a stable property cluster under the boundary conditions of a domain of inquiry A (e.g., that of the Tzeltal Maya) but not under the boundary conditions of another domain of inquiry B (e.g., that of academic mycology). Indeed, there are countless properties of populations that are stable within one environment but not in another. A plant may prefer a specific soil and proximity to another species in one environment but not in another. A mushroom may be eaten by boars and only grow in the forest in one environment but not in another, and so on. As a consequence, a group of organisms can form a salient and relevant property cluster within an Indigenous knowledge system while being considered at best superficially unified by an academic taxonomist.

This recognition of different property clusters provides a clear challenge to knowledge integration. In contrast to the examples of successful knowledge integration from the previous section, Indigenous knowledge about *Tsa' wakax* does not provide novel information about a biological kind that is already part of an academic biological ontology.

Locally stable property clusters can be grounded in the specific ecological conditions of a restricted environment, but they can also be the product of other mechanisms, such as local social practices. As Khalidi (2015) has argued, many social kinds satisfy standard criteria for natural kinds in the sense that they involve stable property clusters that are causally unified and sometimes also exist independently of us recognizing them as kinds. These observations are often presented as a challenge to the common distinction between natural and social kinds (see Guala 2014; Khalidi 2015; Kincaid 2000; Thomasson 2003), but they also identify another mechanism that can lead to locally stable property clusters. While some social kinds such as money appear in vastly different societies, others reflect social dynamics that are unique to a specific cultural context. In this sense, both local ecological and social dynamics can ground locally stable property clustering. Again, we should expect local communities to employ at least a partly different ontology that acknowledges the existence of different social kinds within their target domains.

While local social dynamics can ground social kinds, they are also of crucial importance for a less commonly considered class of "hybrid" kinds that involve mixed clusters of properties from different (e.g., biological and social) domains. In the case of ethnobiology, the relevance of biological properties is often mediated by social practices that confer a range of novel social properties (e.g., aesthetic, agricultural, culinary, economic, medical, spiritual, or symbolic). For example, an Indigenous community may distinguish between two varieties of a mushroom because they are used in different medical contexts and therefore also have different economic, spiritual, and symbolic properties. While the two varieties have different chemical properties (the difference in chemical composition that allows different medical uses) and morphological properties (the markers that are used by the community to distinguish the varieties), they become recognized as distinct kinds in a local taxonomy only because the chemical and morphological property cluster is enriched by social properties. Without social embedding, the varieties might appear as only superficially distinct members of the same taxonomically relevant kind.

Indeed, this is a common scenario in the case of mushrooms. Indigenous societies strongly differ in their social (e.g., medical, nutritional, or spiritual) uses of mushrooms and therefore also employ radically different mycological taxonomies (Ellen 2008). The examples of local biological, hybrid, and social kinds all illustrate that properties and regularities are not always geographically evenly distributed. It is therefore far from surprising that societies will often employ different ontologies that reflect their local biological and social environments. Note that this source of ontological divergence differs from goal dependency: two societies could have the same goals but still employ different ontologies because they engage with different environments (and vice versa).

We argued that overlaps between Indigenous and academic ontologies will be partial because of different goals as well as the occurrence of different property clusters in distinct domains of inquiry. More abstractly, we can summarize this result by extending the model presented in the last section. Our examples of successful knowledge integration are represented by the case (A) where a kind K is recognized by both knowledge systems S_1 (stripes) and S_2 (solid). A prototypical case of ontological divergence would be the case (B) where a kind K' is only recognized by S_1 and only S_1 involves knowledge about properties that are shared by the members of K'. A related scenario is (C) where at least some properties are recognized by both knowledge systems, but only one of them recognizes K'' as a relevant kind. For example, recall the case of "hybrid kinds," such as culturally significant varieties within a single species. While salient morphological properties P''–R'' of the variety K'' may be known in both S_1 and S_2, only S_1 recognizes uses in local (farming, fishing, medical, spiritual, etc.) practices and therefore includes K'' as a distinct taxon.

In section 4.2.4, we will discuss the kinds of fish recognized by fishers in Siribinha. In some cases, the community splits one academic species into several local ethnotaxa that are relevant for the fishing practices of the community but not relevant for academic researchers. In these cases, the relations between local and academic taxonomies are inverted in relation to lumping and splitting: for instance, academic scientists lump into a single species, *Centropomus undecimalis*, at least three different species identified by the fishers, namely, *Robalo comum/normal/verdadeiro*, *Robalo espalmado/espada*, and *Robalo suvela* or *Robalão* (Renck et al. 2022a).

Recognizing the partiality of ontological overlaps in the sense of Figure 4.2 matters for methods and politics of transdisciplinary encounters.

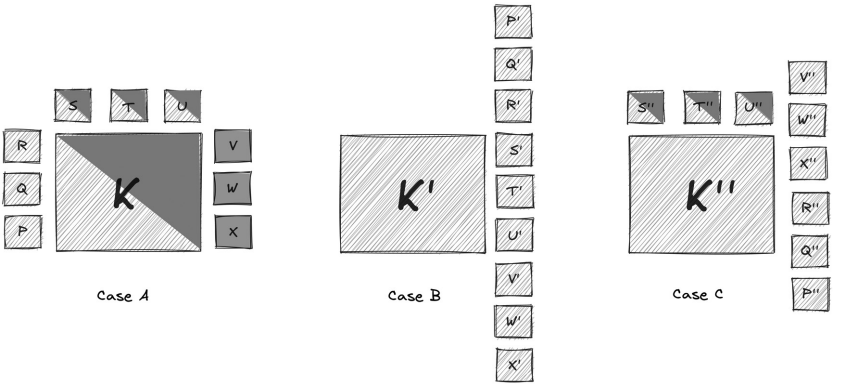

Figure 4.2 Case A illustrates successful knowledge integration. Both knowledge systems S_1 (stripes) and S_2 (solid) recognize the same kind K but have knowledge about different properties of K. Cases B and C illustrate failed knowledge integration in which only S_1 (stripes) recognizes K′ or K″. In Case B, only S_1 recognizes any of the clustered properties [P′ – X′] while S_2 does not recognize clustered properties and therefore also not the kind K′. Case C may be the empirically more common case. S_1 recognizes a rich property cluster [S″ – V″] and therefore also recognizes K″ as a relevant kind in its ontology. S_2 only recognizes some properties [S″ – U″] and therefore does not recognize K″ as a relevant kind.

While shared reference to the same property clusters (Figure 4.2A) clearly facilitates knowledge integration, ontological divergence (Figure 4.2B and Figure 4.2C) challenges simple appeals to integration. For example, knowledge about *Tsa' wakax* cannot be integrated into academic biology in the same way as knowledge about *Balam* (jaguar) because only the latter appears in academic biological ontologies (as *Panthera onca*). Indigenous knowledge about kinds that are not even remotely similar to any academic scientific kinds will often be missed entirely or not taken seriously. Although one may describe cases of ontological divergence such as *Tsa' wakax* or different soil types in terms of "taxonomic incommensurability" (Sankey 1998), this does not imply that academic researchers are incapable of making sense of alternative ontologies. By taking the goals of Indigenous communities and their domains of inquiry seriously, an academic biologist may recognize a kind that is unique to an Indigenous ontology and its relevance for local practices.

4.1.6 What's Left of Natural Kinds?

The "tradition of natural kinds" (Hacking 1991) has dominated ontological reasoning in philosophy of science. At its core, this tradition expresses a realist attitude toward scientific ontologies as based on empirical discovery about the structure of the world rather than mere linguistic constructions or conventions. As we discussed in the section on "convergence metaphysics," the assumption of natural kinds shaped the early days of ethnobiology. Cross-cultural convergence of taxonomies was interpreted not merely through the lens of natural kinds but presented as empirical evidence for objective "discontinuities in nature" (Hunn 1973) that are universally recognized independently of cultural and social diversity. For ethnobiologists like Berlin (1992) and Hunn (1973), only a strong realism about natural kinds could explain ethnotaxonomic data showing that communities around the world categorize the biological world in strikingly similar ways.

Our story about the "rise and fall of convergence metaphysics" traced the decline of natural kind debates in ethnobiology. First, cross-cultural convergence of categories may tell us more about human cognition than natural kinds. If different cultures use similar categories like *tree* or *fish*, for example, this may reflect universals of human perception, reasoning, and practice rather than these categories being demarcated by objective discontinuities in the biological world. Second, ethnobiological appeals to natural kinds were often driven by a narrow focus on cross-cultural convergence, sidelining evidence about categories that reflect local ecological, economic, cultural, social, or spiritual concerns. As questions of local livelihoods and Indigenous self-determination gained prominence in ethnobiology, priorities often shifted from the search for universal categories to contextualized attention to local categories and their functions in local practices.

The fall of convergence metaphysics in ethnobiology runs parallel to a mounting crisis of the tradition of natural kinds in philosophy of science. During the heydays of convergence metaphysics in ethnobiology in the 1960s and 1970s, analytic metaphysics also often simply assumed that scientific categories identify natural kinds with discrete essences. As convergence metaphysics declined in ethnobiology toward the end of the twentieth century, philosophers of science also increasingly pointed out that "biological classification provides no encouragement to essentialism. Not only does essentialism fail in biology, but it can be argued that there is not even a

unique set of kinds into which biological organisms should ideally be sorted" (Dupré 1993, 6).

In recent years, the crisis of essentialism has grown into a crisis of the tradition of natural kinds as a whole. It may not be enough to get rid of some of its essentialist baggage as a growing chorus of philosophers insists that the tradition of natural kinds has outlived its usefulness and tends to be both metaphysically and normatively misleading (Hacking 2015). On the metaphysical side, the project of one general demarcation criterion for "naturalness" has been challenged. Attempts to divide the diversity of human categories into a "natural" and a "non-natural" half may lack sufficient nuance (Ludwig 2018c) and thereby make philosophical debates largely irrelevant for scientific practice (Chakravartty 2023; Papale and Montminy 2023). On the normative side, the tradition of natural kinds has been criticized as a driver of parochial attitudes that have largely divorced philosophy of science from interdisciplinary discussions about the social and political complexity of conceptual change in science (Brigandt 2022; Ludwig 2023). In the case of deeply contested categories such as *biodiversity, mental disorder,* or *race,* for example, the tradition of natural kinds encourages superficial engagement with normative issues by focusing on a narrow set of criteria to determine "naturalness" (Ludwig 2021)

Even if the tradition of natural kinds is in disarray (for the longer argument, see Ludwig 2018c, 2023, 2024), many philosophers are still hesitant to give up on it. One reason to defend the tradition of natural kinds is the metaphysical worry that it provides the main realist anchor of philosophy of science that distinguishes it from untenable forms of constructivism and relativism in poststructuralist science studies. Natural kinds have been central to explaining why some categories are explanatorily more fruitful than others, why categories succeed in supporting inductive inferences and predictions, why categories converge across cultures and disciplines, and why categories can be supported or challenged by empirical evidence. Abandoning the tradition of natural kinds, one may worry, will lead to a poststructuralism that reduces scientific categories to linguistic constructions and discursive power.

Poststructuralism promised conceptual liberation, eschewing the notion of naturalness by instead understanding concepts "as fundamentally social, precisely because dominant essentialist accounts legitimized [them] as 'natural' and thus inevitable and immutable" (Rahman and Witz, 2003, 244). The narrative of conceptual liberation captured the imagination of academics

and activists far beyond professional philosophy, as most clearly reflected by the popularity of the writings of philosophers like Michel Foucault (1976) and Judith Butler (1990). Abandoning naturalness not only highlights the role of politics in categories such as *gender* and *sex* but also opens up space for their deconstruction and reconstruction for emancipatory politics.

Poststructuralism challenges both essentialism and depoliticization in the tradition of natural kinds but is also limited by failing to provide positive frameworks for analyzing the structure of categories beyond discursive power. While it is indeed insufficient to analyze categories such as *gender* and *sex* through the lens of natural kinds, it is equally limiting to analyze them exclusively as linguistic constructions. In feminist philosophy, much of the discontent with the limitations of poststructuralism has become expressed in a return of materiality and materialism. For example, Jagger (2015, 321) introduces the "new materialism" in feminist philosophy as "a response to the linguistic turn that has dominated the humanities in the past few decades and that, it is claimed, has neglected the materiality of matter." Jackson (2001, 285) takes more explicit aim at poststructuralist philosophies by arguing that their project of subversive conceptual liberation ultimately made them "lose touch with material social structures and practices. . . . The cultural turn effectively sidelined this materialist analysis and emptied the concept of gender of its social import as a hierarchical division between women and men." Many of these concerns become even more salient when engaging with the diversity of scientific categories and their epistemic functions in scientific practices. Even if essentialist accounts of natural kinds fail, epistemic functions of scientific categories such as their ability to support inductive inferences require a positive account beyond their framing as linguistic constructions.

As the tradition of natural kinds is facing mounting criticism and linguistic constructivism in poststructuralist traditions is not an attractive alternative, the main response in philosophy of science has been busy reformism. A constant flow of new theories promises to fix the problems of the tradition of natural kinds. Redefining "natural kind" has become its own genre of philosophical literature, including proposals of homeostatic property clustering (Wilson et al. 2007), stable property clustering (Slater 2015), nodes in causal networks (Khalidi 2018), causal unification (Lemeire 2015), pure projectability (Valero 2023), indispensability (Magnus 2012), categorical bottlenecks (Franklin-Hall 2015), and grounded functionality (Ereshefsky and Reydon 2023).

Approaching this crowded field of reform proposals through the lens of ethnobiological research generates both positive and negative lessons. On the one hand, many of these recent proposals provide helpful frameworks for making sense of ethnobiological categories and of global ontological diversity more generally. Incorporating their frameworks in debates about ontological diversity highlights that local categories are shaped not only by discursive power but also by empirical insights about property clustering and causal networks as well as epistemic concerns about functionality and fruitfulness. On the other hand, ethnobiology provides a window into global ontological diversity that casts doubt on any of these proposals succeeding in their ambition of providing a "general natural kind concept" (Slater 2015, 3) or "a unified causal account of natural kinds" (Khalidi 2018, 1).

Starting with the positive lessons, the previous sections demonstrated the usefulness of property cluster models for exploring ethnobiological categories. Local communities are often experts about local biodiversity and keenly aware of many material—for example, anatomical, behavioral, ecological, economic, culinary, medicinal, or morphological—properties of animals and plants. As local classifications of the biological world are shaped by this knowledge, some of them identify property clusters that are specific to a local context and therefore do not correspond to categories of academic biologists. Others identify clusters that are stable across contexts and therefore recognized by diverse actors, from Indigenous communities to biological systematics. Property cluster models are insightful when trying to trace dynamics of cross-cultural convergence and divergence of categories. They are also helpful to address metaphysical anxieties that arise when global ontological diversity turns biological categories into nothing but linguistic constructions. Rather than reducing categories to discursive power, property cluster models show how diverse categories are grounded in equally diverse knowledge about material structures.

Even if property cluster models are helpful for understanding many ethnobiological categories, they do not always provide the most helpful framework for engaging with global ontological diversity. For example, some ethnobiological categories are driven by specific concerns—say, culinary or medicinal—that do not involve "homeostatic" or "stable" clustering. Think of categories such as *poisonous vine* or *edible mushroom* that may not involve homeostatic clustering but are still grounded in material structures relevant for local communities rather than being arbitrary linguistic constructions. Not every fruitful ethnobiological category is grounded, thus, in property

clusters. Limitations of property cluster models have also been pointed out in philosophy of science and motivated alternative frameworks such as Ereshefsky and Reydon's (2024) grounded functionality account of natural kinds. Ereshefsky and Reydon require categories to be grounded in "an aspect of the world rather than merely on human interests" while functional "in achieving the aims [they are] posited for" (2024, 4). Grounded functionality may be achieved through property clustering but also through other means, therefore providing a more inclusive account for engaging with the diversity of ethnobiological categories and with global ontological diversity as a whole.

While Ereshefsky and Reydon's account is helpful for appreciating diverse forms of grounding and functionality, not all ethnobiological concerns are captured by their framework. For example, recall ethnobiological interests in cross-culturally stable categories that were at the center of "convergence metaphysics," as discussed in section 4.1.3. Indeed, natural kinds became a concern in ethnobiology to make sense of evidence showing that people around the world often classify animals and plants in strikingly similar ways. Grounded functionality does not help to clarify this more restricted phenomenon of cross-cultural convergence, as many kinds that are unique to a specific culture still turn out to be grounded and functional. Understanding cross-culturally stable kinds requires more than grounded functionality and points toward more restrictive frameworks, such as Franklin-Hall's discussion of natural kinds as "categorical bottlenecks" that "to some degree line up with one another" (2015, 932) because they are recognized by diverse epistemic actors across diverse contexts.

Different frameworks such as "property clusters," "grounded functionality," and "categorical bottlenecks" have different virtues that make them useful for different purposes. Rather than prioritizing one of them as a general definition of naturalness, we are much better off embracing the diversity of nonarbitrary categories in (and beyond) ethnobiology. Some ethnobiological categories highlight material structures that are recognized across cultures while others point toward social or spiritual norms that are locally negotiated. Many ethnobiological categories clearly involve material and normative elements in the sense of being driven both by empirical knowledge about biological properties and by normative negotiation of their social importance. Often, they exhibit a complex interplay between material structures and normative concerns. Normative concerns (say, about successful farming) shape attention to material properties (say, yield of a plant).

In reverse, empirical knowledge about material properties (say, medicinal effects) shapes norms (say, appropriate uses in medical practice).

The messy complexity of ethnobiological kinds does not sit well with the tradition of natural kinds. They are often too practical. Too local. Too political. Too spiritual. And they often do not aim to "carve nature at its joints." But ethnobiological categories also do not sit well with poststructuralist framings of categories as merely linguistic constructions, as they are also shaped by empirical knowledge about the structure of the material world.

Refusing to divide ethnobiological kinds into a "natural" and a "non-natural" half while recognizing the usefulness of frameworks such as "property clustering," "grounded functionality," or "categorical bottlenecks" allows for a nuanced engagement with global ontological diversity. It emphasizes that local categories are usually more than linguistic constructions, as they reflect local knowledge about properties and regularities of the material world. At the same time, it allows for recognition of the many ways in which ethnobiological kinds are shaped by normative concerns and involve value-laden "ontological choices" (Ludwig 2016a) rather than "carving nature at its joints" in a value-free manner. Giving up on the program of one general definition of "natural kind" and recognizing the many different dimensions of nonarbitrary classification opens up a space for engaging with global ontological diversity beyond the limitations of the traditions of both natural kinds and linguistic constructivism.

4.1.7 Radical Alterity and the Limits of Representation

The previous sections outlined an account of partially overlapping ontologies and contrasted it with the exclusive focus on difference in the ontological turn of cultural anthropology and the exclusive focus on similarity in the convergence metaphysics of cognitive anthropology. The partial overlaps framework not only is descriptively more accurate in recognizing complex relations between ontologies but also provides a basis for transdisciplinary and transformative practices that can identify common ontological ground for collaboration and mutual learning while recognizing the need to negotiate new ontological grounds rather than simply assuming the validity of dominant frameworks.

Interpreting partial overlaps through property clusters, as we proposed in the previous sections, demystifies ontological difference. The biological

world is a messy place that can be conceptualized and represented in many different ways. It is not surprising that Indigenous communities and academic researchers often highlight different properties and regularities when distinguishing between kinds of animals, plants, soils, and so on. While differences in biological ontologies can come with the appearance of radical alterity, intercultural care and effort can make many of these differences cross-culturally understandable. For example, an academic scientist can acknowledge that an Indigenous community recognizes properties of soils that are related to Indigenous farming practices and lead to distinctions between soil types that are quite different from the categories used by an academic pedologist. It takes care, immersion, and reflexivity to make sense of other taxonomic groupings, but there is no need for grandiose claims about incommensurable worlds that are metaphysically impossible to cross.

The framework of property clusters suggests a representational pluralism that interprets alterity through a multiplicity of ways of representing the world that responds to a multiplicity of goals and practices. And the same can be said of other approaches to natural kinds, such as, say, the grounded functionality account. Indeed, such representational pluralism is well-established in many other areas of philosophy of science that engage with the large variety of epistemically productive concepts, models, and theories in scientific practice (Ludwig and Ruphy 2021). It also resonates with a large range of pluralist (Longino 2020; Ruphy 2013), perspectivist (Massimi 2022; Winther 2020), and neo-pragmatist (Lohse 2017; Putnam 2004) approaches that have been embraced by philosophers of science in accounting for the large variety of representational tools that are used to make sense of the world. Rather than assuming that science converges on one absolute description of reality, representational pluralism recognizes that there are always different ways of conceptualizing and framing a target domain and that the diversity of epistemic projects in science inevitably comes with a diversity of epistemic tools.

Such a pluralism demystifies alterity by interpreting it as the result of different representational needs. What appeared to be radical alterity without any possible bridges may therefore turn out to be just regular alterity with the possibility of intercultural understanding. This tendency to demystify alterity is both a strength and limitation of the representational framework. On the one hand, it makes ontological difference accessible and understandable in transdisciplinary practices. It shows how we can learn from both ontological similarity and ontological difference in creating richer intercultural

understandings of domains. It also provides methodological and political entry points for addressing the sophistication of Indigenous ontologies and against implicit assumptions of exclusive validity of academic ontologies.

On the other hand, we do not think that the appearance of radical alterity is always misleading or that representational pluralism is always sufficient to address ontological plurality. In this section, we argue that radical alterity needs to complement representational pluralism by highlighting that ontological difference is not always about representational difference. Often, it is not enough to ask what an ontology *represents* in the world; we also need to ask what an ontology *does* in the world. This move from representation to practice opens opportunities for engaging with and appreciating ontological difference without demanding that alterity can always be interpreted through representational plurality.

To explore both the strengths and limitations of the proposed account of property clusters, this section discusses three cases of alterity: (1) the classification of bats as birds, (2) the claim that forests think, and (3) the personhood of rivers. We will describe cases (1) and (2) to show how representational pluralism can work with alterity to a significant extent and then highlight limitations of representational approaches in case (3).

Bats as Birds: The classification of bats as birds is well-documented in many Indigenous communities (see Ludwig 2020). For academic researchers, such classifications can be deeply puzzling. For any phylogenetically grounded taxonomy, bats are clearly mammals and not birds. It may seem like Indigenous communities are either simply wrong about the structure of the biological world or that the identification of bats as birds constitutes a case of radical alterity that is beyond the understanding of academic biology. Representational pluralism helps to illustrate that neither is the case. Indigenous communities are not confused when classifying bats as birds, and we can understand classifications of bats as birds without appealing to radical alterity and the idea that Indigenous communities live in a world beyond our understanding.

A biologist may be inclined to consider the classification of bats as birds a simple mistake. According to this interpretation, Indigenous communities are misled by the fact that birds fly, and a deeper level of knowledge—for example, about anatomic, genetic, or phylogenetic properties—will correct this misunderstanding by revealing that bats are in fact mammals. Framing this constellation in terms of the property cluster model from the previous sections, one may assume that bats and birds share one salient property (the

ability to fly) while deeper biological understanding reveals that bats actually share a wide range of interlinked properties with other mammals.

Serious engagement with Indigenous expertise, however, reveals that the situation is more complex. While bats share a range of interlinked properties with other mammals, they also share a range of interlinked properties with other birds. It is not only the ability to fly that bats share with birds but also having wings, a light bone structure, a keeled sternum, a similar size range, streamlined bodies, high metabolism, migratory behavior, similar natural enemies, a fruit- and insect-based diet, dispersing seeds in the environment, reducing local insect biomass, and so on. Atran (1998) shows that Itza' Maya in northern Guatemala classify bats with birds (*ch'iich'*) and argues that Itza' taxonomy is strongly influenced by ecological relations that contrast with the focus on internal structure of organisms in Western science. Note that similar ecological roles of bats and birds are not limited to rather generic characterizations such as "seed dispersal" but can be applied to highly specific ecological relations, such as the density of ramon around Maya ruins that "may owe more to . . . seed dispersal by bats inhabiting the ruins than to artificial selection by Maya" (Atran et al. 1993, 636).

The convergent evolution of bats and birds has created a rich property cluster that involves not only analogous traits such as flight mechanisms but also shared ecological roles that can be more meaningful for local communities than traits shared by bats and mammals. It is neither wrong nor mysterious to classify bats as birds. Instead, ontological difference is produced by the complexity of the biological world and the diverging interests of Indigenous communities and academic biologists in representing through general categories such as the Itza' group of *ch'iich'* or the academic class of Mammalia. A representational pluralism therefore allows us to recognize ontological difference and its importance for communities without appealing to incommensurable worlds of radical alterity.

Thinking Forests: The relation between humans and nonhumans has become a focal point of anthropological debates about radical alterity (Ogden et al. 2013; Tsing 2018; Viveiros de Castro 2014). The story is usually told through the assumption of human exceptionalism that has shaped modern science—from the very distinction between culture and nature (Descola 2005) to biodiversity conservation that aims for a pristine nature free from humans (Büscher and Fletcher 2020) to ethical debates that treat nonhumans as having only an instrumental value for humans rather than a moral status of their own (Baracchi and Baciadonna 2020).

The common anthropological narrative contrasts human exceptionalism with Indigenous multispecies worlds in which the human and nonhuman are neither ontologically nor morally separated (Descola 2005; Roothaan 2019; Vogel 2015). As this literature commonly highlights, the very distinction between nature and culture has no place in Indigenous ontologies that understand communities to be part of their environments and environments to be part of their communities. Stories of shamanic transformations of animals into humans and of humans into animals are commonly mobilized to make the case against a sharp boundary between humans and nonhumans (Viveiros de Castro 2014). This lack of a sharp boundary becomes further emphasized through discussions of ontologies in which categories such as *mind* or *thought* or *personhood* are radically extended beyond the human (Harvey 2005; Kramm 2020).

Ontologies without sharp boundaries between the human and nonhuman are indeed good candidates for radical alterity, as they challenge core ontological assumptions of modern science. Kohn's *How Forests Think* (2013) has become one of the defining documents of the ontological turn that mobilizes "Amazonian ethnography to think ontologically" (2013, 10) through engagement with the Runa community of Ávila, in the upper Ecuadorian Amazon. While the Runa's commitment to thinking forests is certainly an ontological provocation, it is far from clear that it constitutes a case of radical alterity that establishes incommensurability between Indigenous and academic perspectives on forests.

Indeed, Kohn himself does not want to establish two incommensurable worlds with the conclusion that forests only think in the Runa world but not in the world of modern science. Instead of an unrestricted "wholesale relativism" (Mncube 2021), Kohn's ontological ambition is much more straightforward: "Forests are good to think because they themselves think. Forests think. . . . I want to show that the fact that we can make the claim that forests think is in a strange way a product of the fact that forests think" (2013, 22). Kohn's strategy for justifying thinking forests is itself rooted in the Western philosophical tradition and appeals primarily to Peirceian semiotics: "Semiosis (the creation and interpretation of signs) permeates and constitutes the living world, and it is through our partially shared semiotic propensities that multispecies relations are possible, and also analytically comprehensible" (2013, 9).

One does not need to rely on Peirceian semiotics, however, to recognize that thinking forests are very much an ontological possibility within modern

science. Indeed, the boundaries of *thought* have become deeply contentious across the biological and cognitive sciences. Accounts of embodied, extended, and situated cognition extend the cognitive systems beyond the human by arguing that cognitive tools and aids can themselves become part of cognitive systems and thought processes (Ludwig 2015a; Wilson 2014). Debates about "plant intelligence" are built on an exploding literature on information processing and exchange among plants (Calvo 2016; Hendlin 2022; Trewavas 2017). And even bacterial cognition has become a respectable thesis in the academic literature (Fulda 2017; Lyon 2015).

While the idea of thinking forests disrupts widely shared ontological assumptions about human (or at least mammalian) exceptionalism, many ontological alternatives are actively entertained across the biological and cognitive sciences. A framework of representational pluralism can help to make this ontological plurality intelligible. Instead of assuming that there is only one correct ontology that determines which organisms really think, the category *thought* can be interpreted in different legitimate ways. Some researchers are focused on cognitive processes that are unique to mammals or at least to animals. They may consider information exchange or semiosis among plants fascinating but find little value in expanding the category *thought* toward them. Other researchers are focused on the complexity and sophistication of these processes in plants and push for a broader ontology. The world does not force us to use the category *thought* in a broad or narrow sense (Ludwig 2015a). These ontological choices (Ludwig 2016a) are up to us and can lead researchers with different explanatory interests in different directions.

Recognizing the plurality of ontologies of thought in biological and cognitive sciences demonstrates that *thinking forests* are not a case of radical alterity that remains fundamentally incomprehensible for academic researchers and forces the recognition of incommensurable worlds. On the contrary, a representational pluralism provides good reasons for expecting ontological difference. Forests are not passive objects but complex systems that involve equally complex information processing, exchange, and active responses to environmental stimuli. Indigenous communities that live in, with, and from the forest have a much richer understanding of its agency than those who do not share this experience and way of living. It is far from surprising that Indigenous communities often expand categories such as *thought* to highlight these insights rather than limiting themselves to cognitive structures that are unique to humans or mammals.

Rivers as Persons: Our discussions of bats and forests interpreted alterity through representational pluralism. Indeed, the characterization of bats as birds and forests as thinking can invoke impressions of radical alterity—deeply different ontologies that constitute distant worlds beyond the possible comprehension of modern scientists. But not everything that appears incomprehensible at first sight actually turns out to be incomprehensible. Indigenous communities have good reasons to treat categories like *bird* or *thought* differently from academic researchers, and these reasons are deeply embedded in their practices. Furthermore, many of these reasons can be appreciated by external actors who take the knowledge and practices of Indigenous communities seriously. Ontological alterity remains in the sense that Indigenous and academic actors operate with different ontologies. However, it is not a radical alterity of incommensurable worlds but rather an understandable alterity that is generated by a plurality of representational practices and can be appreciated intersubjectively.

It is time to acknowledge, however, the limitations of this strategy of deradicalizing alterity through representational pluralism. For this purpose, we shift our attention from forests to rivers and from thinking to personhood. The issue of rivers as persons (Kramm 2020) has become widely reflected in debates about "rights of nature" (Acosta and Martínez 2009; Kauffman and Martin 2021), and the recognition of legal personhood of rivers has become one of the most striking cases of recognition of Indigenous ontologies in policy and mainstream frameworks for environmental conservation. Indeed, the legal personhood of rivers has been recognized in a large variety of geographic and cultural contexts, including Aotearoa New Zealand (e.g., Whanganui River), Canada (e.g., Magpie River), Colombia (e.g., Río Atrato), and the United States (e.g., Klamath River).

In the anthropological literature, thinking forests and rivers as persons are both commonly discussed under the umbrella of "animism" (Harvey 2005) and exemplify the push for an "anthropology beyond the human." From a philosophical perspective, however, there are important differences between these cases. The dense network of information processing and exchange among plants provides a relatively straightforward referent for claims of thinking forests. For an academic researcher it may be challenging but far from impossible to understand how the world could be represented with a radically extended category of *thought* that includes not only humans and mammals but also plants. The situation is quite different in the case of rivers,

where it is much more difficult to point toward representational plurality and identify a potential referent for *person* (or *thought*) of rivers.

At this point, it becomes crucial to recognize that ontologies are not merely representational tools. We use ontologies to represent the world around us—whether it is about similarities between animals in the case of *bird*, or forms of information processing in the case of *thought*. One may ask what *person* represents when an Indigenous community characterizes a river as a person. And, indeed, there may be interesting answers. For many communities, rivers are agents with unique characteristics that require careful understanding (Kramm 2020)—from the many ways in which a river provides for the community to ways in which it behaves through different seasons to the dangers it may pose to a careless intruder to the multigenerational relations that communities build in coevolving with a river.

Even if we use categories to represent the world around us, we also use categories for many other purposes. It is therefore often more fruitful to ask what an ontology *does* rather than to focus exclusively on the question of what it represents. Even if philosophers may speculate about the referent *person* in the characterization of rivers as persons, the representational content seems less important than the role of personhood of rivers in building relations and moral orders between communities and their environments. Indeed, the characterization of rivers as persons is often a crucial part of Indigenous ethics in the sense that it opens a space for mutual care between humans and nonhumans. An academic researcher or external policymaker does not have to understand what *person* represents in the world to recognize that consideration of rivers as persons leads to forms of care that are different and often more sustainable than perspectives on rivers as inanimate objects and natural resources.

