

# The Paradoxical Politics of Viral Containment; or, How Scale Undoes Us One and All

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Life is a window of vulnerability. It seems a mistake to close it.  
—Donna Haraway, “The Biopolitics of Postmodern Bodies”

How do we contain viral disease? This question seems to obsess us of late. Not yet ten years into the third millennium the world has already weathered a bevy of actual or feared viral epidemics: HIV/AIDS, sudden acute respiratory syndrome (SARS), highly pathogenic avian influenza (HPAI), and now a novel influenza A: H1N1 (also known as “swine flu,” or “Mexico flu,” as it was identified in Israel since, as Israel’s deputy health minister, Yakov Litzman, declared, “pigs are not kosher”<sup>1</sup>). While these contagious matters have received considered and considerable attention, the biomedically oriented responses that they have provoked also raise a few important conceptual questions about what we mean when we reflect on how to “contain” them. Despite manifesting genuine concern for the health and well-being of the world’s human populations—although perhaps not so much for the birds and pigs with whom we consort—these bioscientifically inflected reactions incorporate a paradox that subtends their control fantasies: the reason we (i.e., humans) want to contain such diseases is precisely because we (i.e., living organisms) already contain them.

However, this overt paradox also indexes yet another, perhaps more insidious contradiction, that of the “we” itself. Indeed, the politics of viral containment relentlessly plays upon the contingency of the human “we.” It conceptually and materially confounds our understanding both

of how individuals constitute our collectives and of how we exclude other collectivities that might not belong to them—whether these “others” are other individuals, other populations, other humans, other species, or other non-vital entities, such as viruses. In other words, the politics of viral containment foregrounds the tensions that cut across our biopolitical parsings of the world insofar as they inscribe within themselves, and inscribe themselves within, the biological *and* political phenomena that we construe as epidemic disease. Since the end of the eighteenth century, political and medical responses to epidemics have been informed by, and conversely have informed, the economic assumptions of industrial capitalism. The official “costs” of epidemics are figured primarily in terms of the monetary “value” by which they diminish general productivity rather than the qualitative experiences of suffering and loss they engender. (Mortality and morbidity statistics weigh on the quantitative side, since they refer to populations as abstract aggregates and not to illness as a transformative embodied event.) Even the rudimentary distinction between epidemics and epizootics—that is, between illness patterns that afflict humans *as opposed to* those that afflict all other types of animals—assumes simultaneously that the kind of life that humans incorporate essentially differs from all other living beings (the *zoe* in epizootics) and that what makes human life special is the political character which qualifies it as “human” in the first place (the *demos* in epidemic).<sup>2</sup> Following from this etymological distinction, we apprehend that an epidemic becomes an epidemic if and only if its effects traverse the thresholds of the political; otherwise, it is just illness.

Yet our contemporary understanding of *epidemic* also carries with it another *geopolitical* implication: that epidemics spread through space and time. Throughout most of its twenty-five-hundred-year existence—from ancient Greece, which gave us the word as well as the concept, to Europe in the mid-nineteenth century, when cholera’s transit “from India” recast the epidemic as a full-scale “invasion”—*epidemic* referred primarily to a collection of symptoms occurring at a given place over a given period.<sup>3</sup> For more than two millennia, epidemics, in the prevailing Hippocratic sense, referred to temporal and spatial concatenations of somatic disturbances that were episodic: they appeared “upon the people” (the most literal translation of epidemic), often in conjunction with seasonal or environmental changes. Even if they seemed to move from one place to another—which is what made “the plague” a plague, for example—they did not travel from afar, and they did not endure.

Today *epidemic* signifies much more broadly. Though we frequently use the term metaphorically—speaking of epidemics of obesity, of drugs, of financial and political corruption—since the mid-nineteenth century, epidemics have primarily connoted biopolitical phenomena that collapse time and space, rendering seemingly stable geopolitical and biological dis-

inctions tenuous, if not moot. Hence, in addition to their material effects, epidemics constitute what geographers call “scalar narratives,” stories that temporally bind up different ways of construing space.<sup>4</sup> If we consider epidemics as concatenations of biopolitical events that occur within space-time, then their scalar articulations inform our sense of what causes them, what they are, and how they affect different people in different ways; furthermore, they do so by making these implications seem “natural.”<sup>5</sup>

Using their biological connotations as an alibi (literally an “elsewhere,” an other space), epidemics enfold their economic, political, technological, and bioscientific significance within themselves and “jump scales,” to use Neil Smith’s phrase, by jumping among discourses (molecular, genetic, epidemiological, sociological, economic, meteorological, agromonic, etc.).<sup>6</sup> Concomitantly, because they compose *narratives*, these spatial and discursive dynamics assume temporal shapes that articulate relations of coordination and subordination among them, thereby serving as quasi-natural explanations for them.<sup>7</sup> From this perspective, epidemics appear to “take place” *naturally*—that is, their occurrence constitutes a temporal mode of emplacement which seems beyond or outside human agency.<sup>8</sup> However, if we actually begin to appreciate this quasi-natural appearance as appearance, epidemics can also remind us that the ways in which we *emplot* ourselves in the world, both spatially and temporally, are in fact fictions—in the strong, fabricating sense of the term.<sup>9</sup>

## 1. Particularity; or, How Viruses Come to Matter

The epidemic emplotments that seem to concern us most these days are viral. Indeed, these viral narratives challenge us precisely because they seem to revise, or “rewrite,” the ways we like to make sense of ourselves as agents in the world. For example, in her official statement declaring the start of the 2009 influenza A pandemic, Dr. Margaret Chan, director-general of the World Health Organization, averred: “The virus writes the rules and this one, like all influenza viruses, can change the rules without rhyme or reason, at any time.”<sup>10</sup> According to Chan’s declaration, viruses appear as authors, as agents; they govern us, they rule, they reign; they are fickle, whimsical, unreasonable, inconstant; they veer from one place to another; they shift shapes. Like all vulnerable subjects, we rightfully fear such capricious sovereigns because we cannot predict their behaviors toward us. Thus we make up stories about them in order to encompass their peculiarities. According to these narratives, viruses are peculiar kinds of beings in part because they are “particular.”

The etymology of *particular* gives some sense of the complex questions that viral ontology enfolds: Particulars are not universals; they are odd, bizarre, and still familiar; they are individuals and yet they are parts;

they are partial—in all possible senses.<sup>11</sup> Moreover, if viruses are particular, it is partly because they are particles. Their particular and particulate nature straddles the cusp of “life itself,” confusing the very notion of what *living* means.<sup>12</sup> Indeed, their indeterminate animate/inanimate existence bespeaks a curious historical process that disturbs much evolutionary thinking: which came first, the virus or its host?<sup>13</sup> For the truly particular thing about viruses, what makes them actually and not just figuratively partial, is that viruses cannot reproduce themselves by themselves. Hence, when we refer to viruses circulating in the world, as Chan did in declaring the opening of the 2009 influenza A pandemic, we really speak about products of living organisms which now exceed those vital contexts, having become free from them—sometimes by killing them—to circulate among one and all.

