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COVID-19 and Circuits of Capital

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Calculation

COVID-19, the illness caused by coronavirus SARS-CoV-2, the second severe acute respiratory syndrome virus since 2002, is now officially a pandemic. As of late March, whole cities are sheltered in place and, one by one, hospitals are lighting up in medical gridlock brought about by surges in patients.

China, its initial outbreak in contraction, presently breathes easier. [1] South Korea and Singapore as well. Europe, especially Italy and Spain, but increasingly other countries, already bends under the weight of deaths still early in the outbreak. Latin America and Africa are only now beginning to accumulate cases, some countries preparing better than others. In the United States, a bellwether if only as the richest country in the history of the world, the near future looks bleak. The outbreak is not slated to peak stateside until May and already health care workers and hospital visitors are fist fighting over access to the dwindling supply of personal protection equipment.[2] Nurses, to whom the Centers for Disease Control and Protection (CDC) has appallingly recommended using bandanas and scarves as masks, have already declared that "the system is doomed."[3]

The U.S. administration meanwhile continues to outbid individual states for basic medical equipment that it refused to purchase for them in the first place. It has also announced a border crackdown as a public health intervention while the virus rages on ill-addressed inside the country.[4]

An epidemiology team at Imperial College projected that the best campaign in *mitigation*—flattening the plotted curve of accumulating cases by quarantining detected cases and socially distancing the elderly—would still leave the United States with 1.1 million dead and a case burden eight times the country's total critical care beds.[5] Disease *suppression*, looking to end the outbreak, would take public health further into a China-style case (and family member) quarantine and community-wide distancing, including closing down institutions. That would bring the United States down to a projected range of around 200,000 deaths.

The Imperial College group estimates a successful campaign in suppression would have to be pursued for at least eighteen months, carrying an overhead in economic contraction and decay in community services. The team proposed balancing the demands of disease control and economy by toggling in and out of community quarantine, as triggered by a set level of critical care beds filled.

Other
modelers have pushed back. A group led by Nassim Taleb of *Black Swan* fame declares the Imperial College model fails to include contact tracing and door-to-door monitoring.[6] Their counterpoint misses that the outbreak has broken past many governments' willingness to engage that kind of *cordon sanitaire*. It will not be until the outbreak begins its decline when many countries will view such measures, hopefully with a functional and accurate test, as appropriate. As one droll put it: "Coronavirus is

too radical. America needs a more moderate virus that we can respond to incrementally."[7]

The Taleb group notes the Imperial team's refusal to investigate under what conditions the virus can be driven to extinction. Such extirpation does not mean zero cases, but enough isolation that single cases are not likely to produce new chains of infection. Only 5 percent of susceptibles in contact with a case in China were subsequently infected. In effect, the Taleb team favors China's suppression program, going all out fast enough to drive the outbreak to extinction without getting into a marathon dance toggling between disease control and ensuring the economy no labor shortage. In other words, China's strict (and resource-intensive) approach frees its population from the months-long—or even years-long—sequestration in which the Imperial team recommends other countries partake.

Mathematical epidemiologist Rodrick Wallace, one of us, overturns the modeling table entirely. The modeling of emergencies, however necessary, misses when and where to begin. Structural causes are as much part of the emergency. Including them helps us figure out how best to respond moving forward beyond just restarting the economy that produced the damage. "If firefighters are given sufficient resources," writes Wallace,

> "under normal conditions, most fires, most often, can be contained with minimal casualties and property destruction. However, that containment is critically dependent on a far less romantic, but no less heroic enterprise, the persistent, ongoing, regulatory efforts that limit building hazard through code development and enforcement, and that also ensure firefighting, sanitation, and building preservation resources are supplied to all at needed levels....

> Context counts for pandemic infection, and current political structures that allow multinational agricultural enterprises to privatize profits while externalizing and socializing costs, must become subject to “code enforcement” that reinternalizes those costs if truly mass-fatal pandemic disease is to be avoided in the near future." [8]

The failure to prepare for and react to the outbreak did not just start in December when countries around the world failed to respond once COVID-19 spilled out of Wuhan. In the United States, for instance, it did not start when Donald Trump dismantled his national security team’s pandemic preparation team or left seven hundred CDC positions unfilled.[9] Nor did it start when feds failed to act on the results of a 2017 pandemic simulation showing the country was unprepared.[10] Nor when, as stated in a *Reuters* headline, the United States “axed CDC expert job in China months before virus outbreak,” although missing the early direct contact from a U.S. expert on the ground in China certainly weakened the U.S. response. Nor did it start with the unfortunate decision not to use the already available test kits provided by the World Health Organization. Together, the delays in early information and total miss in testing will undoubtedly be responsible for many, probably thousands, of lost lives.[11]

The failures were actually programmed decades ago as the shared commons of public health were simultaneously neglected and monetized.[12] A country captured by a regimen of individualized, just-in-time epidemiology—an utter contradiction—with barely enough hospital beds and equipment for normal operations, is by definition unable to marshal the resources necessary to pursue a China brand of suppression.

Following up the Taleb team's point about model strategies in more explicitly political terms, disease ecologist Luis Fernando Chaves, another coauthor of this article, references dialectical biologists Richard Levins and Richard Lewontin to concur that "letting the numbers speak" only masks all the assumptions folded in beforehand.[13] Models such as the Imperial study explicitly limit the scope of analysis to narrowly tailored questions framed within the dominant social order. By design, they fail to capture the broader market forces driving outbreaks and the political decisions underlying interventions.

Consciously or not, the resulting projections set securing health for all in second place, including the many thousands of the most vulnerable who would be killed should a country toggle between disease control and the economy. The Foucauldian vision of a state acting on a population in its own interests only represents an update, albeit a more benign one, of the Malthusian push for herd immunity that Britain's Tory government and now the Netherlands proposed—letting the virus burn through the population unimpeded.[14] There is little evidence beyond an ideological hope that herd immunity would guarantee stopping the outbreak. The virus may readily evolve out from underneath the population's immune blanket.

Intervention

What should be done instead? First, we need to grasp that, in responding to the emergency the right way, we will still be engaging in both necessity and danger.