The case of rivers as persons, therefore, expands ontological considerations beyond questions of representation. Rather than exclusively asking what an ontology represents in the world, we need to broaden our considerations to what ontologies do in the world. Understanding this step beyond representation is crucial for addressing questions of ontological alterity. Appreciating ontological difference does not always require that we interpret it by making its representational content explicit and understandable for external actors. Indeed, the incorporation of personhood of rivers in legal frameworks illustrates this dynamic. Even if actors disagree about what it means to state that the river is a person, recognizing the legal personhood of rivers may still

turn out to be an important element of recognizing Indigenous practices of safeguarding their environments.

While examples such as "thinking forests" or "rivers as persons" or "mother palm trees" (Story 4.2) can provide some specificity to such ontological contestations, our discussion of ontology has been admittedly deeply abstract so far. Before returning to representationalism and its limitations, the following sections therefore move to concrete cases of ontological difference that our collaborators and us have encountered when working with communities. As our discussion in the following sections demonstrates, both representational pluralism and radical alterity play important roles for understanding relations between ontologies in their real-life complexity.

Story 4.2: The Babassu Mother Palm Tree

Adriana Ressiore C.

A palm tree as a mother. The first time I read about the "mãe palmeira," it captivated my attention. "Wait, women in my home country, Brazil, relate to a palm tree as a mother? What does that mean?" The curiosity concerned what I later came to know as a very special and caring interspecies relationship. I started researching the socioenvironmental Interstate Movement of Babassu Coconut Breakers, MIQCB, formed and organized by peasant women whose livelihoods depend on products crafted from the babassu coconut. I followed their social media, their struggles, and their achievements. Sometimes I'd even dream that I was there in the first ever babassu breaker's territory: Vila Esperança, in Piauí.

More than two years after the initial curiosity spark, there I was. I was doing fieldwork in Piauí and Maranhão, moving with the Movement for eight weeks. I was curious to understand this intriguing ontology: How does the mother-daughter relationship shape practice? How do they care for and with each other? And how does the mother palm tree provide care? It was clear from the start that the mother palm tree was not just a metaphor. The meanings and explanations of why the palm tree was a mother were diverse but always present. The Movement's *companheiras* (companions) say that the palm tree feeds them; it protects them. It is their mother because they learn to be resistant with the palm tree and its hard-to-break coconut. Sometimes, the palm tree also taught them to be stubborn.

Babassu coconut breakers relate care with the many things the palm tree gave them: "she takes care of us when she covers the house, when she makes the wattle, when she makes the matting, even when people cut it so that it rots, she takes care of us by giving us the manure. She takes care of us by giving us oil and soap" (Maria Alaídes, Maranhão). Babassu coconut breakers have a kin relationship with the palm tree: "For us [the palm tree] is mother, grandmother, aunt, sister, it's everything" (Sebastiana, Maranhão).

What happens and what changes when a tree is a mother? What does this ontology mean in practice? Questions such as those were popping up often. However, there was a problem at the root of where these questions were coming from: Was the view on difference coming from me? Did they see a difference? Difference to what? The apparent difference comes from biases, from an idea of a mother being only a human or the impossibility of having a nonhuman as our kin.

Yet for the babassu breakers, the palm trees are kin, and this relationship was not questioned. It just was; it just is. As an outsider, of course, the palm tree is not my mother, but I could feel and share some of the love, respect, and gratitude the babassu coconut breakers had, not only for the palm trees in their garden but for all of them. Love, respect, and gratitude went from daily practices to how they articulated themselves politically.

Indeed, for the Western researcher's eye that is shaped by modernity's dichotomy between humans and nature, the difference between human and nonhuman kin remains at the center. For the babassu breakers, however, that difference was articulated through facing threats. It was felt when the possibility of caring on their own terms was not accepted by property laws and rural development projects. That is when the difference shows its face. It becomes real when the babassu coconut breakers' existence and their modes of caring with palm trees do not fit into dominant modes of knowing, dominant modes of development. To exist, they must resist. Babassu breakers organize themselves in the MIQCB as a means to exist and resist in a world that often tells them they should not or they cannot, at least not on their own terms. Babassu breakers, together with their mother palm trees, resist for a world where their and plural caring and reciprocal relationship can exist and thrive.

4.2 Ontologies in Action

4.2.1 Ontology Beyond the Armchair

Ontological debates in academic philosophy are sometimes intentionally separated from ontological negotiations of everyday life. Indeed, philosophers have imagined an "ontology room" (Sider 2014; Van Inwagen 2014; cf. Korman 2015) in which fundamental questions of existence are discussed independently of everyday ontological assumptions. In the ontology room, one may wonder about the very existence of composed objects like tables while admitting that the existence of tables is trivial in everyday life. Despite such attempts to separate everyday life from ontological debates, we argued that ontology matters deeply for intercultural and transdisciplinary negotiations that involve a wide range of ontological commitments and tensions between heterogeneous actors. The aim of this section is to outline the project of community-based ontology through cases of ontological difference in real-life settings. In addition to Siribinha and Poças, we will visit two communities that have been the focus of our collaborators: the farming communities of Coração de Maria and Retiro in the state of Bahia, in Brazil, and the community of Koro in the Upper West of Ghana.

In putting these three communities in conversation with ontological debates, three core insights emerge. The first insight concerns the intricate interplay of ontological overlaps and partialities in practice. From the perspective of community engagement, unrestricted doctrines of universalism or relativism lack empirical depth and complexity. There is plenty of cross-cultural continuity and mutual understanding even if they do not carry a general doctrine of ontological universalism. There are plenty of cross-cultural differences and limits to intercultural understanding even if they do not carry an unrestricted ontological relativism. Navigating ontology in transdisciplinary practices requires engagement with a much more intricate network of ontological relations.

Second, community-based ontology provides a more concrete entry point for addressing representational pluralism and its limitations. Representational pluralism is crucial for navigating ontological differences, from Coração de Maria and Retiro to Koro to Siribinha and Poças. In all three cases, it allows appreciation of local ontologies even when they diverge from academic ontologies. Rather than simply assuming incommensurability, representational pluralism provides tools for understanding why different

communities employ different ontologies. At the same time, Koro as well as Siribinha and Poças provide important lessons about radical alterity. Not all cases of ontological differences are easily interpreted in representational terms. Taking community ontologies seriously, therefore, demands looking beyond representation and taking concerns about radical alterity seriously.

Third, community-based ontology provides an entry point for connecting theoretical questions of ontological difference with practical and political questions of local livelihoods. A community-based perspective allows understanding of ontologies in action—for example, the ways they support pest management in Coração de Maria and Retiro, food security and food sovereignty in Koro, and sustainable engagement with mangroves in Siribinha and Poças. In this sense, political ontology becomes a crucial part of equitable transdisciplinary practices that aim to support livelihood practices and sustainability in and with communities.

4.2.2 Of Insects and Fungi

For our first discussion of community-based ontology, we remain close to Siribinha and Poças but travel inland in the state of Bahia to the farming communities of Coração de Maria and Retiro (Robles-Piñeros 2017, 2020; Robles-Piñeros et al. 2020, 2024), which have been prized for their pineapples. However, the area of Coração de Maria is a site not just of rich agricultural traditions but also of cultural and economic struggle about the increasing dominance of industrial agricultural production. In the middle of the twentieth century, Coração de Maria was known as the pineapple capital of Bahia and famed for producing the largest quantity and highest quality pineapples in the state. While some of this agricultural fame remains, the economic conditions of the municipality have deteriorated, and its residents are struggling with peasant marginalization and lack of investment in small farmers in rural areas in the northeast of Brazil.

Against this backdrop of rich agricultural traditions and economic struggles, Jairo Robles-Piñeros's PhD project focused on ethnobiological and ethnoentomological knowledge and its importance in primary education of the farming community (Robles-Piñeros 2021). Based on a diagnosis of cultural erosion that resulted in an undervaluation of local knowledge by young people (Baptista 2007; Robles-Piñeros 2017), Jairo's project aimed to understand this knowledge and its potential roles in primary school education.

One of the main insights from our collaborations with Jairo has been the importance of partial ontological overlaps in pest management (Robles-Piñeros 2021; Robles-Piñeros et al. 2020, 2024). Focusing on insects in agricultural contexts, he found that the community of Coração de Maria and academic researchers classify many agricultural pests in strikingly similar ways. One straightforward example is the lesser cornstalk borer (*Elasmopalpus lignosellus*) that is locally called *lagarta cinza do milho* ("gray corn caterpillar"). Another widely recognized species is the fall armyworm (*Spodoptera frugiperda*), which has a great impact on the development of sprouts and is locally called *lagarta verde do milho* ("green corn caterpillar"). In these caterpillar cases, farmers and academic researchers employ converging ontologies in the sense that they use categories with identical extensions, which identify the same biological kinds. This ontological overlap reinforces our earlier arguments (section 4.1.4) about the epistemic productivity of knowledge integration regarding cross-culturally recognized biological kinds. In these cases, the communities can work together with external actors from agronomists to agroecological activists in responding to local challenges, because they will recognize the same biological kinds and be able to communicate about them across diverse groups of actors.

Despite these cases of convergence, Jairo also encountered substantial differences between local and academic taxonomies. One intriguing case is the local classification of organisms in the Pseudococcidae (Coccoidea) family as fungi, while academic taxonomies treat Coccoidea as insects of the order Hemiptera. As one farmer explained to Jairo: "let me see, there is a fungus, it is very small, it almost does not seem to see, but when it arrives it attacks the plant and the plant looks bad and is very difficult to remove" (Robles-Pineros et al. 2020).

Ethnotaxonomic studies (Costa-Neto 2002) show that local classifications of insects often include phylogenetically heterogeneous organisms (e.g., spiders, snakes, myriapods) that share morphological characteristics, including patterns of corporality, such as the presence of a head, a thorax, and extremities. But Coccoidea do not seem to conform to this morphological pattern (Figure 4.3), and they also do not behave like insects; for instance, females in their imago stage are sessile. Furthermore, differences in taxonomic practices relate not only to behavioral and morphological features but also to ecological roles of the organisms. In the case of Coccoidea, for instance, these differences are also related to their agricultural significance as

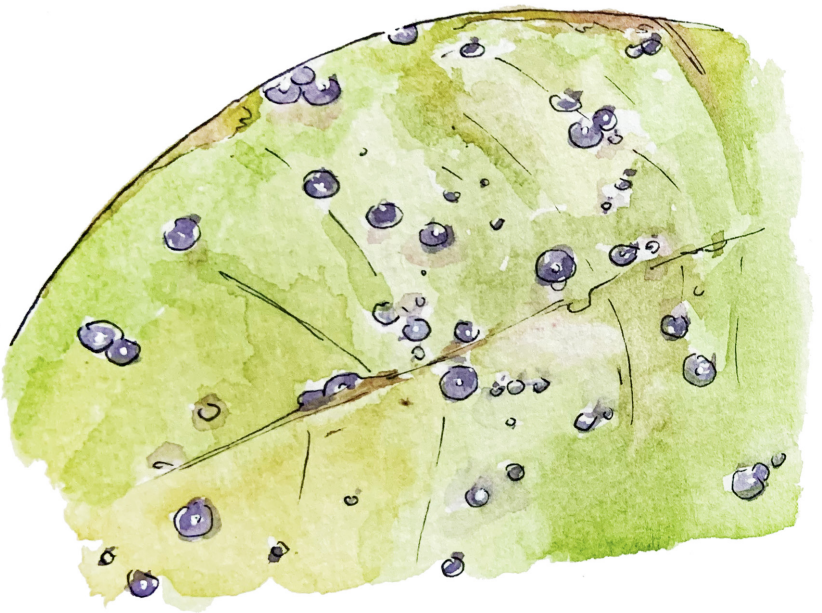

Figure 4.3 Pseudococcidae (Coccoidea) as an agricultural pest on a leaf. Pseudococcidae are classified as fungi by the community but as insects by academic taxonomists. (Illustration by Raphael Q).

an organism that attacks the manioc plants in ways that are more similar to fungi than to insects.

Farmers have, therefore, a variety of reasons for not treating Coccoidea as insects, which include behavioral (the organism can be sessile), morphological (the organism does not seem to have an insect-like body), and agricultural aspects (the organism has similar effects on crops as other fungi).

The case of Coccoidea provides a window into the entanglement of ontologies and practices. For an academic researcher, Coccoidea are insects because they are more phylogenetically related to them than to fungi. For the community of Coração de Maria, Coccoidea are fungi because they are more similar to fungi in behavioral, ecological, and morphological aspects that matter for traditional agricultural practices of the community. When it comes to these traditional practices, it is more important how Coccoidea resemble other fungi than how they resemble other insects. This is not to say that the treatment of Coccoidea as fungi would be suitable for all practices.

For example, the increasing displacement of traditional agricultural practices with industrial agriculture may come with the application of pesticides that make it important to distinguish Coccoidea from fungi that will be affected by fungicides. Instead, the lesson of this example is that different practices come with different representational needs that translate into different ontologies.

Rather than simply diagnosing the need for different ontologies in different contexts, Jairo sets out to co-design educational interventions for transdisciplinary knowledge exchange (Robles-Piñeros 2021; Robles-Piñeros et al. 2020, 2024). The co-design of these interventions was facilitated through a close relationship between Jairo and the teachers that involved discussion of pedagogical approaches and their embedding in daily farming practices. One teaching activity aimed at addressing core concepts from ecology such as the notions of ecological relationships, food chains, and trophic networks. Aiming to "bring ethnoecology into the classroom," this intervention led to a dialogue that addressed ecological concepts through everyday situations. For example, the concept of ecological relationships was introduced through insects of agricultural importance that students and farmers recognized from daily experience. Using caterpillars as a teaching model, concepts of predation, mutualism, and parasitism were introduced. This pedagogical activity built on overlaps between local knowledge and school science knowledge to develop the students' understanding of more abstract concepts of ecological relationships through their concrete application in farming practice.

A second activity with teachers and students was developed through a participatory method using contextual cognition tables (Baptista 2018), which establish links between local and academic knowledge. Contextual cognition tables focus on relations of proximity and difference between cognitive constructs and are thus distinct from the partial overlaps method, which not only considers cognitive constructs but focuses primarily on convergences and divergences in epistemological practices, ontological categories, and value systems. Relations between local and academic knowledge, as transposed into school knowledge, can significantly contribute to dialogues in science classrooms. This activity turned out to be mutually enriching: for the students because they were able to recognize the importance of their local knowledge and its cultural value, and for the teachers because it broadened their pedagogical tools by identifying spaces for dialogue. During this activity, partialities and tensions between knowledge systems

also became apparent. In addressing these tensions, the students reflected on the appropriateness or pragmatic value of knowledge systems, developing a critical attitude toward the validity of knowledge and a reflexivity about the plurality of ways of creating knowledge about ecological systems. Rather than treating accounts of Coccoidea as fungi as simply wrong, for example, it became possible to explore the use of this classification for local practices while also acknowledging biological reasoning that grounds taxonomies in phylogenetic relationships.

Once we use the partial overlaps method as an analytical framework to interpret data from Jairo's work, it is clear that he not only identifies partial overlaps but also explores how both overlaps and partialities can inform educational practices that embrace academic concepts, such as trophic networks, as well the importance of local concepts about agricultural pests (Robles-Piñeros et al. 2020; see Story 4.3). We will return to these pedagogical issues in section 5.2.3, when discussing educational interventions in Siribinha and Poças.

Story 4.3: Teaching a Culturally Sensitive Ecology

Jairo Robles-Piñeros

When I finished my bachelor's program in biology at Universidad Pedagógica Nacional in Colombia, I was a little concerned about what to do about my professional and academic life. I remember that I was part of the organization committee of the 5th Colombian Congress of Ethnobiology, where I met Eraldo Medeiros Costa-Neto, whom I now call my friend. It was a happy accident that he put me in contact with Professor Geilsa Baptista. I arrived in Brazil with the expectation of completing a master's degree (I never imagined pursuing a PhD), developing research with a charming agricultural community in the peasant region of Coração de Maria and Retiro in Bahia. Collaborating closely with farmers, students, teachers, and others, I realized that it is not enough to think about effective science education; it is also necessary to critically question what we are teaching and how we are teaching. A science and ecology that support the community in addressing challenges and conflicts? Or a science and ecology that remain indifferent to local struggles? How do I present the content to my students? And above all, what is my attitude toward the world of knowledge of my students? Without a doubt, all of this

made me rethink my certainties and left me searching for a new path that is finding its way today.

Rivers of ink have already flown with the importance of diverse perspectives in science education, but when you are living it, feeling it, and participating in these processes, it becomes another story. Like my dear friends who live in Retiro say: *é outro galo que canta*—"it's another rooster that sings." It is not possible to talk about innovative perspectives in science education if you are not innovating yourself in practice. Dialogues and participation in the teaching process require more than dialogues with papers on a computer screen or within the indifferent walls of academic institutions. And even more importantly, it is not possible to talk about a genuine change in the educational, political, and socioenvironmental sense without immersing yourself in the context, participating in it, living in your own experience, and encouraging yourself and others by thinking that another reality is possible.

As researchers, we are very accustomed to talking about results (which sadly are what matters most in the academic world) like they are a part of an "investigation"—like my research, which took over five years. But documents summarizing results leave out so much—the faces, the smells, the feelings, the personal motivations, the struggles, the needs, the lives of those who participated in this journey. This research was much more than can be written (and I speak in terms not of quantity but of value), because it was, is, and will continue to be, after a long time, my most enriching and significant learning process, since in the end the researcher was the one who ended up being researched.

4.2.3 Seeds from the Ancestors

Our second case of community-based ontology takes us from Latin America to Koro, a small village in the Upper West of Ghana near the border with Burkina Faso and home to the Dagara people, where we have collaborated with the Ghanian Center for Indigenous Knowledge and Organizational Development (CIKOD) (Boogaard et al., 2023). Bernard Yangmaadome Guri and Daniel Banuoku from CIKOD carried out community-based research in Koro that focused on the entanglement of Dagara cosmologies with practices that contribute to food security, food sovereignty, and sustainable engagement with local environments. The complex biocultural system

of the Dagara people is threatened by social-environmental disruptions due to industrialized food production, resource extraction, and outmigration toward urbanized areas. In contrast with exogenous frames of neoliberal agricultural modernization and assimilation into global market economies, CIKOD aims to create spaces for endogenous development that are shaped by Indigenous knowledge and practices. In Koro, CIKOD aimed at documenting and supporting the vital roles and activities of the *Tengan dem* (generally translated as "land priests") in rural communities, who are the custodians and mediators of relations between people and the land.

Dagara ontologies often differ substantially from those of academic researchers as they are entangled with wider assumptions of Dagara cosmology. In the context of plant categories, for example, Dagara people distinguish between two fundamentally different kinds of seeds (*bumbuure*). *Bumbuure* for *bondiri* ("seeds for life") are spiritually significant and include sorghum, millet, Bambara beans, cowpea, and yam. *Bumbuure* for *bondi-fogle* ("seeds for commerce") are spiritually insignificant and include maize, rice, sweet potatoes, and groundnuts. The distinction between two fundamentally different kinds of seeds does not correspond to phytological distinctions but rather to ritual meanings and practices. *Bumbuure* for *bondiri* will be offered to the ancestors, and it is a serious taboo to eat any of these crops before the *Tengan dem* perform the necessary rituals. Each of these crops has a role to play in traditional ceremonies. For example, when the remains of the deceased are presented on the palanquin *paala* for display to mourners, it is a first requirement for the family to produce a *kagyin*. *Kagyin* is sorghum that has been prepared for storage in the traditional barn, the *bogrr,* by tying it into a bundle. Failure to present a *kagyin* is seen by the community as a symbol of abject poverty. In contrast, the *bumbuure* for *bondi-fogli* have no business in ritual—the ancestors do not recognize them. *Bumbuure* for *bondi-fogli* still play an important role as cash crops for communities, but they have been more recently introduced and are therefore not part of the ancestral bond.

While the distinction between *bumbuure* for *bondiri* and *bumbuure* for *bondi-fogli* does not correspond to distinctions in phytology, it is fundamental for cultural life and the maintenance of spiritual traditions among the Dagara people. Furthermore, these spiritual traditions are entangled with local agrobiodiversity and livelihoods. For example, the requirement to present *bumbuure* for *bondiri* in ritual practices ensures the maintenance of endemic crop varieties rather than their disappearance due to monocropping

of economically more lucrative cash crops that have been more recently introduced. This maintenance of local agrobiodiversity in turn contributes to food security, nutritional diversity, and food sovereignty—even in the case of a bad harvest of cash crops, the Indigenous food crops are still available and widely planted. In contrast, exclusive reliance on one cash crop may increase income under favorable conditions while proving catastrophic under external environmental or economic pressure, such as a drought or pest. Thus, the distinction between *bumbuure* for *bondiri* and *bumbuure* for *bondi-fogli* is an essential part of the resilience of the local food system and shows that in the Dagara ontology the biological, environmental, social, and spiritual dimensions are closely interrelated.

Koro constitutes a rich place for thinking about ontological difference. As the case of seeds illustrates, representational pluralism can account for some of this difference. Even if the distinction between *bumbuure* for *bondiri* and *bumbuure* for *bondi-fogli* does not correspond to phytological differences, it represents historical differences between seeds that have been cultivated in the region for a long time and seeds that have been more recently introduced. Representing this difference matters for the community of Koro, both because it preserves an important element of the biocultural heritage of the Dagara and because this heritage is crucial for food security and for avoiding overreliance on cash crops that create vulnerability in the case of a bad harvest or fluctuation of market prices.

At the same time, interpreting Dagara ontology through a representational pluralism has clear limitations and constitutes a case of what Viveiros de Castro (2004) calls a "controlled equivocation." Translating *bumbuure* for *bondiri* into "seeds of the ancestors" and emphasizing its importance for local livelihoods is useful but also introduces equivocations that bend local meanings through academic interpretation. For example, it does not capture more radical elements of ontological difference in Dagara practices, such as the return of Dagara ancestors during ritual practices in which *bumbuure* for *bondiri* are recognized by their spirits.

Other practices in Koro reflect this element of radical alterity even more clearly. For example, consider the story of a market boycott in response to a drought, which was initiated by the *Tengan dem*. While we argued earlier (section 3.2) that communities often possess sophisticated expertise about causal relations and ecological mechanisms, it would be deeply misleading to interpret the market boycott by trying to identify a causal mechanism, from shutting down the market to the return of the rain.

> This year the rains stopped after a few rains and all the crops began to dry up. It got to a point where there was the danger that if nothing were done there would be famine this year. The people therefore approached the tengan dem and asked them to intercede with the ancestors on their behalf, as they believe this was a reflection of some wrongdoings in the village. The head tengan sob [singular form of *Tengan dem*, i.e., land priest] did an initial consultation at the tengan tuu [sacred grove] to find out what should be done. He then called a gathering of the elders and told them the instruction was that the Babile market should be boycotted immediately by all local as well as foreign traders. On the next market day, the tengan sob went early to the market square to carry out some rituals and sent out information that the boycott was on. Information was passed around and the market session was effectively boycotted. By the evening of that day a heavy downpour resulted, to the joy of all in and around Koro. Since then it has been raining consistently and the people are expecting a bumper harvest. (Elder Dongyile; from Boogaard et al. 2023)

Instead of making sketchy claims about causal connections between ritual practices and rain, our collaboration with CIKOD (Boogaard et al. 2023) allowed us to appreciate how market boycotts in Koro are embedded in complex practices that are themselves an integral part of Dagara environmental ethics. Markets are considered places where many agents—humans, animals, plants, ancestors, spirits, gods—come together and meet. If the order is disturbed, the market needs to take a break. Shutting down the market is a highly disruptive event. A market boycott is a powerful ritual that forces the entire community to come together, make a sacrifice, and reflect on disturbances. The spiritual and social authority of *Tengan dem* to disrupt the market in a moment of crisis reflects an understanding of the market as the social and spiritual center of the community rather than merely a place of economic activity.

CIKOD has been a leading actor in mobilizing Indigenous practices for rural livelihoods in Ghana. Much of this knowledge does not create tensions with academic knowledge but rather cross-fertilizes with agroecological and regenerative agricultural practices that bring innovations from different actors together. We will return to some of these cases in section 5.2.4. Other cases—such as the categorizations of seed systems—involve ontological differences but are interculturally accessible. An external researcher can understand why the Dagara people categorize seeds along ancestor relations,

just as a local farmer can understand why a scientist categorizes seeds along phylogenetic relations. Other cases involve more radical forms of alterity, such as marketplaces populated by spirits and gods as well as rituals that link market boycotts to the return of rain. In such cases of radical alterity, representational pluralism clearly reaches its limits—not much good is going to come out of trying to identify the referents of spirits at the market. However, this does not mean that such practices cannot be appreciated as crucial to community livelihoods and sustainability. Adopting an ontological lens in communities such as Koro therefore requires engagement with a complex network of ontological similarities and differences along both representational and nonrepresentational lenses.

4.2.4 Classifying Fish in Siribinha

Let us return to Siribinha. Having worked in this community for many years and across many projects opens a space for encountering diverse ontological concerns. As an example, consider our collaboration with Vitor Renck while supervising his PhD thesis on ethnotaxonomy of fish in Siribinha (Renck 2022). This research provides nuanced quantitative and qualitative insights into classificatory practices that generate both overlaps and partialities in biological ontologies. While the classifications of fish discussed in this section provide a rich case for the potential of representational pluralism, the next section addresses one of the most striking cases of radical alterity in Siribinha: *Caipora,* an Amerindian concept for a herdsman and protector of the forest. Ethnotaxonomy of fish and *Caipora* provide contrasting perspectives on ontological difference in Siribinha. And it is precisely this contrast that makes the conjunction of the cases so valuable. Addressing ontological difference exclusively through ethnotaxonomy or exclusively through *Caipora* would provide a picture that could easily mislead: whether it is by downplaying the depth of ontological difference or wrongly presenting Siribinha as a place dominated by radical alterity.

Let us start with ethnotaxonomy. Siribinha is a fishing community, which made fish an obvious entry point for addressing local ontologies. In the ethnotaxonomic parts of his thesis, Vitor employed two techniques: free listing and triad tasks. Free lists were used to determine the most salient species of fish, by asking each participant, "What fish do you know?" The free listing was carried out in April 2018 with 91 community members,

approximately 20% of the community (for more details on our methodology, see Renck et al. 2022a). Following Chaves et al. (2019), we calculated the Salience Index of each ethnospecies of fish. The Salience Index is based on the frequency as well as the order of mentions, thereby representing both whether the fish is mentioned at all and whether it is prominent in the sense of being mentioned early on. Salience is represented through values from 0 to 1 in a null scenario. The *p*-values of salience show the probability that the salient values occur in a null scenario, calculated from simulated populations with similar characteristics to the real one, using Monte Carlo techniques (see Figure 4.4 for salient ethnospecies with a threshold *p*-value < 0.05 denoting significance).

This table also provides a first entry point for exploring ontological relations by connecting ethnospecies with species in the academic taxonomic literature. As shown in the table, there are many 1:1 correspondences between ethnospecies and academic species of fish in Siribinha. These 1:1 correspondences have been the hallmark of convergence metaphysics that assumes cross-cultural identification of the same natural kinds as related to the same salient "discontinuities in nature" (see section 4.1.3). In the case of

Ethnospecies	Academic Species	Salience	p-value
Tainha	Mugil curema	0.717	<0.001
Carapeba	Eugerres brasilianus	0.584	<0.001
Robalão	Centropomus undecimalis	0.464	<0.001
Robalo branco	Centropomus parallelus	0.386	<0.001
Pescada branca	Cynoscion leiarchus	0.339	<0.001
Pescada amarela	Cynoscion acoupa	0.330	<0.001
Robalo espalmado	Centropomus parallelus	0.303	<0.001
Curimã	Mugil liza	0.299	<0.001
Vermelho	Lutjanus purpureus	0.294	<0.001
Robalo	Centropomus spp.	0.224	<0.001
Corvina	Micropogonias furnieri	0.220	<0.001
Bagre fidalgo	Bagre bagre	0.215	<0.001
Bagre amarelo	Sciades herzbergii	0.206	<0.001
Bagre guiaçu	Sciades proops	0.191	<0.001

Ethnospecies	Academic Species	Salience	p-value
Bagre do mangue	Genidens barbus	0.178	<0.001
Xaréu	Caranx hippos	0.171	<0.001
Cavala	Scomberomorus cavalla	0.165	<0.001
Sardinha	Opisthonema oglinum	0.165	<0.001
Pescada barracuda	Sphyraena guachancho	0.142	<0.001
Bagre uruçu	Apistor luniscutis	0.136	<0.001
Cação martelo	Sphyrna spp.	0.132	<0.001
Sororoca	Scomberomorus brasiliensis	0.115	0.001
Capadinho	Unidentified	0.109	0.002
Cação	Several species	0.107	0.003
Catana	Trichiurus lepturus	0.103	0.005
Bagre cagão	Unidentified	0.099	0.008
Badejo	Mycteroperca bonaci	0.088	0.025
Pescada Caçonete	Cynoscion spp.	0.088	0.026

Figure 4.4 List of the 28 most salient ethnospecies of fish for Siribinha, Brazil. (From Renck et al. 2022a).

fish, 1:1 correspondences are not surprising as they tend to be more common with animals than plants, with larger than smaller animals, and in domains that are the focus of local livelihood practices and therefore of community expertise (Berlin 1992).

At the same time, the table also shows that it was not always possible to establish 1:1 correspondences. Vitor found that locally important populations are sometimes split into several kinds even if academic biologists only recognize one species—for example, two locally important ethnospecies of snooks (*Robalo espalmado* and *Robalo branco*) are recognized as only one species by academic biologists (*Centropomus parallelus*). In inversion of taxonomic splitting, we also found cases of taxonomic lumping, in which one ethnospecies corresponds to a variety of academic species. While the table mentions several cases, such as *Cação* or *Caçonete*, the taxonomic lumping turned out to be even more common in the cases of birds, which are less central to livelihood practices of the community and therefore categorized with less nuance (see section 4.1.5).

In further exploring ontological relations, Vitor employed an empirical technique called "triad tasks" (Ross et al. 2005). Triad tasks allow for a more general understanding of how members of a community categorize living organisms by looking not only at individual categories but also at their relations, as evaluated by assessments of similarity. During the triad tasks, a series of 10 sets of three photographs of fish were presented to 45 community members (around 10% of the community), to elicit local similarity judgments about which fish "go together." For each attempt, participants could describe the pairs as "different" (codes 1–3), "very different" (code 0), or "very similar" (code 4) (see Renck et al. 2022a for more details on the methodology).