Following contemporary scientific definitions (the current fictions that science uses to produce its facts), viruses exist only insofar as they have successfully spurred a cellular organism to commit some of its own resources and processes to producing more “copies” of the “original.”<sup>14</sup> Technically speaking, *virus* describes a small quantity of genetic material, either RNA or DNA (which can appear in single or double strands), enclosed within a protein coat, and sometimes surrounded by a lipid envelope. Viruses appear to exist everywhere on Earth and may in fact constitute “the most abundant biological entities on the planet.”<sup>15</sup> Furthermore, they do not by and large trouble us. As Luis Villarreal writes: “Most known viruses are persistent and innocuous, not pathogenic. They take up residence in cells, where they may remain dormant for long periods or take advantage of the cells’ replication apparatus to reproduce at a slow and steady rate.”<sup>16</sup> As for the viruses we don’t know about—which are legion—well, we just don’t know. The omnipresence of viruses, coupled with their general inoffensiveness and their minuscule scale, makes them easy to overlook. They exist almost like genetic background radiation, not very interesting until you begin to focus on it—in which case you might discover that it retains an echo of the Big Bang.<sup>17</sup>

Not much is certain about the role viruses play in the evolutionary scheme of things, though theories abound.<sup>18</sup> What we do know suggests that, as Villarreal puts it, “Viruses matter to life. They are the constantly changing boundary between the worlds of biology and biochemistry.”<sup>19</sup> As the shifting border between these domains, viruses necessarily belong to both. They are what Donna Haraway would call “tricksters,”<sup>20</sup> which is another way of saying they might in fact *be* “transboundary in nature.”<sup>21</sup> Given their amazing alchemical abilities, viruses seem to perform as mix-masters of the evolutionary dance, sampling, combining, and remastering genetic records in significant if little understood ways: “Viruses not only move genetic material from one organism to another but from one

ecosystem to another. . . . [V]iruses can move throughout the world and contribute to a global genetic pool.”<sup>22</sup> Furthermore, because viruses must participate in the cellular processes of organisms in order to replicate, their existence testifies to the partiality of definitions that localize life within bounded membranes and against the world (as immunological theories usually suppose).<sup>23</sup>

Many conjectures about how viruses function in the web of life focus on their capacity to link cellular organisms containing distinct genomes by “invading” or “infecting” them. In so doing, viruses modify organisms by commingling bits of viral genomes within them. This promiscuous capacity leads some researchers to hypothesize that cellular evolution depends on viral evolution such that “we” would not even *be* without “them.” Despite this possible ontological and biological dependence, humans still largely retain the prejudice that we, and not they, rule the roost. Their particularity merely seems to butt up against our individuality from time to time — each time we get a cold, for example. For no matter why they are here or what they ultimately do, what mostly interests us (humans) about viruses — at least as far as our current factive fictions allow us to appreciate them — is that when some of them replicate in our cells they catalyze deleterious biological and biochemical effects (a rather *partial* concern, to be sure).

This virulence that we associate with certain viral particles primarily focuses our attention on viruses as infectious agents. Indeed, that is how we came to know about them in the first place. The effects that viruses provoke in humans, animals, and ecosystems have persisted probably as long as there have been humans, animals, and ecosystems — or possibly even before. Yet until the very end of the nineteenth century the existence of viruses qua *viruses* was unimaginable. Before then, *virus* referred ambiguously either “to a substance produced in the body by a disease . . . [or to] any agent causing an infectious disease.”<sup>24</sup> However, over the last decades of the nineteenth century, the “germ theory of disease” refocused this indeterminate meaning of *virus* when it introduced the “microbe” into the world as a new biological *and* political actor.<sup>25</sup> As bacteria were increasingly seen to cause many of the infectious diseases afflicting humans, especially epidemic diseases, the generic sense of *virus* ceded some of its significance to them. Later, after it became technically possible to filter bacteria out of solutions known to transmit infections, bioscientists concluded that even smaller disease-precipitating entities probably existed, despite their having only indirect evidence for them.<sup>26</sup>

Throughout the next several decades, these “filterable viruses” provoked intense philosophical and experimental speculation, culminating in 1939 when the Tomato Mosaic Virus was visualized using an electron microscope, thereby confirming the particulate existence of the virus as “a virus.” Subsequently, virology — like the viruses which define its nominal

subjects—has continued to evince its transboundary nature, bringing together physics, physical chemistry, biochemistry, biophysics, cytology, genetics, epigenetics, metagenomics, proteonomics, immunology, epidemiology, and veterinary science, among others. During the twentieth century, virology contributed to many discoveries that heralded modern medicine's (supposed) triumph over the deadly forces of infectious disease, the development of a polio vaccine and the elimination of smallpox constituting two such celebrated events. Although the appearance of unforeseen viral infections like HIV/AIDS or the recrudescence of old ones like the novel H1N1 influenza A might seem to belie its putative promise, virology continues to catalyze intense rumination on fundamental biological processes. In the wake of the research imperatives precipitated by HIV/AIDS and of the current focus on emerging viral epidemics more generally, the study of viruses remains at the forefront of biotheoretical inquiry.

Today, scientists uncontentiously declare viruses to be “obligate parasites.” Here is an example of a typical bioscientific characterization:

Viruses are small, obligatory-intracellular parasites that contain either DNA or RNA as their genetic material. They depend entirely on host cells to replicate their genomes and produce infectious progeny. Viral penetration into the host cell is followed by genome uncoating, genome expression and replication, assembly of new virions and their egress. . . . Viruses are known to manipulate cells to facilitate their replication cycle.<sup>27</sup>

Although this description simply seems to report what science “knows” about viruses, it nonetheless raises a few questions about the terms in which this knowing appears. For, as we will see in a moment, if viruses entirely depend on (or are “obligated to”) cells, why do they constitute “parasites”? And moreover, even if they are parasites, how did they become parasites even before they were “viruses”? While it now seems quite natural to consider infectious diseases in terms of host/parasite relations, in fact this model only emerged as a corollary of the germ theory of disease. Until the 1870s, the study of parasites focused almost exclusively on organisms like leeches and worms, and there was little attraction in a general theory of parasitism.<sup>28</sup> Only when the newly visualizable, and hence recognizable, entities called “bacteria” began to interest scientists as possible causes for infectious disease did it occur to them that parasitism might serve as a universal explanation.