We need to nationalize hospitals as Spain did in response to the outbreak.[15] We need to supercharge testing in volume and

turnaround as Senegal has.[16] We need to socialize pharmaceuticals.[17] We need to enforce maximum protections for medical staff to slow staff decay. We must secure the right to repair for ventilators and other medical machinery.[18] We need to start mass-producing cocktails of antivirals such as remdesivir and old-school antimalarial chloroquine (and any other drugs that appear promising) while we conduct clinical trials testing whether they work beyond the laboratory.[19] A planning system should be implemented to (1) force companies to produce the needed ventilators and personal protection equipment required by health care workers and (2) prioritize allocation to places with the greatest needs.

We must establish a massive pandemic corps to provide the work force—from research to care—that approaches the order of demand the virus (and any other pathogen to come) is placing on us. Match the caseload with the number of critical care beds, staffing, and equipment necessary so that suppression can bridge the present numbers gap. In other words, we cannot accept the idea of merely surviving COVID-19's ongoing air attack only to return later to contact tracing and case isolation to drive the outbreak below its threshold. We must hire enough people to identify COVID-19 home-by-home right now and equip them with the needed protective gear, such as adequate masks. Along the way, we need to suspend a society organized around expropriation, from landlords up through sanctions on other countries, so that people can survive both the disease and its cure.

Until such a program can be implemented, however, the greater populace is left largely abandoned. Even as continued pressure must be brought to bear on recalcitrant governments, in the spirit of a largely lost tradition in proletarian organizing going back 150 years, everyday people who are able should join emerging mutual aid

groups and neighborhood brigades.[20] Professional public health staff that unions can spare should train these groups to keep acts of kindness from spreading the virus.

The insistence that we fold the virus's structural origins into emergency planning offers us a key to parlaying every step forward into protecting people before profits.

One of many perils lies in normalizing the "batshit crazy" presently underway, a serendipitous characterization given the syndrome that patients suffer—proverbial bat shit in the lungs. We need to retain the shock we received when we learned another SARS virus emerged out of its wildlife refugia and in a matter of eight weeks splattered itself across humanity.[21] The virus emerged at one terminus of a regional supply line in exotic foods, successfully setting off a human-to-human chain of infections at the other end in Wuhan, China.[22] From there, the outbreak both diffused locally and hopped onto planes and trains, spreading out across the globe through a web structured by travel connections and down a hierarchy from larger to smaller cities.[23]

Other than describing the wild food market in the typical orientalism, little effort has been expended on the most obvious of questions. How did the exotic food sector arrive at a standing where it could sell its wares alongside more traditional livestock in the largest market in Wuhan? The animals were not being sold off the back of a truck or in an alleyway. Think of the permits and payments (and deregulation thereof) involved.[24] Well beyond fisheries, worldwide wild food is an increasingly formalized sector, evermore capitalized by the same sources backing industrial production.[25] Although nowhere near similar in the magnitude of output, the distinction is now more opaque.

The overlapping economic geography extends back from the Wuhan market to the hinterlands where exotic and traditional foods are raised by operations bordering the edge of a contracting wilderness.[26] As industrial production encroaches on the last of the forest, wild food operations must cut farther in to raise their delicacies or raid the last stands. As a result, the most exotic of pathogens, in this case bat-hosted SARS-2, find their way onto a truck, whether in food animals or the labor tending them, shotgun from one end of a lengthening periurban circuit to the other before hitting the world stage.[27]

Infiltration

The connection bears elaboration, as much in helping us plan forward during this outbreak as in understanding how humanity maneuvered itself into such a trap.

Some pathogens emerge right out of centers of production. Foodborne bacteria such as *Salmonella* and *Campylobacter* come to mind. But many like COVID-19 originate on the frontiers of capital production. Indeed, at least 60 percent of novel human pathogens emerge by spilling over from wild animals to local human communities (before the more successful ones spread to the rest of the world).[28]

A number of luminaries in the field of ecohealth, some funded in part by Colgate-Palmolive and Johnson & Johnson, companies driving the bleeding edge of agribusiness-led deforestation, produced a global map based on previous outbreaks back to 1940 intimating where new pathogens are likely to emerge moving forward.[29] The warmer the color on the map, the more likely a new pathogen should emerge there. But in confusing such *absolute*

geographies, the team's map—red hot in China, India, Indonesia, and parts of Latin America and Africa—missed a critical point. Focusing on outbreak zones ignores the relations shared by global economic actors that shape epidemiologies.[30] The capital interests backing development- and production-induced changes in land use and disease emergence in underdeveloped parts of the globe reward efforts that pin responsibility for outbreaks on indigenous populations and their so-deemed "dirty" cultural practices.[31] Prepping bushmeat and home burials are two practices blamed for the emergence of new pathogens. Plotting *relational geographies*, in contrast, suddenly turns New York, London, and Hong Kong, key sources of global capital, into three of the world's worst hotspots instead.

Outbreak zones meanwhile are no longer even organized under traditional polities. Unequal ecological exchange—redirecting the worst damage from industrial agriculture to the Global South—has moved out of solely stripping localities of resources by state-led imperialism and into new complexes across scale and commodity.[32] Agribusiness is reconfiguring their extractivist operations into spatially discontinuous networks across territories of differing scales.[33] A series of multinational-based "Soybean Republics," for instance, now range across Bolivia, Paraguay, Argentina, and Brazil. The new geography is embodied by changes in company management structure, capitalization, subcontracting, supply chain substitutions, leasing, and transnational land pooling.[34] In straddling national borders, these "commodity countries," flexibly embedded across ecologies and political borders, are producing new epidemiologies along the way.[35]

For instance, despite a general shift in population from commoditized rural areas to urban slums that continues today across the globe, the rural-urban divide driving much of the

discussion around disease emergence misses rural-destined labor and the rapid growth of rural towns into periurban *desakotas* (city villages) or *zwischenstadt* (in-between cities). Mike Davis and others have identified how these newly urbanizing landscapes act as both local markets and regional hubs for global agricultural commodities passing through.[36] Some such regions have even gone "post-agricultural."[37] As a result, forest disease dynamics, the pathogens' primeval sources, are no longer constrained to the hinterlands alone. Their associated epidemiologies have themselves turned relational, felt across time and space. A SARS can suddenly find itself spilling over into humans in the big city only a few days out of its bat cave.