The triad tasks revealed both overlaps and partialities in the groupings made by the community members and the groupings of organisms in the academic taxonomic literature (Figure 4.5). In two cases, there was exact convergence between groupings of the community and taxonomic groupings of species into families. For example, the *tainha*/*curimã* pair was considered the most similar in Siribinha, and they are also classified as belonging to the same family (Mugilidae) and genus (*Mugil*) in academic taxonomy. The same occurs for the pair *pescada branca / pescada amarela*, which belong to the same family (Scianidae) and genus (*Cynoscion*). In other cases, groupings diverged substantially. For example, *pescada branca/tainha* were considered substantially similar by community members, while they are not

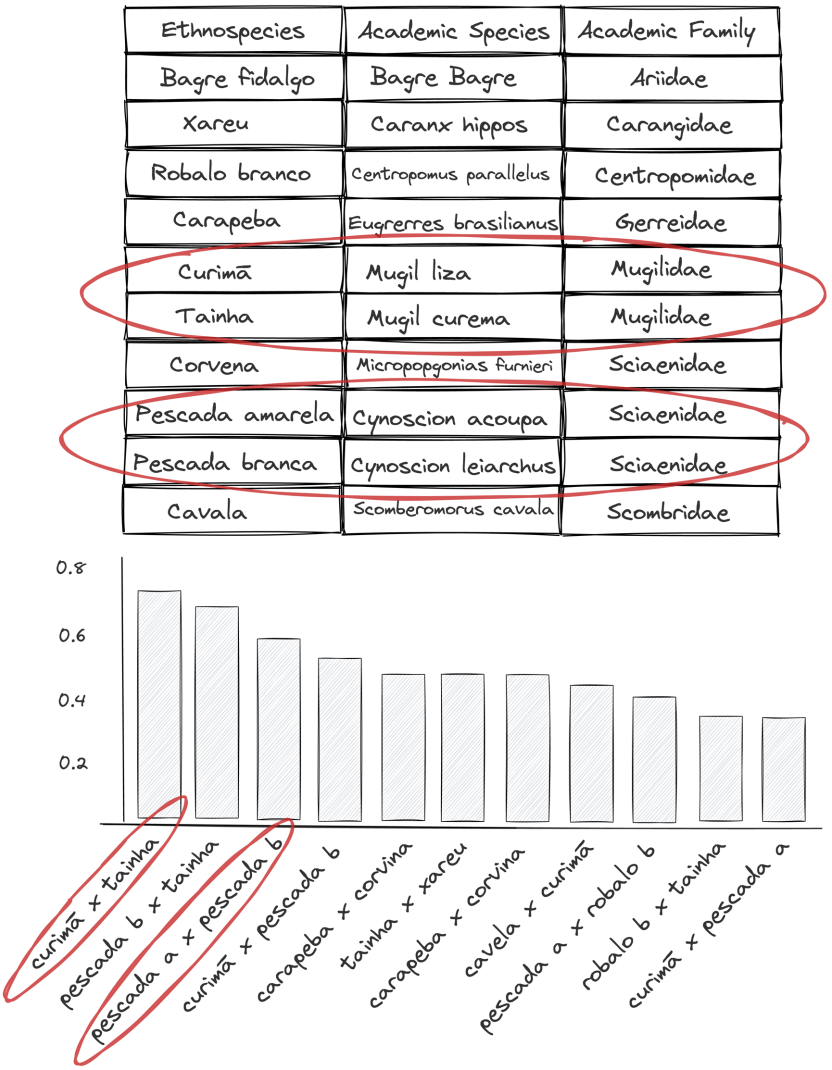

Figure 4.5 Partial overlaps between fishers' categorization and academic fish taxonomy. Above: 10 ethnospecies from the triad tasks. Red circles indicate fish that belong to the same family according to academic taxonomy. Below: the most similar pairs of fish according to the Siribinha fishers. Red circles indicate pairs that are also similar in academic taxonomy in the sense of belonging to the same family.

closely related from the perspective of academic taxonomy, belonging to different scientific families (Scianidae and Mugilidae, respectively).

Free listing and triad tasks lead to a nuanced picture beyond the assumption of universal recognition of natural kinds or incommensurability of incomparable ontologies. Instead, a complex pattern of partial overlaps emerges, in the sense that some categories of fish in Siribinha correspond perfectly to monophyletic taxa that are used by academic researchers while other categories represent fish on the basis of properties (often morphological but also taste, fishing practice, habitat, and economic value) that create a striking difference with categories from academic taxonomy.

The case of taxonomies in Siribinha highlights the epistemic and political relevance of representational pluralism, as outlined earlier. The biological world is a messy place that can be represented in various ways. In philosophy of biology, this variability of representational options has been widely recognized through the plurality of species ontologies in academic biology (Brigandt 2020; Conix 2019; Dupré 1999). The lessons of representational pluralism also extend beyond academic taxonomies, as communities often recognize clusters that matter locally, even if they may not be recognized as relevant by academic researchers. Furthermore, this diversity of representational strategies has direct consequences for livelihood practices of communities—from categories of pests in Coração de Maria and Retiro to categories of seeds in Koro to categories of fish in Siribinha. Far from just being issues of abstract philosophical concern, local ontologies support practices of pest management, farming, and fishing. The marginalization of local ontologies and of local livelihoods is deeply entangled and requires an integrated perspective on political ontology, which we will advance below.

4.2.5 The Challenge of *Caipora*

Ethnotaxonomy demystifies ontological difference by highlighting that the biological world can be carved up in many different epistemically fruitful and socially useful ways. Instead of framing intercultural diversity of ontologies as a clash of incommensurable worlds, ethnotaxonomy allows for mutual understanding of how diverse concepts emerge from equally diverse practices that respond to different features of the biological world. Just as a scientist can understand that a fishing community employs concepts that are shaped by the demands and experiences of daily fishing practices, community

members are perfectly capable of understanding that academic biologists use concepts that are shaped by different concerns. Moreover, joint communication about issues such as phylogenetic relations can make academic taxa intelligible to community members.

In Siribinha and Poças, where we have focused on transdisciplinary co-creation of knowledge and interventions, these opportunities for mutual understanding have made ethnotaxonomy an important starting point for engaging with ontologies. Rather than treating ontology as a mysterious divider that confines people to living in disconnected worlds, attention to fine-grained taxonomic structures can make ontological differences mutually intelligible and allow for bringing diverse ontological resources together for more inclusive practices of co-creation.

However, an ethnotaxonomic approach to ontology through fine-grained and mutually intelligible differences in the classification of fish can also obscure challenges for intercultural communication and transdisciplinary practice by circumventing issues of deep ontological difference and the philosophical challenges that emerge from them. The issue becomes particularly striking when comparing our ethnotaxonomic studies in Siribinha and Poças with anthropological debates about the ontological turn. Much of the anthropological literature focuses on radical ontological differences such as jaguars turning into humans (Viveiros de Castro 2004) or thinking forests (Kohn 2013) that pose very different challenges to intercultural understanding of ontologies than local classifications of fish such as *pescada branca* or *tainha*.

We still think that Siribinha and Poças demonstrate that ethnotaxonomy provides a helpful entry point for thinking about ontological difference and that it is methodologically often more fruitful to start with fine-grained cases of ontological differences rather than the most radical cases of alterity. At the same time, an exclusive focus on ethnotaxonomic studies would generate a biased and partial understanding of ontological relations, just as an exclusive focus on radical alterity would create biases that mystify ontological difference and exoticize communities by reducing them to representatives of otherness in the imagination of academics.

Concerns with social and environmental struggles in Siribinha and Poças have further challenged us to expand our ontological considerations. Indeed, local classifications of fish are crucial for understanding local fishing practices and their entanglement with both economic and ecological concerns. However, a large body of literature from environmental studies

points beyond these ethnotaxonomic issues by highlighting how economic and environmental practices are often intertwined with radically different ontologies (DePuy et al. 2022; Ressiore et al. 2024; Stewart-Harawira 2016).

It has become somewhat commonplace to identify the divide between nature and culture as the ontological foundation of current social-environmental crises. The historical diagnoses come with some variation. Sometimes, the divide is traced back to the book of Genesis as God speaks to Abraham: "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground" (Harrison 1999). Sometimes, capitalism is centered in its relentless pursuit of "Cheap Nature," enabling "not only massive deforestation, pollution, food insecurity, and resource exhaustion, but also implicat[ing] new ways of seeing the world" (Moore 2015, 29). Sometimes, the divide between nature and culture is situated in the "scientific revolution" (Merchant 2006), "scientific modernity" (Neyrat 2018), or, more generally, in "modernist politics" (Escobar 2020) or "Western thought" (Inglis and Bone 2006). Almost always, Descartes takes at least symbolic blame in equations of the nature/culture divide with "Cartesian Dualism" (Moore 2015, 174), "Cartesian Thought" (Escobar 2020, 90), or the "Great Cartesian Divide" (Viveiros de Castro 1998, 475).

Despite variations in historical diagnosis, the narratives mostly converge in challenging the transformation of the nonhuman world into a resource frontier for the production of commodities and modernization. As the divide between nature and culture reifies the former into an object without moral status of its own, it drives both planetary crises and ineffective responses of "sustainable resource management" that fail to address their ontological foundations.

Introducing cultural anthropology to the conversation, the ontological divide is analyzed not only as historically contingent but also as challenged by contemporary alternatives of Indigenous ontologies. As most prominently articulated in Amazonian anthropology (Descola 2005; Viveiros de Castro 1998), clear divisions between a realm of nonhuman nature and a realm of human culture are alien to many communities at the margins of global capitalism and modernity. Indigenous ontologies are therefore often positioned as alternatives to the ontology of Cartesian modernity that has facilitated effective resource extraction but simultaneously drives biodiversity loss, climate change, and economic exploitation (Ludwig et al. 2024).

There is a risk of "metadualism" (see section 2.1.5) lurking in many framings that are pitting Cartesian modernity against a non-Cartesian other. Squeezing capitalism, colonialism, Europe, modernity, science, rationality, "the West," and so on into one side of an ontological binary and hoping for some emancipatory and holistic alternative on the other side can easily become a (meta)dualist caricature itself. The caricature misses out on the complexity of historical formations such as modernity and science in enabling both emancipatory and oppressive politics. It also often misrepresents "non-Western" ontologies through stereotypical characterizations of the "holistic native" who lives in non-dualistic harmony with nature.

While our own approach of partial overlaps favors analysis of complex relations between ontologies over metadualistic binaries, deep differences exist, and they need to be made explicit. Indeed, dominant ideologies of "sustainable development" do not challenge the understanding of nature as a resource frontier but rather highlight that resources are depletable and in need of sustainable management. And indeed, this understanding of nature is deeply alien to many "Southern ontologies" (Ludwig et al. 2023) that do not relate to their environments as resources that are separated from the realms of culture or society.

Recognizing these differences also creates opportunities for learning from global ontological diversity. There is no need for a metadualistic binary between "Cartesian dualism" and "Indigenous holism" to recognize that Southern ontologies ground diverse moral orders that challenge the destructive reduction of nature to a resource system. Southern ontologies have therefore become driving forces in the articulation of alternative visions of relations between humans and nonhumans beyond extraction and commodification. Whether it is debates about multispecies care (Adams 2021), biocultural entanglements (González-Rivadeneira 2023), or communalism (Ochieng'-Odhiambo 2023), Southern ontologies become both intellectual evidence and social sources of mobilization for challenging dominant social-environmental relations.

Siribinha and Poças are generative places for scrutinizing general ontological narratives in the context of complex empirical settings. As we argued in chapter 1, Siribinha and Poças challenge a simple divide between modern and Indigenous spaces. Primarily of African and Indigenous descent and in relative autonomy from Brazilian modernity for much of their history, the communities are holders of their versions of the *Jangadeiros* culture

(see section 1.1) that is characteristic of rural fishing communities in the Brazilian northeast. More recent expansions of modern infrastructures, such as a road connecting the communities with the municipal center and the encroachment of tourism, pose existential risks to this culture and often come with violent socioeconomic disruption that may transform independent fishers into cheap labor force for the tourism industry, while an ontological struggle takes place in the estuarine ecosystems on which their livelihoods depend, reconfigured as potential conservation units or protected areas. At the same time, it would be insincere to portray Siribinha and Poças as Indigenous communities in a struggle against external modernization. At least according to the common Brazilian usage of the notion *indígena*, which is restricted to explicit Indigenous identities, Siribinha and Poças are not Indigenous communities at all. Most community members are Catholic or Evangelical Christians rather than explicitly embracing Indigenous cosmologies and ontologies. Most community members also do not want to separate their *Jangadeiros* culture from Brazilian modernity but rather supplement traditional fishing techniques with small outboard motors and GPS satellite navigation while striving for improved technological infrastructures such as better cell phone reception and internet access.

Together with Julia Turska, who is exploring relations between anthropological and philosophical approaches to ontology in her PhD research (e.g., Turska and Ludwig 2023), we decided to address this complexity through the case study of *Caipora*, an Amerindian forest entity who mediates encounters between humans and game (Figure 4.6). *Caipora* is a major concern for traditional hunting in Brazil as they (*Caipora*'s gender status is ambiguous) provide hunters access to animals but also punish those who do not follow appropriate norms, for example, by overhunting (Almeida 2021). In Siribinha and Poças, stories of *Caipora* were told by local fishers and teachers. This is no isolated finding: generally speaking, people living along the Brazilian shore think of mangroves, rivers, and lakes as inhabited by beings that punish those who destroy the forests (like *Caipora, Curupira, Mãe da Mata* [Mother of the Forest], *Boitatá*), or mistreat animals (*Anhangá*), or abuse animals when reproducing (*Tapiora*), or fish more than necessary (Diegues 2005). These are all manifestations of what Descola (2005) calls *maîtres des animaux* and remain common in the popular Brazilian imagination even if increasingly reduced to a perception of "folklore" in more modernized settings.

As Almeida (2013, 15) writes, *Caipora* is "an ontology full of obscurity, because it is more implicit and assumed than explicit." To ask for the existence

Figure 4.6 *Caipora* is widely represented as an elusive creature with ambiguous gender who lives in the forest and mediates encounters between humans and game. (Illustration by Raphael Q).

of *Caipora* does not result in any straightforward answer, as Almeida argues in another piece: "The question 'Do Caipora exist?' does not have a simple answer, just as it is not simple the answer about the existence of entities whose effects are diffuse in countless aspects of daily life. It is like those entities that 'everybody knows they exist but nobody sees them'—as are viruses and electrons to us. There are hunters who have never come across Caipora, just as there are old hunters who have never come across jaguars, despite knowing that they exist due to evidence of what they do. Caipora is a figure or shadow that leaves no trace. But every hunter suffers the effects of its action" (Almeida 2007, 247). Almeida's assessment provides an important reminder of the difficulty of intercultural translation, which inevitably involves equivocation (Viveiros de Castro 2004), especially when trying to interpret Indigenous ontologies through academic lenses. *Caipora* is present in perceptions of the environment (Ingold 2002) and in norms that shape fishing practices and engagement with the mangroves in Siribinha and Poças. This does not mean that *Caipora* is simply assumed to be another creature existing in the forest alongside other animals and plants. Stories about *Caipora* in Siribinha and Poças are elusive and rarely come in the form of straightforward existence claims.

The elusive nature of *Caipora* made it a focus of our concerns with the limitations of representational pluralism: if we approach *Caipora* in analogy to scientific categories primarily as a tool for representing structures in the world, we are probably going to get it wrong—it is not clear what *Caipora* represents in the world nor is there any obvious referent. In fact, our encounters with the elusive and occasional appeals to *Caipora* in Siribinha and Poças left it unclear whether they should be interpreted as ontological existence claims in the sense of academic philosophy or as expression of a particular metaphysical account of the nature of *Caipora.*

While *Caipora* emerged in small remarks and informally shared stories in Poças and Siribinha, challenges of its interpretation turned *Caipora* into a major theme of our collaborative research and in particular of Julia Turska's PhD research on ontology at the intersection of anthropology and philosophy. Following the published literature on *Caipora* (e.g., Almeida 2007, 2013, 2021), a hypothesis about practice rather than representation provides a clear entry point. *Caipora* shifts attention to the question of what an ontology *does* rather than only what it represents. *Caipora* raises the question of how relations, values, and moral orders between humans and nonhumans are shaped rather than only the question about what an appropriate referent of *Caipora* may be.

Following both Almeida and our fieldwork data, *Caipora* may be interpreted as enforcing a set of norms or an etiquette in hunting and fishing activities: avoidance of hunting or fishing on certain days; of capturing certain species; of harming mangrove trees; of mistreating, insulting, or abusing animals; of hunting or fishing more than needed. This interpretation complements wider debates about the roles of Indigenous ontologies in local relations between people and environment. Instead of treating the mangroves as natural resources that need to be rationally exploited, *Caipora* appears to be part of a different web of relations in which the mangroves can be wronged through hunting or fishing, and this may transgress moral orders and be punished by *Caipora*.

Both Almeida's (2007, 2013, 2021) discussion of *Caipora* and the literature on Indigenous ontologies in environmental anthropology more generally point, therefore, toward a turn from representation to practice, beyond common philosophical concerns about matching categories and referents. By changing the question from asking "What does *Caipora* represent in the world?" to "How does *Caipora* shape relations in the world?," a

new range of questions emerges beyond the common philosophical task of identifying referents: What would it be like to live in a world with *Caipora*? What kind of relations with animals, forests, mangroves, and the sea would exist in such a world? How would such a world differ from the academically familiar world of sustainable resource use? What would it mean for the communities of Siribinha and Poças if *Caipora* disappeared? What are the effects of global ontological transformation and the marginalization of Indigenous ontologies? What can we learn from being reflexive about our own ontologies and ways of relating to social-ecological systems at the brink of ecological collapse?

We do not have conclusive answers to these questions. As Julia Turska's PhD research is diving into the complexity and elusiveness of *Caipora*, an increasingly complex picture is emerging (see Story 4.4). Some of our initial assumptions are confirmed by this research, most importantly, the need to move beyond questions of representation toward questions of practice, which motivated our interest in *Caipora* in the first place. As Julia is focusing on *Caipora* to explore how ontologies become embodied in daily practices and are phenomenologically experienced, it has become increasingly clear that representationalist exercises of matching categories and referents are not enough and can lead to a philosophically impoverished analysis that misses what actually matters about *Caipora* for the communities of Siribinha and Poças, and, more generally speaking, to other local and Amerindian Indigenous communities where this concept circulates.

Other initial assumptions about *Caipora* appear to require nuance. In particular, the idea that *Caipora* govern sustainable relations with environments by protecting the mangroves against improper fishing and hunting may be a tad too convenient to tell the full story about communities like Siribinha and Poças, with complex relations to modernity and tradition. The challenge of *Caipora* therefore does not generate a simple message of Indigenous ontologies enabling sustainable environmental relations and modern ontologies driving environmental destruction. While there is arguably some truth to this message, real-life relations between ontologies and practices do not easily fit into such generalized dichotomies. Instead, we interpret *Caipora* as providing philosophers with the methodological challenge to look beyond questions of representation and take seriously the intricate ways in which ontologies and practices shape each other in rich empirical settings.

Story 4.4: The Elusive *Caipora*

Julia J. Turska

Here is the story of *Caipora* as told by two members of the same family: Seu Mateus*, a senior, well-respected expert fisherman, and Larissa, his daughter-in-law, who was born in a nearby village and had moved to Siribinha when she married Seu Mateus's son. The multigenerational family lives together in a big house surrounded by palm trees on the main road in Siribinha, across the street from the *mercadinho*, a convenience store, the family business. They are members of one of the evangelical congregations present in the village and often speak of their faith, both in casual conversations and during interviews.

Seu Mateus generously shared both his firsthand experience with *Caipora*'s enchantment as well as a story about the time when his daughter fell prey to this being's mischief. The first account was ever so unique, as *Caipora* deceived him in the urban environment of Salvador, as opposed to what we have heard and read about *Caipora* as a creature of the forest. On the day when it happened, he entered a small street and realized he got lost. After retracing his steps and looking around, he came to the realization that he had not been there before, even though he had followed his exact footsteps. It was only after asking for help and seeing a bus pass by that he became conscious of where he was again. When asked to clarify whether it was due to *Caipora*'s enchantment that he had gotten lost, he unequivocally replied: "Of course! It could only have been her because she blinds you, you pass through a place and then when you try to go back you no longer recognize it. I knew the place, I spent the whole week there, but that day she blinded me." He also told a story of his daughter who one day walked all the way from Siribinha to Poças (about 6 km) without realizing where she was. At the same time, when asked whether he was afraid of *Caipora*, he denied, stating that *Caipora* is something like "a dream that passes by us."

Larissa, like many other younger members of the community, remembers *Caipora* as something of the "older days," particularly in relation to her grandmother. While in her view *Caipora*'s efficacy eroded over time, in our conversation she made a connection between this tradition she grew up with, her current belief system, and the ecological importance of *Caipora*: "I believe a lot in the things that are in the Bible, yes, and in the Bible, it says, in Psalm 91 . . . it says that in the night there

are things that are obscure . . . it talks about the death that strikes at midnight, which talks about the arrows and all that . . . Does it make any sense that it's in the Bible with these things that people were telling you and that I'm telling you [about *Caipora*]? . . . I believe that all this, these folkloric figures, yes, they can exist, in favor of defending nature."

And there we have it. One family, living under one roof, and an incredible wealth of diversity of *Caipora*'s manifestations. As a protector of nature, and an urban trickster. As a dream, a thing of the past, but one which can to this day actively affect people's lives and influence how they view their relation to nature. In the face of this diversity, it is hard to make a case that *Caipora* in Siribinha corresponds to any specific entity. Therefore, the question remains: Is Caipora an element of the local ontology, and if yes, in what way?

**The* names used in the story are pseudonyms.

4.2.6 Ontological Self-Determination

Community-based approaches demonstrate that ontology matters not only as a source of philosophical contemplation but also as a major factor in livelihood practices and encounters with environments. Coração de Maria, Koro, Siribinha, and Poças shift attention and political demands to the material implications of ontologies: from managing agricultural pests to maintaining seed diversity to sustainable fishing practices to establishing respectful relations with mangrove forests. Ontology is not just an abstract game in the philosophy room but is central to community lives and livelihoods.

The framework of partial overlaps helps to relate ontological diversity to transdisciplinary practices. First, ontological overlaps provide grounds for collaboration. Establishing overlaps is a daily activity that may often seem too obvious for deep anthropological and philosophical reflection. It is a ubiquitous and sometimes mundane activity that Viveiros de Castro scoffs at when writing that "comparing the commensurable is a task for accountants, not anthropologists" (2004, 11). In contrast, we have argued that establishing overlaps and commensurability is crucial for intercultural encounters and any serious attempt to collaborate across different groups of actors. Our case studies make some of this explicit. For example, an entomologist in Coração de Maria may realize that community members are

identifying *Elasmopalpus lignosellus* when talking about *lagarta cinza do milho*, just as a community member in Siribinha may realize that an ichthyologist identifies *Robalo branco* when talking about *Centropomus parallelus*. It is often this commensurability that grounds fruitful transdisciplinary encounters.

Establishing ontological overlaps is crucial for coordinating action, and section 5.2.2 will return to these overlaps in Siribinha and Poças through a policy angle. During his PhD research, Vitor Renck found that legislation for the protection of *Robalo branco* clashes with local fishers' knowledge about this fish, which indicates that it is being protected during the wrong period of the year (Renck et al. 2023a, 2023b). Because we know that the local name *Robalo branco* and the academic name *Centropomus parallelus* refer to the same fish species, we can translate local knowledge about *Robalo branco* as relevant for Brazilian legislation concerning *Centropomus parallelus*. Establishing ontological overlaps is therefore often crucial for challenging the marginalization of local knowledge and making a case for its inclusion in policy.

Shifting the focus from ontological overlaps to partialities further increases the political stakes of engaging with ontology. While overlaps illustrate the importance of common ontological ground, partialities highlight the importance of ontological self-determination (Kramm 2021; Ludwig 2016a; Viveiros de Castro 2014). As local ontologies often differ substantially from academic ontologies, it becomes crucial to make the case for communities being able to rely on the former rather than having to assimilate into the latter.

Ontological self-determination can be situated in more general debates about Indigenous self-determination. Documents such as the *UN Declaration on the Rights of Indigenous People* treat self-determination as a legal and political notion of Indigenous people being able to "freely determine their political status and freely pursue their economic, social and cultural development" (United Nations 2007, 5). Our discussion of community-based ontologies reflects how political self-determination is intertwined with ontological self-determination. Political self-determination of Indigenous peoples demands the right to maintain Indigenous livelihood practices and relations with environments. As we have argued from Coração de Maria to Koro to Siribinha and Poças, these practices and relations are intertwined with local ontologies. Ontological self-determination also

implies that transdisciplinary projects should not require that Indigenous communities articulate their knowledge in the framework of dominant academic ontologies. While transdisciplinary practices can benefit from transdisciplinary exchange between heterogeneous knowledge systems, self-determination highlights two important dimensions: first, the choice of Indigenous people whether they want to engage in such a transdisciplinary exchange at all and, second, the need to organize such an exchange without prioritizing academic ontologies over those of Indigenous partners.

Ontological self-determination can be put in a wider context of "collective self-determination," as discussed by Whyte (2018). Whyte distinguishes between a "supplemental value" and a "governance value" of Indigenous knowledge. "Supplemental value" means that Indigenous knowledge provides "inputs for adding (i.e. supplementing) data that scientific methods do not normally track" (2018, 59). An exclusive focus on supplemental value would be tantamount to the kind of superficial knowledge integration that we criticized, as it recognizes Indigenous knowledge only insofar as it is useful for academic researchers. In contrast with such an extractivist perspective, Whyte asks what Indigenous knowledge does for Indigenous people and introduces governance as "the sphere in which we discuss community-based institutional means, strategies, and processes that are needed for Indigenous peoples to plan for climate destabilization and the dominance of settler states" (2018, 68). The governance value of Indigenous knowledge requires collective self-determination of Indigenous communities to maintain and develop practices that provide adequate responses to external destabilization and domination. The arguments in this chapter highlight that collective self-determination often presupposes ontological self-determination, as Indigenous practices rely on and are intertwined with Indigenous ontologies.

Ontological self-determination demands engagement with ontological difference along our discussions of both representational pluralism and radical alterity. On the one hand, we argued that heterogeneous practices lead to heterogeneous ways of representing the world. Smallholder farmers and fishers in Coração de Maria, Koro, Siribinha, and Poças have representational needs that are different from those of academic researchers because they interact with species in different ways. On the other hand, ontological self-determination very much extends to questions of radical alterity. Ontological difference is not merely about different ways

of representing but also about different ways of being in the world. Taking ontological self-determination seriously, therefore, also means recognizing that Indigenous communities do not have to explain the representational content of their categories to other actors before being granted the right to preserve them. For example, Dagara practices of the *Tengan dem* in Koro or *Caipora* in Amerindian Indigenous communities play important roles in the social organization of these communities and their relations to environments. Ontological self-determination challenges external actors to recognize the right of communities to safeguard these ontologies rather than to insist that they first have to be made intelligible to academics or other external actors through explication of their representational content.

Ontological self-determination becomes a crucial element of "political ontology" in the sense of a discussion of the political dimensions of ontological negotiations. Following up on our earlier discussion of the triad of paternalism, diversity, and decolonization (sections 2.1.2 to 2.1.4), political ontology navigates between conflicting strategies of relating ontologies. Ontological paternalism follows patterns of dismissing Indigenous ontologies as misrepresentations of the world while embracing academic ontologies as representations of the world as it really is. While this paternalism is deeply entrenched in colonial and developmentist accounts of science, our case studies show the sophistication of Indigenous ontologies in meeting the representational needs of Indigenous communities.

Case studies of ontological difference in this chapter showcase epistemic and political productivity of ontological diversity and its importance for transdisciplinary practice. We have argued that appeals to diversity remain in productive tension with decolonial approaches that highlight persisting inequalities between actors and their ontologies in transdisciplinary collaboration. Ontological self-determination therefore becomes an important element in pushing political ontology beyond tame appeals to diversity and plurality. Ontologies do not always complement each other in harmonious ways and raise the question of how the political positioning of actors affects recognition of their ontologies. While Indigenous ontologies are commonly treated as being in need of academic validation, ontological self-determination inverts this dynamic by insisting that the incorporation of academic ontologies should

not be externally imposed but rather under the control of Indigenous communities. In this sense, ontological self-determination becomes a springboard for ontological justice, recognizing that struggles for social justice and for different ways of being in the world are closely entangled (see Story 4.5).

Ontological self-determination articulates a case for ontological plurality along what Latin American activists and scholars refer to as a "pluriverse" (Boacik et al. 2020; Demaria et al. 2020; Trueba 2008). The "Fourth Declaration of the Lacandón Jungle" of the Zapatista Army of National Liberation (*Ejército Zapatista de Liberación Nacional*, EZLN) provides an influential articulation of this pluriversal ideal: "Many words are walked in the world. Many worlds are made. Many worlds make us. There are words and worlds that are lies and injustices. There are words and worlds that are truthful and true. In the world of the powerful there is room only for the big and their helpers. In the world we want, everybody fits. The world we want is a world in which many worlds fit" (EZLN 1996).

A world in which many worlds—from Chiapas to Coração de Maria to Koro to Siribinha and Poças—can fit most clearly challenges ontological monocultures that universalize one ontological order—whether imposed through colonialism or science-led development. At the same time, a "world in which many worlds fit" is not the vision of an isolationist pluralism in which incommensurable worlds exist with minimal contact. As Escobar puts it: "We may say, following their [the Zapatistas] guide, that every encounter between worlds is an encounter between designs of different worlds. It's a phrase that reads much better in Spanish: *El encuentro entre mundos es el encuentro entre diseños de mundo*. This statement makes it clear that there was never an expectation that differently designed worlds couldn't or wouldn't meet" (2023, 46). Political ontology is therefore not merely about stipulating different worlds but also about relating them. Some of these relations can be positive and even emancipatory in character (see our examples in sections 4.2.2 to 4.2.4). At the same time, ontological encounters often remain violent processes of oppression or eradication in the name of development, modernization, and progress. The challenge of political ontology is not only to theorize but to intervene in such dynamics—both as a constructive force that can facilitate ontological encounters and as a critical tool for challenging ontological oppression.

Story 4.5: The Ayuuk Way of Being a Community

Matthias Kramm

From 2009 to 2011, I worked as an English instructor at the Ayuuk Institute of Higher Studies (ISIA) in the southeast of Mexico, in the state of Oaxaca. Back then, I had no particular research project I was working on, which allowed for plenty of time to immerse myself in the vibrant life of Jaltepec de Candayoc. Jaltepec is located in a region officially called Baja Mixe, which means that it lies in the lowlands of the region inhabited by the Mixe people. However, Mixe is merely the official title, while the Mixe call themselves "Ayuuk."

The Ayuuk language is a branch of the Mixe-Zoque language family and is entirely different from Mexican Spanish. The Ayuuk have a strong identity based on the fact that they were never conquered by the Spanish, as was even reported by Hernán Cortés in one of his letters from Mexico. Furthermore, the Ayuuk have a great academic tradition that comprises important public intellectuals such as the anthropologist Floriberto Díaz and the linguist Yásnaya Aguilar.

The economy in Jaltepec is largely based on subsistence agriculture, and the prevailing religion is a syncretism that combines elements of Catholicism and Ayuuk cosmology. Simultaneously, Jehovah's Witnesses and the sect La Luz del Mundo actively recruit members in the region. Notable festive days such as Christmas Eve and Easter Sunday are celebrated in a communal manner with the entire village—a stark contrast to the Central European traditions to which I was accustomed, where both Christmas and Easter have developed into private celebrations that rarely extend beyond the confines of one's family.

As the anniversary of the ISIA approached, preparations to celebrate this milestone together with the citizens of Jaltepec began. The religious authorities were invited, and on the morning of the 10th of November we traveled in small pickup trucks to the *cerro sagrado*, the sacred hill. Each of us carried a chicken for a ritual sacrifice at the top of the hill. The students were very excited, and it was an enjoyable trip filled with chatter and laughter. After we had climbed the mountain, a circle was formed using fresh eggs, the chickens were slaughtered, and further offering and incense (*copal*) were added to the setup. We joined the religious authorities in prayer and expressed gratitude for everything we had

received during the previous year. Afterward, we returned to the village for a nice breakfast and a day full of wonderful festivities.

While I thoroughly enjoyed the ritual on the *cerro sagrado* and the subsequent celebrations in Jaltepec, this brief experience also contained a very important insight for me: For the Ayuuk, there exists a deep relationship between the individual, the community, and their territory, which finds its direct expression in the Ayuuk way of life. Festive days are not restricted to the individual or even to their core family—they are celebrated with the whole community. Additionally, the landscape is not merely a background for these human activities but is actively part of them. The sacred hill is a place where we could thank nature for all we had received from it. Nature had given, and now it was our turn to say thank you and reciprocate.

This relational understanding of the hill differs considerably from a notion of nature as a mere assemblage of geographical objects or natural resources that can be exploited. However, it also requires self-governance and self-determination on the part of the Ayuuk people to enable their ontology, in which the individual forms part of a community and belongs to a certain territory, to become a lived ontology. While the federal state of Oaxaca grants a certain degree of self-determination to the Ayuuk people, the exact scope of this self-determination remains contested.

4.2.7 New Directions for Political Ontology

The previous chapter highlighted transformations of research agendas in epistemology through the institutionalization of both social and political epistemology. Ontology is currently undergoing a similar process with the increasing prominence of social ontology (Epstein 2018; López Rivera and Andrés 2015; Stahl 2021; Testa 2016) and the politics of human kinds (Bessone 2013; Godman 2020; Hauswald 2014; Mallon 2016; Winther and Kaplan 2013). Following influential articles such as Appiah's "The Uncompleted Argument: Du Bois and the Illusion of Race" (1985) and Haslanger's "Gender and Race: (What) Are They? (What) Do We Want Them to Be?" (2000), ontology has become a vibrant meeting ground in academic philosophy that engages contested entities in the social domain, such as gender and race, but also caste, class, disability, ethnicity, intelligence,

mental disorder, mother, refugee, obesity, sexual orientation, and so on (e.g., Ásta 2018; Barnes 2016; Berman 2022; Diaz-Leon 2015).