Robert Koch's etiology of anthrax (1876) probably provides the initial example of a microbe construed as a disease-causing “parasite.”<sup>29</sup> In order to explain how the newly identified *Bacillus anthracis* correlated with, or “caused,” anthrax in ruminants—a correlation for which he could provide no specific mechanism—Koch metaphorically leaned on the host/parasite relation to resolve this causality deficit. In his subsequent, much-

heralded identification of cholera's "comma bacillus" (1884), he adapted this same metaphor to the study of cholera (an epidemic which had already long since been imagined as a foreign "invasion") and then metonymically termed the "parasitic" cholera bacterium itself an "invader." In so doing, he elided the difference between "parasite" and "invader," constituting them as two sides of the same coin.<sup>30</sup> Not coincidentally, this association arose in a text that explicitly took as its point of departure the "struggle against epidemics" and indeed in the very text in which Koch introduced his famous "postulates" for establishing disease causality. With this implicit scalar connection, Koch articulated cholera bacteria and cholera epidemics as belonging to the same narrative. He thereby inoculated his metaphoric equivalence between parasite and invader (or alternately, "enemy") into an enduring bio-logic of epidemic containment which continues to underwrite contemporary biomedical rationales. Despite the fact that Koch did not bother to motivate the logic underlying the associations he invoked nor to explain conclusively how parasitism, disease, and epidemics might coincide, the notion flourished and—I am loath to say—became highly infectious.

In the early 1880s, Louis Pasteur fleshed out Koch's initial parasitic intimations, providing some important missing details. Drawing on a well-known analogy (derived from humoral medicine) between fermentation and disease, as well as on his own work concerning fermentation in wine and beer, Pasteur surmised that microorganisms cause infectious disease just as yeast "causes" fermentation. Presuming that a biotic agent must catalyze the chemical changes which transform organic matter from one qualitative state to another, Pasteur reasoned that the biochemical transformations known as disease must also require a biotic agent.<sup>31</sup> Hence, in Pasteur's bio-logic, the living "germ" that converts smashed grapes into vintage wine provides the analogue for the deadly "germ" that transforms living bodies into putrefying corpses.<sup>32</sup> Moreover, he inferred, since during their own metabolic processes these germs consume the matter of the milieu in which they live, diseases must arise because the parasitic microbes deplete nutrients essential to the host organism's vitality. While this idea revises and recapitulates an earlier notion of disease causality found in humoral medicine, it also imports the biopolitical assumption derived from Pasteur's friend and mentor Claude Bernard, who introduced the seminal idea that an organism's *milieu intérieur* constitutes its "proper" milieu (literally, its "own" milieu and, conversely, that which it *owns*).<sup>33</sup> In depriving the host of its own proper and essential material, the parasitic microbe thus "naturally" violates liberalism's most sacred precept (i.e., that one owns one's body as one's property).<sup>34</sup> Disregarding the body's propriety by purloining its essential property—like the bad guest that violates its host, as we will consider below—the germ materially

perturbs the quasi-natural basis for liberal personhood (i.e., “the body” defines a “natural” metonym for the person<sup>35</sup>). Hence, insofar as it comes to represent the “virulent agent” of epidemic-causing infectious diseases, which themselves necessarily enfold the biological within the political, the “microscopic parasite” not only biologically but also *politically* threatens the organism’s “economy.” As Pasteur exclaimed: “The truly real novelty of the preceding observations, the novelty which provides much to reflect on about the nature of viruses [*la nature des virus*], is that here it is a question of an illness whose virulent agent is a microscopic parasite, a living being, which can be cultivated outside the economy.”<sup>36</sup>

### **The Paradoxical Parasite; or, The Antinomies of Viral Life**

Historically speaking, then, viruses were parasites before they were viruses. Or, to put it slightly less anachronistically, by the time science declared that viruses exist and foment disease, parasitism already dominated the explanatory field. Yet even though we have now largely forgotten it, parasitism does not in fact represent a “natural” relationship, since the host/parasite relation derives from political theories dating back to ancient Rome. Only in the eighteenth century did it begin to be applied metaphorically to the biological domain. Moreover, the relation of host and parasite necessarily depends on the complicated notion of “host” itself. The Latin eponym for host, *hospes*, means guest, host, and stranger; it therefore constitutes an antithetical word, a word that means both one thing and its opposite. Thus, in the terms used in this essay, “host” *actually* contains a paradox (and, reciprocally, then so does parasite—but more on that in a moment).

The incomparable linguist Emile Benveniste has argued that the tension internal to *host* reveals itself in the word’s historical trajectory. He holds that *host* derives from two roots. One connotes “master of the house” (in a male-gendered sort of way), which then evolved into a notion of mastery of one’s self—a development that testifies to a specific political situation: “There must be a circle of persons subordinated to a central personage who assumes the personality and complete identity of the group to such an extent that he is its summation: in his own person he is its incarnation.”<sup>37</sup> The other root stems from a word meaning “stranger,” but in a very specific sense:

A *hostis* is not a stranger in general . . . *hostis* is “the stranger in so far as he is recognized as enjoying equal rights to those of Roman citizens.” This recognition of rights implies a certain reciprocity and supposes an agreement or compact. Not all non-Romans are called *hostis*. A bond of equality and reciprocity is established between this particular stranger and the citizen of Rome, a fact which may lead to a precise notion of hospitality. From this



point of view *hostis* will signify “he who stands in a compensatory relationship” and this is precisely the foundation of the institution of hospitality.<sup>38</sup>

The idea of “host” fuses two disparate kinds of relations: Host as the container of all the particulars, their political and religious incarnations (hence the Christian meaning of *host* as holy toast), and, conversely, host as the one who enters into relations of reciprocity, or gift giving, with the other, thereby evincing hospitality rather than hostility.<sup>39</sup> “Host” then encompasses both a self-relation that totalizes the particularities of a multiplicity (as the father does the patriarchal household or Christ does the Church) and a relation to that which exists outside the self but to which one cannot *not* enter into relation without negating oneself. From this confluence, the logic of hospitality implies that the good other is the “guest” who reaffirms the host’s property in himself and *as* his “self,” while the bad other is the “parasite” who abuses this propriety—this “proper” relation of the self to itself—and who thus quickly evolves into the “enemy.”<sup>40</sup>

The paradox of the parasite has incited at least two important philosophical responses that bear on the question of viral containment. The first from Jacques Derrida:

It should be remembered that the parasite is by definition never simply external, never something that can be simply excluded from or kept outside of the body “proper,” shut out from the familial table or house. Parasitism takes place when the parasite (called thus by the owner, jealously defending his own *oikos*) comes to live *off the life* of the body in which it resides—and when reciprocally, the host incorporates the parasite to an extent, willy nilly offering it hospitality: providing it with a place. The parasite then “takes place.” And at bottom whatever violently “takes place” or occupies a site is always *something* of a parasite.<sup>41</sup>

In Derrida’s gloss, the parasite disturbs the promise of the proper, the bounded, the inside as opposed to the outside. It calls for the host to defend the *oikos*, his vital economy. An abusive guest, the parasite is undesirable precisely insofar as what the host most desires is clarity of borders, a certain distinction between boundedness and unboundedness (the very one that viral infection threatens to disrupt). What the parasite reveals is that the “life of the body” also belongs to life in general, which is why the parasite can eat both with us (as guest, as commensal) and from us (the literal meaning of *parasite*). In so doing, the parasite confronts us with the fact that life does not properly “take place” within a proper body.