Ecosystems in which such "wild" viruses were in part controlled by the complexities of the tropical forest are being drastically streamlined by capital-led deforestation and, at the other end of periurban development, by deficits in public health and environmental sanitation.[38] While many sylvatic pathogens are dying off with their host species as a result, a subset of infections that once burned out relatively quickly in the forest, if only by an irregular rate of encountering their typical host species, are now propagating across susceptible human populations whose vulnerability to infection is often exacerbated in cities by austerity programs and corrupted regulation. Even in the face of efficacious vaccines, the resulting outbreaks are characterized by greater extent, duration, and momentum. What were once local spillovers are now epidemics trawling their way through global webs of travel and trade.[39]

By this parallax effect—by a change in the environmental background alone—old standards such as Ebola, Zika, malaria, and yellow fever, evolving comparatively little, have all made sharp turns into regional threats.[40] They have suddenly moved from

spilling over into remote villagers now and again to infecting thousands in capital cities. In something of the other ecological direction, even wild animals, routinely longtime disease reservoirs, are suffering blowback. Their populations fragmented by deforestation, native New World monkeys susceptible to wildtype yellow fever, to which they had been exposed for at least a hundred years, are losing their herd immunity and dying in the hundreds of thousands.[41]

Expansion

If by its global expansion alone, commodity agriculture serves as both propulsion for and nexus through which pathogens of diverse origins migrate from the most remote reservoirs to the most international of population centers.[42] It is here, and along the way, where novel pathogens infiltrate agriculture's gated communities. The lengthier the associated supply chains and the greater the extent of adjunct deforestation, the more diverse (and exotic) the zoonotic pathogens that enter the food chain. Among recent emergent and reemergent farm and foodborne pathogens, originating from across the anthropogenic domain, are African swine fever, *Campylobacter*, *Cryptosporidium*, *Cyclospora*, Ebola Reston, *E. coli* O157:H7, foot-and-mouth disease, hepatitis E, *Listeria*, Nipah virus, Q fever, *Salmonella*, *Vibrio*, *Yersinia*, and a variety of novel influenza variants, including H1N1 (2009), H1N2v, H3N2v, H5N1, H5N2, H5Nx, H6N1, H7N1, H7N3, H7N7, H7N9, and H9N2.[43]

However unintended, the entirety of the production line is organized around practices that accelerate the evolution of pathogen virulence and subsequent transmission.[44] Growing genetic monocultures—food animals and plants with nearly

identical genomes—removes immune firebreaks that in more diverse populations slow down transmission.[45] Pathogens now can just quickly evolve around the commonplace host immune genotypes. Meanwhile, crowded conditions depress immune response.[46] Larger farm animal population sizes and densities of factory farms facilitate greater transmission and recurrent infection.[47] High throughput, a part of any industrial production, provides a continually renewed supply of susceptibles at barn, farm, and regional levels, removing the cap on the evolution of pathogen deadliness.[48] Housing a lot of animals together rewards those strains that can burn through them best. Decreasing the age of slaughter—to six weeks in chickens—is likely to select for pathogens able to survive more robust immune systems.[49] Lengthening the geographic extent of live animal trade and export has increased the diversity of genomic segments that their associated pathogens exchange, increasing the rate at which disease agents explore their evolutionary possibilities.[50]

While pathogen evolution rockets forward in all these ways, there is, however, little to no intervention, even at the industry's own demand, save what is required to rescue any one quarter's fiscal margins from the sudden emergency of an outbreak.[51] The trend tends toward fewer government inspections of farms and processing plants, legislation *against* government surveillance and activist exposé, and legislation against even reporting on the specifics of deadly outbreaks in media outlets. Despite recent court victories against pesticide and hog pollution, the private command of production remains entirely focused on profit. The damages caused by the outbreaks that result are externalized to livestock, crops, wildlife, workers, local and national governments, public health systems, and alternate agrosystems abroad as a matter of national priority. In the United States, the CDC reports foodborne

outbreaks are expanding in the numbers of states impacted and people infected.[52]

That is, capital's alienation is parsing out in pathogens' favor. While the public interest is filtered out at the farm and food factory gate, pathogens bleed past the biosecurity that industry is willing to pay for and back out to the public. Everyday production represents a lucrative moral hazard eating through our shared health commons.

Liberation

There is a telling irony in New York, one of the largest cities in the world, sheltering in place against COVID-19, a hemisphere away from the virus's origins. Millions of New Yorkers are hiding out in housing stock overseen until recently by one Alicia Glen, until 2018 the city's deputy mayor for housing and economic development.[53] Glen is a former Goldman Sachs executive who oversaw the investment company's Urban Investment Group, which finances projects in the kinds of communities the firm's other units help redline.[54]

Glen, of course, is not in any way personally to blame for the outbreak, but is more a symbol of a connection that hits closer to home. Three years before the city hired her, upon a housing crisis and Great Recession in part its own making, her former employer, along with JPMorgan, Bank of America, Citigroup, Wells Fargo & Co., and Morgan Stanley, took 63 percent of the resulting federal emergency loan financing.[55] Goldman Sachs, cleared of overhead, moved to diversifying its holdings out of the crisis. Goldman Sachs took 60 percent stock in Shuanghui Investment and Development, part of the giant Chinese agribusiness that bought U.S.-based

Smithfield Foods, the largest hog producer in the world.[56] For $300 million, it also scored out-and-out ownership of ten poultry farms in Fujian and Hunan, one province over from Wuhan and well within the city's wild foods catchment.[57] It invested up to another $300 million alongside Deutsche Bank in hog raising in the same provinces.[58]

The relational geographies explored above have circulated all the way back. There is the pandemic presently sickening Glen's constituencies apartment-to-apartment across New York, the largest U.S. COVID-19 epicenter. But we need also to acknowledge that the loop of causes of the outbreak in part extended out from New York to begin with, however minor in this instance Goldman Sachs' investment may be for a system the size of China's agriculture.