Our case for political ontology builds on these developments but also aims to substantially extend them. Indeed, social ontology has already come a long way in taking ontological debates into spaces of public relevance. Mainstream ontology in the second half of the twentieth century was largely restricted to socially detached issues such as the very existence of abstract or composed objects. Much has changed, and a new generation of social ontologists is pushing the field toward the interface of social reflexivity and action. Especially in light of growing philosophical concerns with the relation between ontology and justice (Díaz-León 2022; Griffith 2019; Jenkins 2020; Mikkola 2015), social ontology has *de facto* already expanded into political ontology. This body of literature is not exclusively concerned with the ontology of the social domain but more broadly with the social dimensions of ontological negotiation.

Indeed, "social ontology" can be defined in two complementary but different ways: first, as the ontology of the social domain and, therefore, as one ontological subfield in addition to the ontology of other domains, such as biology, mathematics, physics, or psychology. Second, social ontology can also be defined through the social dimensions of ontological negotiations that also occur in the natural sciences around many categories, including biodiversity, conservation, disorder, extinction, genetic modification, metabolism, natural resource, health, or sustainability, among many others (Bocchi et al. 2022; Boersma et al. 2023; Ludwig et al. 2023; Mol 2002; Rijssenbeek et al. 2022; Sarkar 2019; Shah 2021). "Social ontology" in this wider sense can be read in analogy to "social epistemology," which is also not exclusively concerned with knowledge about the social world but more broadly with the social dimensions of epistemic practices. For example, social epistemologists not only discuss knowledge production in the social sciences but have also critically engaged with epistemic practices in biological and other natural sciences (e.g., Wagenknecht 2016, Wray 2011). In analogy, a broader reading of social ontology also opens space for reflexivity about the social dimensions of producing and negotiating ontologies across domains of inquiry.

Just as social epistemology in this wider sense needs to incorporate political epistemology (Edenberg and Hannon 2021; Hannon and De Ridder 2021; Haslanger 2021), social ontology needs to incorporate political ontology. While the negotiation of ontologies does not reduce to politics, it also does not reduce to purely empirical, epistemological, or metaphysical

questions either. Understanding ontologies in real-world practice requires understanding the interaction of these factors. While current developments in social ontology increasingly point toward the development of a substantial political ontology, community-based approaches also allow expanding the toolbox of philosophical ontology along at least three dimensions.

(1) Expanding the Domain of Political Ontology: Currently, the notion of political ontology is most commonly used in anthropology rather than philosophy (Bormpoudakis 2019; Escobar 2015; Pimentel 2021). For example, Blaser (2009, 11) defines political ontology through the "negotiations involved in bringing into being the entities that make up a particular world or ontology [and the] conflicts that ensue as different worlds or ontologies strive to sustain their own existence as they interact and mingle with each other." Blaser's definition includes ontological conflicts far beyond the social world, and much of the anthropological literature has become concerned with ontological conflicts around nonhuman entities such as mountains, rivers, plantations, or forests (Chao 2018; Ressiore et al. 2024). Along similar lines, our case studies from Coração de Maria, Koro, or Siribinha included ontological tensions along very different entities, such as agricultural pests, seeds, fish, or *Caipora*.

While social ontology has come a long way in recognizing the deeply normative and value-laden character of ontological conflicts, normative debates often remain restricted to focusing on human kinds such as gender and race in North America and Europe (Ludwig 2019a, 2021; Msimang 2022). In order to become relevant for a global perspective, ontology once again needs to fundamentally rethink its domain (see also Baumann and Bultmann 2020; Ludwig and Weiskopf 2019).

- First, it requires a reconsideration of dominant debates in social ontology about issues such as gender and race by linking them with rich controversies about global conceptual contestation. An ontology of race that focuses exclusively on the United States will at best be irrelevant to understanding the situation of the majority of the world's racialized people, from Brazil to China to Libya to Myanmar to Qatar to South Sudan to Poland.
- Second, a globally relevant political ontology needs to diversify the kind of categories it considers. While the current emphasis on gender and race in social ontology also points toward relevant controversies in the Global South, an exclusive focus on these categories would be far too

narrow. On the global scale, political ontology needs to address the nature of phenomena such as development or sustainability, which have been largely ignored by social ontologists but shape the livelihoods of billions of people around the world.

- Third, political ontology also needs to be able to look beyond the social domain and recognize that "ontological troubles" (Verran 2021) extend into other—for example, agricultural, ecological, medical, or psychological—domains. Understanding livelihood struggles under conditions of global challenges such as biodiversity loss or climate change also means that politics cannot be neatly contained to the ontology of social kinds.

Contemporary philosophy has come a long way in making ontology socially relevant but still has a long way to go in making ontology globally relevant. Just as social and especially feminist ontologists challenged the philosophical mainstream to incorporate debates about gender and race, it is time to challenge the field once again to broadly reconsider its scope from a global perspective.

(2) Beyond Representation: This chapter has developed a representational pluralism while simultaneously emphasizing that ontological conflicts cannot be understood exclusively through a representational framework. As we have argued, local communities and academic biologists often use different representational strategies that identify different referents. For example, the community of Coração de Maria classifies agricultural pests according to factors that are relevant for farming, instead of phylogenetic relations. The community of Koro classifies seeds according to the use of ancestors that contribute to food security, even if they do not pick out monophyletic groupings. Representational pluralism converges with pluralist trends in philosophy of science (Ludwig and Ruphy 2021) and is familiar to social ontologists who work on issues of gender and race. For example, it has become widely argued that racial concepts can be used for different representational purposes: to refer to false racist ideas of deep population differences, to refer to superficial phenotypic groupings, to refer to social groups in positions of privilege and oppression, and so on. Recognizing the plurality of representational options makes any negotiation of racial ontologies a deeply political issue (Ludwig 2015a, 2021; Hochman 2017; Winther and Kaplan 2013).

While questions of representation matter, we also emphasized the need to move beyond the philosophical focus on linking concepts and referents through accounts of representation. Philosophers often depart from the assumption that "concepts, just like beliefs, are representational devices, their function is an epistemic one: to represent the world" (Simion 2018, 923). In cases such as the personhood of rivers or *Caipora*, we suggested that such a representational understanding of concepts is far too narrow. Rather than asking what *personhood* or *Caipora* represents in the world, we argued that it will sometimes be more productive to ask what these concepts *do* in the world. Representing the world is only one of the things that concepts do in the world. Especially in the context of ontological self-determination, we therefore challenged the idea that the legitimacy of an ontology depends on communities explaining referents to external actors.

While philosophers often assume a representational starting point (see, however, Price 2004; Risjord 2021), anthropologists commonly reject "representationalism." Despite the ubiquitous talk about the "crisis of representation" in anthropology (Lianfeng 2018), we maintain that thinking about representation remains crucial. At the same time, our arguments highlight a broader need to think about ontologies not exclusively in representational terms. The importance of looking beyond representation is not unique to intercultural contexts but also matters for many other debates in social ontology. For example, think about controversies about the concept *woman* and the inclusion of trans women (Dembroff 2021; Díaz-León 2022; Jenkins 2016). The issue can be partially addressed through representational pluralism. The concept *woman* can fulfill different representational functions in the sense that it can be used to refer to people with certain identities, cultural practices, social roles, chromosomes, gametes, hormones, genitals, and so on. Depending on the representational content, *woman* will pick out sets of people with slightly different extensions and be suited for different epistemic functions.

Just as in our discussion of Indigenous ontologies, however, the issue here is not only what the concept *woman* represents in the world but also what it does in the world. Prioritizing questions about the epistemic functions of *woman* neglects that social concepts are tools for building our social world. How we use *woman*, for example, shapes how we treat trans women as individuals and as a society. It shapes the world that trans women inhabit from everyday practices to legal and medical treatment. Ontologies of gender and sex are much more than representational tools that serve specific

epistemic functions; they are tools for building and negotiating the social world. Trans liberation is therefore primarily about the social mechanisms that we create, challenge, or maintain through our use of categories such as *woman* and only secondarily about evaluating the epistemic functions of specifying the referent of *woman* in terms of identities, cultural practices, social roles, chromosomes, gametes, hormones, genitals, or whatever.

Developing social ontology into a substantial political ontology demands careful thinking about both representational and nonrepresentational functions of ontologies. Ontologies are tools for structuring the world around us and for shaping our practices of interacting with the world (Figure 4.7). Of course, representational and nonrepresentational functions are intimately connected, in the sense that the specification of representational content will often shape practices, and the demands from practice can shift representational needs. However, it is crucial not to reduce ontologies to their representational functions or to evaluate them exclusively in representational terms. Representing the world does not exhaust what we do with ontologies.

(3) From Paternalistic to Community-Based Ontology: Community-based philosophy points to a crucial methodological challenge for social ontology. Our community-based approach is driven by a wider critique of paternalistic traditions of research that recognize only the knowledge of academic actors while neglecting the expertise of marginalized communities (section 2.1.2). However, moving toward community-based approaches constitutes a difficult challenge for philosophers who are used to giving advice from the philosophical armchair and who have few established traditions of collaborative, intercultural, and interdisciplinary research (see, however, the growing

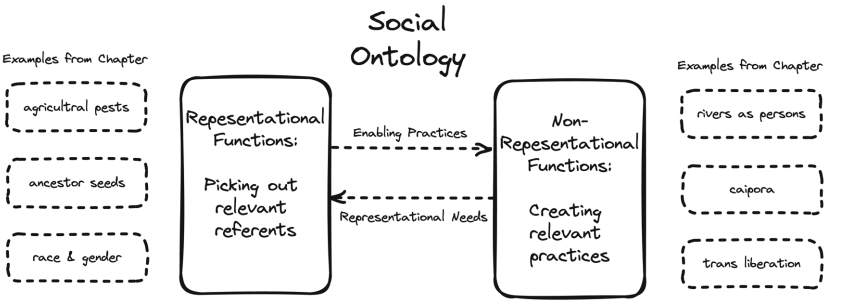

Figure 4.7 Dual character of social ontology with representational and nonrepresentational functions.

debates about field philosophy and community-based science; e.g., Brister and Frodeman 2020; Despret 2018; Weisberg et al. 2021, 2023; Wylie 2022a).

Recent debates about "conceptual engineering" and "conceptual ethics" (Burgess, Cappelen, and Plunkett 2020; Isaac and Koch 2022, Podosky 2022) illustrate this problem, as philosophers often develop normative proposals of how concepts—say: *woman* or *race*—should be used in society while implicitly positioning themselves as final authorities in evaluating the thicket of empirical, metaphysical, and normative concerns. Some of these issues have become recently discussed as the so-called "implementation challenge" (Koch 2021; Queloz and Bieber 2021): Do philosophers really have the power to transform concepts and ontologies? Should they have this kind of power in society?

Community-based ontology suggests that these questions deserve negative answers if they follow a "vanguard model" in which philosophers evaluate concepts or advocate for conceptual change in a top-down manner. When positioning themselves as the conceptual authority for the rest of the world, philosophers simply reproduce paternalistic modes of research that we criticized in section 2.1.2 as fundamentally inadequate for engagement with complex social realities. This does not mean giving up on normative engagement with concepts and ontologies, but it challenges philosophers to learn to contribute to collaborative practices in which normative authority is distributed across actors. As an alternative to a vanguard model, community-based ontology provides an entry point for such a methodological reorientation toward a substantial political ontology that is based on community engagement rather than a positioning of philosophers as ultimate ontological authorities. At the same time, such a reorientation also indicates that social ontology—just as academic philosophy more generally—still has a very long way to go in learning how to speak *with* rather than merely *about* people.

5
Community-Based Politics

5.1 On Community Struggles

5.1.1 The Case for Co-production

Frameworks of knowledge co-production are often articulated by communities as tools for local action and as demands for epistemic recognition. For example, consider the framework of "Two-Eyed Seeing," which was formulated by Mi'kmaw Elder Albert Marshall in the 2000s as a way of relating Indigenous and academic knowledge. Two-Eyed Seeing emphasizes the potential of bringing together heterogeneous forms of knowledge by "learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and to using both these eyes together, for the benefit of all" (Bartlett et al. 2012, 335).

While the notion of Two-Eyed Seeing is of relatively recent origin, it stands in a long tradition of Indigenous thought across the Americas about the epistemic conditions of Indigenous survival in settler colonial societies. Marshall and Bartlett (2006) respond to the imposition of "One-Eyed Seeing" through genocide and epistemicide in North America. The aspiration of Two-Eyed Seeing is not only to recognize Indigenous knowledge in areas such as education and conservation but also to relate it to academic knowledge in ways that genuinely support the struggles of Mi'kmaw communities. The Mi'kmaw chief Charlie Labrador highlights the motif of genuine support through the picture of trees holding hands: "Go into a forest, you see the birch, maple, pine. Look underground and all those trees are holding hands. We as people must do the same" (Marshall and Bartlett 2006, 8). Two-Eyed Seeing is therefore not merely about two complementary types of knowledge but rather about creating a third space of mutual care and support. Indigenous survival does not demand merely recognition of Indigenous knowledge in isolated niches but rather coordination of different forms of knowledge in support of Indigenous struggles.

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Shifting the focus from North America to South America, *conscientização* constitutes a core concept of Paulo Freire's liberatory pedagogy that refers to the interplay of critical reflection and active intervention. *Conscientização* demands the synthesis of "reflection and action upon the world in order to transform it" (Freire 1970/2000, 51) and thereby highlights the importance of doing research not only *about* communities but also *for* communities. However, *conscientização* is more than just scientific humanitarianism that uses the epistemic resources of science for the benefit of communities. Instead, *conscientização* has become a foundational concept for Participatory Action Research (PAR) (Campos and Anderson 2021), as Freire emphasizes the need for symmetrical relations between researchers and communities: *Conscientização* becomes a dialogical praxis by expanding from research *for* communities to research *with* communities, in which different forms of knowledge enrich and transform each other. In this sense, Freire emphasizes that "*conscientização* cannot rest content with the technical or scientific training of intended specialists" and that genuine dialogue requires transformative relations: "The correct method lies in dialogue. The conviction of the oppressed that they must fight for their liberation is not a gift bestowed by the revolutionary leadership, but the result of their own *conscientização*" (1970/2000, 67).

Conscientização complements Two-Eyed Seeing not only in its emphasis on the multiplicity of epistemic actors but also in the recognition of the need for a transformative dialogue between them. It is not enough to simply have two knowledge systems coexisting; they need to support and shape each other—from Chief Labrador's pictures of trees holding hands to Freire's vision of a liberatory education that transforms both oppressor and oppressed. Dialogue is embraced as a transformative process that emerges out of struggles against oppression. Knowledge co-production that emerges from this struggle cannot be additive in the sense of merely producing the sum of the knowledge of the oppressor and oppressed. Instead, it needs to be transformative in challenging oppressive relations between knowledge systems and creating the "means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world" (Freire 1970/2000, 38).

Two-Eyed Seeing and *conscientização* could easily be supplemented with other examples of co-production frameworks that have emerged from community struggles, such as the *ConCiencias* of the Zapatistas in Mexico (Flores Marín 2017) or *endogenous development* discourses in Ghana (Millar 2014).

Despite their geographic and political heterogeneity, these frameworks approach knowledge co-production through the interests of communities rather than the ambitions and careers of academics. Along similar lines, many scholar activists have emphasized the need to center the practical demands of community struggles. For example, Whyte (2018) focuses on the question of what "Indigenous knowledges do for Indigenous peoples" in contrast to the question of how it may supplement academic research in answering academic research goals. Co-production therefore becomes a framing that mobilizes and transforms diverse sources of knowledge in the service of local communities rather than merely acknowledging local knowledge when it is useful for academic research questions.

5.1.2 How Academia Co-opts Co-production

While "transdisciplinarity" is commonly used as an umbrella term for different forms of knowledge co-production, its institutional embedding often shifts agency from communities to academics (Ludwig and Boogaard 2021; Turnhout et al. 2020). The quick rise of transdisciplinarity in academia has been driven not by community-based struggles but rather by institutional mainstreaming in supranational organizations like the Organisation for Economic Co-operation and Development (OECD) or the European Union, national science funders, and universities of the Global North. For example, transdisciplinarity is assigned a prominent role in the European Commission's Horizon 2020 and Horizon Europe programs, with a combined budget of €172.5 billion and the promise that "support for transdisciplinary research and innovation will lead to a better understanding of the environmental, socio-economic and demographic drivers of change as well as deployment of digital, social and community-led innovations that will foster a sustainable, balanced and inclusive development of rural, coastal and urban areas" (European Commission 2021).

Mainstreaming of transdisciplinarity by organizations like the European Commission illustrates the risk of steering the co-production of knowledge away from community struggles and into established mechanisms of academic knowledge production. More specifically, mainstream transdisciplinarity risks co-opting co-production across (a) interests, (b) directions, and (c) actor groups (see Figure 5.1).

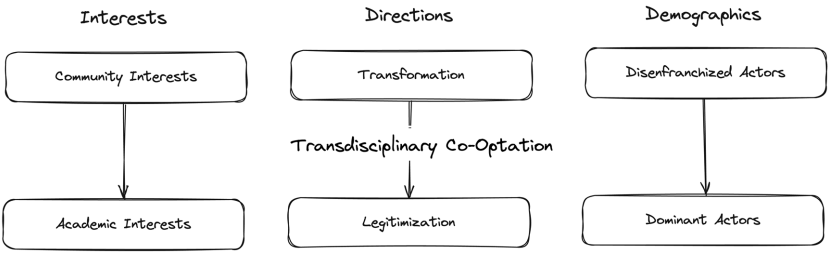

Figure 5.1 Three forms of transdisciplinary co-optation that involve shifts toward (a) academic interests, (b) legitimizing processes, and (c) dominant actors.

(a) *Interest Co-optation* has been a prominent concern across the chapters in this book as we have warned extensively about the risks of "knowledge mining" and "epistemic extractivism," in which community knowledge becomes transformed into supplementary data for academic consumption (Alcoff 2022; Grosfoguel 2016; Kimmerer 2012). In such processes of epistemic extractivism, community-based knowledge ceases to be mobilized for community struggles but becomes a resource for academic researchers who are in charge of the design, budgets, and execution of transdisciplinary projects. This is not to say that the goals of academic researchers cannot be laudable and that many transdisciplinary projects revolve around important issues such as biodiversity conservation, climate change, or public health. As these goals tend to be conceptualized through the concerns of academia and its funders, however, they often push community concerns to the periphery. For example, mobilizing Indigenous knowledge for "sustainable development" may highlight Indigenous expertise about local seed varieties or about maintaining soil health while further marginalizing practices that do not meet expectations of academics, for example, by not contributing to economic growth or by not being scalable beyond the local context or by being "too spiritual" for academic comfort. Mobilizing Indigenous knowledge for "biodiversity conservation" may highlight Indigenous expertise about threatened species or fragile ecosystems while prioritizing the interests of external conservation managers rather than those of Indigenous communities. From questions of sustainable development to biodiversity conservation, transdisciplinary projects commonly reflect unequal arrangements of

institutional power, as it is usually academics who initiate, design, and execute such projects. Thus, academic control over transdisciplinary processes commonly results in interest co-optation in the sense that co-production ceases to be mobilized to advance community interests and is instead shaped through academic concerns.

(b) *Directional Co-optation* changes the trajectory of co-production from transformation to legitimization. For example, transdisciplinary practice has become increasingly positioned as a tool "to restore public trust through participatory processes" (Bracken et al. 2015, 1294) and to reduce public hostility toward science in the light of urgent issues such as climate change or Covid-19 denialism. However, this goal of legitimizing science through transdisciplinarity can invert the transformative ambitions expressed in co-production frameworks such as Two-Eyed Seeing or *conscientização*. For example, Freire's *conscientização* reflects an approach to co-production that aims for transformation, rather than legitimization, through dialogical practices that are shaped together with the oppressed and their struggles. It is helpful to situate this dynamic in our earlier (section 3.1.2) discussion of standpoint epistemology. We argue that mainstream transdisciplinarity follows an integrationist framing that embraces the plurality of epistemically productive standpoints and the benefits of their integration. Academics know a lot. Indigenous communities know a lot. Bringing these epistemic resources together creates more robust epistemic processes. In contrast to this integrationist paradigm in the transdisciplinary literature, we argue that standpoint theory builds on a critical analysis of the relations between standpoints. For example, the goal of Black standpoint feminists like Collins (1990) is not to supplement the current structure of academia with Black perspectives but to transform it with emancipatory goals. In contrast, the mainstreaming of transdisciplinarity often leads to directional co-optation in the sense that such transformative ambitions become sidelined in favor of legitimizing processes that stabilize existing structures through appeals to diversification and integration.

(c) *Actor Co-optation.* Many community-based approaches to knowledge co-production emerge from the struggle against concrete forms of oppression from Indigenous genocide and epistemicide in the case of Two-Eyed Seeing to resistance against the Brazilian military dictatorship in

the case of *conscientização*. In contrast, mainstream transdisciplinarity often emerges from academics trying to strengthen their links with nonacademic actors and segments of society. On the one hand, this can happen through a depoliticization of transdisciplinarity that decouples "stakeholder diversity" from the politics of representation. This is most striking in literature that frames science-industry collaborations as transdisciplinary processes, thereby identifying industry partners rather than disenfranchised communities as core collaborators (Cai et al. 2019; Ludwig et al. 2022; Schodl et al. 2015). On the other hand, mainstream transdisciplinarity often retains a tamed politics of representation that is integrated into the administrative machinery of academic diversity management (Ahmed 2012; Lopez and Ludwig 2021; Ludwig and Boogaard 2021). Many transdisciplinary projects highlight the importance of diversity, including the need to "involve partners from the Global South." However, such partners are rarely treated as equals and in a position to challenge dominant interests (Polejack et al. 2022). Examples are legion, but our participation (see Vijayan et al. 2022) in the 2021 United Nations Food Systems Summit provided us with a striking reminder of these dynamics: The UN Summit was carefully choreographed with symbolic appeals to diversity and prominently appointed Agnes Kalibata, Rwanda's former minister of agriculture and animal resources, as its special envoy. At the same time, advocates of community interests such as the Alliance for Food Sovereignty in Africa (AFSA) or La Vía Campesina remained largely excluded, and, accordingly, decision-making was ultimately centered on dominant industry and state actors. Despite its symbolic appeal to inclusion and transdisciplinarity, the UN Summit was therefore widely boycotted by community-oriented organizations and criticized as "an effort by a powerful alliance of multinational corporations, philanthropies, and export-oriented countries to ... capture the global narrative of 'food systems transformation'" (Canfield et al. 2021). In this sense, the UN Summit provides a particularly clear case of actor co-optation in transdisciplinary processes that circumvent community struggles by co-producing knowledge with less unruly stakeholders.

The mainstreaming of transdisciplinarity commonly involves the co-optation of community-based approaches by assimilating them into academic

diversity management and framing them along dominant academic interests. The problem, however, is not the concept of transdisciplinarity, and very little is being gained from talking about "citizen science," "co-construction," "co-production," "multi-stakeholder approaches," participatory research," or "open science" instead. No matter what label is used, co-optation across interest, direction, and actor levels remains a structural challenge of co-producing knowledge (see also Story 5.1).

Two-Eyed Seeing offers a rich illustration of this problem of co-optation, as the concept emerged from Mi'kmaw struggles for self-determination but has become increasingly mainstreamed in debates in environmental and sustainability sciences (Forbes et al. 2020; Kutz and Tomaselli 2019; Reid et al. 2021). While this mainstreaming reflects that Two-Eyed Seeing has become a productive framework for co-producing knowledge, it has also raised concerns about a "latent tension in *Two-Eyed Seeing* between a desire to foster dialogue—in order, ideally, to generate a trans-cultural 'third space' of understanding—and the denial or suppression of major contradictions between predominantly wholistic Indigenous and predominantly reductionist Eurocentric worldviews" (Broadhead and Sean Howard 2021, 111). Insofar as Two-Eyed Seeing has become mainstreamed as an integrationist pluralism that frames both eyes in complementary harmony, it risks obscuring the need for transformation of the academic gaze that has been instrumental in framing Indigenous knowledge as inferior and in need of modernization.

The challenge of co-optation does not disappear by replacing *transdisciplinarity* with Two-Eyed Seeing or any other terminology. Instead, the challenge is structurally grounded in the science system that embraces epistemic diversity without challenging institutional control by dominant actors. Academic researchers are doing the integration while the knowledge of communities is being integrated into dominant academic frameworks. This structural inequity requires a structural response that is transformative in Freire's sense: rather than integrating subjugated forms of knowledge into dominant frameworks, genuine dialogue is constituted by joint "reflection and action upon the world in order to transform it" (1970/2000, 51) and, thereby, also requires transformation of academic knowledge production rather than merely integration of nonacademic knowledge into existing structures.

Story 5.1: On Building Reciprocal Relations in Siribinha

Esther Milberg Muñiz

One day I arrived at Dona Patricia's house (may she rest in peace) in dismay, realizing that many community members in Siribinha had doubts about the researchers and their intentions. Some community members expressed faith in the researchers' benevolence and appreciated their presence: "I like it when they ask me questions . . . it makes me feel good they come from far to interview me, I feel important." Others, however, harbored suspicions about the fate of the information they divulged. "I am really worried about what happens with all that information we give. We give, we give, it goes out of here, and we have no idea where it ends up. Personally, I think, they note those fish species we mentioned to restrict you even more from fishing in the future," voiced a wary fisher. After observing interactions between researchers and community members, I realized that some approaches to fieldwork lacked emphasis on fostering reciprocal, open, and affective relationships.

I shared these insights with Charbel upon my return from the community, and his response was one of grave concern. The possibility that the research team had failed to effectively communicate with the community, potentially sidelining their political and material interests, created genuine apprehension in him. With a sense of urgency, he convened the next meeting, stressing, "We really need to discuss this problem. We cannot fall into the trap of superficial participation!" The next meeting was marked by a myriad of newly proposed texts on community engagement, participatory struggles, decolonial partnerships, epistemic diversity in practice, and more. The default mode seemed to be to delve into critical reflective papers, yet, amid this flurry of activity, I couldn't help but wonder: Are these publications and theoretical reflections really what is most needed? Are more concepts and theories truly helping in making transdisciplinarity work in Siribinha?

I first arrived in Siribinha in 2019 for my master's degree research. With my blonde hair and weird accent, I expected that it would take substantial time to develop close relationships in the community. However, an unforeseen tragedy swiftly integrated me into the community's fold. Following a devastating crude oil spill along the northeastern Brazilian coast, Siribinha's shores and mangroves became marred by a toxic black sludge known as "pixe." In response, various collaborative initiatives

emerged, uniting us, strangers to each other, against a common adversary. It was through this collective and collaborative effort that I arrived at a stark realization: genuine engagement needs to transcend the realm of academia, requiring a mastery of interpersonal connection and reciprocity. Without it, it is hard to address the material, political, and epistemic interests of the community. Unfortunately, the bonds we forge and the lives we touch along the way are rarely seen as a priority in the academic world. And even with all the good intentions of the Siribinha project, academic imperatives of fieldwork funding and publications often left insufficient time for building reciprocal relations necessary for collective actions.

Friction arises when institutional procedures drenched in the capitalist ethos of academic science shape the organization of a research project. The more a researcher focuses on academic career progress, the harder it becomes to prioritize these interpersonal and reciprocal relations. Transdisciplinary endeavors such as the Siribinha project are not immune to the pitfalls of superficial transdisciplinarity, and even with all our good ambitions and critical theories, we can become stuck in a system that incentivizes co-optation.

My reflections provided me a poignant reminder of the ever-present risk of co-option of co-production within academia, highlighting the imperative for vigilance and introspection in our collaborations. I've come to realize that the crux of the matter isn't a simple dichotomy of whether research is co-opted or not. Nor is it merely a matter of how much is, and how much is not, captured. The commitment and openness to relate, listen, understand, introspect, and, crucially, to act upon newfound insights embody the spirit of genuine transformative transdisciplinarity.

5.1.3 Transdisciplinarity as Elite Capture

While concepts such as Two-Eyed Seeing and *conscientização* express transformative ambitions that emerge from community struggles, mainstream transdisciplinarity often trades transformative for legitimatizing purposes by integrating nonacademic knowledge into dominant structures of academic knowledge production. Although these dynamics of academic co-optation motivate our demand for *transformative* transdisciplinarity, adding the adjective "transformative" can also easily become an empty gesture. As

"transformative approaches" (Krause 2018; Leal Filho 2015), "transformative research" (Meisch 2020; Widianingsih and Mertens 2019) and "sustainability transformations" (Chambers et al. 2022; Salomaa and Juhola 2020) are rapidly gaining prominence in academia, appeals to transformation themselves become low-hanging fruits for co-optation. Most transdisciplinary projects aim for some kind of change that can easily be branded as "transformative" if the concept is not clearly delineated. For example, academic publishers such as Elsevier and Springer embrace the branding of "transformative journals" when experimenting with new business models for monetizing Open Access publications.

An articulation of transformative transdisciplinarity needs to provide more than vague gestures toward transformation. In developing a more substantial analysis, we build on recent debates about "elite capture" (Shapland et al. 2021; Táíwò 2022) that show how transformative ambitions become captured through mechanisms that turn them into tools for institutional legitimization. The notion of elite capture comes from development studies in which it is used to describe "the capture of the distribution of resources, project implementation and decision making which negatively impacts non-elites or the target population or is deemed to be corrupt under the law" (Musgrave and Wong 2016, 93). In international development, "elite capture" therefore mostly refers to situations in which resources are intended to benefit a local community but end up benefiting local elites that are in control of benefit distribution. Olufemi O. Táíwò (2022) (not to be confused with Olufemi Táíwò, whose views on decolonization were discussed in section 2.1.6) employs a generalized account of elite capture as a ubiquitous political phenomenon beyond international development. Táíwò centers on "identity politics" as a case study of elite capture that shifts from a transformative community-based concept in the 1970s into a mainstreamed tool of diversity management that legitimizes institutions and their managerial elites.

The notion of identity politics was initially proposed by the Combahee River Collective, a Boston-based group of Black feminist and lesbian activists who challenged lack of representation in social movements and positioned identity politics as a tool for community struggles. As the Combahee River Collective (1983) put it: "We believe that the most profound and potentially most radical politics come directly out of our own identity, as opposed to working to end somebody else's oppression. In the case of Black women this is a particularly repugnant, dangerous, threatening, and therefore revolutionary concept because it is obvious from looking at all the political

movements that have preceded us that anyone is more worthy of liberation than ourselves."

Táíwò's analysis of identity politics as elite capture is based on a twofold argument. First, identity politics was initially conceived as a tool for political organizing and coalition building, highlighting liberatory struggles of Black women that remained excluded in feminist and in civil rights organizations. Second, identity politics has become captured as a currency of elite-based politics that symbolically appeals to "the marginalized" while structurally serving the interests of institutional elites: "In a stunningly clear summary . . . the mayor of Washington, DC, had 'Black Lives Matter' painted on streets near the White House, atop which protestors continued to be brutalized. The following year, the Central Intelligence Agency rolled out the second strategy, producing a dozen 'Humans of CIA' recruitment videos reaching out to multiple identity groups, including queer and Indigenous people" (Táíwò 2022, 24).

Comparing Táíwò's discussion of identity politics with our case of transdisciplinarity allows a specification of elite capture along two axes. First, we consider *what* is being captured (we will claim: *concepts*, *benefits*, and *processes*). And second, we consider *who* is doing the capturing (we will claim: *local elites* and *dominant elites*).

Starting with the first axis, both identity politics and transdisciplinarity illustrate the phenomenon of *conceptual capture*. In its original formulation by the Combahee River Collective, identity politics meant coalitional organizing in social struggles. The captured concept of identity politics, however, shifts meaning, shaping it as a tool of diversity management in dominant institutions such as companies, universities, or political parties. Conceptual capture is also reflected in the reinterpretation of co-production through mainstreamed transdisciplinarity. While Two-Eyed Seeing and *conscientização* appeal to knowledge co-production as tools for communities, mainstream transdisciplinarity understands co-production through generic appeals to epistemic diversity in which community perspectives supplement established academic frameworks.