Consequently, the parasite reveals that “the body” itself does not exist as a proper and proprietary given—that is, as a natural fact—but rather incorporates a scalar narrative, a fiction, that emplots us within what we

call “a life” by emplotting us within “it.” What we name as the body situates us within a life story that binds up space and time, suturing us to our “selves” as the jealous proprietors of our much coveted vital property. The parasite therefore addresses us as “an enemy” only insofar as we identify the body and identify *with* the body as the essential psychological/political/biological metonym for our life. By perturbing this putatively natural metonymy, parasites reveal the underlying paradox of modern political ontology—which perhaps explains in part why viral epidemics seem to trouble us biologically, politically, economically, and psychologically.

Michel Serres extends the paradox of the parasite even further: “The parasitic relation is intersubjective. It is the atomic form of our relations. Let us try to face it head on, like death, like the sun. We are all attacked, together. . . . We parasite each other and live amidst parasites. Which is more or less a way of saying they constitute our environment.”<sup>42</sup> In his fascinating monograph, *Parasite*, Serres meditates on this eponymous figure in order to undo the bio-logics that underwrite Western political ontology. By figuring the parasitic relation as universal, as the “atomic form of our relations,” Serres displaces the atomized individual from the center of both our biological and political schemas—or even more significantly, he illustrates that the former does not “naturally” imply the latter. His insistence that “we parasite each other,” or indeed that “man is the universal parasite,” displaces the hierarchy of value which host/parasite implies in part because the parasite provokes a paradox: “This is the paradox of the parasite. It is very simple but has great import. It is necessary for the relation and ineluctable by the overturning of the force that tries to exclude it. But this relation is nonrelation. The parasite is being and nonbeing at the same time.”<sup>43</sup> For Serres, the parasite’s universality belies the spirals of negation entailed by dialectical thinking. The parasite’s paradox cannot be reduced, transcended, or overcome. It serves as the condition of possibility for relation, which the parasite simultaneously incorporates and disturbs, precisely because relation *is* both necessary and disturbing. Living entails vulnerability—as Haraway put it, “life *is* a window of vulnerability”<sup>44</sup>—so we might say that through the parasite *we personify this paradox*. Yet when bioscience names the parasite as the “cause” of infectious diseases, it excludes or forgets the parasite’s paradoxical nature, which allows it to exclude or forget those relations—especially the political and economic ones—that also rank among the effective causes of epidemic disease.

When scientists say that viruses are “obligate parasites,” then what are they saying exactly? The idea that a parasite is obligated to its parasitism somewhat undermines the premise of the parasite, since its very nature requires it to be the bad guest. Indeed if it has no “life” apart from the life that it “manipulates” through the host’s cellular processes, then it may not be either a good or a bad guest at all, but something more like a symbiont.

The idea that as parasites viruses act within cells to their host's detriment also belies the fact that all "viral activity" is cellular activity—albeit directed to particular ends. Furthermore, we honestly don't know that viruses only affect cells deleteriously, since some evidence suggests otherwise.<sup>45</sup> In any case, viruses only "act" (as far as we know) indirectly by acting on the actions of cells.

Yet viral virulence proposes a scalar narrative that confers agency on "a virus" as an originator of intracellular changes that turn a cell's proper processes away from their pre-scripted aims by offering them a new script—quite literally. Indeed, the notion that viral DNA or RNA overwrites or overcodes a cell's original patterns of transforming matter and energy and redirects them to its own ends implies an explicit, albeit wayward, authority on the virus's part. However, as critiques of DNA reductionism have made clear, cells produce and reproduce; DNA does not.<sup>46</sup> What this suggests is that the question of viral agency is probably somewhat more paradoxical than the obligate parasite model implies. For if viral activity actually names the ways cells function, albeit to viral ends, it may require us to revise our oppositions of subjects and objects, or hosts and parasites, to encompass the multiple levels of actors and actions that coincide within this cellular nexus.

To account for this confusing situation, some researchers have recently proposed the idea that when viruses begin to modulate cellular processes to their own purposes (if such a concept even applies), they form "viral factories" that "induce a recruitment of organelles, usually to the perinuclear area, and build a new structure that functions in viral replication, assembly, or both."<sup>47</sup> The notion of viral factories introduces a bit of a twist to the parasitic narrative: the bad guest now can become the bad capitalist who organizes a "hostile takeover" and "exploits" indigenous production systems. Despite these potential metaphoric infelicities, the image of the viral factory does nevertheless introduce a new set of possibilities for imagining how viruses "exist," or at least for indicating that viral ontologies cohabit with—and within—political ontologies and that decisions about one constitute decisions about the other. Furthermore, it suggests that organisms might be both corporeal and corporate, that their singularities might entail multiplicities working together, that the one and the many may coincide: "The 'virus factory' comprises the structures that are involved in the replication and assembly of various viruses in the infected cells. They consist of complex assemblages of viral elements combined with recruited cell components, in particular membrane fragments."<sup>48</sup>

The "complex assemblages" that viral factories articulate manifest a different style of parasitism than the viral invader. (Although if we fuse the two we might end up with something like the virus as a "terrorist assemblage," which does seem to capture the ethos of much current discussion

about emerging viral diseases.)<sup>49</sup> In their factories, viruses organize and reorganize cellular production and reproduction. They introduce new production plans; they combine cellular apparatuses; they “recruit cell components.” What they do not do is appropriate the host’s property by making it their “own.” Instead, at the cellular and molecular levels, they confuse the categories of property, of ownership, of propriety, of self and other. Indeed, perhaps what we have come to call the virus, the “obligate parasite” that was a parasite before it was a virus, takes the place of this confusion. Or maybe it is the “place” that this confusion takes. Given how much remains obscure about viral existence, we might need to recognize that “the virus,” whatever it may “be,” acts as a political supplement to our ways of imagining living beings as individuated entities.

