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Reifications in Disease Ecology 2: Towards a Decolonized Pedagogy Enabling Science by, and for, the People

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ABSTRACT

In the second half of this essay about reifications in disease ecology, drawing upon our experience, we propose ideas and practices for invigorating a disease ecology by, and for, the people, guided by pedagogical principles and experiences that do not separate subjects and objects of study into roles and categories. Rather, we envision a disease ecology that seeks to understand relations, processes and contexts driving complex ecological phenomena like disease emergence. In doing so, we examine how science, when brought into a political pedagogy of context and relation, may become surprisingly helpful in moving beyond the *false erudition* that José Martí critiqued at the start of our colonial capitalist modernity.

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For What Kind of Education?

The Cuban intellectual and national hero José Martí reflected extensively on the epistemological legacy of colonialism within Latin America. *Nuestra America* is one of his key texts, an essay that is widely studied in Latin America. Poetic fragments are included in elementary school Spanish textbooks by the craft of the language. Beyond its form, the essay also proposes ideas relevant to change the current epistemology of disease ecology. When

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discussing how Latin America should shape its identity, Marti asserted that "There is no fight between civilization and barbarism, rather between false erudition and nature" (Martí 1978). Disease ecology must reject the *false erudition* of the colonizer that sees the world in terms of civilization versus barbarism, and thus at the same time, transform its understanding of nature to encompass the decolonized human as well. A disease ecology that seeks to understand the ecology of pathogen transmission needs to demystify BLIPP (Blame Local Indigenous and Peasant Populations) fables within the historical context they emerged (Chaves et al. 2022b). In doing so, a radical disease ecology should be able to dialectically understand nature, untangling what we believe we understand from that which we socially construct, and vice-versa (Levins 1998). However, to achieve the necessary change, educational systems must have their colonialist roots removed, the grounding of Marti's "false erudition" or "societal fascism" as defined by Boaventura De Sousa Santos (2015) when describing current global hegemonic epistemic neocolonialism.

Walter Rodney (1981) documented that the reasons for African underdevelopment are related to the European-led colonialist removal of material resources and human lives, through resource extraction in African lands and enslavement abroad. To ease the plundering, it was key for European powers to eliminate local educational systems in Africa. Rodney, for example, commented how Bemba children from Zimbabwe were able to identify up to sixty tree species as part of their engagement in swidden agriculture. That agriculture, with a strong understanding of biodiversity and ecological management was the basis for the Bemba survival. However, Bemba children had little knowledge about ornamental flowers, as that was less relevant within the context of their society. But in reducing the capacity for self-government and increasing the relevance of education for integration into the lower rungs of an increasingly global capitalist division of labor, it was helpful to devalue and undermine the transmission of traditional knowledge that emerged from peoples' millennia of working across these lands, of interacting with, and shaping, lands. Indeed, Rodney asserts that as part of colonial domination, it was key to remove any education that was relevant for Africans. Part of it was done through the introduction of institutions that replaced what was present in Africa, but also through the introduction of values and practices that served the colonial masters.

This kind of persistent colonization is also present in Latin America, as described by Venezuelan historian Vladimir Acosta (2020), where an earlier drive toward independent nations has been constrained to continue allowing colonial extractivism. Acosta specifically identifies that colonialism persists through the engagement in economic development models and programs that are generated in the Global North. These programs are

unquestioned in educational systems that want to mimic those of former colonial masters, systems that de-emphasize important ongoing questions about identity in nations that have been created through a process of creative destruction, "mestizaje." However, the deeply ingrained colonial mentality interferes with the realization of this new identity by negating its existence and sticking to class structures that work for the interests of stakeholders in the Global North engaged in extracting wealth from the Global South.