Nationalistic finger pointing, from Trump's racist "China virus" and across the liberal continuum, obscures the interlocking global directorates of state and capital.[59] "Enemy brothers," Karl Marx described them.[60] The death and damage borne by working people on the battlefield, in the economy, and now on their couches fighting to catch their breath manifest both the competition among elites maneuvering for dwindling natural resources and the means shared in dividing and conquering the mass of humanity caught in the gears of these machinations.

Indeed, a pandemic that arises out of the capitalist mode of production and that the state is expected to manage on one end can offer an opportunity from which the system's managers and beneficiaries can prosper on the other. In mid–February, five U.S. senators and twenty House members dumped millions of dollars in personally held stock in industries likely to be damaged in the oncoming pandemic.[61] The politicos based their insider trading

on nonpublic intelligence, even as some of the representatives continued to publicly repeat regime missives that the pandemic served no such threat.

Beyond such crass smash-and-grabs, the corruption stateside is systemic, a marker of the end of the U.S. cycle of accumulation when capital cashes out.

There is something comparatively anachronistic in efforts to keep the spout on even if organized around reifying finance over the reality of the primary ecologies (and related epidemiologies) on which it is based. For Goldman Sachs itself, the pandemic, as crises before, offers “room to grow”:

> "We share the optimism of the various vaccine experts and researchers at biotech companies based on the good progress that has been made on various therapies and vaccines so far. We believe that fear will abate at the first significant evidence of such progress....
>
> Trying to trade to a possible downside target when the year-end target is substantially higher is appropriate for day traders, momentum followers, and some hedge fund managers, but not for long-term investors. Of equal importance, there is no guarantee that the market reaches the lower levels that may be used as justification for selling today. On the other hand, we are more confident that the market will eventually reach the higher target given the resiliency and preeminence of the US economy.
>
> And finally, we actually think that current levels provide an opportunity to slowly add to the risk levels of a portfolio. For those who may be sitting on excess cash and have staying

> power with the right strategic asset allocation, this is the time to start incrementally adding to S&P equities." [62]

Appalled by the ongoing carnage, people the world over draw different conclusions.[63] The circuits of capital and production that pathogens mark like radioactive tags one after the other are thought unconscionable.

How to characterize such systems beyond, as we did above, the episodic and circumstantial? Our group is in the midst of deriving a model that outstrips efforts by the modern colonial medicine found in ecohealth and One Health that continues to blame the indigenous and local smallholders for the deforestation that leads to the emergence of deadly diseases.[64]

Our general theory of neoliberal disease emergence, including, yes, in China, combines:

- - global circuits of capital;
- - deployment of said capital destroying regional environmental complexity that keeps virulent pathogen population growth in check;
- - the resulting increases in the rates and taxonomic breadth of spillover events;
- - the expanding periurban commodity circuits shipping these newly spilled over pathogens in livestock and labor from the deepest hinterland to regional cities;
- - the growing global travel (and livestock trade) networks that deliver the pathogens from said cities to the rest of the world in record time;
- - the ways these networks lower transmission friction, selecting for the evolution of greater pathogen deadliness in both livestock and people;

- - and, among other impositions, the dearth of reproduction on-site in industrial livestock, removing natural selection as an ecosystems service that provides real-time (and nearly free) disease protection.

The underlying operative premise is that the cause of COVID-19 and other such pathogens is not found just in the object of any one infectious agent or its clinical course, but also in the field of ecosystemic relations that capital and other structural causes have pinned back to their own advantage.[65] The wide variety of pathogens, representing different taxa, source hosts, modes of transmission, clinical courses, and epidemiological outcomes, all the earmarks that send us running wild-eyed to our search engines upon each outbreak, mark different parts and pathways along the same kinds of circuits of land use and value accumulation.

A general program of intervention runs in parallel far beyond a particular virus.

To avoid the worst outcomes here on out, *disalienation* offers the next great human transition: abandoning settler ideologies, reintroducing humanity back into Earth's cycles of regeneration, and rediscovering our sense of individuation in multitudes beyond capital and the state.[66] However, economism, the belief that all causes are economic alone, will not be liberation enough. Global capitalism is a many-headed hydra, appropriating, internalizing, and ordering multiple layers of social relation.[67] Capitalism operates across complex and interlinked terrains of race, class, and gender in the course of actualizing regional value regimes place to place.

At the risk of accepting the precepts of what Donna Haraway dismissed as salvation history—"can we defuse the bomb in

time?"—disalienation must dismantle these multifold hierarchies of oppression and the locale-specific ways they interact with accumulation.[68] Along the way, we must navigate out of capital's expansive reappropriations across productive, social, and symbolic materialisms.[69] That is, out of what sums up to a totalitarianism. Capitalism commodifies everything—Mars exploration here, sleep there, lithium lagoons, ventilator repair, even sustainability itself, and on and on, these many permutations are found well beyond the factory and farm. All the ways nearly everyone everywhere is subjected to the market, which during a time like this is increasingly anthropomorphized by politicians, could not be clearer.[70]

In short, a successful intervention keeping any one of the many pathogens queuing up across the agroeconomic circuit from killing a billion people must walk through the door of a global clash with capital and its local representatives, however much any individual foot soldier of the bourgeoisie, Glen among them, attempts to mitigate the damage. As our group describes in some of our latest work, agribusiness is at war with public health.[71] And public health is losing.

Should, however, greater humanity win such a generational conflict, we can replug ourselves back into a planetary metabolism that, however differently expressed place to place, reconnects our ecologies and our economies.[72] Such ideals are more than matters of the utopian. In doing so, we converge on immediate solutions. We protect the forest complexity that keeps deadly pathogens from lining up hosts for a straight shot onto the world's travel network.[73] We reintroduce the livestock and crop diversities, and reintegrate animal and crop farming at scales that keep pathogens from ramping up in virulence and geographic extent.[74] We allow our food animals to reproduce onsite,

restarting the natural selection that allows immune evolution to track pathogens in real time. Big picture, we stop treating nature and community, so full of all we need to survive, as just another competitor to be run off by the market.