In its official guise as obligate parasite, the virus naturally shores up the contradictions between the one and the many that epidemic diseases necessarily disclose by filling the space of this contradiction with its particularity. As Jacques Derrida asks: “Whether viewed from close up or from far away, does not everything that comes to affect the proper or the literal have the form of a virus (neither dead nor alive, neither human nor ‘reappropriable by the proper of man,’ nor generally subjectivable)?”<sup>50</sup> The “form of the virus” does not here refer to the viron with its protein capsid and lipid envelope—in fact in this instance Derrida refers primarily to “computer viruses” (even while recognizing the “AIDS virus” as its contagious cognate). Rather, he suggests that the viral form derives from and plays on the effects (or affects) it induces in the place of the “proper or the literal.” It “takes place,” jumping across different scales and discourses from hardware, to software, and to wetware, whenever and wherever propriety or literalness tremble. Conversely, anything that rends the proper human scale—especially insofar as “the human” appears to take place properly within the scalar narrative we call “the body”—can assume the viral form. This is one reason the virus could be a parasite before it was a virus: it was also a *form* before it was a virus.

Insofar as it is a form, the form of the virus contains the form of a paradox—the form of anything material does. Since Aristotle introduced hylomorphism into philosophy, the being of the world has been commonly parsed into form and matter. A thing is what it is, say a brick, because it is made out of something (mud) and assumes a particular form (a rectilinear mold). The former represents its potentiality and the latter its actuality. Yet as Gilbert Simondon’s wonderful critique of hylomorphic duality indicates, this parsing completely ignores at least one other essential ingredient, one that this account conceals as inessential: the energy from the kiln needed to enable the mud in the rectilinear mold to assume the form of the brick.<sup>51</sup> Or, in Simondon’s terms, it neglects the “preindividual” in which “form, matter, and energy preexist in the system.”<sup>52</sup> If you tell a story in terms of

bricks, then you can “forget” the energy—as well as the labor—as well as the place that the mud comes from—as well as the other animals and plants displaced by the kiln and the aggregations of humans needed to run the kiln—as well as the trees or the coal needed to fire the kiln . . . but you get my drift. In terms of telling a scalar narrative, the formal paradox facilitates a high degree of truncation. It contains within itself more than it says. It allows you to stop the plot when you get to the unit that you deem most essential, thereby foreclosing the need to consider whether this “essential form” is truly essential precisely because the unrecognized “inessential” secreted within it disappears.

Of course in Derrida’s view, nothing is essentially essential, and that is why he says “deconstruction happens,” in the way that shit happens—or indeed in the way that we might say that viruses “happen.”<sup>53</sup> The paradox of form is that if it applies to matter, that is, if it has been materialized or actualized, then it contains at least two incommensurable modes that take place together only because other essential dimensions—or scales if you prefer—remain unappreciated. However, this lack of appreciation does not reveal a “natural” or inevitable absence of appreciation, but instead reveals a decision, or an ongoing process of deciding, about where value lies.

The viral form of the story, or the story about the “viral form,” cuts the telling short. It decides which agents are essential and which are not. It enables paradoxes to remain unappreciated as paradoxes and hence not to trouble the narrative’s coherence. In other words, the paradoxical form enables the truncated viral narrative to make sense, to produce and reproduce meaning, to conceive the world in its image.

### **Coda: Incorporating Viral Paradox**

When we tell the story of emerging infectious diseases in terms of viruses, we leave out a lot: especially all the ways “we” are in the world and the world is in us. From the viruses’ perspective, we (humans) are not essentially different from any other cellular beings. Indeed, the problem that zoonotic diseases name is precisely viruses’ indifference to this difference in which we are so invested. Moreover, since viruses are cellular products, through “the virus” we (cellular beings, including the human kind) are actually and actively involved in each other—as the popular shorthand terms *swine flu* and *avian flu* both indicate and obscure. In fact, from an evolutionary perspective, this involvement may confer an adaptive resource for future speciation. Unbeknownst to us, our futures may depend on the ways we learn to live with the viruses that take place within and among us—though of course the referent of this “us” would then be up for grabs. Yet this coincidence, literally a co-incidence, troubles us both physiologically and conceptually. If as humans we suppose ourselves

to be distinct, then the emergence of new viral agents, especially those that can jump species and scales, poses multiple threats. Unfortunately, what makes this emergence so interesting to us (humans) is not that it challenges us to think about the complex scalar connections through which we (living organisms) relentlessly weave ourselves into the world, let alone to reflect on the ways our political and economic values deeply inform—and often deform—our vital interests. Instead, our current interest in emerging viral diseases demonstrates that even as we might acknowledge an urgent need to recognize the myriad ways the world hails us and entails us, we continue to maintain our own investment in human particularity as if it were a natural fact.

The recent concern about the pandemic of “swine flu” provides an excellent case in point with which to conclude this essay’s circuitous viral meditation. Since the outbreak of the novel influenza A (H1N1) first claimed public attention in April 2009, both medical and popular attention has focused on the question of its “origins.” The headline in *Science* declared: “Out of Mexico? Scientists Ponder Swine Flu’s Origins,”<sup>54</sup> since the correlation between origin and containment seemed self-sufficient. However, soon after it was first localized in Mexico, it quickly became apparent that “models of influenza pandemics have shown that it’s nearly impossible for a country to contain an out break of a new influenza virus. ‘You can see that happened in the United States,’ says [epidemiologist Mauricio] Hernández-Ávila. ‘They even found the virus before we did and they were not able to contain it.’”<sup>55</sup> But an uncontainable virus threatens to reveal the paradox that the virus itself contains, so a new container presented itself: the pig.

In the biomedical literature on the origins of the novel influenza A virus, pigs emerge as—to use the highly technical terms—“shelters” and “mixing vessels.”<sup>56</sup> Here the generic pig, or “swine host,” figures as a human-animal-ecosystem interface incarnate. Despite the evidence for “multiple reassortment events” which may have transpired on different continents, the pig hypothetically appears to contain the virus’s origin. Because the pig cohabits both with humans and with birds—though with neither by its own choice, we might note—it provides a fertile matrix for these animals’ viral extrusions to commingle. A virtual incubator on the hoof for avian, swine, and human influenza genomes, the porcine vessel thus appears as a “natural” nexus from which a new and potentially deadly influenza A agent emerges.