Some of the structural issues described by Rodney and Acosta could be used to help understand the difference between a "citizen science" for the people or communities, as suggested by the work of the Detroit Geographical Expedition and Institute discussed in the first half of this essay, and contemporary "citizen science." The latter is still too often a means for data collection and not education; it is a process that separates the roles of scientists framing the inquiry and analyzing the data from citizens collecting the data. Too often, the process of citizen science, together with other forms of knowledge claims generated outside the academy, are increasingly serving neoliberal agendas that ultimately seek to appropriate, privatize and commodify common natural resources (Lave 2012), and do so by either externalizing research costs or creating "civil society" stakeholders that ultimately make governance increasingly less democratic under a simulated umbrella of representation that conflicts with the abilities of peoples, communities, and nations to participate in the re-appropriation and use of knowledge (Carroll et al. 2020; Latulippe and Klenk 2020).

Colonialist models of education can explain both the generation and adherence to fables like BLIPP, which are widespread among scientists—and not only among scientists—of the global North. The more alienated scholars become from the phenomena they study, the easier to control them from the perspective of a master that justifies its monopolization of power (political, economic, and ideational) via Western fables of the current ordering of the world.

In Latin America, we see both colonial and liberatory pedagogies of science. Our research has brought us to Panama, where we have learned about, participated in, and ultimately sought to co-develop scientific practices that structurally differ from mainstream disease ecology in the Global North. We have participated in research and training programs at Instituto Conmemorativo Gorgas de Estudios de la Salud, where the structure is not the pyramidal hierarchy of Principal Investigators having a battalion of minions to generate knowledge and train less experienced scientists. As we referred to in the first part of this essay, technicians and field assistants get engaged in the process of study design, site selection and sampling dynamics, in a dynamic process that also commonly involves the rural communities where our studies have taken place. In the process of knowledge generation and training all members of the parasitology department – the unit with

which we work more closely – get involved in most tasks, from sampling in the field, laboratory processing of samples, data analysis and interpretation as well as results reporting. This experience, we think, enriches both the individual and group perspective on the knowledge that is being generated. This dynamic also creates an environment of mutual respect and appreciation for complementary skills across team members and establishes protective barriers that impede the colonization of a research agenda that ultimately is crafted towards responding to Panama's health problems. Similarly, the system is open to the promotion of young researchers through an evaluation system that evaluates their skills not only by papers produced and diplomas, but also by their constructive participation in group dynamics. Research papers tend to include all researchers and technicians involved in knowledge generation, with a golden rule where everyone involved in the process is invited to co-author manuscripts. This occurs against a background where the national research agenda of Panamá ultimately seeks the development of a national scientific cadre able to tackle the challenges of the country. Research funding for what are locally large-scale grants is on the scale of what would in the US be medium-scale science grants. As such, domestic opportunities often represent more financial resources than what would have been gathered through a subcontract from a large-scale grant (such as an R01 from the US NIH). The choice to participate in an international collaboration is thus taken more on the intellectual terms of the researcher. The Gorgas Institute offers an important example that many of us may wish to learn from and with.

We agree that education is a key component for a radical solution to social conditions leading to disease emergence and spillover. But not all education is created equal, either in terms of how it changes disease ecologies or our abilities to know them. A critical education becomes an imperative; we need education that allows individuals to understand their own problems in their local contexts, then propose, implement, and iterate on solutions. To explore how a critical education can change how we understand and respond to our disease ecologies and their wider social and ecological relations, we first highlight more examples of how critical education has been developed in contexts within the Global South.

José "Pepe" Mujica, the former president of Uruguay, who frequently is asked if his frugality is poverty, quotes Seneca: "It is not the man who has too little, but the man who craves more, that is poor" (Sarasqueta 2017). We are aware that by no means Mujica implies that we should live a life of deprivation; certainly, his government reduced poverty and advanced social reforms in Uruguay (Piñeiro and Cardeillac 2017; Leite 2020). Instead, with an open and generous heart, Mujica teaches us that a system that justifies grotesque inequality, through the accumulation of goods as a measure of success, is wrong. The position of Mujica, as a political leader

from the Global South, reflects what emerges when ideas about a critical education that changes people take a hold on a society (Leite 2019, 2020).