The way out is nothing short of birthing a world (or perhaps more along the lines of returning back to Earth). It will also help solve—sleeves rolled up—many of our most pressing problems. None of us stuck in our living rooms from New York to Beijing, or, worse, mourning our dead, want to go through such an outbreak again. Yes, infectious diseases, for most of human history our greatest source of premature mortality, will remain a threat. But given the bestiary of pathogens now in circulation, the worst spilling over now almost annually, we are likely facing another deadly pandemic in far shorter time than the hundred-year lull since 1918. Can we fundamentally adjust the modes by which we appropriate nature and arrive at more of a truce with these infections?

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[1] Max Roser, Hannah Ritchie, and Esteban Ortiz-Ospina, "Coronavirus Disease (COVID-19)—Statistics and Research," *Our World in Data*, accessed March 22, 2020.

[2] Brian M. Rosenthal, Joseph Goldstein, and Michael Rothfeld, "Coronavirus in N.Y.: 'Deluge' of Cases Begins Hitting Hospitals," *New York Times*, March 20, 2020.

[3] Hannah Rappleye, Andrew W. Lehren, Laura Stricklet, and Sarah Fitzpatrick, "'The System Is Doomed': Doctors, Nurses,

Sound off in NBC News Coronavirus Survey," *NBC News*, March 20, 2020.

[4] Eliza Relman, "The Federal Government Outbid States on Critical Coronavirus Supplies After Trump Told Governors to Get Their Own Medical Equipment," *Business Insider*, March 20, 2020; David Oliver, "Trump Announces U.S.-Mexico Border Closure to Stem Spread of Coronavirus," *USA Today*, March 19, 2020.

[5] Neil M. Ferguson et al. on behalf of the Imperial College COVID-19 Response Team, "Impact of Non-Pharmaceutical Interventions (NPIs) to Reduce COVID-19 Mortality and Healthcare Demand," March 16, 2020.

[6] Nassim Nicholas Taleb, *The Black Swan* (New York: Random House, 2007); Chen Shen, Nassim Nicholas Taleb, and Yaneer Bar-Yam, "Review of Ferguson et al. 'Impact of Non-Pharmaceutical Interventions,'" *New England Complex Systems Institute*, March 17, 2020.

[7] NewTmrw, Twitter post, March 21, 2020.

[8] Rodrick Wallace, "Pandemic Firefighting vs. Pandemic Fire Prevention" (unpublished manuscript, March 20, 2020). Available upon request.

[9] Jonathan Allen, "Trump's Not Worried About Coronavirus: But His Scientists Are," *NBC News*, February 26, 2020; Deb Riechmann, "Trump Disbanded NSC Pandemic Unit That Experts Had Praised," *AP News*, March 14, 2020.

[10] David E. Sanger, Eric Lipton, Eileen Sullivan, and Michael Crowley, "Before Virus Outbreak, a Cascade of Warnings Went Unheeded," *New York Times*, March 19, 2020.

[11] Marisa Taylor, "Exclusive: U.S. Axed CDC Expert Job in China Months Before Virus Outbreak," *Reuters*, March 22, 2020.

[12] Howard Waitzkin, ed., *Health Care Under the Knife: Moving Beyond Capitalism for Our Health* (New York: Monthly Review Press, 2018).

[13] Richard Lewontin and Richard Levins, "Let the Numbers Speak," *International Journal of Health Services* 30, no. 4 (2000): 873–77.

[14] Owen Matthews, "Britain Drops Its Go-It-Alone Approach to Coronavirus," *Foreign Policy*, March 17, 2020; Rob Wallace, "Pandemic Strike," *Uneven Earth*, March 16, 2020; Isabel Frey, "'Herd Immunity' Is Epidemiological Neoliberalism," *Quarantimes*, March 19, 2020.

[15] Adam Payne, "Spain Has Nationalized All of Its Private Hospitals as the Country Goes into Coronavirus Lockdown," *Business Insider*, March 16, 2020.

[16] Jeva Lange, "Senegal Is Reportedly Turning Coronavirus Tests Around 'within 4 Hours' While Americans Might Wait a Week," *Yahoo News*, March 12, 2020.

[17] Steph Sterling and Julie Margetta Morgan, *New Rules for the 21st Century: Corporate Power, Public Power, and the Future of Prescription Drug Policy in the United States* (New York: Roosevelt Institute, 2019).

[18] Jason Koebler, "Hospitals Need to Repair Ventilators: Manufacturers Are Making That Impossible," *Vice*, March 18, 2020.

[19] Manli Wang et al., "Remdesivir and Chloroquine Effectively Inhibit the Recently Emerged Novel Coronavirus (2019-nCoV) In Vitro," *Cell Research* 30 (2020): 269–71.

[20] "Autonomous Groups Are Mobilizing Mutual Aid Initiatives to Combat the Coronavirus," *It's Going Down*, March 20, 2020.

[21] Kristian G. Andersen, Andrew Rambaut, W. Ian Lipkin, Edward C. Holmes, and Robert F. Garry, "The Proximal Origin of SARS-CoV-2," *Nature Medicine* (2020).

[22] Rob Wallace, "Notes on a Novel Coronavirus," *MR Online*, January 29, 2020.

[23] Marius Gilbert et al., "Preparedness and Vulnerability of African Countries Against Importations of COVID-19: A Modelling Study," *Lancet* 395, no. 10227 (2020): 871–77.

[24] Juanjuan Sun, "The Regulation of 'Novel Food' in China: The Tendency of Deregulation," *European Food and Feed Law Review* 10, no. 6 (2015): 442–48.

[25] Emma G. E. Brooks, Scott I. Robertson, and Diana J. Bell, "The Conservation Impact of Commercial Wildlife Farming of Porcupines in Vietnam," *Biological Conservation* 143, no. 11 (2010): 2808–14.

[26] Mindi Schneider, "Wasting the Rural: Meat, Manure, and the Politics of Agro-Industrialization in Contemporary China," *Geoforum* 78 (2017): 89–97.

[27] Robert G. Wallace, Luke Bergmann, Lenny Hogerwerf, Marius Gilbert, "Are Influenzas in Southern China Byproducts of the Region's Globalising Historical Present?," in *Influenza and*

Public Health: Learning from Past Pandemics, ed. Jennifer Gunn, Tamara Giles-Vernick, and Susan Craddock (London: Routledge, 2010); Alessandro Broglia and Christian Kapel, "Changing Dietary Habits in a Changing World: Emerging Drivers for the Transmission of Foodborne Parasitic Zoonoses," *Veterinary Parasitology* 182, no. 1 (2011): 2–13.