Of course, the savvy media did recognize that pigs don’t fly, so they quickly identified a possible mediating entity: a Smithfield Foods facility in Veracruz, Mexico. The corporation quickly issued a denial on 20 May 2009, on the industry Web site, MeatInternational.com,<sup>57</sup> and after another

round or two of accusations and demurrals, the issue dropped, since in terms of the origin question the mystery seemed pretty much solved. If not this feed lot then another one; if not this pig then that one, since “the virus” is what most interests us. However, this version of the story occludes a few significant facts: for example, pigs do not naturally inhabit feedlots—or barnyards for that matter. And feedlots do not constitute the only way to raise pigs, though they do provide excellent ways to breed new bacteria and viruses. How might the relations among pig factories, virus factories, and other agribusinesses commingle? For example, Michael Pollan has recently elucidated the connections among the corn industry, cattle feedlots, big pharma, and the development of antibiotic-resistant bacteria (which evolve in response to the antibiotics given to cattle because they do not naturally digest corn).<sup>58</sup> Might not the pig be subject to similar pressures? Moreover, why was the pig domesticated, and how does this porcine history contribute to its evolution as a “mixing vessel”? Might we not need to inquire into how the pig has informed the movements of peoples and technologies, in the ways that Sarah Franklin has recently done for sheep?<sup>59</sup> Might we not want to consider, as Susan Squier has, how the shift to the industrial farming of chickens from home breeding mostly by women (the source of the colloquial “egg money”) has created not just more and cheaper chicken nuggets but also opportunities for rapid viral transformations?<sup>60</sup>

Asking such questions does not mean that viruses don’t matter. Au contraire. However, if we do not ask these kinds of questions, the form that we ascribe to the viruses’ materiality too often enables us to forget, for example, that pigs do not fly—though of course humans have learned to, prosthetically, and we carry viruses with us. In order to apprehend the paradoxical politics of viral containment, we need to appreciate that we *are* paradoxical beings, along with all other life forms. Our vulnerability and our vitality coexist. If we try to negate the former, we are likely to negate the latter, as the history of smallpox suggests: after all, how did the first “naturally occurring” viral disease that humans eliminated become the most deadly bioweapon in existence? How we think about viruses and how we think about our vulnerability matter to each other. Insofar as we fancy ourselves as autonomous individuals, aggregated into populations, we misrecognize a few essential facts as inessential. Population thinking is fine for answering some questions, but not all—and probably not the most vital ones—since population only calculates in terms of whole numbers.<sup>61</sup> Population cannot encompass gradations and relations between units; however, life can and does all the time. What the virus’s trickster nature, its paradoxical form, its particularity can remind us of is that such gradations and relations truly matter. In other words, we need to think of viral epidemics in terms of how we narrate scale, since that is how we account

for the ways in which living takes place in time. Whatever our political and economic ideologies try to tell us, then, the paradoxical politics of viral containment says otherwise: for what the viruses show—and what we might need to learn—is that scale undoes us one and all.

## Notes

1. Associated Press, "Israel Must Call New Disease Mexico Flu, as Swine Unkoshes," *Haaretz*, 27 April 2009, [www.haaretz.com/hasen/spages/1081515.html](http://www.haaretz.com/hasen/spages/1081515.html).

2. As Giorgio Agamben underscores in his essay "Special Being," in *Profanations*, trans. Jeff Fort (New York: Zone, 2007), such specialness leans on the tension internal to Aristotelian definitions of "species" (*eidos*). Following medieval reflections on the correspondences between image and essence, Agamben holds that special being concerns one whose "essence coincides with its being given to be seen, with its aspect. . . . [However] between the perception of the image and the recognition of oneself in it, there is a gap, which medieval poets called love. . . . The species is nothing other than the tension, the love with which each being desires itself, desires to persevere in its own being. . . . In this sense, special being is the being that is common or generic, and this is something like the image or the face of humanity" (57–58).

3. Paul Martin and Estelle Martin-Granel, "2,500-Year Evolution of the Term Epidemic," *Emerging Infectious Disease* 12 (2006): 976–80.

4. Erik Swyngedouw, "Neither Global nor Local: 'Glocalization' and the Politics of Scale," in *Spaces of Globalization: Reasserting the Power of the Local*, ed. Kevin Cox (New York: Guilford, 1992), 137–166. As Swyngedouw explains:

These 'scalar narratives' provide the metaphors for the construction of 'explanatory' discourses. . . . [The] multiplicity of scalar levels and perspectives also suggest that scale is neither an ontologically given and a priori definable geographical territory nor a politically neutral discursive strategy in the construction of narratives. Scale, both in its metaphorical use and material construction, is highly fluid and dynamic, and both processes and effects can easily move from scale to scale and affect different people in different ways, depending on the scale at which the processes operate. Similarly, different scalar narratives indicate different causal moments and highlight different power geometries in explaining such events. ("Neither Global nor Local," 139–40)

5. An explicit interest in "scale" also appears within recent scientific thinking about epidemics, especially in the new subfields of "landscape epidemiology" and "phylogeography"; however, as in Swyngedouw, their analysis assumes that "scale is . . . an ontologically given and a priori definable geographical territory . . . [and] a politically neutral discursive strategy"—precisely the opposite sense that critical geographers invoke. See, for example, the articles cited in the review essay by Archie Clements and Dirk Pfeiffer, "Emerging Viral Zoonoses: Frameworks for Spatial and Spatiotemporal Risk Assessment and Resource Planning," *Veterinary Journal* 182 (2009): 21–30.

6. Neil Smith, "Homeless/Global: Scaling Places," in *Mapping the Futures: Local Cultures, Global Change*, ed. Jon Bird et al. (London: Routledge, 1993), 90.

7. We might also remember that "explain"—from the Latin *ex-* + *planus*, meaning to flatten or unfold—itself embeds a spatial trope to evoke the process of making visible or comprehensible.



8. For a discussion of how scale “takes place,” see Andrew Jonas, “The Scale Politics of Spatiality,” *Environment and Planning D: Society and Space* 12 (1994): 262. For how “nature”—or indeed the “metaphysics of nature”—constitutes the effective limits of the political, see Bruno Latour, *Politics of Nature*, trans. Catherine Porter (Cambridge, MA: Harvard University Press, 2002).

9. See Bruno Latour, *Sur le culte modern des dieux faitiches* (Paris: Éditions La Découverte, 2009). In Donna Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm Press, 2003), Haraway reminds us that fact and fiction decline the Latin verb meaning to make or do, with the former deriving from the past participle and the latter from the present participle:

Etymologically, facts refer to performance, action, deeds done—feats, in short. A fact is a past participle, a thing done, fixed, shown, performed, accomplished. . . . Fiction, etymologically, is very close, but differs by a part of speech and tense. Like facts, fiction refers to action, but fiction is about the act of fashioning, forming, inventing, as well as feigning or feinting. Drawn from a present participle, fiction is in process and still at stake, not finished, still prone to falling afoul of facts, but also liable to showing something we do not yet know to be true, but will know. (*Companion Species*, 19–20)

10. Margaret Chan, “Statement to the Press by WHO Director-General Dr Margaret Chan 11 June 2009,” World Health Organization, [www.who.int/mediacentre/news/statements/2009/h1n1\\_pandemic\\_phase6\\_20090611/en/index.html](http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html) (accessed 7 November 2010).