Mujica reflects the pedagogical insights of Paulo Freire, an innovative and revolutionary educator from Brazil, in his classical book *Pedagogy of the Oppressed* (Freire [1970] 2014). In his book, whose arguments are built upon his first-hand experience as an educator, Freire untangles how mainstream educational systems have been designed for the purpose of creating a labor force dedicated to satisfy the purposes of the ruling class. Opposing the *tabula rasa* description of a student, where a passive reception of fixed knowledge is assumed for the person learning, Freire invites us to learn through a dialogue between people from different routes and at different stages in the path of life, creating the critical thinkers that we need for a better world:

> ... the more radical the person is, the more fully he or she enters into reality so that, knowing it better, he or she can transform it. This individual is not afraid to confront, to listen, to see the world unveiled. This person is not afraid to meet the people or to enter into a dialogue with them. This person does not consider himself or herself the proprietor of history or of all people, or the liberator of the oppressed; but he or she does commit himself or herself, within history, to fight at their side. (Freire 2014)

It is easy to imagine that if emphasis was to be put on increasing access to education, which is associated with reduced fertility, the demographic pressure on natural resources might decrease (Cohen 1997, 2005). But what if, as advocated and practiced in the aforementioned contexts, education in the South is repurposed to foster critical thinkers? Disease ecology would itself not be immune to transformation under such contexts. A disease ecology for, by, and of the South would likely foster resistance to the pervasive unequal development of the planet, relations and processes which are not only within-place but across very much between South and North. Disease ecology would affirm agricultural ecologies and human health as did Amilcar Cabral (Cohen 1998; César 2018), Ernesto "Che" Guevara (Guevara 2003, 2009) and many others whose names are yet lesser known to us (see, *inter alia*, Bellamy 2021; Laterra, Eliosoff, and Costantino 2021) who fought and still fight colonialism.

In the Global North, a push for a radical pedagogy is also necessary. First Nations philosopher Leanne Betasamosake Simpson has articulated engaged learning through land (Simpson 2017). For many peoples (foremost among them, Indigenous peoples), land is pedagogy, as process and context of intelligence. Simpson advocates learning through the land, through the interdependent relationships of many beings, or relationality, the skills, knowledge, and values, that we rebuild. In other efforts, curricula with ecosocialist pedagogic approaches are starting to take ground (Chattopadhyay, Gahman, and

Watson 2019); so is the teaching and contextualization of quantitative methods within the colonial framework where they were conceived (Zwiener-Collins et al. 2021). Still, currently, they are often siloed in particular disciplines within Anglophone academic spaces (Watson 2019). However, recent pedagogical movements such as the Poverty Initiative movements focus on activities such as collective self-study, music and art, leadership, and critical evaluation of the root causes of poverty (Baptist and Theoharis 2011).

From our experience, a more radical pedagogy for disease ecology has been brewing across the global South, probably favored by a more fluid intellectual dynamic unwilling to silo knowledge or alienate scientific practice from the many forms of learning. In Venezuela, well before the advent of "disease ecology," training in "parasite ecology" was established at the most important higher education institutions in the country. Efforts were visibly led by José Vicente Scorza (1924–2016). Scorza was a school teacher also trained in biology and parasitology, a guerilla leader during the 1960s armed conflict in Venezuela, and a key player in the administration and founding of faculties, schools and programs for the study of the sciences, especially those regarding infectious diseases (Camacaro 2005). Jailed by his revolutionary struggle, Scorza spent time at "Carcel Modelo," a major prison still existing in Venezuela. During that time, he organized fellow inmates to run the kitchen, improving nutrition and even saving money for the state that jailed him, while also teaching his fellow inmates that didn't know how to read and write basic literacy, while also performing research on the behavior and bionomics of *Culex quinquefasciatus*, a major nuisance mosquito pest common at that prison (Scorza 1972) and everywhere across the tropics. These activities are thoroughly exemplary of the shape his effort took when able to found or lead many science and/or biology programs at higher education institutions in Venezuela.