Conceptual capture is intertwined with *benefit capture*. The separation of identity politics from community struggles has also created novel beneficiaries. Rather than directly pushing for benefits for oppressed communities, appeals to minority identities of CEOs, Hollywood actors, university professors, or politicians largely benefit dominant institutions and a few individuals who are well-positioned within these institutions. Benefits for

oppressed communities become largely symbolic in the promises of trickle-down effects of having some members of oppressed groups elevated into the managerial class of dominant institutions. *Benefit capture* is also rampant in transdisciplinary practices that provide epistemic resources and political legitimacy to dominant institutions of knowledge creation. Consider biopiracy as an extreme form of benefit capture that brings Indigenous knowledge into academic and industrial contexts for the exclusive benefit of the latter (Mgbeoji 2014). However, a focus on biopiracy can also mislead, as many cases of benefit capture in transdisciplinary research do not involve direct commercial exploitation of Indigenous knowledge. Transdisciplinary benefit capture is often more subtle, for example, by shifting priorities away from livelihood struggles of communities toward research questions that benefit academic publication records and careers of scientists. As Leonelli (2023, 18) puts it in relation to the recent push for data sharing and Open Science: "Making data widely available on global databases, with little regard for what regimes of intellectual property (and resulting innovations) may apply down the line, carries risks for the farmers and breeders generating data through their labor and expertise. It is often unclear what benefits, if any, the indigenous and farming communities who contribute to data collection may accrue."

Both conceptual and benefit capture are intertwined with *procedural capture*. The early days of identity politics were reflected in the agency of the Combahee River Collective and its push to expand agency of Black women in feminist and civil rights movements. Captured identity politics operates through captured agency that is concentrated within dominant institutions and their diversified managerial class rather than actually representing oppressed communities in decision-making processes. In the case of transdisciplinarity, both Two-Eyed Seeing and *conscientização* center on the agency of oppressed communities with the goal of transforming dynamics of knowledge co-production. In contrast, captured transdisciplinarity also captures agency in the sense that oppressed communities are "allowed to participate" and that their knowledge becomes integrated into established structures of knowledge production that remain in firm procedural control of dominant actors.

Distinguishing between (a) *conceptual capture*, (b) *benefit capture*, and (c) *procedural capture* provides an entry point for navigating the complexity of interlinked phenomena of elite capture. While it is important to clarify *what* is being captured, the origins of the elite capture concept in

international development also highlight the need for another axis of analysis that clarifies *who* is doing the capturing.

Debates about elite capture in mainstream development focus on "local elites leveraging superior political and economic status to usurp the benefits of community development and decentralisation programmes that transfer control over public goods to lower-level governance structures" (Shapland et al. 2021, 81). The targets of this elite capture critique are usually privileged members of local communities: chiefs and mayors capturing resources that were meant for the community as a whole; men capturing resources that are meant to support rural livelihoods of women; local companies and local NGOs turning development aid into profit for their organizations rather than sustainable benefits for the community as a whole; dominant ethnic or religious groups capturing benefits against the interests of oppressed groups within communities. This interpretation of elite capture has become widely mobilized to cast doubts about community-driven development (CDD) and has challenged the idea that "CDD projects are more effective than more conventional approaches in terms of efficiency, equity (reaching the poor), and sustainability" (Platteau 2004, 224).

This focus on capture by local elites without similar concern about capture by dominant elites in development often reinforces narratives according to which the former cannot be trusted, and control over resources, therefore, needs to remain firmly with the latter. CDD and related bottom-up approaches have become embraced in development in response to a wider critique of the colonial and paternalistic structures of the development industry (see section 2.1.2). Highlighting capture at the local level without similar concern about capture at the global level therefore often serves to " legitimise top-down control over development resources," and "development researchers and practitioners implicitly argue that elite capture in decentralisation and CDD is worse than the capture that occurs when national elites or development institutions maintain top-down control over development resources" (Shapland et al. 2021).

The pushback against CDD and the legitimization of top-down control in development practice demonstrate the need to distinguish between two levels of elite capture. Indeed, local elites commonly capture development resources in ways that lead to unequal benefits within communities (see also Cabral 1979; Sankara 1988b). At the same time, resources are often more thoroughly captured by external elites, as the development industry is saturated with the overheads of international NGOs and research projects that

capture development resources for processes that serve their own agendas. Often, this external capture is grounded in a first-order critique of local elites while masking its own second-order capture. As Shapland et al. (2021, 88) point out, external capture by dominant elites commonly exceeds capture by local elites as "staff salaries, administrative costs, equipment for the NGOs (computers, cars, etc.), and air travel typically comprise at least 50% of project budgets, and some studies show that NGO and donor capture can be as high as 60–90%."

Taking this instrumentalization of the elite capture critique in development back into our discussion of the elite capture concept, we can therefore complement the distinction of *what* is being captured (we argued: *concepts*, *benefits*, *processes*) with a distinction of *who* is doing the capturing (Figure 5.2). First-order capture occurs when concepts, benefits, and procedures become dominated by a local elite *within* an oppressed group. Second-order capture occurs when first-order capture is mobilized to legitimize the capture of concepts, benefits, and procedures by an already dominant elite *outside* of an oppressed group.

For example, consider elite capture and gender in the context of international development. Even if a development intervention is intended to benefit a community at large, first-order capture may lead to the marginalization of women. The starting point will often be process capture through

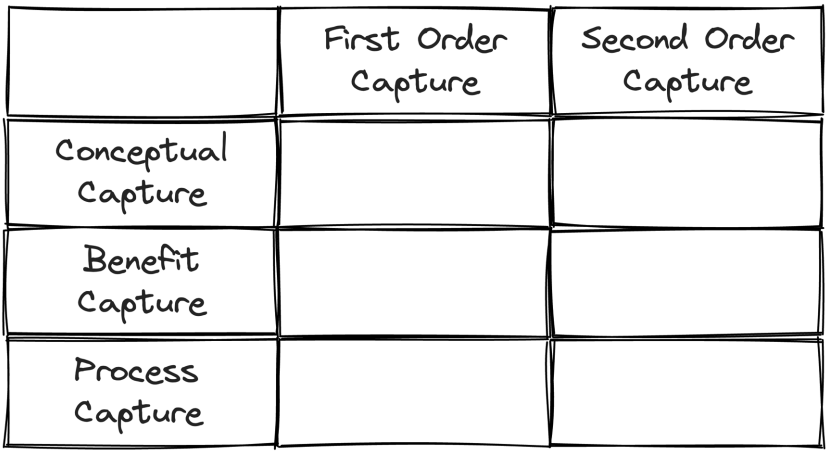

Figure 5.2 Model of elite capture along two dimensions (a) What is being captured? Concepts, benefits, and processes. (b) Who is capturing? First-order capture by local elites and second-order capture by global elites.

co-creation or validation workshops that bring community members and external development actors together but exclude women from equal participation. The result will commonly be benefit capture by shaping interventions along the material interests of men in the community, while also producing more subtle forms of conceptual capture through biased operationalizations of what "community needs" or "community perspectives" mean in the first place. As gender has become a major concern in the development industry and is highlighted by donor demands, it also becomes fertile ground for second-order capture. As international development organizations assume that communities "cannot be trusted" due to their "backward" gender norms, procedural control remains firmly in the hands of external organizations, while interventions are conceptualized through the apparatus of academic gender studies and European feminism rather than the perspectives of local women (Lopez and Ludwig 2021). Process and conceptual capture through international organizations is also often accompanied by benefit capture, as external control requires an infrastructure of highly salaried gender specialists who conduct fieldwork and surveys, design and validate interventions, and elaborate reports while shifting donor resources from communities to operational costs of the development industry.

Clearly distinguishing between first- and second-order capture is crucial for understanding how elite capture has been mobilized for opposing political purposes, from radical Black activism to top-down control of international NGOs over development interventions. Indeed, Táíwò's starting point is a critique of first-order capture that is largely analogous to the critique of local elites in international development. For example, Táíwò argues that "centering the most marginalized" involves first-order capture in the sense of benefiting "whoever is already in the room and appears to fit a social category associated with some form of oppression—regardless of what they have or have not actually experienced, or what they do or do not actually know about the matter at hand. . . . The rules of deference have often meant that the conversation stayed in the room, while the people most affected by it stayed outside." Táíwò explores "already being in the room" in relation to captured identity politics—for example, the benefits for a Black managerial class of CEOs, Hollywood actors, university professors, or politicians rather than oppressed Black communities. In this sense, his argument translates rather straightforwardly into development contexts, where it may be the chief, mayor, land owner, entrepreneur, or dominant ethnic group that is "already in the room" when a development project is initiated.

However, Táíwò does not challenge first-order capture to legitimize second-order capture. Second-order capture is also ubiquitous in debates about identity politics and most clearly reflected in a violent backlash against diversity management that targets members of oppressed groups as supposedly illegitimate beneficiaries of "identity politics," "affirmative action," "political correctness," or "wokeness," in order to maintain firm control of dominant groups over concepts, benefits, and processes (Weeks and Allen 2022). Challenges of first-order elite capture, however, do not have to be in the service of "white bourgeoisie agenda-setting power" (Bright 2023, 19). In the case of identity politics, many frameworks in the Black radical tradition, from Frazier's (1955) "Black Bourgeoisie" to Cabral's (1979) "Class Suicide" to James's (2016, 2021) "Captive Maternal," challenge first-order elite capture within oppressed communities by centering on community agency rather than second-order appeals to dominant elites and their agenda-setting power.

While local elite capture is often criticized to legitimize outside control by dominant elites, it can also shift focus back to community agency. This is reflected not only in critiques of identity politics in the radical Black tradition but also in contrasting approaches to transdisciplinarity. Elite capture in community-driven development and other transdisciplinary projects can invoke two opposite responses: It can be turned against transdisciplinarity in legitimizing top-down control by external actors, or it can be turned into a case for a transformative transdisciplinarity that centers on community agency.

5.1.4 Centering on Community Agency

Challenging elite capture requires centering on community agency. While our taxonomy of different forms of elite capture provides a critical framework for understanding how community agency is sidelined in transdisciplinary practice, James's (2016, 2023) framework of the Captive Maternal provides a positive countermodel of how community agency emerges from community struggles. James's concept of the Captive Maternal complements the concept of elite capture because it shifts attention from capturing to captured actors, "those most vulnerable to violence, war, poverty, police, and captivity" (2016, 255). James defines Captive Maternals through their function of exploited care labor. Captive Maternals fulfill heterogeneous roles of care

labor, many of them in positions of low societal recognition, such as cleaners, cooks, maids, nurses, peasants, school teachers, sex workers, single parents, or waitresses. While patriarchal societies largely force women into positions of Captive Maternals, James highlights that the concept is defined by its function of exploited care labor rather than by gender (2021a, 21).

On the one hand, the exploited care labor of Captive Maternals is crucial to the functioning of societies that hold them captive. As Captive Maternals are marked by care for their community, their exploitation constitutes a core mechanism of societal stabilization—"caretaking is the priority, even at the expense of one's own self, which is not a healthy choice, but for the captive is it a necessity" (2021a, 19). However, Captive Maternals are not merely passive victims of exploitation but rather are actors who often actively resist their capture. It is often Captive Maternals who organize community struggles and carry most of the burden of challenging material conditions of exploitation when losing their jobs and livelihoods, being violated and incarcerated. While public recognition of community struggles tends to center on "community leaders" or "public intellectuals," James emphasizes that Captive Maternals drive local mobilization while also facing the most violent repression. Community agency is therefore constituted by the agency of Captive Maternals along two dimensions: first, agency in daily struggles in which Captive Maternals keep oppressed communities afloat through exploited care labor; and second, agency in organized struggles in which Captive Maternals resist oppression of their communities.

What makes James's account of the Captive Maternal insightful for a discussion of transformative transdisciplinarity is that it expands discussions of community agency from local elites who are complicit in capture to the agency of those whose care labor is captured. Indeed, substantial parts of James's argument follows familiar critique of elite capture by scrutinizing how the Black "managerial class" or the "talented tenth" (James 2014) has become part of the infrastructure of an oppressive state. At the same time, the concept of the Captive Maternal provides an alternative to focusing exclusively on the agency of elites who are capturing and instead centers on the agency of the captured. The Captive Maternal therefore provides James with a radically different response to first-order capture by a Black "managerial class" that does not legitimize second-order capture by dominant elites, but rather highlights the agency of communities in resisting the very conditions of their oppression.

In spelling out the agency of Captive Maternals, James offers the image of "concentric circles of care" forming a "dialectical spiral that moves from caretaker, to protester, into movement maker, marronage, and war resister" (2023, 16). Presenting these five stages of the Captive Maternal as a dialectical spiral highlights that individuals commonly move between stages and that different stages tend to coexist in the same community. The first stage of the conflicted caretaker is characterized by the commitment of keeping communities afloat through exploited care labor. However, the experience of violent exploitation often drives Captive Maternals to become political actors in protesting and eventually organizing. As the dialectical spiral moves into zones of direct confrontation, marronage offers sanctuary—spaces in which exploitation and oppression are at least partly evaded through community self-organization. War resistance finally marks the stage of explicit confrontation of communities becoming liberation movements in protecting themselves from the state.

The dialectical character of James's stages is reflected in the different communities discussed in this book, as well as their changing historical positions. Siribinha and Poças are very literally the product of marronage—they are Afro-Brazilian communities that gained relative autonomy from the Brazilian state, at least for some time, in the sanctuary of the Itapicuru River. This does not mean, however, that they moved from there on a linear path to James's last stage of confronting the state. It also does not mean that their current agency would still be adequately described as marronage. As we discussed in section 1.1, modernist development in both communities increasingly captures them for cheap labor in the fishing and tourism industries. In Forikrom, the situation is somewhat different (see section 1.2), as the community is not only vocal in protesting the violence of externally imposed agricultural modernization but is actively organizing local movements that aim to articulate alternative visions of self-determination and rural life in Ghana. James's later stage of war resistance becomes most clearly reflected when considering communities such as the Zapatistas, who initiated an active liberation struggle against the Mexican state (see section 5.1.5). The concept of the Captive Maternal therefore helps to understand communities not only as passive victims of elite capture but also as active agents whose political agency becomes expressed in diverse and historically shifting ways.

James's account of the Captive Maternal also helps to clarify how the first-order diagnosis of elite capture gives way to two radically

different responses: second-order elite capture and community struggle. Understanding these different modes is crucial for understanding the complex politics of transdisciplinarity. Indeed, transdisciplinary processes are often shaped by elite capture. First-order elite capture shapes benefits and participation in transdisciplinary projects. Even if transdisciplinary projects aim to include marginalized communities such as Indigenous peoples, women farmers, or ethnic minorities in the co-production of knowledge, they often turn to representatives who are "already in the room" in Táíwò's sense or who have at least sufficient proximity to dominant actors who design and fund transdisciplinary practice.

The critique of elite capture with its backlash against CDD has become a powerful tool in delegitimizing transdisciplinary practice and instead pushing for top-down control and the "effective altruism" of donors and NGOs (Crary 2021; Greaves and Pummer 2019). As this critique of elite capture reinforces wider academic discourses about an alleged "Tyranny of Participation" (Cooke and Kothari 2020), the aim to democratize knowledge production and development becomes undermined as inefficient and idealistic. The result is often second-order elite capture that replaces transdisciplinarity with paternalistic control by dominant elites of the development industry. Communities are deemed to be "too backward" and "too corrupt" to be in charge of their own fate. The concept of the Captive Maternal points toward a radically different response to the diagnosis of first-order elite capture that mobilizes community agency rather than legitimizing top-down control.

5.1.5 Local and Connected Struggles

In his lectures on "Unity and Struggle," Cabral characterizes struggle as a ubiquitous phenomenon of social life that emerges from the entanglement of conflicting social forces. "All are in struggle, all struggle" (Cabral 1979, 31). Cabral's wide use of the concept *struggle* in the anticolonial war against the Portuguese resonates with the broad political meaning of *luta* across the Lusophone world, including contemporary Brazilian political activism (Campos 2021; Pereira 2012). Adopting this use implies that struggles are not exclusive to large-scale liberatory or revolutionary movements but are part of the "everyday resistance" (Scott 1985) of communities that are struggling with local effects of globalized capitalism, such as depeasantization, environmental degradation, and migration.

Recognizing that not all struggles are struggles of organized movements is crucial for returning from political theory to practice in the second part of this chapter. The communities we have been collaborating with exhibit different degrees of organization, but none of them resemble the international superstars of Latin American social movements, such as the Landless Workers' Movement (MST) in Brazil or the Zapatistas in Mexico. To understand seemingly uneventful places such as Siribinha and Poças as places of struggle, we need to distinguish between local and connected struggles.

Local struggles have always shaped daily life for the people in Siribinha and Poças, whose ancestors survived the transatlantic slave trade and the Portuguese genocide of Indigenous peoples. Local struggles remain ubiquitous as these communities are increasingly assimilated into global capitalism with the declining profitability of traditional fishing practices and the rising influence of tourism (see section 1.1). Similar stories can be told for countless other rural communities in (and beyond) Brazil that have persisted through exploitative and oppressive environments without ever attracting the public attention of contested social movements. Local struggles in this sense are defined by communities responding to daily threats to their livelihoods, without necessarily positioning them in the context of regional, national, or even global struggles and forms of resistance.

Connected struggles link a multitude of local struggles in facing interlinked conditions of exploitation and oppression. In Brazil, the MST arguably constitutes the most prominent example of a connected struggle that became powerful enough to shape Brazilian politics, through the linking of local struggles of dispossessed peasants across the country. Other political organizations, such as the Homeless Workers' Movement (MSTS), have followed this model of nationally connecting struggles in Brazil. Connected struggles in this sense are the product of linking local struggles at larger regional, national, or global scales and often become publicly visible through social movement politics.

Conceptualizing local and connected struggles as distinct is not to treat them as independent from each other. On the contrary, distinguishing them allows for better understanding their entanglements. James's account of the Captive Maternal provides a framework for understanding these entanglements, insofar as her framework is applied to not only individual but also community dynamics. While James's different stages of the Captive Maternal can describe an individual's political journey, they can also very much apply to the political journeys of entire communities.

James's first stage of exploited care labor is marked by local struggles rather than overt politicization. It very much applies to many communities whose struggles primarily revolve around providing care and daily necessities in the face of their exploitation as places of cheap labor and cheap natural resources. Rather than being marked by political organization of connecting struggles, the first stage of James's framework is marked by localized needs. On the communal level, this care labor centers on daily human necessities, such as food security, but commonly also involves "more-than-human care" (Yates 2021) in the sense of community kinship that extends beyond the human (Miller 2019). The care labor of many communities extends to the land, forest, or river that is an integral part of the community rather than merely a resource frontier for commodity production (Ressiore et al. 2024).

Many communities around the world are best characterized through the first stage of James's framework of the Captive Maternal. Despite its violent character, the first stage often remains stable in the face of repression. As James points out, however, the interplay of exploitation and repression can also become the catalyst for organized resistance. This is true not only for individuals but also for communities as social actors. Many of the most visible social movements in Latin America emerged from local struggles against state repression (Barbosa 2015; Vergara-Camus 2014). The armed uprising of the Zapatista Army EZLN in 1994, for example, was catalyzed by the repression of Indigenous peasants in Chiapas under the neoliberal policies of Carlos Salinas de Gortari. Local community struggles about access to land turned into an organized struggle when the Mexican government violently turned against the land claims of Indigenous communities that came to see the Mexican state as the primary class enemy. In a similar vein, the MST has its roots in local struggles that became catalyzed into an organized struggle through state repression. While landless and land reform have long histories in Brazil, the MST emerged in the final period of Brazil's military dictatorship through connections of peasant oppression across the country, such as an encampment of 6,000 landless families in Rio Grande do Sul who had been displaced through state-sanctioned dispossession by means of projects such as the hydroelectric dam of Passo Real.

The interplay between local and connected struggles reflects complicated and sometimes tense negotiations of feasibility and systemic transformation. On the one hand, it often appears much more feasible to find local solutions to local problems. A community that is struggling with daily needs such as food security or public health or environmental destruction may find it more feasible to mitigate effects locally, for example, by introducing new forms

of agricultural production or health services or conservation plans. On the other hand, many communities find that such local mitigation strategies, insofar as they are available at all, are only addressing symptoms of global mechanisms of exploitation that continue to position them as sources of cheap labor and cheap natural resources. Challenging such mechanisms of exploitation, however, cannot be a purely local struggle, as they are largely institutionalized at national, regional, and global levels.

Understanding this interplay between local and connected struggles is crucial for not pitching them against each other. Indeed, an exclusive focus on either misleads political practice. An exclusive focus on local struggles leads to a superficial pluriversalism that celebrates community self-determination but lacks tools for understanding global systems, such as capitalism, that turn communities into frontiers of cheap labor and cheap natural resources (Moore 2022). Focusing only on local scales indeed risks addressing symptoms of exploitation rather than the mechanisms of exploitation themselves. An exclusive focus on global struggles without local grounding risks neglecting material conditions of communities in favor of abstract radicalism on the "world historical" scale. This may be fine for academics for whom local livelihood struggles are at best "case studies" for critical theory, but it is not feasible in places like Siribinha and Poças, where daily struggles cannot be put on hold. Understanding the interplay between local and connected struggles therefore helps us avoid pitfalls and guides our return to community practice in the second half of this chapter. Starting with two tangible and locally restricted projects—on fisheries policy and science education—we will explore how transdisciplinary collaborations have the potential of contributing to local livelihoods. Situating such contributions and their limitations in wider movements demonstrates how local community-based work becomes entangled with connected struggles that aim for transformative and systemic change.

5.2 Communities in Action

5.2.1 The Hard Problem of Scholar Activism

Our discussion of transdisciplinarity as elite capture highlighted mechanisms that shift agency away from communities. As academics who engage in transdisciplinary research, these arguments hit awfully close to home. Sure, we have good intentions when working with communities, but the problem

of elite capture is not a problem of bad intentions. Most academics who capture concepts, benefits, and processes are very nice people with good intentions—the transdisciplinary research community in particular is full of lovely people with genuine ambitions of creating a better world.

Transdisciplinary research that actually supports communities, however, is not marked by good intentions but by effective mechanisms for community-based co-production. Aiming for such mechanisms has been—and continues to be—a rocky learning process in our projects. While we can tell stories of success (see Bollettin, Ludwig, and El-Hani [2023] for some of them), there have also been many failures and limitations in our attempts to navigate between the interests of communities and academia.

In Siribinha and Poças, co-production has evolved in a long and ongoing learning process of more than eight years since Charbel and his colleague Diego Fernando Valderrama-Pérez first visited the communities. Much of this learning has been inspired by collaborations with master's students, PhD candidates, and postdoctoral researchers who committed substantial time and energy to establishing relations of trust and collaboration in Siribinha and Poças. For example, one of the main challenges when striving to avoid elite capture is to co-produce agenda-setting that is not dominated by the institutional logic of academic research. During her master's research, Gabriela De La Rosa organized community-based workshops in Siribinha that aimed to collectively define problems, causes, and pathways of action (De La Rosa 2020; De La Rosa et al. 2024; see also Figure 5.3). Building on this collaboration, Gabriela's PhD research now aims at developing critically reflexive transdisciplinary tools that are actually shaped through community agency and mechanisms of inclusive co-production (see Story 5.2).

Our attempts to approach transdisciplinarity in Siribinha and Poças through co-produced agendas have not always been a success. The learning curve for philosophers in the field can be steep, and carefully composed academic texts can obscure the messiness of underlying processes. One helpful strategy for addressing these tensions has been to turn the research team into the object rather than the subject of study. In 2019, Esther Milberg Muñiz joined us to explore dynamics within the research team and between the team and the community. Her master's thesis "Research as a Mangrove" (Milberg Muñiz 2021) uses the image of the mangrove forests surrounding Siribinha and Poças to explore a messy thicket of relations between researchers and community members in which we often risked getting stuck ourselves (see also Milberg Muñiz, Ludwig, and El-Hani 2024).

Figure 5.3 Gabriela De La Rosa discussing social-environmental problems with the community of Siribinha to co-produce diagnoses of problems, identify possible causes, and jointly develop and implement courses of action. (Photograph by Charbel El-Hani, reproduced with permission by Gabriela De La Rosa).

Although Esther found the research team to be driven by sincere ambitions to work with local communities, she also encountered tensions between these ambitions and the reality of academic fieldwork. While the philosophical background of the project fostered reflexivity about epistemic and ontological diversity, many persistent tensions turned out to be much more mundane: Academic requirements of thesis research and publication pressure could push community concerns to the periphery. Precarious labor conditions in Brazilian academia could foster competition rather than collaboration. For example, lack of fieldwork funding would not only create an atmosphere of competition for sparse resources but also mean that data collection in communities was sometimes rushed rather than being based on time-consuming methods of co-production.

There can be no doubt that these structural factors of academic labor incentivize co-optation and capture of concepts, benefits, and processes. While time and material resources are often too limited to generate substantial benefits for communities, researchers are simultaneously pushed to prioritize outputs such as dissertations or publications that would benefit researchers themselves while coming only with vague promises of community benefits. Although the research project carried out in Siribinha

and Poças included co-production elements and political ambitions, the processes often remained structured along academic needs and framed through academic concepts and theories.

Such limitations of transdisciplinary processes occurred despite overall favorable conditions: Collaborations between researchers and the communities of Siribinha and Poças have been growing for many years and constitute the opposite of "helicopter research" (Haelewaters et al. 2021), in which academics land in a community, grab data, and disappear. The project has been largely funded as basic research in philosophy, ethnobiology, and science education, without pressure by companies or donors to produce tangible benefits for external funders. Through its philosophical orientation, the project also fostered critical reflexivity from a wide range of sources such as feminist standpoint epistemology, decolonial theory, and intercultural education. And still, the mundane reality of academic labor at times pushed the project toward a captured transdisciplinarity that prioritized academic questions and outputs over those relevant for community struggles.

It is this tension between academic labor and community-based practice that we call the "hard problem of scholar activism." Recognizing its hardness is to recognize that we have not solved the problem and that a smooth solution may not exist at all. As academics, most of us are employees of the state (e.g., in public universities and research centers) or of private corporations (e.g., in private universities and R&D departments). As employees, our roles are thoroughly shaped by interests of the state and of private corporations (James 2021, James and Wilcox 2022). In engagement with local communities, such dependency on external interests can be expressed through overtly exploitative relations such as biopiracy for the profit of a corporation but also becomes reflected—as in our work—through more subtle mismatches between external interests and those of local communities.

Often, the prioritization of external interests over community interests is not even consciously realized because it is so deeply entrenched into the routines of "what we do" as academics. For example, grant funding for fieldwork commonly means that academics enter local communities with many research questions, methods, and target outputs predefined and approved by a funder and ethics committee. Furthermore, junior researchers do the vast majority of data collection in most projects but are disciplined by job insecurity and precarious labor conditions that sideline more substantial engagement with concerns of communities. Publications become the main currency in the hyper-competitive labor market of academia but are often

largely meaningless from community perspectives on transdisciplinary processes.

Scholar activism involves deep contradictions because the interests of communities often do not align with interests of the state or of private corporations that fund our research. Beyond simply having different priorities, local struggles also emerge because communities articulate interests that are actively oppressed by dominant actors in society who also fund higher education and institutionalized research. Insofar as academics claim to be working in the interests of communities and their struggles, they often find themselves in implicit or explicit tension with the interests of their employers and funders.

The hard problem of scholar activism is an institutional problem of conflicts of interest between communities that activists intend to support and institutions that shape our labor as scholars. It is decisively not an epistemic problem of "lack of objectivity" that activist research is commonly accused of (Crasnow and Campus 2006). As we argued in detail in section 3.1.8, the notion of "objectivity" is often misleadingly ambiguous and serves at best as a vague umbrella label for the mitigation of heterogeneous forms of epistemic risk. Scholar activism often mitigates some of these risks while increasing others (Koskinen 2022). For example, our attempts at co-producing knowledge with the communities of Siribinha and Poças have mitigated some epistemic risks through standpoint diversity. The next section will provide a detailed case study of such mitigation of epistemic risks, as our recognition of local expertise of fishers revealed that Brazilian law protects many fish at the wrong time, outside of their reproductive period. At the same time, there can be little doubt that transdisciplinary research introduces novel epistemic risks. While the expertise of nonacademic actors can complement academic expertise (Byskov 2017; Martínez-Cruz and Eulalia 2022; Turnhout et al. 2019; Van Bouwl 2023), it does not usually involve formal standards of reproducibility or statistical significance that aim to reduce epistemic risks in academic knowledge production.

Activist research can also be biased in favor of interventions that are co-produced with communities and against interventions that are promoted by external actors. For example, agroecological scholar activism is sometimes overly optimistic about the potential of local practices while hastily rejecting any type of conventional agriculture without careful evaluation of evidence on local impacts. But the inverse is at least as common, as researchers who work within mainstream paradigms of agricultural modernization

often overestimate their own positive contributions while dismissing local practices without sufficient evidence. Intervention-oriented research always runs the risk of being biased in promoting its own interventions and requires careful reflexivity about promises and realities.

From our participation in community-based research, we see no evidence that it is less reflexive than research that is carried out to support dominant agendas (see also Duncan et al. 2021). On the contrary, working with communities often demands epistemic sincerity and responsibility because it connects actions and consequences in a more concrete way. Academic research is full of unsubstantiated claims of its potential societal benefits, and grant-driven research environments incentivize empty jargon in mandatory "societal impact" and "knowledge utilization" sections. It is easy to write an academic article or grant proposal that concludes with some vague gestures toward its potential to create a positive impact for society. In Siribinha and Poças, we cannot get away with that. In our collaborations from conservation to education to tourism, interventions need to prove themselves in practice and require epistemic and social responsibility for their effects. Rather than leading to biased romanticization of communities and their knowledge systems, being situated in community-based practice often demands a much more sober analysis of what actually works on the ground.

While community-based research faces many epistemic risks, we see no evidence that it is epistemically more vulnerable than mainstream research that contributes to dominant agendas of addressing food production or other global challenges. In this sense, we do not think that there is a unique epistemic vulnerability or a unique "problem of objectivity" in scholar activism that aims to support communities in their struggles. There is, however, a unique institutional vulnerability that makes scholar activism an inherently contradictory and fragile activity: As we argued above, scholar activists are committed to community struggles, but they are also overwhelmingly employees of the state or of private corporations. Academia is structured along the interests of dominant actors rather than those of communities. The intentions of scholar activists therefore rarely match institutional realities of academic competition, fieldwork, funding, publishing, and so on.

We do not have a solution for this hard problem of scholar activism. The case studies of the following sections, therefore, do not represent ideal solutions but rather non-ideal craftwork of navigating tensions between academic and community-based labor.

Story 5.2: The Power of Interpersonal Relationships

Gabriela De La Rosa

After I finished my bachelor's program in biology at the Federal University of Bahia, I started working on humpback whale conservation in Brazil. That's when I began to notice the huge gap between the concepts we rely on in academia and what people actually experience in their daily lives. Surrounded by people who had a deep understanding of their own ecosystem, I felt inspired to engage more with them. I wanted to learn from their expertise and try to bridge the gap between the worlds of academic ideas and local realities. In 2017, I arrived in Siribinha with a background in ecology and a strong interest in developing conservation initiatives with the community, even though my theoretical knowledge was limited at the time. Through my experiences, including challenges, failures, and successes, I started to question whether my methodologies were sufficient to achieve my goals. Was the main goal of including other knowledge holders in the decision-making process becoming a reality? I also began to build strong relationships with some community members, realizing their importance in the process, understanding their perspectives, and translating academic language for other stakeholders.