[28] David Molyneux et al., "Zoonoses and Marginalised Infectious Diseases of Poverty: Where Do We Stand?," *Parasites & Vectors* 4, no. 106 (2011).

[29] Stephen S. Morse et al., "Prediction and Prevention of the Next Pandemic Zoonosis," *Lancet* 380, no. 9857 (2012): 1956–65; Rob Wallace, *Big Farms Make Big Flu: Dispatches on Infectious Disease, Agribusiness, and the Nature of Science* (New York: Monthly Review Press, 2016).

[30] Robert G. Wallace et al., "The Dawn of Structural One Health: A New Science Tracking Disease Emergence Along Circuits of Capital," *Social Science & Medicine* 129 (2015): 68–77; Wallace, *Big Farms Make Big Flu*.

[31] Steven Cummins, Sarah Curtis, Ana V. Diez-Roux, and Sally Macintyre, "Understanding and Representing 'Place' in Health Research: A Relational Approach," *Social Science & Medicine* 65, no. 9 (2007): 1825–38; Luke Bergmann and Mollie Holmberg, "Land in Motion," *Annals of the American Association of Geographer*, 106, no. 4 (2016): 932–56; Luke Bergmann, "Towards Economic Geographies Beyond the Nature-Society Divide," *Geoforum* 85 (2017): 324–35.

[32] Andrew K. Jorgenson, "Unequal Ecological Exchange and Environmental Degradation: A Theoretical Proposition and Cross-

National Study of Deforestation, 1990–2000," *Rural Sociology* 71, no. 4 (2006): 685–712; Becky Mansfield, Darla K. Munroe, and Kendra McSweeney, "Does Economic Growth Cause Environmental Recovery? Geographical Explanations of Forest Regrowth," *Geography Compass* 4, no. 5 (2010): 416–27; Susanna B. Hecht, "Forests Lost and Found in Tropical Latin America: The Woodland 'Green Revolution,'" *Journal of Peasant Studies* 41, no. 5 (2014): 877–909; Gustavo de L. T. Oliveira, "The Geopolitics of Brazilian Soybeans," *Journal of Peasant Studies* 43, no. 2 (2016): 348–72.

[33] Mariano Turzi, "The Soybean Republic," *Yale Journal of International Affairs* 6, no. 2 (2011); Rogério Haesbaert, *El Mito de la Desterritorialización: Del 'Fin de Los Territorios' a la Multiterritorialidad* (Mexico City: Siglo Veintiuno, 2011); Clara Craviotti, "Which Territorial Embeddedness? Territorial Relationships of Recently Internationalized Firms of the Soybean Chain," *Journal of Peasant Studies* 43, no. 2 (2016): 331–47.

[34] Wendy Jepson, Christian Brannstrom, and Anthony Filippi, "Access Regimes and Regional Land Change in the Brazilian Cerrado, 1972–2002," *Annals of the Association of American Geographers* 100, no. 1 (2010): 87–111; Patrick Meyfroidt et al., "Multiple Pathways of Commodity Crop Expansion in Tropical Forest Landscapes," *Environmental Research Letters* 9, no 7 (2014); Oliveira, "The Geopolitics of Brazilian Soybeans"; Javier Godar, "Balancing Detail and Scale in Assessing Transparency to Improve the Governance of Agricultural Commodity Supply Chains," *Environmental Research Letters* 11, no. 3 (2016).

[35] Rodrick Wallace et al., *Clear-Cutting Disease Control: Capital-Led Deforestation, Public Health Austerity, and Vector-Borne Infection* (Basel: Springer, 2018).

[36] Mike Davis, *Planet of Slums* (New York: Verso, 2016); Marcus Moench & Dipak Gyawali, *Desakota: Reinterpreting the Urban-Rural Continuum* (Kathmandu: Institute for Social and Environmental Transition, 2008); Hecht, "Forests Lost and Found in Tropical Latin America."

[37] Ariel E. Lugo, "The Emerging Era of Novel Tropical Forests," *Biotropica* 41, no. 5 (2009): 589–91.

[38] Robert G. Wallace and Rodrick Wallace, eds., *Neoliberal Ebola: Modeling Disease Emergence from Finance to Forest and Farm* (Basel: Springer, 2016); Wallace et al., *Clear-Cutting Disease Control*; Giorgos Kallis and Erik Swyngedouw, "Do Bees Produce Value? A Conversation Between an Ecological Economist and a Marxist Geographer," *Capitalism Nature Socialism* 29, no. 3 (2018): 36–50.

[39] Robert G. Wallace et al., "Did Neoliberalizing West African Forests Produce a New Niche for Ebola?," *International Journal of Health Services* 46, no. 1 (2016): 149–65.

[40] Wallace and Wallace, *Neoliberal Ebola*.

[41] Júlio César Bicca-Marques and David Santos de Freitas, "The Role of Monkeys, Mosquitoes, and Humans in the Occurrence of a Yellow Fever Outbreak in a Fragmented Landscape in South Brazil: Protecting Howler Monkeys Is a Matter of Public Health," *Tropical Conservation Science* 3, no. 1 (2010): 78–89; Júlio César Bicca-Marques et al., "Yellow Fever Threatens Atlantic Forest Primates," *Science Advances* e-letter, May 25, 2017; Luciana Inés Oklander et al., "Genetic Structure in the Southernmost Populations of Black-and-Gold Howler Monkeys (*Alouatta caraya*) and Its Conservation Implications," *PLoS ONE* 12, no. 10 (2017);

Natália Coelho Couto de Azevedo Fernandes et al., "Outbreak of Yellow Fever Among Nonhuman Primates, Espirito Santo, Brazil, 2017," *Emerging Infectious Diseases* 23, no. 12 (2017): 2038–41; Daiana Mir, "Phylodynamics of Yellow Fever Virus in the Americas: New Insights into the Origin of the 2017 Brazilian Outbreak," *Scientific Reports* 7, no. 1 (2017).