Scorza's achievements reflected the "ideological inclusiveness" of Venezuela, as this happened during governments that were not identified with the "left" and while the country was welcoming émigrees from the "left" cleansing happening in the southern Cone, with the arrival of Pinochet in Chile and the military dictatorships in Argentina, Uruguay and Brazil in the 1970s. An important aspect of this "ideological inclusiveness" of Venezuela was the appreciation for science as an abstract means for knowledge and the importance of critical education. Scorza, for example, had a mutually respectful relationship with Arnoldo Gabaldón, a pioneer in the science of malaria control and elimination (Gabaldón 1949). Gabaldón was part of the ruling establishment of Venezuela who had major ideological differences with Scorza, yet was simultaneously committed to using science to improve people's health and well-being. Gabaldón had the critical capacities to understand Scorza's work and to support it. Gabaldón was self-critical (e.g.

Gabaldón 1978) of the limitations of the approach he himself championed for malaria elimination. According to Scorza, a major source of frustration for Gabaldón was witnessing how Gabaldón's own successful efforts for malaria elimination, instead of helping to solve structural issues that might improve health in other ways, ended up producing the most benefits for those who were already rich, favoring the exacerbation of socioeconomic inequities and the emergence of new diseases (Camacaro 2005). A degree of critical education let Gabaldón see past some aspects of his own ideology and social position. Gabaldón was key in facilitating Scorza's successful return after self-imposed exile following Scorza's prison term in the 1960s and Scorza's successful engagement in the development of higher education in Venezuela (Camacaro 2005).

As the first elected dean at Universidad de Los Andes Faculty of Sciences, Scorza created a graduate program and undergraduate minor in parasitology. He also supported similar programs at Universidad Central de Venezuela and Universidad de Carabobo. The latter was led by Witremundo Torrealba and with Leonidas and Maria Deanne among the faculty (Brazilian exiles who lost their jobs after the intensification of Brazil's military dictatorship in the 1970s, despite being top parasitological researchers). In his position as an academic administrator, Scorza promoted inclusive environments for the incorporation of women in science – the parasitology group and the larger academic units he led had a 1:1 ratio between women and men – and a major tradition of naming health and academic institutions after scientists that were historically discriminated against by virtue of their race or beliefs. For instance, Scorza advocated naming a satellite campus of Universidad de Los Andes in honor of Rafael Rangel, a scientist who ended his life due to the continued discrimination he suffered by having African descent; Scorza also named his laboratory at the main campus in honor of Jose Francisco Torrealba, an infectious disease researcher who chose to live in rural Venezuela to better understand the socioecological relations of the diseases he studied while serving people suffering from these diseases (Camacaro 2005). Torrealba showed what is possible when one is less alienated from the field conditions of scientific work and from the ecological relations under study.

Central to Scorza's pedagogical school is the understanding that diseases are more than the expression of an infection by a pathogen; they are the expression of larger social inequities and problems. Thus, excellent research on the mere biology of pathogens is not enough to improve people's health and well-being. On top of this wider – and more dialectical – understanding of disease, Scorza was always a schoolteacher at heart. He preferred to be addressed as "maestro" (the title for school teachers in Venezuela) than "doctor" or "professor" (titles he said were preferred by people unsure of their own experience and that were not engaged in making people learn;

Añez 2016). And this philosophy proved essential for some of the impactful "disease ecology" that Scorza developed. For example, Scorza was the first to describe Leishmaniasis as an occupational disease of coffee collectors in Venezuela (Scorza et al. 1983; Scorza and Rojas 1988) and was a major advocate for the development of safe and cheap drugs for what he called diseases of poverty and social exclusion (Scorza-Dagert et al. 2006), diseases which have been rebranded as neglected tropical diseases over recent years in the global north (Hotez et al. 2006).