After so many years of working with the community members, they've had a profound impact on me. The experiences I've had, the stories I've heard, the hugs we've exchanged—they've all reshaped my perspective on the world and on what type of science truly matters to me. Being awakened by the children of the community, asking to assist me in "my work," and being introduced by them to other members of the community made me feel like I was on the right path. I grew up hearing that if kids like and trust you, something in you is right. Many times, when I doubted myself as a researcher, this belief gave me strength. Once, an elderly fisherman from Siribinha shared with me that he attended our workshops and meetings because he felt that he could teach us and share his wisdom and that we care about his perceptions. He also felt that we were speaking his language and sharing our knowledge as well. Something was clicking by this point; I could feel it. I'm still not sure if I've fully developed the necessary theoretical background or if my academic peers from ecology truly value what I've explored and written. However, I'm certain that what adds vibrancy and provides guidance to our academic journey are interpersonal

relationships, in particular the complexity and contradictions that they can bring to the surface. Aspiring to construct bridges instead of walls, viewing our knowledge as rivers that can merge without losing their individual paths and thus form a confluence of knowledge, is what can truly empower ideas and turn them into something tangible. Perhaps that isn't what natural sciences are all about, but for myself, that is what these people have been teaching me.

5.2.2 Community-Based Policy

Siribinha and Poças are fishing communities, making fish a focal point of our epistemological and ontological concerns. Part of our research has involved ethnobiological studies on local knowledge and classification of fish in the Itapicuru estuary. Ethnobiological methods can provide fine-grained documentation of local knowledge that can inform better practices and policies, as shown by Vitor Renck's PhD research (see section 4.2.4). In exploring policy implications, Vitor compared fishers' knowledge with the knowledge of academics and technicians that is used to formulate Brazilian environmental policies. Very much in line with our discussion of overlaps and partialities from previous chapters, Vitor found that the relations between different bodies of knowledge are complex in exhibiting both convergences and divergences (Renck et al. 2023a).

Additionally, he classified some partialities as complementary. For example, only local fishers know where to find certain populations in the mangroves while only academic biologists know about their phylogenetic relations. However, these differences are complementary in the sense that they can be integrated into a broader transdisciplinary knowledge base.

However, Vitor also identified partialities that he categorized as competing in the sense that they made incompatible claims that suggest different interventions or policies. The issue of reproductive periods of fish involved a particularly challenging case of competing partiality of knowledge systems. Reproductive periods of fish are crucial for protecting marine fauna, as reflected in closed-season policies that prohibit fishing of certain species. In Siribinha and Poças, protected species in closed seasons include snooks, shrimps, and the crab *Ucides cordatus*. For the snooks *Centropomus undecimalis* and *Centropomus parallelus*, locally known as *Robalão* and *Robalo branco*, the closed season is set between the 15th of May and the 31st

of July. For the shrimp species *Farfantepenaeus subtilis, Farfantepenaeus brasiliensis, Xiphopenaeus kroyeri*, and *Litopenaeus schmitti*, the closed season is set between the 1st of April and the 15th of May, and from the 1st of December until the 15th of January. For the mangrove crab (*U. cordatus*), locally known as *Caranguejo-sal*, the closed seasons are between the 1st of December and the 31st May (for female crabs), and between January and March, on the full and new moons (for both males and females).

Closed seasons are a common source of bewilderment in Siribinha and Poças. Fishers are compensated by the federal government with a closed-season insurance (called *seguro defeso*), corresponding to the Brazilian minimum wage (around 275 US dollars), for each banned month. As artisanal fisheries in Brazil are responsible for about half of the country's catches, *seguro defeso* constitutes an important mechanism of environmental protection. Sometimes there is frustration with *seguro defeso* among the fishers, when payments by the government are delayed or missing, but a feeling that one can constantly find among the fishers is one of bewilderment with an apparent mismatch between the closed season that is set by law and the actual reproductive periods of the fish, as the fishers pointed out in the Itapicuru estuary. As fishers of Siribinha and Poças suggested to Vitor, the law is protecting the species simply at the wrong time.

Prompted by this tension between legally mandated closed seasons and local fishers' knowledge about reproductive periods, Vitor conducted semistructured naturalistic interviews (Beuving and de Vries 2015) with fishing experts. Expertise on fish was defined by a combination of peer nomination (who the members of the community consider as being an expert), using a snowball sampling procedure (Albuquerque et al. 2014), and fulfilling the following requisites: Interviewees had to be at least 30 years of age and be experienced fishers (or had been such, in the case of retired fishermen) (this meant that they perform or performed fishing activities ≥4 days a week). Vitor interviewed a total of 18 fishers (43–87 years of age), 12 in Siribinha (fish and crab interviews) and 6 in Poças (shrimps interviews).

While the 12 Siribinha experts agreed that the crab *U. cordatus* is spawning during the mandated closed period, there was substantial disagreement regarding the reproductive period of the two snook and the shrimp species (Figure 5.4). For the snook species, only four of the fishers (33%) agreed with the Brazilian legislation, with most of the fishers' citations pointing to the months of August (for both species) and January (for the *Robalão*) as reproductive periods. For *Robalão* (*C. undecimalis*), only two of 22 (9%) agreed

with the Brazilian legislation, whereas for *Robalo branco* (*C. parallelus*), six citations out of a total of 22 (27%) showed agreement. Furthermore, five of the 12 fishers (42%) distinguished the spawning period for both snook species (reporting that *Robalão* spawns in the summer and *Robalo branco* in the winter), as expressed by E.:

> The spawning of the Robalão is concentrated in January / but sometimes we find some ovulating in August / The spawning of the Robalinho (*Robalo branco*) is concentrated in July and August / but sometimes we find some ovulating in January.

For the shrimp species, there was also a clear mismatch between local experts and the shrimp closed-season legislations, as expressed by G.:

> The closed season is from the 1st of December to the 15th of January and from the 1st of April to the 15th of May / It doesn't match (with the reproductive period) / At that time it's not spawning/It's spawning in the month of São João (Midsummer's Day)/June/July / it goes until the end of August / . . . The closed season doesn't match in this whole region.

The month that received most citations was June (67%), just after the end of the second closed-season period.

Considering only the months that had more than 10% of citations (as suggested by Nora 2013), the reproductive period indicated by the fishers occurs in January, February, and August for the *Robalão*, and June and August for the *Robalo branco*, as opposed to May, June, and July, as defined by the Brazilian legislation. Regarding the shrimps, the reproductive period indicated by the Poças fishers occurs in February, June, August, and November (Figure 5.4), as opposed to April–May and December–January, as stated in the Brazilian closed-season legislation.

The mismatch between community knowledge about reproductive periods in the estuary and the federally mandated closed periods provides a clear example of both epistemic and social benefits of policy based on community knowledge (see also Ludwig and Macnaghten 2020). Taking fishers seriously as epistemic peers indicates that snook and shrimp are protected during the wrong time periods. Acknowledging expertise in Siribinha and Poças (and, for that matter, many other fishing communities along the Brazilian coast) would allow for the formulation of better policies that do not

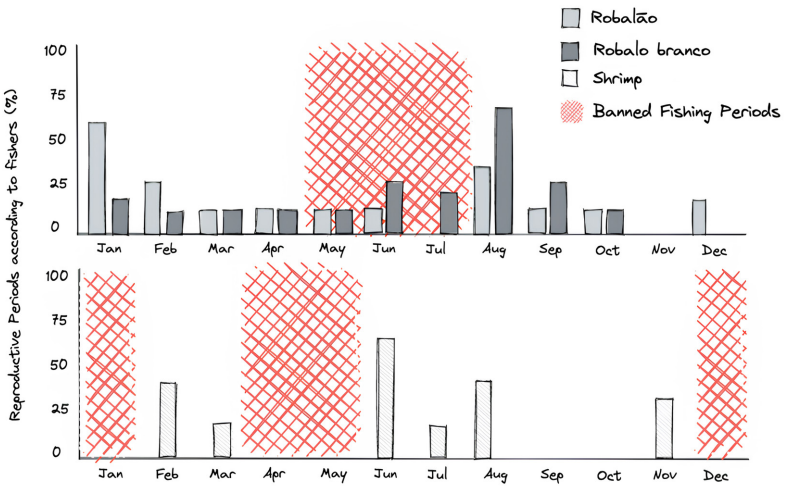

Figure 5.4 Mismatch between fishers' knowledge about reproductive periods and Brazilian closed season legislation. The banned fishing periods are marked in red for *Robalão* and *Robalo branco* (first row) and shrimps (second row). The banned periods clearly do not match the reproductive periods that are reported by fishers and represented through the bars in the figure.

force fishers to either break the law or follow inefficient rules. Furthermore, community-based policies for the closed season would much more efficiently protect the ecosystem and thereby secure the livelihood of the fishing communities. In this sense, Vitor's work demonstrates the potential of a transdisciplinary process that brings communities and external researchers together in support of daily struggles of the former.

And indeed, we published a policy brief together with Vitor and local fishermen that highlights the potential of community-based policies (Renck et al. 2023b). Written in Portuguese for an audience of Brazilian policymakers and technicians, the policy brief emphasizes that the problem is widespread across artisanal fishing communities in Brazil that are governed by federal or state laws that do not fit local community contexts. It shows how recognition of fishers' knowledge can create benefits for communities and environments if locally implemented in Brazil.

While the case of the closed season points toward the potential of community-based policies, it also highlights the systemic challenges of overcoming the marginalization of community knowledge along both

methodological and political dimensions. On the methodological side, the structure of community expertise does not fit dominant standards and procedures of academic research and policymaking. This issue is not unique to Siribinha and Poças but widely reflected in the literature on transdisciplinarity and Indigenous knowledge. Local methods of creating knowledge about the world rarely fit academic standards of data collection, analysis, and presentation (Marlor 2010).

In our case of reproductive periods of snooks and shrimps, community knowledge about fish is informally acquired and shared. It does not come with *p*-values or replication studies. As apparent in Figure 5.4, the messages are also not always straightforward—while there can be little doubt that the snook and shrimp closed seasons protect species at the wrong time, answers of local experts are too varied to suggest a precise alternative time period. Furthermore, the expertise of fishers employs nonstandardized methods that are often shaped by local experimentation (Hansson 2019) but not transparent for external researchers (Wynne 1996). The expertise of fishers does not lead, therefore, to an easily regimented data set that can be simply inserted into existing models and policy mechanisms. Instead, taking the expertise of fishers seriously also requires a methodological orientation toward communities. It requires extensive qualitative and ethnographic efforts (and, possibly, also participatory processes) that build serious relations with communities and can generate meaningful dialogues about policies at local scales.

The challenges, however, are not only methodological in nature. Foregrounding community expertise for community livelihoods requires political processes that prioritize the concerns and knowledge of local communities. The case of federal fisheries legislation in Brazil collides with such a focus on local contexts, as the legislation for snooks is intended to cover more than 1,500 kilometers of coastline. In the case of closed seasons, there is no institutional entry point for adapting legislation according to local community needs. This conflict between local issues and federal legislation points toward a much broader collision between community struggles and political realities that surround them.

Addressing this collision requires centering on the agency of communities in responding to daily struggles, and the next part of this chapter will explore how this agency can be mobilized in transdisciplinary educational interventions. At the same time, community agency becomes heavily restricted by external structures of cultural, economic, environmental, social,

and political domination. Most struggles of Siribinha and Poças are the result of external impositions—as exemplified by the devastating oil spill of 2019–2020, the declining profitability of artisanal fishing in global food commodity markets, the influx of tourism, gentrification, and so on. Responses to such external impositions are largely dominated by political actors outside of the community on national, regional, and global scales. Localizing community struggles can therefore not be separated from the need to connect community struggles, as we will explore in section 5.2.4 through the case of the Ghanaian farming community of Forikrom.

5.2.3 Partial Overlaps and Intercultural Education

School education constitutes a crucial junction of epistemic traditions and has been a focal point for our collaborative work with the communities of Siribinha and Poças since we started working there, in 2016. When we arrived at the communities, there was a school functioning in Siribinha, Escola Sagrada Família, with four teachers. More recently, this school was closed, and now both communities share a school located in Poças, Escola Brazilina Eugênia de Oliveira. These schools are attended by students from preschool and primary school (from grades 1–5 in the Brazilian educational system), with ages ranging from 2 to 10 years. Schooling provides a meeting ground for diverse forms of knowledge and as such also reflects wider dynamics between paternalism, diversity, and decolonization that we diagnosed in section 2.1.

School education in the Global South is often paternalistic by design when exclusively presenting externally produced knowledge, typically with scant or no consideration of local contexts and culture. While intercultural education challenges paternalistic relations by focusing on the importance of epistemic diversity (El-Hani 2022; El-Hani and Ludwig 2024), decolonial approaches highlight that education has been one of the most violent instruments of colonization and still constitutes a core mechanism of devaluing local contexts and culture. Decolonizing education therefore does not merely mean an intercultural fusion of different forms of knowledge but rather demands critical consideration of their roles in community life (Barbosa 2019; Smith et al. 2018).

Especially in Indigenous communities, decolonial arguments can challenge the very idea of formal schooling. Indigenous peoples have established

complex mechanisms of intergenerational knowledge transmission without any reliance on the infrastructure of formal schooling such as classrooms and curricula. Indeed, the introduction of formal schooling can be deeply disruptive for local practices of knowledge transmission and can thereby contribute to the loss of Indigenous knowledge (Ahenakew 2017; Athayde et al. 2017; Salem 2019).

At the same time, an outright rejection of formal schooling is not an option for communities like Siribinha and Poças, which are far too entangled with modern Brazilian society to rely exclusively on traditional forms of knowledge transmission. In Siribinha and Poças, fishing cultures have been shaped through the interplay of African, European, and Indigenous influences that have been formative to the *Jangadeiros* culture (see section 1.1). The interculturality of Siribinha and Poças is not merely the product of historical relations but has also been shaped by concepts and products that are connected across cultures through globalization. Far from being isolated or even resisting all outside influence, Siribinha and Poças are also places of consumption of the products of global capitalism from the local grocery store to TV shows to social media.

As we argued in detail in section 2.1.6, decolonization should not be mistaken for a simplistic nativism that rejects everything external as a violent colonial imposition. Siribinha and Poças are places whose interculturality is here to stay. Both coloniality and decoloniality are therefore found within intercultural encounters. The communities are located in a relatively remote area along the Bahian coast because of Indigenous genocide and transatlantic slave trade of the Portuguese from which community ancestors escaped. The communities often remain in neocolonial relations (Nkrumah 1965) in global capitalism that have made them particularly vulnerable to threats to livelihoods, such as the oil spill of 2019–2020, overfishing by fishing trawlers off the coast, and migration of middle-class people from urban centers, which displaces residents and has been increasingly changing the landscape and social relationships (Thompson et al., 2016; see also section 1.1). As Kitcher's (2022) recent book on rethinking education highlights, education is central to coordination needed when facing the interlinked and global challenges of contemporary societies. This is also true for Siribinha and Poças, as global challenges are inevitably present in their local, daily lives, as shown by the potential effects of climate change on the sea level, which will certainly affect these communities, or by the decline of the fishing stocks on which they depend.

Recognizing colonial realities in Siribinha and Poças requires consideration of the interplay between decolonial and intercultural encounters. Freire's (1970/2000) liberatory pedagogy provides an influential approach for relating decoloniality and interculturality. For Freire, liberation of the oppressed is not achieved through elimination of any dialogue with the oppressor. The reality in most of Brazil, including Siribinha and Poças, is that the lives of oppressor and oppressed are too entangled to create purely nondialogical solutions. However, dialogues need to be liberatory rather than compromising. Instead of finding a middle ground that protects the status quo sufficiently to be palatable to the oppressor, liberatory dialogues aim at transformation of both oppressed and oppressor. In this sense, Freire's liberatory pedagogy is pervaded by a tension between confrontation and dialogue, between the denunciation of all forms of oppression and the vision of intercultural collaboration. From this tension, Freire builds a conception of education that is not limited to schooling and in fact harbors a broadly critical view of the school and its teaching practices. Freire's legacy thereby demands broadening what counts as legitimate knowledge and favoring cultural border-crossing without denying difference, a "dialectical overcoming in which the different preserve what is essential in their differences and share what brings them together in their similarities," as Peroza, Silva, and Akkari (2013, 479) put it.

As we take a Freirian perspective on dialogical and liberatory education into practice in Siribinha and Poças, in combination with other intercultural and dialogical approaches to education (El-Hani 2022; El-Hani & Ludwig 2024), our overall framework of partial overlaps has been providing some guidance. For example, there are plenty of overlaps between school science and community knowledge. It would be deeply against the interests of the community to impose some romanticized notion of purified "tradition" that comes with a rejection of all external modern influences, such as school education about biology and ecology (see section 2.1). At the same time, we have documented in detail (see sections 3.2.3– to 3.2.5) that fishers in Siribinha and Poças are experts on the Itapicuru estuary and its ecological dynamics. The pedagogical challenge is therefore not only to recognize a diversity of experts in educational practice but to relate them in ways that actually support the struggles of the communities (see Story 5.3).

In this effort to relate knowledge systems in intercultural education at the school attended by the students from Siribinha and Poças, we have been carrying out a co-production initiative with the local teachers in which we

combine the partial overlaps framework with other philosophical standpoints (El-Hani 2022; El-Hani and Ludwig 2024): (i) a pluralist pragmatist understanding of knowledge systems and their value to address situated problems; (ii) a conception of intercultural societies as showing cultural contact zones where disparate cultures meet, often in highly asymmetrical relations of domination and subordination, but where new arrangements of culture and power can also emerge (Pratt 2008; Tsing 2005); (iii) an understanding of intercultural education as a dialogue involving translation as a creative, meaning-making act in which learning from others can take place by means of a challenge to our conceptual and practical toolboxes that is potentialized by controlled equivocation (Viveiros de Castro 2004); and (iv) the proposal of a pluriversal science education that can contribute to a transition to a *world where many worlds fit*, as defended by the Zapatista Army EZLN, and to an expansion of cultural cohabitation (Wolton 2004) that benefits from relational humility as an epistemic virtue (Alcoff 2022; Dalmiya 2007).

In this collaborative work, we use a number of design principles derived from the teachers' knowledge, the educational literature, and the pedagogical and philosophical frameworks mentioned above in order to design teaching approaches to promote intercultural education at the local school as a dialogue between knowledge systems (El-Hani 2022): (i) to create opportunities for joint reflection by teachers and researchers about the local school as a cultural contact zone between school knowledge and the local fishing knowledge; (ii) to foster intercultural dialogue between these knowledge systems in the classroom (using the partial overlaps framework), as a way to open up a space for artisanal fishing knowledge in the curriculum and classroom practice but without losing sight of the social demands on the teachers' work and the learning goals established for the students (El-Hani and Mortimer 2007); (iii) to understand the local knowledge system to the largest extent possible in order to develop a classroom dialogue that does not subject it to a caricatural view (McCarter and Gavin 2011; McKinley and Stewart 2012); and (iv) to take into account the pedagogies associated with the transmission of fishing knowledge and practices in the communities when planning and carrying out educational work in the local school (as proposed by studies on Indigenous pedagogies; see, e.g., Battiste 2002, Kulnieks, Longboat, and Young 2013).

The teaching innovations developed and investigated in collaboration with the local teachers who work with the children from Siribinha and Poças aim at fostering educational processes that create opportunities for the

students to ascribe value to their origins and the knowledge and practices of their communities, while also acquiring tools for critically reading the local and global realities in which they are embedded (Freire 1970/2000). When developing these teaching approaches, we consider school scientific ideas that are important for the students to learn, how school education can be better adjusted to the communities' ways of living and learning, and how educational processes should not alienate the students from their own culture. Schooling should also contribute to the maintenance of the local identity-building processes while prompting the students to develop their own capacities of crossing cultural borders to understand the culture of others, increasing their possibilities of participating in new social arrangements that can support the communities' struggle toward more self-determination. This is not only about what education can do to them as individuals but also about what it can do in relation to the struggles and interests of their communities. As Kitcher (2022, 4) discusses, there is a balance to be struck between educational goals that can offer the students grounds to pursue lives they find fulfilling and that can provide for the interests of communities to be well served. After all, even though one's fulfilled life is one's own, each of us becomes who we are through a dialogue in which learn from and give back to a broader community (Kitcher 2022, 7).

We mention here four examples of teaching innovations developed in collaboration with the teachers:

Cultural tales: Students are asked to inquire about stories of their communities and/or families and write them down, as well as illustrate them. In this manner, school teaching and learning can be connected with local memory and narratives. This activity contributes to students' identity-building and reinforces their connections with the communities while also preserving the fishers' cultural heritage and creating room for dialogue between local knowledge/practices and scientific school content (for more details, see Almeida 2022; El-Hani 2022; Silva 2022; see also Story 5.3). The partial overlaps framework can be used to explore the relations between local and school knowledge using the cultural tales.

Garden of local plants: Both teachers and students engage in research on local knowledge of plants and their uses, in dialogue with previous studies of our team (Tng et al. 2021), culminating in the construction of a garden with plants used by the communities as food and medicine. This garden will have information boards elaborated by the students, using partial

overlaps to put botanical school knowledge in dialogue with local plant knowledge.

Social-environmental perception through photographs and knowledge production practices: The students, teachers, fishermen, fisherwomen, and university students are asked to take pictures of the communities and their environments in order to show others their territories and ways of life. The teachers then work with the three indicators of scientific literacy proposed by Sasseron and Carvalho (2008) for primary school: hypothesis raising, justification, and hypothesis testing. The students raise hypotheses on what has been photographed by each group, justify these hypotheses, and finally test them by verifying the pictures organized in an exposition. The activity culminates with a class on how these and other knowledge-building processes underlie the scientific contents treated in the textbooks. In this class, overlaps between how academic scientists and fishers raise, justify, and test hypotheses are discussed, drawing on our studies of local knowledge construction practices.

We will now expand on a fourth example, the development of new school materials that foster transformative dialogues between different forms of knowledge through educational comics. Drawn by Jairo Robles-Piñeros (Universidad Pedagógica Nacional, Colombia) and Juan Manuel Farietta-Robles (Universidad Nacional de Colômbia), the comic *Saberes Pesqueiros, Saberes da Escola. O Ciclo do Massunim* ("Fishers' Knowledge, School Knowledge. The Cycle of the Massunim") begins by introducing the protagonists, Carlinha from Siribinha and her cousin Zé from Poças (Figure 5.5).

As Carlinha and Zé face a range of community issues, they also encounter the importance of different types of knowledge for addressing them. We have already discussed the cases of *Massunim* (section 3.2.3) and reproductive periods of fish (section 5.2.2) in technical academic terms. In our comic, Carlinha and Zé encounter these issues when two experienced fishers are invited by the teachers to come to the classroom to explain that the disappearance of the *Massunim* is caused by the increase of rain upstream in the Itapicuru River, which leads to an influx of freshwater into the estuary that is usually dominated by brackish water because of its connection with the Atlantic Ocean at the river mouth (Figure 5.5). They also explain, not only in the classroom but also by bringing the students to the river, a natural learning place for the fishers, that the *Massunim* reappears because not all

Figure 5.5 Educational comic based on results of studies carried out with the communities, written by Charbel N. El-Hani and drawn by Jairo Robles-Piñeros and Juan Manuel Farietta-Robles. The first page introduces Carlinha and Zé as well as the communities of Siribinha (top right) and Poças (bottom right). Translation of the texts: Narrator: "Carlinha lives here in Siribinha, a fishing village situated between the river and the sea. Her name is Carla Almeida Silva, but everyone calls her Carlinha." Narrator: "Carlinha always plays with his cousin Zé, that's how everyone calls José Santana de Almeida." Narrator: "Lively boy who lives in Poças, always playing in the rocks that embellish the beach in this other fishing village."

of them die when freshwater invades the estuary. Some remain buried in the river bottom mud and, when the rain decreases upstream and freshwater is washed away by the seawater (as the fishers say), the *Massunim* goes up from the mud and reappears.

The story of the *Massunim* communicates not only the expertise of local fishers but also its complementarity with academic biology that describes *Massunim* behavior with different concepts, such as "saline gradients," but supports the same explanation that has already been given by the local fishers (Figure 5.6A). Complementarity between fishers' knowledge and school knowledge is shown not only through the case of the *Massunim* but also when Carlinha and Zé learn about climate change in the classroom and

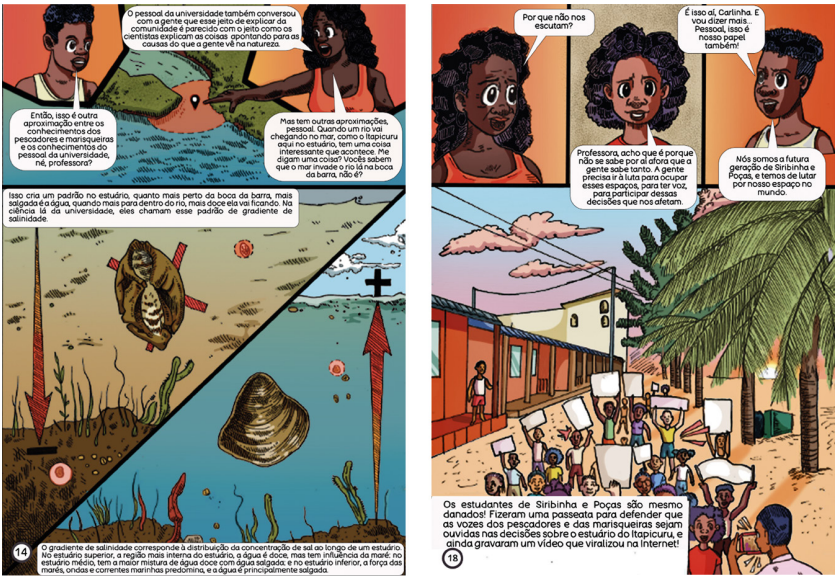

Figure 5.6 Educational comic based on results of studies carried out with the communities, written by Charbel N. El-Hani and drawn by Jairo Robles-Piñeros and Juan Manuel Farietta-Robles. The left side (A) relates local knowledge about *Massunim* cycles with academic knowledge about salinity gradients, exploring an overlap between these knowledge systems. The right side (B) shows Carlinha and Zé discussing the devaluation of local knowledge and the students taking action to advocate for the fishers' participation in policymaking through a protest that has been videotaped and went viral in social media. Translation of the texts: (A) Teacher: "The people from the university also told us that the community explains things in a similar way as scientists by pointing to causes of what we see in nature." Zé: "Then this is another approximation between the knowledge of the fishermen and fisherwomen and the knowledge of the people from the university, isn't it, teacher?" Teacher: "But there are other approximations. When a river is coming close to the sea, as the Itapicuru here in the estuary, an interesting thing happens. Tell me something, do you know that the sea invades the river in its mouth, don't you? This creates a pattern in the estuary, the closer to the river mouth, the saltier the water, the further into the river, the sweeter it gets. In the university's science, they call this pattern salinity gradient." Narrator: "The salinity gradient corresponds to the distribution of salt concentration along an estuary. In the upper estuary, the estuary's more internal region, the water is fresh, but there is still influence of the tide; in the middle estuary, we find the greater mixture of fresh and salt waters; and in the lower estuary, the force of the tide, waves and marine currents prevail, and we mostly find salt water."

situate the phenomenon through the local perspective of the community. The school provides Carlinha and Zé with knowledge that is not endogenous to the community about issues such as the causal roles of greenhouse gases and their largest producers. At the same time, Carlinha and Zé are able to contextualize this school knowledge through community knowledge about the intricate ecological dynamics of the Itapicuru estuary.

The case of climate change demonstrates how the dialogue between community and school knowledge can be more than just the sum of disjunct parts: School knowledge about issues such as greenhouse gases and their producers is only of limited practical significance for the community if not contextualized and combined with local knowledge. Only by bringing both community knowledge and school knowledge into dialogue will a holistic picture emerge in which the complex network of causes and effects of environmental and livelihood threats becomes visible in Siribinha and Poças.

The adventures of Carlinha and Zé, however, do not only provide optimistic lessons about complementarity and fruitful dialogues. As we have seen in the previous section on fisheries policy, community knowledge is not always recognized by external actors and often remains excluded in policy and decision-making processes. Recognizing this marginalization of local knowledge and the dangers it produces to the future of the communities, Carlinha and Zé decide to take action. The comic ends with the students staging a protest in defense of the participation of fishers in decision making that affects their lives. As a way of encouraging the local students to take action, the comic tells how the protest has been videotaped and went viral online (Figure 5.6B).

The adventures of Carlinha and Zé demonstrate how abstract academic considerations about transdisciplinary knowledge production can become materialized in concrete community struggles and educational practices.

(B) Teacher: "Why don't they listen to us?" Carlinha: "Teacher, I think it is because they are not aware that we know so much. We need to fight to occupy these spaces, to have a voice, to participate in the decisions that affect us." Zé: "That's right, Carlinha. And I will say more . . . Folks, this is our role too! We are the future generation of Siribinha and Poças, and we have to fight for our space in the world." Narrator: "The students from Siribinha and Poças are really smart! They made a protest to defend that the voices of the fishermen and fisherwomen be heard in the decisions on the Itapicuru estuary, and they even recorded a video that went viral on the Internet!"

The comic based on the studies carried out with the communities reflects the opportunities of transdisciplinarity in bringing different forms of knowledge together and making them work for the community. In order to create a meaningful picture of the state of the ecosystem and its threats, both community knowledge and school knowledge are needed.

At the same time, Carlinha and Zé learn that dialogue between knowledge systems is not always a harmonious process, as local knowledge often becomes silenced and the livelihoods of the community thereby become threatened. To live up to its transformative ambitions, transdisciplinarity therefore needs to be connected to community perspectives and struggles. This is not to say that everything external becomes rejected. When discussing Táíwò's (2022) worries about nativist misinterpretations of decolonization in section 2.1.6, we objected that this mischaracterizes the intercultural reality of Indigenous communities like Forikrom in Ghana. In Forikrom, we argued that the call for decolonization comes with the tune of the latest Afrobeats from Accra and Lagos rather than a static nativism that is exclusively oriented toward tradition. In the story of Carlinha and Zé, a similar dynamic is reflected in a viral video that mobilizes traditional fishing knowledge but is recorded on a cell phone and shared on social media. For young decolonial activists from Brazil to Ghana, the choice between decolonization and intercultural modernity is a false one. Decolonial futures are not positioned against modernity but rather envision a different modernity that emerges from connected struggles (Sankara 1986).

5.2.4 Connecting Struggles in African Agriculture

In October 2021, the Center for Indigenous Knowledge and Organizational Development (CIKOD) invited David to join festivities in Forikrom that were organized around the theme of "Celebrating women farmers, Indigenous seeds, and community resilience in the post-Covid era" (Modern Ghana 2021). In Forikrom, the dysfunctionality of the global food system is not an abstract issue but part of daily struggles about assimilation into global commodity markets. For example, the festivities took place on the former premises of an Indian agricultural company (Figure 5.7) that had identified Forikrom as a site for cashew production and constructed an administrative and a factory building for processing. It turned out that producing cashews for global markets was not profitable in Forikrom. The company

Story 5.3: Transdisciplinarity and Collaborative Educational Research

Adielle de Almeida Silva and Juliana de Oliveira Fonseca

Our project in Siribinha and Poças began through collaborations with the local teachers. The proposal of jointly developing educational innovations for a dialogue between school and local fishing knowledge was shared with the teachers during our first encounter, in September 2016. Along the following years, we built trust relations, reached agreements, faced challenges, and, above all, challenged ourselves. Everything that can be learned in a collaborative and transdisciplinary educational work would not fit into a short story. We will highlight, therefore, just a few aspects of this long and continuous process.

The first aspect we would like to emphasize is the alignment of objectives, which brings with it the need to give up individual expectations and make room for the fluid construction of collective expectations. The need to recognize that school demands may not be the demands of the university also comes into play here. A fundamental root for the fruitfulness of the bridge between school and university lies in the alignment of their goals in collaborative work.

An example from our work with the local teachers, the construction of a book of cultural tales, raises interesting reflections about these issues. Initially, we planned that the students would collect in the community stories involving knowledge related to fishing and the local environment (e.g., mangrove, river, estuary, sea), with the aim of connecting the stories they would write down with the school science curriculum. As the students got involved in the process of researching local tales, the paths were transformed and rich stories emerged, which are strongly present in the memory of the communities and are also part of the culture of other traditional fishing communities, such as the story of the Caipora. Thus, an activity that initially seemed to be about constructing tales that could be related to the science curriculum became a rescue of local stories in broader terms. These tales carry a richness of narratives, values, customs, and knowledge found in the communities and are, therefore, permeated by their identities. They also show how the means of transmitting knowledge from one generation to another are alive in these communities.