[42] Mike Davis, *The Monster at Our Door: The Global Threat of Avian Flu* (New York: New Press, 2005); Jay P. Graham et al., "The Animal-Human Interface and Infectious Disease in Industrial Food Animal Production: Rethinking Biosecurity and Biocontainment," *Public Health Reports* 123, no. 3 (2008): 282–99; Bryony A. Jones et al., "Zoonosis Emergence Linked to Agricultural Intensification and Environmental Change," *PNAS*110, no. 21 (2013): 8399–404; Marco Liverani et al., "Understanding and Managing Zoonotic Risk in the New Livestock Industries," *Environmental Health Perspectives* 121, no, 8 (2013); Anneke Engering, Lenny Hogerwerf, and Jan Slingenbergh, "Pathogen-Host-Environment Interplay and Disease Emergence," *Emerging Microbes and Infections* 2, no. 1 (2013); *World Livestock 2013: Changing Disease Landscapes* (Rome: Food and Agriculture Organization of the United Nations, 2013).

[43] Robert V. Tauxe, "Emerging Foodborne Diseases: An Evolving Public Health Challenge," *Emerging Infectious Diseases* 3, no. 4 (1997): 425–34; Wallace and Wallace, *Neoliberal Ebola*; Ellyn P. Marder et al., "Preliminary Incidence and Trends of Infections with Pathogens Transmitted Commonly Through Food—Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 2006–2017," *Morbidity and Mortality Weekly Report* 67, no. 11 (2018): 324–28.

[44] Robert G. Wallace, "Breeding Influenza: The Political Virology of Offshore Farming," *Antipode* 41, no. 5 (2009): 916–51; Robert G. Wallace et al., "Industrial Agricultural Environments," in *The Routledge Handbook of Biosecurity and Invasive Species*, ed. Juliet Fall, Robert Francis, Martin A. Schlaepfer, and Kezia Barker (New York: Routledge, forthcoming).

[45] John H. Vandermeer, *The Ecology of Agroecosystems* (Sudbury, MA: Jones and Bartlett, 2011); Peter H. Thrall et al., "Evolution in Agriculture: The Application of Evolutionary Approaches to the Management of Biotic Interactions in Agro-Ecosystems," *Evolutionary Applications* 4, no. 2 (2011): 200–15; R. Ford Denison, *Darwinian Agriculture: How Understanding Evolution Can Improve Agriculture* (Princeton: Princeton University Press, 2012); Marius Gilbert, Xiangming Xiao, and Timothy Paul Robinson, "Intensifying Poultry Production Systems and the Emergence of Avian Influenza in China: A 'One Health/Ecohealth' Epitome," *Archives of Public Health* 75 (2017).

[46] Mohammad Houshmar et al., "Effects of Prebiotic, Protein Level, and Stocking Density on Performance, Immunity, and Stress Indicators of Broilers," *Poultry Science* 91, no. 2 (2012): 393–401; A. V. S. Gomes et al., "Overcrowding Stress Decreases Macrophage Activity and Increases Salmonella Enteritidis Invasion in Broiler Chickens," *Avian Pathology* 43, no. 1 (2014): 82–90; Peyman Yarahmadi , Hamed Kolangi Miandare, Sahel Fayaz, and Christopher Marlowe A. Caipang, "Increased Stocking Density Causes Changes in Expression of Selected Stress- and Immune-Related Genes, Humoral Innate Immune Parameters and Stress Responses of Rainbow Trout (*Oncorhynchus mykiss*)," *Fish & Shellfish Immunology* 48 (2016): 43–53; Wenjia Li et al., "Effect of Stocking Density and Alpha-Lipoic Acid on the Growth Performance, Physiological and Oxidative Stress and Immune

Response of Broilers," *Asian-Australasian Journal of Animal Studies* 32, no, 12 (2019).

[47] Virginia E. Pitzer et al., "High Turnover Drives Prolonged Persistence of Influenza in Managed Pig Herds," *Journal of the Royal Society Interface* 13, no. 119 (2016); Richard K. Gast et al., "Frequency and Duration of Fecal Shedding of *Salmonella* Enteritidis by Experimentally Infected Laying Hens Housed in Enriched Colony Cages at Different Stocking Densities," *Frontiers in Veterinary Science* (2017); Andres Diaz et al., "Multiple Genome Constellations of Similar and Distinct Influenza A Viruses Co-Circulate in Pigs During Epidemic Events," *Scientific Reports* 7 (2017).

[48] Katherine E. Atkins et al., "Modelling Marek's Disease Virus (MDV) Infection: Parameter Estimates for Mortality Rate and Infectiousness," *BMC Veterinary Research* 7, no. 70 (2011); John Allen and Stephanie Lavau, "'Just-in-Time' Disease: Biosecurity, Poultry and Power," *Journal of Cultural Economy* 8, no. 3 (2015): 342–60; Pitzer et al., "High Turnover Drives Prolonged Persistence of Influenza in Managed Pig Herds"; Mary A. Rogalski, "Human Drivers of Ecological and Evolutionary Dynamics in Emerging and Disappearing Infectious Disease Systems," *Philosophical Transactions of the Royal Society B* 372, no. 1712 (2017).

[49] Wallace, "Breeding Influenza"; Katherine E. Atkins et al., "Vaccination and Reduced Cohort Duration Can Drive Virulence Evolution: Marek's Disease Virus and Industrialized Agriculture," *Evolution* 67, no. 3 (2013): 851–60; Adèle Mennerat, Mathias Stølen Ugelvik, Camilla Håkonsrud Jensen, and Arne Skorping, "Invest More and Die Faster: The Life History of a Parasite on Intensive Farms," *Evolutionary Applications*10, no. 9 (2017): 890–96.

[50] Martha I. Nelson et al., "Spatial Dynamics of Human-Origin H1 Influenza A Virus in North American Swine," *PLoS Pathogens* 7, no. 6 (2011); Trevon L. Fuller et al., "Predicting Hotspots for Influenza Virus Reassortment," *Emerging Infectious Diseases* 19, no. 4 (2013): 581–88; Rodrick Wallace and Robert G. Wallace, "Blowback: New Formal Perspectives on Agriculturally-Driven Pathogen Evolution and Spread," *Epidemiology and Infection* 143, no. 10 (2014): 2068–80; Ignacio Mena et al., "Origins of the 2009 H1N1 Influenza Pandemic in Swine in Mexico," *eLife* 5 (2016); Martha I. Nelson et al., "Human-Origin Influenza A(H3N2) Reassortant Viruses in Swine, Southeast Mexico," *Emerging Infectious Diseases* 25, no. 4 (2019): 691–700.