Another example worthy of study is Maria Carlota Monroy's (1954–) school of disease ecology. Carlota's research has revolutionized the understanding of Chagas disease, developing impactful multidisciplinary research headquartered at Universidad San Carlos, the main and most socially inclusive university in Guatemala. Carlota's research has been evolving through the years from looking at parasitological aspects of onchocerciasis (Monroy 1979) and basic ecological aspects of *Triatoma dimidiata* (Monroy et al. 2003), the kissing bug that across most of Mesoamerica is the main vector of *Trypanosoma cruzi*, the parasite causing Chagas disease, to a fully articulated research and intervention agenda that bit by bit helped to reduce Chagas disease burden in the remote villages of Guatemala where Carlota's group has focused their research (Monroy et al. 2022).

From Carlota, we have learned that the problem of house infestation by kissing bugs should not be merely seen as an expression of the bug's dispersal ability, but, taking a dialectical approach, also demands examining housing quality as a factor that modulates the interaction between bugs, parasites and humans. From this point, her research has involved civil and environmental engineers that have helped with a local and sustainable housing design while promoting local economies that use local resources that are not dependent on larger circuits of trade. And as someone whose research is primarily concerned with people's health and well-being, her research advocates improving housing quality not solely to interrupt Chagas' disease transmission but also to improve health via access to quality water as well as developing and implementing technologies in the remote communities where they are needed (Monroy et al. 2009; Lucero et al. 2013). Another dialectical dimension of Carlota's research, where Hegel's "the truth is the whole" is practiced, incorporates critical social scientists and their interpretative frameworks when crafting alternatives that reduce Chagas' disease transmission risk. These approaches improve the process and interpretation of community engagement, using communitarian framings as opposed to default individualistic assumptions often held by western academics not trained in critical social science (López et al. 2019).

Regarding our own work in Panamá, part of the process and contribution has been supporting the decolonization of the biomedical research agenda, which was conceived and shaped to satisfy health needs to run the

Panamá Canal Zone, a colonial outpost created by the US to control international trade (Sutter 2007), a creation with a narrow conception of the populations that deserved an environment of health and wellbeing (Gorgas 1909; Chaves 2018). In that sense, a constant struggle has been doing research outside of the historical Canal Zone, where little is known about the local ecology of endemic zoonotic diseases such as Chagas disease (Rodríguez et al. 2018; Pineda et al. 2022) and leishmaniasis (Calzada et al. 2013; Saldaña et al. 2013; González et al. 2015; Rigg et al. 2021). We also have tried to understand how to render malaria elimination feasible, both looking at vectors, particularly their ecology under changing environments (Hurtado et al. 2018, 2020; Rigg et al. 2019a, 2019b), and parasite circulation and genetic structure (Santamaría et al. 2020, 2021). In these efforts, we have tried to examine diseases relationally within wider socioecological relations, emphasizing that disease ecology is not only ecological but also social in nature (e.g. Fung et al. 2014; Yamada et al. 2016; Hurtado et al. 2020). Yet we think there is space for more relational research, which we explore and advocate for in the following sections.

Blaming Neocolonial Relations from Global Uneven Development, Not the Victims

The greater the attention to relations offered by education, the less natural the BLIPP fable will seem, whether to disease ecologists or to others. Instead, especially as (neo-)colonialism is called into question, disease emergence as an expression of uneven geographical development (Amin 1973; Bunge 1977; Harvey 2006) and associated unequal global relations (Mies 2014) comes into focus.