11. *Oxford English Dictionary*, s.v. “particular.” The etymology given is as follows: “limited to a part, not universal (c1265), distinguished from other individuals or elements, special (c1265), concerning only an individual, private (c1300), relating to the property or characteristic of an individual (1314), turned in on oneself, egotistic (end of 14th cent.), odd, bizarre (1549), familiar (1559) and its etymon post-classical Latin *particularis*: of or concerning a part, particular, not universal (4th cent., especially in logic), partial (6th cent.), separate, individual (c1197, 1459 in British sources), detailed (1242, c1564 in British sources).”

12. For the two sides of the argument, see David Moreira and Purification Lopez-Garcia, “Ten Reasons to Exclude Viruses from the Tree of Life,” *Nature Reviews: Microbiology* 7 (2009): 306–11; and Jean-Michel Claverie, “Viruses Take Center Stage in Cellular Evolution,” *Genome Biology* 7 (2006): 110.

13. On the role that viruses have played in “origin of life” debates, see Scott Podolsky, “The Role of the Virus in Origin-of-Life Theorizing,” *Journal of the History of Biology* 29 (1996): 79–126. Conversely, the evolutionary force of viruses contributes to the debates about whether they are “alive” or not. See, for example, Claverie: “The origins of viruses are shrouded in mystery, but advances in genomics and the discovery of highly complex giant DNA viruses have stimulated new hypotheses that DNA viruses were involved in the emergence of the eukaryotic cell nucleus, and that they are worthy of being considered as living organisms” (“Viruses,” abstract, 110). Viruses also figure centrally in debates about the precedence of RNA over DNA in evolutionary development; see, for example, Patrick Forterre, “The Two Ages of the RNA World, and the Transition to the DNA World: A Story of Viruses and Cells,” *Biochimie* 81 (2005): 793–803.

14. Although, given the evolutionary conundrum, the paradoxical logic of original and copy seems even more troubling here than in Judith Butler’s original exposition, which suggested that originals become “original” only *after* a copy

appears. Judith Butler, *Gender Trouble: Feminism and the Subversion of Identity* (New York: Routledge, 1990), 31.

15. Robert A. Edwards and Forest Rohwer, "Viral Metagenomics," *Nature Reviews: Microbiology* 3 (2005): 504. Similar claims are made in marine biology, where, for example, Curtis Suttle claims: "Without doubt, viruses are the most abundant and genetically diverse 'life forms' in the ocean" ("Viruses in the Sea," *Nature* 437 [2005]: 356); Andrew Lang et al. affirm: "Although viruses cannot replicate autonomously, they outnumber all forms of cellular life in the oceans by roughly an order of magnitude" ("RNA Viruses in the Sea," *Federation of European Microbiological Societies Microbiological Reviews* 33 [2009]: 295).

16. Luis Villarreal, "Are Viruses Alive?" *Scientific American* 291 (2004): 105.

17. Cosmic Microwave Background Radiation, a form of electromagnetic radiation that fills the universe, corroborates the inflationary Big Bang theory. For an introduction, see the Wikipedia entry, "Cosmic Microwave Background Radiation," [http://en.wikipedia.org/wiki/Cosmic\\_microwave\\_background\\_radiation](http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation) (accessed 1 August 2009). The model of the Big Bang has also been applied recently to evolution generally (see Eugene Koonin, "The Biological Big Bang Model for the Major Transitions in Evolution," *Biology Direct* 2 [2007], at [www.biology-direct.com/content/2/1/21/](http://www.biology-direct.com/content/2/1/21/) [accessed 7 November 2010]) and to viruses specifically (see Eugene Koonin et al., "The Big Bang of Picorna-like Virus Evolution Antedates the Radiation of Eukaryotic Supergroup," *Nature Reviews: Microbiology* 6 [2008]: 925–39).

18. For an introduction to the topic, see the essays collected in Esteban Domingo, Colin R. Parrish, and John J. Holland, eds., *Origin and Evolution of Viruses*, 2nd ed. (Boston: Elsevier, 2008), and Stephen S. Morse, ed., *The Evolutionary Biology of Viruses* (New York: Raven, 1994). Also see Luis Villarreal, *Viruses and the Evolution of Life* (Washington, DC: ASM Press, 2005).

19. Villarreal, "Are Viruses Alive?" 105.

20. For Donna Haraway's take on her own use of the term *trickster*, see *How Like a Leaf* (New York: Routledge, 2000), 66–67.

21. The phrase "transboundary in nature" appears in a "consultation document" titled "Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface," published for discussion at the International Ministerial Conference on Avian and Pandemic Influenza in Sharm el-Shiekh, Egypt, in October 2008 by a consortium of international agencies (including the World Health Organization, the World Bank, the United Nations Food and Agriculture Association, U.N.I.C.E.F., the World Organization for Animal Health, and the United Nations System for Influenza Coordination), <http://un-influenza.org/node/2341/> (accessed 27 December 2009). As the document states: "This Strategic Framework has been developed to address the potential threat of EID [Emerging Infectious Diseases] at the animal-human-ecosystems health interface, particularly those that are transboundary in nature and have the potential for wide-ranging global impacts."

22. Forest Rohwer and Rebecca Vega Thurber, "Viruses Manipulate the Marine Environment," *Nature* 459 (2009): 208.

23. How this came to be the case is the subject of my recent book: *A Body Worth Defending: Immunity, Biopolitics, and the Apotheosis of the Modern Body* (Durham, NC: Duke University Press, 2009).

24. *Oxford English Dictionary*, s.v. "virus." Etymologically, *virus*, like the *pharmakon* on which Derrida meditates in "Plato's Pharmacy," in *Dissemination*, trans. Barbara Johnson (Chicago: University of Chicago Press, 1981), 61-172, can refer

both to poison and to cure. See also Sally Smith Hughes, *The Virus: A History of the Concept* (New York: Science History Publications, 1977).

25. Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan and John Law (Cambridge, MA: Harvard University Press, 1988). On the multiple “germ theories” during the period, see Nancy Tomes and John Harley Warner, “Introduction to the Special Issue on Rethinking the Reception of the Germ Theory of Disease: Comparative Perspectives,” *Journal of the History of Medicine and Allied Sciences* 52 (1997): 7–16; and Michael Worboys, *Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900* (London: Cambridge University Press, 2000).

26. For a succinct history of virology, see V. Essanu, “Moments de l’histoire des idées sur la nature et l’origine des virus,” *Virologie* 39 (1988): 59–67. See also Alfred Grafe, *A History of Experimental Virology*, trans. Elvira Reckendorf (New York: Springer-Verlag, 1991); and A. P. Waterson and Lise Wilkinson, *An Introduction to the History of Virology* (New York: Cambridge University Press, 1978).

27. Sven Miller and Jacomine Krijnse-Locker, “Modification of Intracellular Membrane Structures for Virus Replication,” *Nature Reviews: Microbiology* 6 (2008): 363.