The work with the cultural tales resulted in the organization of a booklet written and illustrated by the students, titled *Tales and Charms of*

the Mangrove, River and Sea: Stories Told by Students from Siribinha and Poças. The booklet was presented to the communities at a launch event in the local schools.

When the activity was carried out, the teachers were working with several aspects related to Portuguese learning, and this was reflected in the way they conducted the activity in the classroom, focusing on those curricular subjects. This made us realize the broad possibilities opened up by the booklet, which could be used for addressing not only school science contents, as initially planned, but also other subjects, such as Portuguese, history, and geography. Indeed, in their own time, the teachers began using the booklet to teach other subjects. This example illustrates the fruitfulness of being open to the changes that can occur in transdisciplinary and collaborative work. As people with different experiences and, consequently, different intentions and needs find room for true participation, the work can take different directions that are as productive as those previously planned and, in addition, can be adjusted to the rhythms typical of each participant's activities.

Throughout these collaborative processes, one issue always permeates our minds: hierarchy in relationships. As we work in a community of practice gathering teachers from municipal schools situated in fishing communities and researchers from a federal university, hierarchical relations imposed by social structures are unavoidable. Being attentive to how they emerge in relationships during collaborative work is fundamental.

An example is found in the noticeable difference in the teachers' positioning when the project coordinator—one of the authors of this book—was present or not in the meetings for building and analyzing educational interventions. When he was present, the teachers behaved in a much shier way and were reluctant to express certain views on the work. Their positioning was much different when he was not there, with all of them actively participating in the discussions, acting in a more relaxed manner, even talking about personal matters. This example illustrates that even though we are aware of hierarchies and act in an attempt to deconstruct them, social structures are inevitably in place and influence the entire work. That's precisely why we need to understand the existing hierarchical positionings in order to build avenues for questioning them such that relationships can be built on a more equal footing. This eventually meant the project coordinator could not participate in the community of

practice with local teachers, unless some specific administrative or political need demanded his participation.

Transdisciplinary collaborative educational research faces multiple challenges. We as researchers are educated in diverse fields of study, within the constraints of academic schedules and outcome demands. When we work in collaborative, transdisciplinary contexts, we face a series of complex challenges posed by the tensions and convergences in goals and rhythms, to which we need to adapt. By doing so, however, we find ourselves in a dynamic transformation process marked by continuous learning, as researchers, but above all as human beings.

disappeared, leaving houses, machinery, and local employees behind. The community offered the vacant buildings to the Abrono Organic Farming Project (ABOFAP) and CIKOD, turning Forikrom into a grassroots hub for countervisions of the future of African agriculture.

When David returned to Forikrom in October 2022, much of the conversation on the global food system had already moved from Covid-19 to the Russian invasion of Ukraine and its implications for food security in Africa. The 2021 message of "Celebrating women farmers, Indigenous seeds, and community resilience," however, had become even more urgent. At the outset of the war, Ghana appeared less vulnerable to disruptions than other countries such as Benin, Democratic Republic of the Congo, and Tanzania that imported more than 50% of their wheat from Ukraine or Russia. In October 2022, however, the value of the Ghanaian currency, cedi, collapsed, putting the disastrous risks of global agrifood commodity chains out in the open: Urban centers in Ghana had become dependent on cheap agricultural imports, which became rapidly unaffordable through the double pressure of increasing prices of agricultural commodities in global markets and the rapid devaluation of the Ghanaian currency (Kwakye et al. 2023).

While the 2021 activities aimed mostly at supporting the community, the 2022 event more explicitly emphasized connections between local and global struggles by hosting the African Learning Institute (ALI), a Pan-African initiative that connects the activities of CIKOD with agroecological movements in Africa. The first iteration of ALI in 2016 represented 15 different organizations across 10 African countries—Benin, Ethiopia, Gambia, Ghana, Kenya, Lesotho, South Africa, Uganda, Zambia, and Zimbabwe. As it happens with resource dependency on development and academic institutions, funding

Figure 5.7 Showcase of Indigenous seeds in Forikrom during the 2021 festivities "Celebrating Women Farmers, Indigenous Seeds, and Community Resilience in the Post-Covid Era." (Photograph by *David Ludwig, 2022*).

ran out, and ALI went into hibernation. The 2022 revival of ALI reflected the contingencies of funding as a grant from Wageningen University made it possible to continue the project and aim for further institutionalization.

ALI brings diverse actors together, including community elders, farmers, policy makers, union workers, NGOs, students, and university researchers. While ALI involves exchange between external actors and local communities, the program aims to avoid co-optation of knowledge co-production for the interests of external actors. In the 2016 iteration, the two-week training involved three core components: first, a *storytelling* approach in which participants shared their perspectives on community resilience. Rather than having external experts explaining what community resilience is and what it should be, the course started with the participants' own perspectives, experiences, and interventions. This resulted in stories about, for example, Indigenous healing in Uganda, music and cultural celebrations in Ethiopia, protection of Indigenous peoples' rights in Kenya, and a Biocultural Community Protocol that was instrumental in halting gold mining in Tanchara, Ghana. Subsequently, the stories were collectively discussed to identify shared characteristics of resilient communities, and they were also related to resilience theory.

The second element of ALI embraced spiritual community practices through a burning ritual. The burning ritual articulated the need for processing shared stories and experiences of violence beyond relating them to theory. As we reflected earlier in relation to James's (2016, 2021a) concept of the Captive Maternal, community struggles are marked not only by productive labor but also by the violence of its exploitation. Many of the shared stories revolved around the violence of treating community livelihoods as collateral damage of national development agendas and corporate profits. Facilitated by an elder from South Africa, the burning ritual invited the participants to write about their own experiences of violence that were subsequently burned in a collective ceremonial fire.

The third core component of the ALI training was a residential program that allowed the participants to stay with a host family in a community, where they experienced community members' daily life routines. Staying with different communities and families in the area exposed the participants to both embodied knowledge and daily struggles. The main assumption in the design of the ALI training was that learning about Indigenous knowledge does not occur primarily through classroom discussion but through engagement with Indigenous practice. During the community residencies,

the participants engaged with agroecological farming, visited sacred natural sites, shared their experience during festivities, and joined an Indigenous food exhibition.

ALI exemplifies a transdisciplinary approach that is grounded in *local struggles* of the community of Forikrom. At the same time, ALI also shows how daily struggles become the basis for *organized struggles* that challenge the very conditions under which they emerge. ALI connects Forikrom and other communities of the Techiman region of Ghana with national organizations like CIKOD and wider supranational networks such as the Alliance for Food Sovereignty in Africa (AFSA). While transdisciplinarity needs to be localized through daily community struggles, locations of struggle are far from isolated but connect at larger scales. Indeed, local struggles of rural communities across Africa are shaped by modernist visions of development that treat Indigeneity at best as folklore while pushing for assimilation into global food commodity markets.

The effects for rural communities follow familiar patterns in countries from Benin to Zimbabwe that participated in ALI: Land grabbing and dispossession create large urban underclasses; militarized conservation criminalizes local livelihood practices; soils erode, and agrobiodiversity is lost; dependency on cash crops leads to loss of food security; and local food cultures are eroded and with them access to nutritious food. Activities in Forikrom such as the local agroecological celebrations and Pan-African training programs of ALI show how daily struggles at the community scale and organized struggles at the international scale become intertwined. On the one hand, daily struggles at the local scale inform organized struggles by teaching about forms of co-creation that actually support livelihoods and resilience. On the other hand, organized struggles at the international scale target the conditions under which daily struggles emerge, which cannot be challenged exclusively on a local scale.

5.2.5 Epistemology and Ontology as Liberatory Projects

While daily community struggles are not always explicitly politicized, they often catalyze organized struggles that challenge the very conditions under which they appear—from smaller initiatives like the ones we described in Forikrom to global movements such as La Via Campesina that represents some 200 million peasants (McKeon 2015). This interplay between local

and organized struggles highlights that transformative politics is commonly shaped by the agency of communities rather than an intellectual vanguard in academia. As Pleyers (2019, 89) points out with reference to the Zapatista uprising of 1994 and La Via Campesina: "Unexpectedly, indigenous people and small peasants became the frontrunner of the global movement that denounces the neoliberal order and explores or renews the paths to achieve emancipation."

Our discussion of community agency and the Captive Maternal suggests that this dynamic is actually not all that surprising. James's account of the different stages of the Captive Maternal reflects that the exploited care labor of local struggles drives communities into organized struggles that become expressed in different forms of protest, organization, and resistance against the state or other agents of oppression. These dynamics are salient in Indigenous peasant movements across Latin America from the *Movimento dos Trabalhadores Rurais Sem Terra* (Landless Workers' Movement, MST) in Brazil to the *Ejército Zapatista de Liberación Nacional* (Zapatista Army of National Liberation, EZLN) in Mexico. While MST and EZLN differ in forms of organization and political goals, both exemplify how daily struggles of oppressed communities turn into political movements that present radical alternatives to the very conditions of their struggle. While none of the communities that we have visited in this book—Coração de Maria, Koro, Forikrom, Poças, Siribinha—exhibit similar levels of explicit political organization, all of them are characterized by struggles against exploitation and therefore helpfully contrast with the Zapatista context, which marks the transition from local to organized struggle most clearly.

When the EZLN launched its armed uprising on the January 1, 1994, its declaration of war against the Mexican state was presented as the product of a long-standing Indigenous struggle against exploitation and oppression. The First Declaration of the Lacandón Jungle argued that "we are a product of 500 years of struggle: first against slavery, then during the War of Independence against Spain led by insurgents, then to avoid being absorbed by North American imperialism, then to promulgate our constitution and expel the French empire from our soil, and later the dictatorship of Porfirio Diaz denied us the just application of the Reform laws and the people rebelled and leaders like Villa and Zapata emerged, poor men just like us" (EZLN 1994).

Indeed, the 1994 uprising was the result of escalating daily struggles against state oppressions from which the EZLN emerged as an act of organized

struggle. Struggles about livelihoods of Indigenous peasant communities in Chiapas reached new dimensions in the 1980s when price drops of maize and coffee affected the major cash crops in the region. The neoliberal policies of President Carlos Salinas de Gortari deepened the crisis through the privatization of the national coffee producer INMECAFÉ and the revocation of land rights of hundreds of peasant communities in favor of politically loyal farmers associated with the Partido Revolucionario Institucional (PRI) that had ruled the country since 1929. These policies made daily struggles for livelihoods untenable and pushed Indigenous peasant communities into an organized struggle that culminated in the Zapatista uprising. It also turned the state into the primary enemy of Indigenous peasant communities in Chiapas. As Collier puts it: "Government intervention into the colonization of one of Mexico's last frontiers thus subtly but irrevocably reversed earlier perceptions of agrarian authorities as allies. The government replaced large landowners as the hated enemy by taking over their role" (cited in Vergara-Camus 2014, 216).

Positioning the state as the primary enemy of Indigenous peasants has motivated the Zapatistas to radically reimagine politics through Indigenous community organization rather than established ideologies from the intellectual vanguard in academia. Most importantly, the Zapatistas insisted that their armed uprising was grounded in the rejection of state institutions rather than an attempt to take control of them. As Vergara-Camus (2014, 257) puts it: "When in the early weeks of 1994 the EZLN insisted that its political project and strategy were not about taking state power but rather about changing the relationship between the rulers and the ruled, it generated enormous confusion within the left." The ambition of "another way of doing politics" has become most clearly expressed in the steadfast rejection of the Zapatistas to collaborate with political parties and other state institutions. Approaching politics from the perspective of Indigenous self-determination and community institutions, the Zapatistas have been building alternative alliances with local and international supporters, civil society, and nongovernmental organizations that do not require compromising community structures in exchange for state benefits.

The Zapatista uprising constitutes a prominent case of the transition from local to organized struggle that we discussed in previous sections. As the Zapatistas insisted on another way of doing politics, their mobilization highlighted the formative agency of communities. James argues that "the deliberative faculties shared among the least recognized, shaped by battle,

offer new theories as leverage for freedom" (2016, 285). In the case of the Zapatistas, this leverage is multifaceted as it involves a countermodel of political mobilization and governance that is grounded in Indigenous community perspectives rather than the centralized power of the state.

This ambition to fundamentally rethink politics through local knowledge, practices, and worldviews gives the Zapatista uprising a deeply epistemological and ontological character. Political practice is recognized as intertwined with different forms of knowledge production and ways of being in the world. On the epistemological side, organized struggles of the Zapatistas have been grounded in a strategy of complex coalition building that also involves a vision of liberatory knowledge co-production with internal and external actors. Zapatista epistemology is not based on a simple "myth of two knowledge systems" (section 3.1.4) that contrasts Indigenous and modern knowledge in an irreconcilable dichotomy. As the complex coalition building of Zapatistas with both activists and academics illustrates, the Zapatistas do not reject external knowledge *tout court* but rather demand that it is unambiguously positioned in the service of community struggles (Ludwig, Milberg Muñiz, and Gatti 2024). Vergara-Camus (2014, 221) has argued that "after forty years of broken promises and betrayals from state officials, many indigenous subsistence peasants in the Lacandona jungle of Chiapas have come to see the state as the main class enemy." Insofar as the science system turns academics into agents of the state (Reyes-Galindo 2022), they do not fall within the epistemic coalition of the Zapatistas. At the same time, the global movement network of the Zapatistas articulates an alternative vision of knowledge co-production in which not only Indigenous but also academic knowledge becomes mobilized in support of both local and connected struggles.

The epistemological case for mobilizing knowledge diversity in the service of community struggles is embedded in an ontological challenge of the very frameworks in which knowledge production takes place. As the Zapatistas put it in their Fourth Declaration of the Lacandón Jungle: "Many words are walked in the world. Many worlds are made. Many worlds make us. There are words and worlds that are lies and injustices. There are words and worlds that are truthful and true. In the world of the powerful there is room only for the big and their helpers. In the world we want, everybody fits. The world we want is a world in which many worlds fit" (EZLN 1996).

The Fourth Declaration has become a watershed moment in Latin American debates about the ontological agency of social movements. This

influence is most clearly reflected in the recent rise and prominence of the notions of "political ontology" and the "pluriverse" (Dorrico 2018; Escobar 2018, 2023; Maldonado-Villalpando et al. 2022; Savransky 2019; Trueba 2008). For example, Kothari et al. (2019, xxxiii) directly link the pluriverse to the Fourth Declaration when writing: "With their phrase 'A world where many worlds fit,' the Zapatistas give us the most succinct and apt definition of the pluriverse."

The pluriversal worldmaking of the Zapatistas is distinct from *Ways of Worldmaking* (Goodman 1978) as discussed in academic philosophy. Goodman's famous case for worldmaking emerges from a philosophical challenge to a metaphysics that assumes a "given reality" that can be described in absolute terms, free from human subjectivity and contingency. There are some important parallels between Goodmanian and pluriversal worldmaking as both insist on an irreducible plurality of world versions and reject universalist appeals to one system that is assumed to be "preeminent and all-inclusive, such that every other version must eventually be reduced to it or rejected as false or meaningless" (Goodman 1978, 59). Goodmanian pluralism primarily targets reductionism that treats physics as an absolute description of reality while casting aside arts, humanities, and other forms of worldmaking beyond the natural sciences. Pluriversal worldmaking, in turn, primarily targets colonialism in its claims of universality, whether expressed in natural science, Christianity, or diffuse appeals to modernity.

While Goodmanian and pluriversal worldmaking meet in their rejection of one universal version of reality, they tell very different stories about worldmaking. Goodmanian worldmaking emerged out of the intellectual climate of the linguistic turn by radicalizing linguistic constructionism. Goodman's suggestion that we literally make worlds with our words was quickly challenged by the objection that he cannot seriously claim that we're making the stars ourselves. In response, Goodman asked, "which features of the stars we did not make, and . . . to state how these differ from features clearly dependent on discourse" (1980, 213). In contrast, pluriversal worldmaking emerges from material struggles: Claiming land, growing Indigenous maize varieties, building community structures of self-governance, and maintaining practices of mutual care are all important material aspects of Zapatista worldmaking. This is not to say that discourse does not matter but that linguistic practices (e.g., conceptualizing land as *ejidos* with communal access) matter insofar as they interact with other material practices (e.g., organizing communal access to agricultural resources). The

importance of discourse for pluriversal worldmaking does not lie in a general constructivist argument about our inability to move beyond discourse but rather in its causal efficiency in shaping material realities (Barad 2007, 211; Ludwig 2023; Srinivasan 2019). The concept of *ejido,* for example, is an important part of Zapatista worldmaking insofar as it shapes practices of sharing land and labor and thereby becomes a major factor in determining local livelihoods. Pluriversal worldmaking, therefore, involves an ontology in which conceptual and material practices are intertwined beyond mere questions of conceptual representation (see section 4.1.7). To say that there are different worlds is not a Goodmanian claim that we cannot move beyond contingent representations but rather a claim about the empirical realities that we build around ourselves.

By being mobilized for community struggles rather than external academic consumption, both epistemology and ontology become liberatory tools for Zapatista self-determination. The liberatory mobilization of epistemology and ontology reflects our earlier discussion of two complementing community strategies: scaling down toward local struggles and scaling up toward connected struggles. On the one hand, we have shown how local epistemic resources support local practices. For example, fishers' knowledge about fish seasonal distribution, behaviors, reproductive periods supports fishing practices that sustain livelihoods in Siribinha and Poças (section 5.2.2). Local knowledge about Indigenous crop diversity in Forikrom supports food security and sovereignty (section 5.2.4). The same is true for local ontologies in the service of local practices. For example, ontologies of insects and fungi support pest management in the farming communities of Coração de Maria and Retiro (section 4.2.2). Ontologies of seeds that are organized by relations to the ancestors in Koro support community resilience through diverse food crops (section 4.2.3). Land ontologies of *ejidos* in Zapatista communities support community access to food and resources that are threatened through land privatization. And so on.

On the other hand, epistemologies and ontologies also play a crucial role in connecting struggles. Exploitation and oppression in local struggles catalyze organized struggles that challenge the very conditions from which they emerge. The articulation of radical political alternatives comes with the articulation of radical alternatives in political epistemology and ontology. On the epistemological side, organized struggles demand visions of knowledge co-creation that reimagine academic research in the service of community struggles rather than in the service of the state or of private commodity

production. On the ontological side, the connection of community struggles articulates visions of a pluriverse that leaves space for heterogeneous ontological frameworks that serve diverse material and spiritual concerns and realities of communities. Radical alternatives in epistemology and ontology emerge as "leverages of freedom" (James 2016, 285) from community struggles and demand from academic philosophy that community-based methods are embraced and that it does not position itself as an intellectual vanguard that centers political agency in academia.

6

Epilogue

Another (Philosophy of) Science Is Possible

6.1 Science Must Be Defended

Science studies have grown increasingly worried about the fragile social position of science in addressing crises from climate change to food insecurity to economic inequality. While humanity depends on research in fields like agricultural sciences, climatology, conservation biology, or epidemiology, the interface of science and society appears threatened by corrosive waves of antiscience populism, anti-intellectualism, and distrust in science (Collins and Evans 2019; Gelfert 2022; Oreskes 2021; cf. Vogelmann 2022b). An unlikely alliance of scholars has emerged to "regain some of the authority of science," as Bruno Latour puts it in an interview with *Science* (Vrieze 2017). Historians, philosophers, and sociologists of science, who have long operated in distinct intellectual niches, find a common calling in emphasizing the existential importance but also fragile position of science in society.

In her TED talk "Why We Should Trust Scientists," historian of science Naomi Oreskes (2014; see also 2021) sets the stage with two salient issues: climate change and public health. Oreskes emphasizes that we need to trust scientists when it comes to a warming planet or vaccines. This is not because science is infallible, but rather because scientists gather and evaluate evidence through collective practices that increase robustness. The scientific consensus may be wrong but often provides the best judgment that societies have when facing complex societal challenges. For instance, Bruno Latour (2004a) argues that even though science does not offer the only standpoint to be considered in social deliberation, we cannot lose sight of what has been established by science about the natural world, unless we have good reasons to question the scientific conclusions. In his essay "Science as Craftwork with Integrity," sociologist of science Harry Collins (2021, 297) recommends not just trust but even love for science: "We should love science other than that which is visibly corrupt, because basing political decisions upon it gives rise

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to the best decisions." Collins's love is qualified in similar ways as Oreskes's trust: science is not characterized by its infallible objectivity but by its sophisticated craftwork. While science can be corrupted, noncorrupted science often provides the best craftwork we have in addressing global challenges and social-environmental crises.

Latour's authority, Oreskes's trust, and Collins's love exemplify a "new defense of science" that contrasts with the legacy of science and technology studies (STS), which has often focused on challenging the authority of science. But the stakes are now too high to focus exclusively on critique (Latour 2004b). Collins et al. (2020, 1) even go a step further in arguing that "STS erodes the cultural importance of scientific expertise and unwittingly supports the rise of populism."

The existential importance and fragile societal position of science has also been the source of disciplinary disruptions in philosophy of science. In contrast to earlier depoliticized debates about the nature of science (Reisch 2005), philosophy of science has become substantially broadened with debates about "science and values" as well as "science and democracy," which became part of the institutional mainstream of the field (Brown 2020; Douglas 2021; Elliott 2017). Rather than rehearsing earlier modes of critique in STS, however, much of this literature aims to position itself as a constructive and supportive partner of science—for example, by clarifying the ways in which we should trust scientists or the ways in which social values are a legitimate part of scientific practice that do not undermine its epistemic standing.

As philosophy of science (and science studies more broadly) is turning attention to social-environmental crises and antiscience populism, an increasing number of scholars aims to defend science against its external threats (Vogelmann 2022b). To be sure, the new defense of "authority," "trust," or "love" of science is not a return to old-fashioned scientism. It is not characterized by appeals to value-free objectivity and duly recognizes that "scientists invariably bring biases, values, and background assumptions into their work" (Oreskes 2021, 64). As Collins (2021, 304) argues, science is not some kind of infallible "magic" but rather a very specific kind of "craftwork" that can go wrong and can be corrupted. The answer to global crises is not an unquestioned appeal to scientific authority that preaches from the pedestal of certainty and value-freedom. On the contrary, scholars like Latour, Oreskes, and Collins appeal to a "science with a human face" that is reflexive about its entanglement with society and honest about its own limitations.

The rise of transdisciplinarity complements this wider case for a humanized science. Indeed, transdisciplinarity—and related trends such as citizen science, participatory research, open science—are important entry points for humanizing science by centering on the importance of diverse perspectives and values. By highlighting this diversity, transdisciplinary methods clearly contrast with an old-fashioned scientism that is rejected by Oreskes, who embraces the ubiquity of values, and by Collins, who presents science as craftwork rather than infallible magic. At the same time, transdisciplinary science provides a positive vision of inclusive science beyond old-fashioned scientism. It also provides a vision of science that is oriented toward societal needs and brings together diverse epistemic resources to tackle issues such as biodiversity conservation or public health in practice. As such, transdisciplinary science constitutes a striking case of science that is humanized through diverse perspectives and values while focused on responding to social-environmental crises.

6.2 Science Must Fall

The new defense of science provides a nuanced middle ground beyond outdated dichotomies of the "science wars" (Carrier et al. 2004) that demand a simple choice between scientism and postmodern critiques of science. It reflects the complex state of philosophical debates about issues such as values, objectivity, and pluralism. By painting a nuanced picture of a "science with a human face," the new defense of science manages to highlight the societal importance of science while simultaneously cautioning against blind acceptance of the authority of science. Science is not infallible magic and can be corrupted, as Oreskes and Conway (2011) show in detail in their discussion of "Merchants of Doubt" who misuse scientific authority in the interest of the oil and tobacco industry. Science that is not corrupted, however, is considered to be the most reliable (Cartwright 2021) guide to intervening in the world and informing the governance of social-environmental systems.

Humanizing science means recognizing it as a human practice that is embedded in societies in all of their cultural, economic, and political intricacy rather than putting it on a pedestal of value-free neutrality. At the same time, humanizing science also opens space for recognizing its importance as an epistemic and social infrastructure of contemporary societies beyond postmodern critique. Despite this nuance, the defense of "science with a

human face" risks presenting an overly positive account of the interface of science and society by obscuring its fundamental contradictions. Science is indeed an indispensable epistemic and social infrastructure for addressing crises such as biodiversity loss, climate change, food production, or public health. However, science is simultaneously a key actor in producing many of these crises and deepening global inequality in the distribution of social-environmental burdens.

The problem with the new defense of science is not that it claims anything particularly wrong. On the contrary, most of its claims are overtly reasonable. However, it puts so much emphasis on contrasting the trustworthy mainstream of "noncorrupted science" with its corrupted fringes that it obscures deep-seated contradictions of the science system. The risk of structural blindness is especially pressing in a lack of engagement with the role of science in society beyond Europe and North America. Programmatic statements in Oreskes's (2021) *Why Trust Science* or Latour's (2018) *Down to Earth*, or Collins and colleagues' (2020) *Experts and the Will of the People* depart from a rather uniform set of examples: Brexit and Trump; climate denialism and anti-vaxxers; conspiracy theories and social media trolls. Communities such as Siribinha and Poças, who have been the protagonists of this book, are typically invisible in these narratives and so are community struggles with the failed promises of science-driven development and modernization.

This issue becomes most salient when contrasting the new defense of science with scholar activism from the Global South. While scholars in Europe and North America often approach the relation between science and society through a narrow lens of antiscience populism, many commentators in the Global South encounter much more complex entanglements of capitalism, colonialism, and the social-environmental toll of resource extraction. In the *Pedagogy of the Oppressed*, Freire presents a much more cautious evaluation when writing that "the oppressors are using science and technology as unquestionably powerful instruments for their purpose: the maintenance of the oppressive order through manipulation and repression" (1970/2000, 60). While Freire reflects on the role of science and technology under conditions of the Brazilian military dictatorship, his sentiment very much remains part of contemporary intellectual discourse in Latin America.

For example, Colombian postdevelopment scholar Arturo Escobar challenges trust in science by arguing that "science has become the most central political technology of authoritarianism, irrationality, and oppression of

peoples and nature" (2018, 89). According to Escobar, science is implicated in the production of global injustice in two ways. First, he argues that science often constitutes a vehicle for "violent development" in the Global South, where it contributes to neoliberal agendas of growth and modernization that deepen global economic inequality while redistributing the social and environmental burdens of biodiversity conservation, food production, and resource extraction onto the Global South. Second, Escobar argues that science functions as "a reason of state" that "even standardizes the formats of dissent" (2018, 89). Alternative visions of societies and environments in the Global South—from *Buen Vivir* and *Ubuntu* philosophies to Indigenous and peasant movements—remain invisible in mainstream development, as they are not couched in academic vocabulary and, therefore, fail to adhere to standards of disagreement and dissent that are defined by the science system.

Freire's and Escobar's perspectives resonate with scholar activism across a wide range of geographies. Writing from the Indian context, for example, Vandana Shiva's (1991) *The Violence of the Green Revolution* challenges the narrative of the Green Revolution as a shining humanitarian achievement of modern science that allegedly elevated much of the "Third World" out of hunger and poverty. Focusing on the Green Revolution in Punjab, Shiva argues that agricultural modernization left the state "with diseased soils, pest-infested crops, waterlogged deserts, and indebted and discontented farmers. Instead of peace, Punjab has inherited conflict and violence" (1991, 11). While the Green Revolution promised progress and prosperity for rural communities, it delivered environmental degradation and land conflicts. In Shiva's story, agricultural sciences are complicit enablers of this violence by introducing new crop varieties, new fertilizers, new pesticides, new machines, and new value chains without taking responsibility for their negative impacts. While scientists take credit for societal benefits created by their research—for example, for scientific agriculture reducing global rates of hunger—they commonly externalize issues like environmental degradation and land conflicts as problems of inadequate policy rather than inadequate science.

Scholar activists like Freire, Escobar, and Shiva provide a striking contrast to prominent science studies scholars like Latour, Oreskes, and Collins. While the latter focus on a qualified defense of science, the former can be understood as developing a qualified critique. The phrase "science must fall" may provide the most polarizing expression of this critique, emerging from the "Rhodes Must Fall" movement in South Africa (Harris 2021). The Fallist

movement grew out of the 2015 protests against a symbolic prominence of colonialist and industrialist Cecil Rhodes in South African academia, including the Rhodes statue on the campus of the University of Cape Town. As student activists increasingly pointed out, however, the problems of South African academia went much deeper than statues of Cecil Rhodes on university campuses, reflecting its roots in colonial and apartheid structures from financial requirements of admission to the structure of the curriculum.

When a student activist articulated this critique in a recorded seminar with the phrase "science must fall," viral responses and memes across the internet celebrated a racist imaginary of an "angry Black woman" expressing her ignorance of science. While these responses largely aimed at delegitimizing structural critique of South African academia, "science must fall" complements "science must be defended" in important ways. Indeed, science is indispensable for addressing social-environmental crises and therefore demands a qualified defense. At the same time, science is also deeply implicated in the production of these crises and therefore demands a qualified critique.

One may be tempted to diffuse critique of the Fallist movement by arguing that it conflates science with its potentially harmful application: "Of course, scientific knowledge has been used to exploit people and the planet. Of course, many scientists have contributed to this exploitation. However, none of this is intrinsic to science itself." Such an attempt at diffusion, however, fails a basic demand of symmetry in debates about the interface of science and society. If we want to defend science for its potential to do good in mitigating climate change or viral pandemics, we also need to face the potential of science in accelerating these crises and deepening inequality. Indeed, this demand for symmetry motivates Shiva's (1991) critique that modern science claims credit for technological fixes while delinking itself from the problems it creates. Facing the interface of science and society, therefore, means that we also need to face its deep contradictions.

6.3 Another Science Is Possible

While "science must be defended" and "science must fall" are contrasting slogans, both are insightful and jointly point toward the contradictory state of the science system as a major tool in mitigating and accelerating social-environmental crises. These contradictions cannot be reconciled by separating "good science" that needs to be defended from "bad science" that

needs to fall (see also Moore and Antonacci 2023). Of course, there are clear cases of bad science that are epistemically corrupted, from racial pseudoscience to climate change denialism. And of course, it is often important to distinguish these from legitimate research in population genetics or climatology.

While the critique of epistemically corrupted research matters, we deliberately avoided centering our discussion around such comparatively straightforward targets. The demarcation between bad/corrupted and good/noncorrupted science may help in debunking racial pseudoscience, for example, but it can simultaneously obscure how epistemically successful research remains instrumental to contemporary racial orders. Dehumanization through racial pseudoscience played a central role in early capitalism for the creation of what Moore (2015, 27) calls "Cheap Nature" and specifies as the "Four Cheaps of labor-power, food, energy, and raw materials." For example, plantation regimes crucially relied on dehumanization to legitimize the appropriation of labor power through slavery and of land through colonial conquest. However, the rise of Cheap Nature in plantation regimes was not exclusively the product of corrupted racial pseudoscience but was co-produced with the epistemically most sincere and successful science standardizing and quantifying plantation production while mapping colonized land, identifying new species for commodification, breeding more productive crop varieties, improving food storage and transport technologies, and mechanizing labor.

Turning from the history of plantation agriculture to the current food system, racial pseudoscience has lost its central function in the appropriation of nature. Still, the global food system remains deeply violent in its mechanisms that dispossess peasants, expose them to pesticides and other toxins, dismantle local community structures, and create urban underclasses. Agricultural sciences and agrotechnology are the backbone of "innovation" for a global food system that connects spaces of poverty and richness (Ploeg 2018, 93) in the pursuit of Moore's Four Cheaps. The violence of the global food system remains staggering along racial (as well all class and gender) dimensions. Its violence is directed against not only humans but also nonhumans. From the current extinction crisis to unprecedented deforestation to global soil erosion—contemporary science and technology are central tools of a food system that relentlessly ravages ecosystems in the pursuit of cheap commodities. The hard problem for philosophers of science (and science studies scholars more generally) is that these tools do not come from epistemically corrupted pseudoscience but rather from the

most advanced and sincere state-of-the-art research, providing increasingly sophisticated tools that fine-tune the exploitation of people and the appropriation of nature.