Questioning "the causes of the causes" of disease and its emergence suddenly appears more urgent; we might ask questions about how political economy and imperialism can drive land use change through population growth. This is the argument of Benjamin White (1973) about Java island, where taxation pressures from Dutch colonial rulers were met by increasing the labor force biologically. Unused land needed to be productive, generating wealth for the colonial masters, and generating latifundia that destroyed biodiversity. We can ask how a colonialist legacy still produces laws that support land appropriation, or expropriation, for the sake of not underutilizing land in places far apart like Indonesia (Peluso and Vandergeest 2001; Kelley et al. 2020) and Costa Rica (Rosero-Bixby and Palloni 1998; León Araya 2015). Is it mere coincidence or do we find the same stakeholders benefit from a legal framework crafted by uneven power relationships?

Theories about uneven development have been used to study several environmental issues. It has been shown that deforestation follows an unequal ecological exchange (Hornborg 2022) where richer nations get

wood from poorer nations, externalizing environmental degradation to poorer nations (Jorgenson 2006). Similar patterns have been documented for carbon emissions (Bergmann 2013, 2017) and more generally for the trade of commodities as major drivers for land use change (Bergmann and Holmberg 2016), which can include deforestation (Curtis et al. 2018). Indeed, as recently shown, increased profits for commodity crop investors are connected with forest loss (Ceddia 2020). Even patterns of COVID-19 spread can be more comprehensively understood as an expression of uneven development. For example, in Mesoamerica and the Caribbean, nations more engaged in free trade were more likely to have an exacerbated burden of disease during the first one hundred days of transmission as measured by diverse epidemiological parameters, including cases, deaths, and exponential growth patterns in the number of new infections (Chaves et al. 2022a).

Similarly, in Costa Rica, malaria is not always present in areas where its mosquito vector, *Anopheles albimanus*, is likely present, but is restricted to areas where the disease co-occurs with labor relations that are characteristic of the Plantationocence (Rhodes et al. 2022) – landscapes where degraded environmental, health and socioeconomic conditions result from commoditization of crops that severely undermine local food sovereignty to feed delicacies to more affluent global markets (Wolford 2021). The new stage in the Costa Rican Plantationocene repeats malaria's history in Costa Rica, where uninterrupted development of a plantation economy, currently driven by pineapples, the main commodity produced in Costa Rica (CANAPEP 2021), took the role that banana plantations historically had in generating malaria transmission (Chaves et al. 2020) and snakebite niches as described in the novels *Mamita Yunai* by Carlos Luis Fallas ([1941] 2013) and *Puerto Limón* by Joaquín Gutiérrez Mangel ([1950] 1977). These works of literature depict the feudal-like relationships between plantation workers, who were treafted like *serfs de la glèbe* (Santos 2000), and the plantation company masters, who, like feudal lords, had no major interest in the wellbeing of landless people generating the company surplus capital while working the land. Both *Mamita Yunai* and *Puerto Limòn* also depict the major role that the organizing of labor unions had in improving the living conditions of workers. Organizing around solidarity principles was critical to the social reforms that resulted in a public and universal healthcare system that historically made Costa Rica a positive outlier of population health and wellbeing within Latin America (Unger et al. 2008). Unfortunately, these public health achievements are disappearing (Badilla Solano 2021; Chaves et al. 2021) as Costa Rica increasingly engages in the neoliberal gospel of public health austerity (Wallace et al. 2018).

While dispossessed groups raise their voice with concern about the concentration of land in few hands (Wright and Wolford 2003), the BLIPP fable

leads our attention elsewhere, helping us ignore a major root cause for many environmental and social problems. The roles of colonial land relations and land tenure were extensively documented even by Alexander Humboldt when denouncing the deplorable conditions of Indigenous populations and enslaved Africans in the latifundia of the tropical regions he visited (Foner 1983) or 100 years ago by Alfred Russell Wallace (1906), the commonly unaccredited father of organismal evolutionary theory (Wallace 2016), who advocated for reforms in land tenure as a major need for biological species conservation. More needs to be done to address how inequities in land are major drivers of disease emergence and persistence. The evidence keeps accumulating, from early insightful studies (Celli 1908, 1933), to recent mathematical modeling (Chaves 2013) and observations about the emergence and encroachment of malaria and other tropical diseases in areas where land use is dominated by latifundia and the poverty they foster, as observed in Costa Rica (Chaves et al. 2008, 2015, 2020), Panamá (Fung et al. 2014; Yamada et al. 2016; Hurtado et al. 2020) and distant places like Alabama (McKenna et al. 2017) and Texas (Hotez 2018).