28. John Farley, “Parasites and the Germ Theory of Disease,” *Millbank Quarterly* 67, no. S1 (1989): 50–68. Farley states: “The word ‘parasite’ was not widely used; they were helminths or entozoans and their study was termed ‘helminthology,’ and less often ‘entozoology’ or ‘parasitology.’ Parasitism, therefore, was not seen as a lifestyle common to a wide variety of animal groups” (“Parasites and the Germ Theory,” 55).

29. Robert Koch, “The Etiology of Anthrax, Founded on the Course of Development of the *Bacillus Anthracis*” [1876], in *Essays of Robert Koch*, trans. K. Codell Carter (New York: Greenwood, 1987), 1–18.

30. Robert Koch. “Lecture at the First Conference for the Discussion of the Cholera Question” [1884], in *Essays of Robert Koch*, 171–78.

31. For an explanation of this bio-logic, see Louis Pasteur, “Sur les maladies virulentes, et en particulier sur la maladie appelée vulgairement choléra des poules,” in *Oeuvres* (Paris: Masson, 1922–39), 6:291–312.

32. Pasteur, *Oeuvres*, 3:481.

33. I develop this connection at length in Cohen, *A Body Worth Defending*.

34. C. B. Macpherson, *The Political Theory of Possessive Individualism: Hobbes to Locke* (Oxford: Clarendon, 1962).

35. Ed Cohen, “A Body Worth Having?: Or, A System of Natural Governance,” *Theory, Culture, and Society* 25 (2008): 103–29.

36. Pasteur, “Maladies Virulentes,” *Oeuvres*, 6:298.

37. Emile Benveniste, *Indo-European Language and Society*, trans. Elizabeth Palmer (Coral Gables, FL: University of Miami Press, 1973), 74.

38. *Ibid.*, 77. A bit later in the same section (79) Benveniste links this idiom to the Roman concepts of *munus*, *immunus*, and *communis*, which lurk at the heart of that other great medical domain, virology’s confrere, immunology.

39. Benveniste explicitly follows Marcel Mauss in his understanding of the gift.

40. For an extended meditation on this dynamic, see Jacques Derrida, *Of Hospitality*, trans. Rachel Bowlby (Stanford, CA: Stanford University Press, 2000).

41. Jacques Derrida, *Limited, Inc.*, trans. Jeffrey Mehlman and Samuel Weber (Chicago: Northwestern University Press, 1988), 90. Emphasis in original.

42. Michel Serres, *Parasite*, trans. Lawrence Schehr (Minneapolis: University of Minnesota Press, 2007), 8, 10.

43. Ibid., 10, 24, 79.
44. Donna Haraway, "The Biopolitics of Postmodern Bodies: Determinations of Self in Immune System Discourse," in Haraway, *Cyborgs, Simians, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 224. Emphasis added.
45. See, for example, Erik S. Barton et al., "Herpes Virus Latency Confers Symbiotic Protection from Bacterial Infection," *Nature* 447 (2007): 326–30.
46. See, for example, Evelyn Fox Keller, *The Century of the Gene* (Cambridge, MA: Harvard University Press, 2000); Richard Lewontin and Richard Levins, *Biology under the Influence: Dialectical Essays on Ecology, Agriculture, and Health* (New York: Monthly Review Press, 2007).
47. Reyes R. Novoa et al., "Virus Factories: Associations of Cell Organelles for Viral Replication and Morphogenesis," *Biology of the Cell* 97 (2005): 147–72. Also see Claverie, "Viruses Take Center Stage," which uses this image to argue both that viruses are "living" and that the "factory" constitutes the unit of life.
48. Moreira and Lopez-Garcia, "Ten Reasons," 310.
49. Jasbir Puar, *Terrorist Assemblages: Homonationalism in Queer Times* (Durham, NC: Duke University Press, 2007).
50. Jacques Derrida, *Points . . . : Interviews*, trans. Elisabeth Weber (Stanford CA: Stanford University Press, 1995), 472.
51. Gilbert Simondon, *L'individu et sa genèse physico-biologique* (Paris: Jérôme Millon, 1995); Simondon, *L'individuation psychique et collective: À la lumière des notions de forme, information, potentiel, et métastabilité* (Paris: Aubier, 1987). For a captivating extrapolation from and development of this critique, see Bernard Stiegler, *Technics and Time*, vol. 1, *The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Stanford, CA: Stanford University Press, 1998), as well as the numerous essays by Stiegler available on the Web site of Ars Industrialis: Association internationale pour une politique industrielle des technologies de l'esprit, [www.arsindustrialis.org/les-pages-de-bernard-stiegler](http://www.arsindustrialis.org/les-pages-de-bernard-stiegler) (accessed 27 December 2009).
52. Simondon, *L'individuation psychique et collective*, 16.
53. Jacques Derrida, *Negotiations: Interventions and Interviews, 1971–2001*, trans. Elizabeth Rottenberg (Stanford, CA: Stanford University Press, 2002), 193.
54. Jon Cohen, "Out of Mexico? Scientists Ponder Swine Flu's Origins," *Science* 324 (2009): 700–702
55. Ibid., 700.
56. See for example: Vladimir Trifonov, Hossein Khiabani, and Raul Rabadan, "Geographic Dependence, Surveillance, and Origins of the 2009 Influenza A (H1N1) Virus," *New England Journal of Medicine* 361 (2009): 115–18; Gavin J. D. Smith et al., "Origins and Evolutionary Genomics of the 2009 Swine-Origin H1N1 Influenza A Epidemic," *Nature* 459 (2009): 1122–25; Chungun Pan et al., "High Genetic and Antigenetic Similarity between a Swine H3N2 Influenza A Virus and a Prior Human Influenza Vaccine Virus: A Possible Immune Pressure-Driven Cross-Species Transmission," *Biochemical and Biophysical Research Communications* 285 (2009): 402–7.
57. Meat International, [www.meatinternational.com/news/smithfield-foods-ceo-comments-on-mexican-h1n1-outbreak-id1434.html](http://www.meatinternational.com/news/smithfield-foods-ceo-comments-on-mexican-h1n1-outbreak-id1434.html) (accessed 9 August 2009). The Web site, which subsequently announced that it was "closed," has limited its content to a set of links to newer articles on meat industries.
58. Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (New York: Penguin, 2007).
59. Sarah Franklin, *Dolly Mixtures: The Remaking of Genealogy* (Durham, NC: Duke University Press, 2007), 207.

60. Susan Squier, "The Sky Is Falling: Risk, Safety, and the Avian Flu," *South Atlantic Quarterly* 107 (2008): 387–409.

61. Lewontin and Levins, *Biology under the Influence*, 169. In Lorraine Daston, "Life, Chance, and Life Chances," *Daedalus* 137:1 (2008): 5–14, Daston reminds us that statistical thinking only provides ways for managing anxiety about the risks that life entails, not for eliminating risk itself.