Following Moore (2015), one of the core features of Cheap Nature is its instability. Cheap Nature does not remain cheap as it exhausts the systems it appropriates, from slavery to resource extraction. Agriculture is a prime example in the enormous violence it imposed on humans from Indigenous genocides to transatlantic slave trade, but also in its relentless exhaustion of ecosystems from deforestation to soil degradation. The point is not a novel one, as it was already articulated in Marx's (1872, 530) observation that "progress of capitalist agriculture is not only progress in the art of robbing the worker but simultaneously robbing the soil," thereby creating a self-destructive process that "simultaneously undermines the sources of all richness: the land and the worker."

The contradiction of contemporary science is that it is simultaneously an instrument in the destructive pursuit of Cheap Nature and indispensable for any credible attempt to address this destruction. From encroaching deserts to melting glaciers to degrading farmland to hazardous landfills to growing city slums to the endless suffering produced in livestock factories, the "ruins of capitalism" (Tsing 2015) are to a large extent also ruins of technoscientific modernity. Even if science often functions as a willful enabler of planetary destruction, however, science is also indispensable in any robust vision of what Tsing (2015) calls "the possibility of life in the ruins of capitalism." From collapsing ecosystems to growing economic inequality to climate change to food security—none of these crises can be successfully addressed without careful research and incorporation of scientific evidence into policy.

Again, however, there is a risk of a simple dichotomy between "bad science" that is implicated in the appropriation of Cheap Nature and "good science" that is committed to its conservation and restoration. As Cheap Nature exhausts the systems it appropriates, conservation and restoration themselves become central to the Cheap Nature strategy, as reflected in the rise of "green capitalism" and its ideologies of "green growth" and "sustainable development."

As political ecologists have documented for decades (Bryant and Bailey 1997), not only resource extraction but also conservation of biodiversity is embedded in violent forms of appropriation and exploitation. For example, Indigenous peoples are often most directly affected by the pursuit of Cheap Nature through industrial agriculture, logging, mining, and

other forms of resource extraction. This does not mean, however, that they are beneficiaries of conservation regimes of green capitalism. There are countless counterexamples such as "green grabbing" (Fairhead, Leach, and Scoones 2012), including the expulsion of Indigenous communities for the creation of conservation areas free of humans and the criminalization of peasant farming and Indigenous hunting (Snook et al. 2020).

Yet another example are human-wildlife conflicts that largely affect oppressed communities "when wildlife forage on crops, attack livestock, or otherwise threaten human security" (Treves et al. 2006, 383). As biodiversity becomes a commodity for "green capitalism," familiar contradictions appear in global biodiversity governance: as in the case of food commodities, biodiversity is also most cheaply produced in spaces of poverty to be consumed by spaces of richness—from carbon offsetting markets to ecotourism (Büscher and Fletcher 2020). Biodiversity regimes often actively increase violence in these spaces by forcibly relocating local communities, criminalizing their livelihood practices, or even celebrating their murder through dehumanizing framings as "poachers" (Lunstrum 2017). In contrast, economic benefits become largely concentrated in the hands of large producers of biodiversity such as owners of carbon offsetting plantations, wildlife parks, and eco-lodges.

We need to move beyond generalist narratives of "science must be defended" and "science must fall" to address the contradictions of the current science system, both as an agent of violence and as an indispensable tool for addressing social-environmental crises. We cannot solve this contradiction through a simple demarcation criterion separating bad corrupted from good noncorrupted science. Epistemic corruption does not provide a reliable demarcation, as much epistemically noncorrupted science is deeply implicated in violence against humans and nonhumans. We also cannot solve this contradiction by distinguishing between bad science aiming for resource extraction and good science aiming for conservation, as a lot of conservation-oriented science follows familiar patterns of violence in appropriating spaces of poverty and exploiting poor people for the production of biodiversity.

Rather than limiting ourselves to questions of epistemic corruption or conservation, we need a substantial notion of *just* science that can challenge the *status quo* of the science system while articulating a positive vision of science through the multifaceted demands of global justice (Ludwig 2023; Ludwig and Macnaghten 2020). Fraser's (2009) three-dimensional account

of global justice provides a helpful entry point by distinguishing two substantive dimensions (distribution and recognition) and one procedural dimension (representation) that account for the complexity of global justice demands, from direct effects on livelihoods and well-being to procedural issues such as community agency and governance.

Distributive justice provides the most straightforward angle for challenging the complicity of science in the exploitation of people and appropriation of nature. Scientific research shapes a wide range of practices and technologies that distribute benefits and burdens of global capitalism across and within societies. Agriculture again provides a prime example, as the current science system plays a crucial role in enabling a food system that aims to expand and maintain access to cheap labor and land through globalized "food empires" (Ploeg 2018) while dispossessing peasants, increasing food insecurity, and eradicating biocultural diversity.

Distributive justice provides a lens for focusing on tangible effects of scientific research on livelihoods. None of the communities that we have visited in the course of this book—from Coração de Maria to Forikrom to Koro to Siribinha to Poças—are beneficiaries of the current structure of the food system. On the contrary, community struggles are intensified through expansion of global food commodity markets and the replacement of local livelihood practices. While the entanglement of science and food systems illustrates how research becomes complicit in the production of distributive injustice, community-driven research also highlights the possibility of alternative scientific practices that center on the needs of communities rather than treating them as frontiers in the appropriation of nature. Whether it is the preservation of local seeds in Forikrom (section 5.2.4) and Koro (section 4.2.3), fisheries policy in Siribinha and Poças (section 5.2.2), or control of agricultural pests in Coração de Maria and Retiro (section 4.2.2), scientific research that mobilizes local knowledge for community struggles can contribute to creating tangible distributive benefits for communities. First and foremost, just science is therefore science that creates material benefits for communities rather than enabling their external exploitation.

Recognition complements distribution in the articulation of a substantial notion of global justice. As Fraser and Honneth (2003, 1) put it: "Whether the issue is indigenous land claims or women's care work, homosexual marriage or Muslim headscarves, moral philosophers increasingly use the term 'recognition' to unpack the normative bases of political claims." Debates about agriculture in the Global South often misrepresent community struggles

through a narrow perspective that reduces justice demands to access to sufficient calories. Such reductive perspectives fundamentally misrepresent what it means to live a good life in the communities we have visited in previous chapters. From Siribinha to Forikrom, justice involves not only rearranging material benefits and burdens in the production of commodities but also enabling livable relations of community life. Taking community struggles seriously therefore requires what Freire (1970/2000) describes as a humanizing rather than a humanitarian perspective: It needs to recognize and defend the richness of community life rather than treating communities as passive beneficiaries of development interventions that distribute basic resources for survival.

In contestations of food systems, claims of recognition are most clearly articulated in the expansion of political activism from food security to food sovereignty (Noll and Murdock 2020). While food security is typically operationalized in distributive terms through stable access to nutritious and safe food, the Declaration of Nyéléni (2007) defines food sovereignty as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems." Food sovereignty expands the scope of food security through the recognition of cultural and social practices that are crucial for a good life in communities like Siribinha or Forikrom. Demands of food justice therefore reach beyond technocratic perspectives that are limited to distribution, in which people in "underdeveloped areas" are provided with sufficient calories but otherwise have no agency in defining and defending the richness of community life.

Relations between distribution and recognition are complex, and political philosophers have engaged in lengthy debates whether one dimension may be ultimately explainable in terms of the other (Fraser and Honneth 2003; Honneth and Stahl 2010). While the abstract philosophical priority debate may be of limited relevance for present purposes, the intricate relations between distribution and recognition matter for a transformative perspective on the science system. First, distribution of resources shapes the ability to articulate demands for recognition. For example, the economic exploitation of rural communities in the Global South invisibilizes claims for recognition and reinforces a dystopian paternalism of top-down development, in which basic commodities such as food and medicine are handed out to "the poor," who are otherwise expected to remain silent and thankful. Conversely, recognition is also commonly a condition for distributive justice. As Young (1990,

22) argued, an exclusive focus on distributive indicators "tends to obscure the institutional context within which those distributions take place, and which is often at least partly the cause of patterns of distribution." Indigenous food traditions, for example, are not only of cultural importance but also core structures of community resilience that are crucial to distributive concerns of food security. For example, we discussed ceremonial demands for seed diversity in Koro (section 4.2.3) that is of deep spiritual significance, but ultimately also contributes to very tangible aspects of agrobiodiversity that are resilient to external disruptions like droughts, pests, or market pressures on cash crops.

Distribution and recognition identify what Fraser (2009) calls "first-order questions of substance." In the domain of agriculture, they include: How do transformations of agricultural production affect profits and wages? How do they affect patterns of land ownership and issues such as land grabbing? What are the effects on local community structures, from capital accumulation to division of labor to migration patterns? What are the effects on culinary cultures and diets? What are the effects on cultural and spiritual traditions? Who is exposed to what kind of environmental and health hazards? What are the effects on local agrobiodiversity? How do they interact with processes of deforestation and soil erosion? What are the effects on community resilience in the face of disruptive events from climate change to economic shocks?

Representation identifies second-order questions of the frame in which these first-order questions are negotiated. Who gets a say in determining what counts as just distribution and representation? Who gets to decide if competing concerns and priorities make interventions contested? In the current food system, contested trade-offs are often articulated through questions such as: How to weigh cheaper access to food against increased exposure to environmental hazards? How to weigh benefits for one group of actors (say: urban poor) against burdens for another group (say: rural poor)? What is the weight of recognizing cultural dimensions of food sovereignty compared to more straightforward distributive aspects of food security?

While questions of representation are crucial in any account of global justice, they are especially crucial at the interface of science and society. Science-led development provides some of the most striking cases of representational injustice, as it usually involves a dramatic discrepancy between dominant actors who shape interventions (e.g., corporations, donor countries, international NGOs, scientists) and those who are most profoundly affected by

interventions (e.g., Indigenous communities, peasants, urban underclasses). Representational injustices therefore feed back into first-order injustices of distribution and recognition, as the latter are often shaped along the interests of dominant actors. And even interventions that focus on benefits for marginalized communities can deepen injustices if they are grounded in a paternalistic second-order mode that evaluates first-order issues *for* rather than *with* these communities.

The centrality of representation leads us back to the centrality of transdisciplinarity. As long as the science system excludes communities and their struggles, it will produce not only representational injustice but by extension also injustices of distribution and recognition. Making the case that another science is possible therefore requires processes of knowledge production that align with communities and their struggles. And indeed, a wider shift toward community concerns is reflected in the booming academic literature on transdisciplinarity and its many companion concepts such as "citizen science," "co-creation," "community science," "participatory research," or "open science."

While "participation" and "representation" are sometimes used interchangeably, it is important to distinguish them clearly for our purposes by treating representation as a political demand toward just decision-making: Those who are affected by a process need to be in control of it. Understood this way, representation is not only different but much more demanding than fashionable uses of "participation" that may involve a focus group or panel discussion with "diverse stakeholders," without transferring procedural control to those who are affected by a decision. In this sense, demands of representation challenge elite capture (section 5.1.3) while participation can become a captured mechanism of reconciling procedural control of elites with symbolic appeals to inclusion. The shift from representation to participation therefore often appeals to "inclusion" and "diversity" while consolidating procedural control by dominant actors. Ubiquitous debates about the integration of Indigenous and academic knowledge exemplify this dynamic. While Indigenous actors are recognized as experts on issues such as sustainable agriculture, Indigenous knowledge often becomes integrated as an additional resource for academic consumption. Rather than being represented as political actors who should be in control of their own food production, Indigenous actors are often invited to participate in knowledge production and policy negotiation of the food system that remain in firm control of other actors.

Another science is possible only insofar as it moves beyond tame diversity exercises and an uncritical gospel of transdisciplinarity. While participation in integrationist transdisciplinarity often legitimizes dominant procedures, transformative transdisciplinarity requires representational justice that challenges dominant modes of distribution and recognition (Figure 6.1). Debates about global challenges such as food security or biodiversity conservation constitute one of the major arenas in which these different visions of transdisciplinarity become articulated. On the one hand, emphasis on participation and transdisciplinarity can serve the goal of increasing trust and legitimacy of the science system. Driven by the need to defend science in the face of global challenges, the inclusion of nonacademic actors often aims to stabilize the current system (section 5.1.2). On the other hand, we have argued that scientific research is not only indispensable in addressing global challenges but also a driving factor in producing many of these challenges through the exploitation of people and appropriation of nature. Addressing these contradictions requires a substantive notion of representation rather than mere participation in order to articulate demands of distribution and recognition by those who are exploited in the name of science-led development and modernization.

6.4 Another Philosophy of Science Is Possible

When the magazine *Science for the People* published its first edition in 1970, it reflected a multitude of perspectives at the intersection of academia and social activism. As Fox (2014) recalls: "One group wanted *Science for the People* to assume a supportive role in the class struggle with special attention to the issues of science. Another group wanted to work towards 'A Science for the People.' Most wanted to be the voice of critical consciousness from within the scientific community exposing science against the people and the dangers of the misuse of science." In subsequent years, Stephen Jay Gould and Richard Lewontin became the most visible scholars of the movement, representing a new generation of scholar activists in the natural sciences. While Gould and Lewontin challenged the misuse of evolutionary theory and genetics from within the biological sciences, other important developments occurred in the social sciences, linking the "radical science movement" with the emerging fields of STS (Taylor and Patzke 2021) and "participatory action research" (PAR) (Smith et al. 2017).

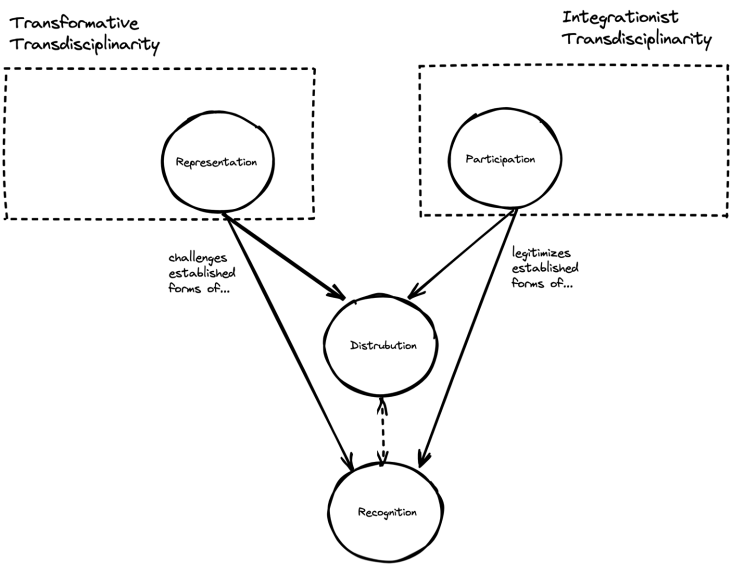

Figure 6.1 Integrationist and transformative transdisciplinarity as relating to participation and representation, respectively. While participation commonly legitimizes established forms of distribution and recognition, representation often leads to challenges of the status quo.

In contrast to both biological and social sciences, academic philosophy remained largely absent in the development of the radical science movement and its quest to conduct science for the people. This absence hardly comes as a surprise as it reflects the broader depoliticization of philosophy of science of the postwar period. As argued by Reisch (2005), the institutionalization of philosophy of science in the United States coincided with the McCarthy era and pressure on emigré logical positivists to clearly separate their philosophical program from their socialist politics in interwar Europe. The result was an institutional separation between philosophical and political discourses about the structure of science in Anglophone debates (for different developments in China, see Guo and Ludwig 2021; in continental Europe, see Ludwig and Ruphy 2021; and in Latin America, see Kreimer and Vessur 2018). While the radical science movement took inspiration from a wide range of social movements in the late 1960s, philosophers of science often focused on the "structure of science" (Nagel 1961) in a largely depoliticized frame. Separating a politically relevant "context of discovery"

from a philosophically relevant "context of justification" (Arabatzis 2006), postwar philosophers of science discussed topics such as causality, explanation, or reduction independently from their messy social embedding.

Of course, there have been interventions that challenged this separation of politics and philosophy of science, including Feyerabend's *Science in a Free Society* (1978) and Harding's *Science Question in Feminism* (1986). These interventions, however, remained largely outside of the institutional mainstream of the field, which is most authoritatively represented by journals such as *Philosophy of Science* and *The British Journal for the Philosophy of Science*. While Feyerabend's epistemological and methodological provocations became widely discussed in the field, his political philosophy remained for a long time what Dupré (1993, 263) called "an oasis of serious critical analysis on a topic that, astonishingly enough, has been almost entirely ignored by philosophers." The situation is comparable for Harding, who raised the *Science Question in Feminism* decisively from the perspective of a philosopher of science but ultimately became much more widely recognized and appreciated in anthropology and social studies of science.

Times are changing. Not only is political philosophy of science (Gómez and López Beltrán 2018; Marcos 2018; Rouse 1987) becoming increasingly recognized as a legitimate subfield, but "philosophy of science is cheerfully and busily engaged with topics like pluralism, values, policy, and the democratic control of science," as Brown and Kidd (2016, 5) remark in their discussion of Feyerabend's legacy. The rise of a new political philosophy of science, however, does not mean that the field has adopted Feyerabend's contrarian attitude or even an emancipatory vision of a just science system. As scientific pluralism and the critique of the value-free ideal have become the new orthodoxy of the field, they have also been largely reshaped as tools for friendly policy advice.

The critique of the value-free ideal, for example, motivates not only the rejection of old-fashioned scientism but also what we called "the new defense of science." Indeed, philosophers emphasize that scientific practices are intertwined with social values but also argue that this value-ladenness does not undermine the trustworthiness of science but rather leads to a positive picture of a "science with a human face." In a similar vein, scientific pluralism has lost much of its subversive edge and is at risk of becoming the intellectual complement to corporate "diversity management" at universities—highlighting the importance of "diversity" and "inclusion" as tools for fine-tuning and legitimizing current institutions of knowledge production

(Ludwig and Ruphy 2021; see von Brentano 1971 for the long history of scientific pluralism along these lines).

While philosophy of science has returned to questions of politics and policy, it is not a return to disruptive or even emancipatory visions of the role of science in society as reflected in the legacy of *Science for the People*. Instead, philosophers of science largely position themselves as supportive partners for science policy that reinterprets "topics like pluralism, values, policy, and the democratic control of science" (Brown and Kidd 2016, 5) to improve rather than challenge the science system. Of course, such generalizations do not hold without exceptions, and feminist philosophy of science has often challenged mainstream research in the pursuit of emancipatory alternatives. When Harding (1986) formulated the *Science Question in Feminism,* emancipatory ambitions were centered through a shift from "a reformist to a revolutionary position, from analyses that offered the possibility of improving the science we have, to calls for a transformation in the very foundations both of science and of the cultures that accord it value" (1986, 9).

Feminism has been by far the most successful explicitly political project in philosophy of science. While earlier feminist philosophers of science were met with hostility and portrayed as antiscience activists (e.g., Dawkins 1998), contemporary feminist philosophy of science has undoubtedly become part of the intellectual and institutional mainstream of the field, as most clearly reflected in the election of Helen Longino, Michela Massimi, and Alison Wylie as recent presidents of the Philosophy of Science Association (PSA 2024). While feminist philosophy of science has been mainstreamed, it has also often been tamed by pushing away from Harding's *Science Question in Feminism* as a revolutionary position that challenges the very structure of science. In fact, Harding's move from "a reformist to a revolutionary position" has become thoroughly inverted in receptions of feminist philosophy of science that focuses on "improving the science we have" (Harding 1986, 9)—for example, by making the case for increasing social diversity in science, highlighting the importance of epistemic and ontological plurality, or defending the legitimacy of social values in scientific practice. In this sense, the reception of feminist philosophy of science also illustrates the wider trend of deradicalization that presents philosophy of science as a friendly partner for policy advice, rather than a transformative vision of science that challenges its systemic complicity in the exploitation of people and appropriation of nature.

The mainstreaming of feminism in philosophy of science has come at the price of a tamed politics that often trades Harding's *Science Question in Feminism* for diversity management in academia. One limitation of this tamed pluralism relates to our earlier discussions of elite capture, in the sense that it legitimizes scientific institutions rather than pushing for systemic transformations of doing science differently. Universities can proudly present data of demographic diversification without being challenged to transform their research agendas beyond the dominant interests of their corporate and state funders. In this sense, diversification of academia is rarely a diversification in which communities like Siribinha or Poças have meaningful representation to transform the course of research agendas.

Another limitation of the new political philosophy of science is that diversification often remains a philosophical ideal that circumvents real-life engagement with the struggles of communities like Siribinha or Poças. For example, Kitcher's account (2002, 2011) of "well-ordered science" is based on an ideal deliberative process in which all relevant stakeholders are adequately represented. Based on Rawls's model of a "well-ordered society," Kitcher imagines an interface of science and society in which all stakeholders are tutored by scientific experts and subsequently negotiate their heterogeneous interests and preferences. Well-ordered science, therefore, aims to articulate a "third way" (Kitcher 2002) between pathologies of direct democratic control of science and an expert-driven technocracy that separates science from society. While Kitcher's "well-ordered science" has been groundbreaking in mainstreaming political philosophy of science as a legitimate field of study (Cartwright 2006; Irzik and Kurtulmus 2021; Lister 2007), its highly idealized model of public deliberation also illustrates the disconnect between philosophical debates and the messy reality of negotiating science in society.

Despite his case for ideal representation, Kitcher remains remarkably skeptical of actual representation, suggesting that "any attempt to orchestrate even a sample of voices representative of the diverse perspectives of living people would produce a vast cacophony" (2011, 51). While tensions between Kitcher's ideal theory and non-ideal realities have been commonly noted (Brown 2013; Fernández Pinto 2015; Philippi 2020; Rolin 2021), Kitcher has defended well-ordered science as an ideal that can guide reasoning about science policy (2011, 10). Kitcher is surely right that ideals can guide reasoning and that blanket rejections of ideal theory in philosophy are not helpful. At the same time, he severely underestimates the potential

of his ideal to *mis*guide as it lacks grounding in actual representation of actual stakeholders. Philosophers of science imagining the outcomes of ideal deliberations will often simply reproduce dominant narratives and biases in academia. This risk is further increased when philosophers of science of elite institutions in the Global North aim to speak *for* marginalized communities in the Global South without any serious attempt of speaking *with* these communities.

Kitcher's (2011) discussion of genetically modified (GM) crops in *Science in a Democratic Society* provides a striking example of this risk. Kitcher imagines that a "well-ordered science" will tutor citizens by teaching them that there "is nothing special, or especially risky, about genetic modification of organisms" (2011, 567). Kitcher's discussion takes public ignorance toward genetics (e.g., endorsement of the statement "GMOs contain genes, but ordinary organisms do not") and a "picture of genes as mysterious little agents of evil, inserted into healthy foods by the wicked minions of agribusiness" (2011, 567) as points of departure. Given such a framing, the contestation of GM crops seems largely analogous to climate change denialism and other misframings of science: While there is scientific consensus about the safety of GM crops, rampant ignorance toward the actual science and diffuse concerns about "big business" in the food system lead to a rejection of technologies that are literally saving the lives of millions of people.

While Kitcher frames his discussion through the knowledge deficit of citizens with respect to genetics, he is not considering the knowledge deficit of scientists regarding the social-environmental context in which GM crops are implemented. Tutoring appears as a one-directional process in which scientists already hold all the relevant knowledge and other stakeholders are negatively characterized through their lack of knowledge. However, the case of GM crops illustrates that it is often the scientists who are in need of tutoring about the limitations of dominant narratives that frame contestation of GM crops narrowly as biosafety issues while remaining oblivious about local livelihood struggles (Hicks 2017; Motta 2016).

This lack of real-world engagement culminates in Kitcher's claim that GM opposition is "largely a European phenomenon" while "not much heard" among "many of the world's people, particularly in Africa and parts of Asia, [whose] current agriculture is unable to provide them" (2011, 318). Such comments reveal much more about how philosophers imagine Africa and Asia than about the farming practices on those continents. GM adoption in the Global South has been hesitant at the policy level and contested at the

social level. In 2018 (ISAAA 2019), GM crops covered 2.9 million hectares on the entire African continent—not even a quarter of Canada's 12.7 million hectares. In Asia, the largest producer is India with 11.6 million hectares, but India only approves GM cotton and no other crops. Without Indian cotton, the whole of Africa and Asia combined cultivate fewer GM crops than Canada and fewer than 20% of the United States' 75.0 million hectares. Competing with the agricultural outputs of GM production in the Americas would risk the livelihoods of millions of farmers across Africa and Asia. Opposition is so strong that only three African countries (Eswatini, South Africa, and Sudan) currently commercialize any GM crops whatsoever.

GM crops are contested not just in policy but also in public arenas. In China, attitudes toward GM crops have been favorable among both scientific and political elites, with GM crops being designated a "national major project" since 2008 and the country establishing itself as the second largest holder of GM patents (Zhang and Datta Burton 2022, 61). However, public opposition has undermined translation of elite preferences into agricultural policy. As Zhang and Datta Burton (2022, 62) argue, Chinese experiences with food safety scandals has made GM food increasingly unpopular, with a 2016 study finding only 25.7% favoring cultivation of GM crops in China and only 18.9% being willing to consume any themselves.

In Brazil, elite preferences favoring GM agriculture have been turned into agricultural policy despite social resistance. Brazil is the second biggest producer of GM crops in the world, and GM varieties dominate the production of soy, maize, and cotton, with an overall adoption rate over 90% (ISAAA 2019). The social contestation of GM crops in Brazil highlights the contradictions between visionary statements of biotechnological benefits "for the poor" and the economic reality of GM crops being part of technological packages that require land- and resource-intensive monocropping of cash crops for industrial use and export. As GM agriculture has been a driving force of land dispossession and rural desolation in Brazil, it does not come as a surprise that peasant movements, such as the Landless Workers' Movement (MST), have been driving resistance against GM agriculture. The roughly 1.5 million members of the MST embody many of the contradictions of agricultural production and of modernist development projects, such as the construction of the Itaipú hydroelectric dam in Paraná that caused the eviction of more than 10,000 mostly Indigenous or peasant families. In the MST case, opposition to GM crops is therefore not driven by affluent consumers, as imagined by Kitcher, but as part of the wider agrarian

struggle of peasants for a food system that is actually able "to provide them," as Kitcher puts it.

The case of GM crops illustrates the risks of a political philosophy of science that claims to speak *for* the people rather than challenging itself to actually speak *with* the people. Philosophers often engage only superficially with heterogeneous publics while simultaneously positioning themselves as authorities who evaluate and weigh their claims in a distant "court of reason." In the case of well-ordered science, this dynamic leads to virtual deliberative processes in which academic philosophers imagine the responses of nonacademic actors on the basis of academic information. It thus comes as no surprise that well-ordered science largely reproduces dominant academic narratives on issues like GM crops, rather than engaging with the complex social-environmental conditions that shape actual contestation of GM in the Global South. This reflects a tradition in philosophy of science that tends to be only superficially engaged with fields such as agriculture and even less concerned with its messy real-world impact on heterogeneous actors, such as smallholder farmers or different consumer groups. While the recent surge of interest in agriculture in philosophy of science (e.g., Ankeny and Bray 2018; Biddle 2018; Bursten and Kendig 2021; Hansson 2019; Hicks and Millstein 2016; Williamson and Leonelli 2023) signals that this is changing, the superficial politics of Kitcher's GM discussion reflects structural limitations of the legacy of mainstream philosophy of science.

Transformative transdisciplinarity provides a countermodel to well-ordered science, in the sense that it centers on mechanisms of actual representation rather than imaginary processes of ideal representation. Such a countermodel also comes with a distinct methodology for political philosophy of science that is community-driven rather than grounded in an import of Rawlsian methods into philosophy of science. Rather than imagining dialogues with actors who are marginalized in the science system, philosophers of science need to actually engage with them in real dialogues. In Kitcher's case of GM crops, for example, community-based philosophy of science would aim to actually engage African and Asian farmers in a dialogue rather than imagine their responses under conditions of an ideal dialogue.

Of course, Kitcher is right that an attempt to create a representative sample of all stakeholders "would produce a vast cacophony" (2011, 51), but he is misguided in relying on philosophical imagination as an alternative that somehow anticipates and balances everyone else's concerns. The alternative is much more straightforward and empirically grounded: identify

communities that are most clearly affected by an issue such as GM. Pay particular attention to communities that are not adequately represented in debates about that issue despite being affected by it. Talk to them and engage in a dialogue that facilitates mutual learning. None of this requires creating a representative sample of all stakeholders. And not being able to create such a sample is not an excuse for substituting actual with imaginary representation.

Engaging actual communities in actual dialogues does not mean simply adopting their stance. We have extensively engaged with fishers of Siribinha and Poças, but this book does not simply adopt the perspective of these communities. Instead, it clearly presents an academic perspective that is influenced by community engagement as well as academic debates in philosophy, biological sciences, and social sciences. Community-based philosophy of science does not mean that philosophers forget about their own epistemic resources, but rather that they are willing to engage in mutual learning that enriches their understanding of how science actually shapes livelihoods at local scales.

Community-based philosophy is therefore not a philosophy *of* transdisciplinarity but rather situates philosophy *in* transdisciplinary practice. Philosophy often risks doing more harm than good by positing itself as a final authority that evaluates epistemic and normative legitimacy of everyone else's claims in the philosophical "court of reason" (Ludwig and Koskinen 2021). Actual community engagement provides philosophers of science with opportunities to do better. It provides opportunities for mutual learning in which tools from philosophy can enrich transdisciplinary processes while philosophers simultaneously learn from other actors. Transdisciplinary philosophy of science does not give up on normative evaluation but highlights that normative authority needs to be recognized as distributed rather than exclusively assigned to philosophers.

Starting with community struggles challenges generic claims that "science must be defended" by emphasizing the contradictory effects of science on communities and their livelihoods. Reflecting on community struggles, however, does not imply a rejection of science along the generalized line that "science must fall." On the contrary, there are plenty of entry points for doing science differently and making meaningful contributions to community livelihoods through collaborations between scientists and communities. Philosophers can make important contributions to such collaborations by

navigating their epistemological, ontological, and political thickets. Such contributions, however, require not only community-based science but also community-based philosophy of science. While philosophers have increasingly embraced the importance of transdisciplinarity in scientific practice, it is time that we practice what we preach by situating philosophy of science *in* transdisciplinary practice (Ludwig et al. 2023).

This book is the product of a collective learning process on how to situate philosophy in transdisciplinary practice. Both of us started this journey as philosophers of science with interdisciplinary experience but a very limited idea of how to practice community-based philosophy. Along this journey, we have learned from a dynamic research collective that has shaped our understanding of transdisciplinarity and action research. In 2023, this collective came together in the workshop Communities of Research, Communities of Practice: Towards a Transformative Transdisciplinarity at Federal University of Bahia (Figure 6.2). The fact that representatives of Indigenous and local communities felt comfortable enough to speak at length and authoritatively within the symbolic walls of the university was a testimony of the ongoing dialogue and mutual learning with the communities of Siribinha and Poças, the Interstate Movement of Babassu Breakers (MIQCB; see Ressiore, Lima, and Turnhout 2024) and the Mebengokré Indigenous people from Mrõtjidam Village (see Xikrin, Xikrin, and Bollettin, 2024). It also reflected how our own understanding of globally engaged philosophy had become transformed through learning with the diverse communities and struggles that we encountered on this journey.

Even after years of collaboration, our approach to community-based philosophy remains work-in-progress and is commonly confronted with its own limitations. The aim of this book has not been to codify what counts as community-based philosophy but to share our learning process through successes and failures. Taking our philosophical training out of its academic niche, we have learned to appreciate philosophy as relevant for navigating through the thicket of real-world problems (Brister and Frodeman 2020; Furman 2021; Leonelli 2016). The relevance of community-based philosophy is partly political in addressing the interface of global challenges and local struggles. However, its relevance is also intellectual in opening up opportunities for thinking beyond the sterile limitations of what Lewis (1986) called the "philosophy room" by unapologetically positioning epistemology and ontology in public contexts. Moving beyond those limitations creates

Figure 6.2 Participants of the workshop Communities of Research, Communities of Practice: Towards a Transformative Transdisciplinarity at the Institute of Biology at the Universidade Federal da Bahia in 2023. (Photograph: Adriana Ressiore).

an optimistic case for the relevance of philosophy in a world of intersecting social-environmental crises. Philosophy matters both for interdisciplinary research and for transdisciplinary co-creation. Community-based research opens up philosophy beyond the exclusive audience of the philosophy room. At the same time, it also challenges philosophers to rethink their methods by becoming part of transdisciplinary communities of practice.

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