Radical Science with An Open Heart

A different kind of science is possible. Its origins do not need to be found in the latest statistical techniques or in "global" syntheses somehow disconnected from "local" knowledge and experience. With the right conceptual adjustments, the new techniques can help us answer pressing questions instead of feeding BLIPP fables and other modern myths.

In Japan, in a manner not assimilated by the hegemony of western capitalist ideology, humans are seen as an essential part of the natural landscape. The sentiment is instilled early on. In the popular animated film, "My Neighbor Totoro," sisters Satsuki and Mei enjoy their time in their field house with Totoro and other Shintoist spirits. The grace of nature arrives as the children interact with beings of the forest: spirits, animals, and plants. Beyond the esthetic beauty of enjoying nature on its own terms, we are asked to understand that there is a struggle between humans and other species as a dialectical process with contradictions back and forth (Napier 2000). Cultures elsewhere have similar views about nature. The Wounaan from Panamá have an everyday relationality where transference and transformation with animals and other beings is foundational for their morality and co-existence, as a unity, with the environment (Runk, Peña Ismare, and Peña Conquista 2019). In contrast to fundamentalist Darwinism that was recruited to justify capitalism from the nineteenth century on, interactions between different species aren't always matters of unequal competition and exclusion and so need not serve as the basis of a voracious extractivism (Kropotkin

1939; Sheppard 2016). Ecological relationships are often also directly mutually beneficial or in their emergent complexity more broadly enriching. Indeed, humanity depends on these relationships, operating far beyond our command and control, for its very existence (Levins 2008).

The Japanese expression "kokoro no semai hito" literally translates as a "person with a narrow heart." It is often translated in English as a "person with a narrow mind," lacking an understanding common to the Japanese and other languages where the mind and the heart are a unity. As we have argued up to this point, having a narrow approach will unlikely help the world prevent the emergence of new diseases. In fact, it may make matters worse through the path dependence of entrenchment in ideas and institutional arrangements: efforts to scientifically describe disease emergence without reference to more sociopolitical circumstances exclude attempts to include them. But that's only half the battle. Changing the world also requires action. Some of that work includes scholarly research, yes. However, the emergence of political organization that rejects the expectation that land is a source of commodities and a commodity itself is also needed.

As argued by Milton Santos and others, a different world is possible (Santos 2000; Saed 2016). When workers, farmers, Indigenous, scientists, and many other people come together to tackle Richard Levins's question, "Where is the rest of the world?" The answer for emerging diseases finds prophylaxes far beyond innovative vaccines, antibiotics and antivirals. They extend to housing improvement, land reform, public health and healthcare for all, and ending the vicious cycle of unequal development, commoditization, and colonization driving the worst of the new pathogens.

We can take the stand of Ashitaka in "Princess Mononoke," Hayao Miyazaki's masterpiece about humanized environmental conservation (Napier 2000). In the face of the destruction of the forest and its spiritual poisoning, Ashitaka and San, the Princess Mononoke, come to terms helping the forest spirit to recover its head and rest in peace. Ashitaka commits to help Lady Eboshi in building a new human settlement that improves the lives of people but is also no longer a threat to the forest. Ashitaka promises to visit his beloved San among the trees he will always fight to protect and preserve. We can make better cities in the tradition of Lady Eboshi and Ashitaka. With an open heart, we can live and learn from the spirits in the forests upon which we depend.

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