[51] Wallace, *Big Farms Make Big Flu*, 192–201.

[52] "Safer Food Saves Lives," Centers for Disease Control and Prevention, November 3, 2015; Lena H. Sun, "Big and Deadly: Major Foodborne Outbreaks Spike Sharply," *Washington Post*, November 3, 2015; Mike Stobbe, "CDC: More Food Poisoning Outbreaks Cross State Lines," *KSL*, November 3, 2015.

[53] Sally Goldenberg, "Alicia Glen, Who Oversaw de Blasio's Affordable Housing Plan and Embattled NYCHA, to Depart City Hall," *Politico*, December 19, 2018.

[54] Gary A. Dymski, "Racial Exclusion and the Political Economy of the Subprime Crisis," *Historical Materialism* 17 (2009): 149–79; Harold C. Barnett, "The Securitization of Mortgage Fraud," *Sociology of Crime, Law and Deviance* 16 (2011): 65–84.

[55] Bob Ivry, Bradley Keoun, and Phil Kuntz, "Secret Fed Loans Gave Banks $13 Billion Undisclosed to Congress," *Bloomberg*, November 21, 2011.

[56] Michael J. de la Merced and David Barboza, "Needing Pork, China Is to Buy a U.S. Supplier," *New York Times*, May 29, 2013.

[57] "Goldman Sachs Pays US$300m for Poultry Farms," *South China Morning Post*, August 4, 2008.

[58] "Goldman Sachs Invests in Chinese Pig Farming," *Pig Site*, August 5, 2008.

[59] Katie Rogers, Lara Jakes, Ana Swanson, "Trump Defends Using 'Chinese Virus' Label, Ignoring Growing Criticism," *New York Times*, March 18, 2020.

[60] Karl Marx, *Capital: A Critique of Political Economy*, vol. 3 (New York: Penguin, 1993), 362.

[61] Eric Lipton, Nicholas Fandos, Sharon LaFraniere, and Julian E. Barnes, "Stock Sales by Senator Richard Burr Ignite Political Uproar," *New York Times*, March 20, 2020.

[62] Sharmin Mossavar-Rahmani et al., "ISG Insight: From *Room to Grow* to *Room to Fall*," Goldman Sachs' Investment Strategy Group.

[63] "Corona Crisis: Resistance in a Time of Pandemic," *Marx21*, March 21, 2020; International Assembly of the Peoples and Tricontinental Institute for Social Research, "In Light of the Global Pandemic, Focus Attention on the People," *Tricontinental*, March 21, 2020.

[64] Wallace et al., "The Dawn of Structural One Health."

[65] Wallace et al., "Did Neoliberalizing West African Forests Produce a New Niche for Ebola?"; Wallace et al., *Clear-Cutting Disease Control*.

[66] Ernest Mandel, "Progressive Disalienation Through the Building of Socialist Society, or the Inevitable Alienation in Industrial Society?," in *The Marxist Theory of Alienation* (New York: Pathfinder, 1970); Paolo Virno, *A Grammar of the Multitude* (Los Angeles: Semiotext(e), 2004); Del Weston, *The Political Economy of Global Warming: The Terminal Crisis* (London: Routledge, 2014); McKenzie Wark, *General Intellects: Twenty-One Thinkers for the Twenty-First Century* (New York: Verso, 2017); John Bellamy Foster, "Marx, Value, and Nature," *Monthly Review* 70, no. 3 (July–August 2018): 122–36); Silvia Federici, *Re-enchanting the World: Feminism and the Politics of the Commons* (Oakland: PM, 2018).

[67] Butch Lee and Red Rover, *Night-Vision: Illuminating War and Class on the Neo-Colonial Terrain* (New York: Vagabond, 1993); Silvia Federici, *Caliban and the Witch: Women, the Body and Primitive Accumulation*(New York: Autonomedia, 2004); Anna Tsing, "Supply Chains and the Human Condition," *Rethinking Marxism* 21, no. 2 (2009): 148–76; Glen Sean Coulthard, *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition* (Minneapolis: University of Minnesota Press, 2014); Leandro Vergara-Camus, *Land and Freedom: The MST, the Zapatistas and Peasant Alternatives to Neoliberalism* (London: Zed, 2014); Jackie Wang, *Carceral Capitalism* (Los Angeles: Semiotext(e), 2018).

[68] Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991); Keeanga-Yamahtta Taylor, ed., *How We Get Free: Black Feminism and the Combahee River Collective* (Chicago: Haymarket, 2017).

[69] Joseph Fracchia, "Organisms and Objectifications: A Historical-Materialist Inquiry into the 'Human and the Animal,'" *Monthly Review* 68, no. 10 (March 2017): 1–17; Omar Felipe Giraldo, *Political Ecology of Agriculture: Agroecology and Post-Development* (Basel: Springer, 2019).

[70] Franco Berardi, *The Soul at Work: From Alienation to Autonomy* (Los Angeles: Semiotext(e), 2009); Maurizio Lazzarato, *Signs and Machines: Capitalism and the Production of Subjectivity* (Los Angeles: Semiotext(e), 2014); Wark, *General Intellects*.

[71] Rodrick Wallace, Alex Liebman, Luke Bergmann, and Robert G. Wallace, "Agribusiness vs. Public Health: Disease Control in Resource-Asymmetric Conflict," submitted for publication, 2020, available at https://hal.archives-ouvertes.fr.

[72] Robert G. Wallace, Kenichi Okamoto, and Alex Liebman, "Earth, the Alien Planet," in *Between Catastrophe and Revolution: Essays in Honor of Mike Davis*, ed. Daniel Bertrand Monk and Michael Sorkin (New York: UR, forthcoming).

[73] Wallace et al., *Clear-Cutting Disease Control*.

[74] Wallace et al., "Industrial Agricultural Environments."