Blurring Contagion in the Information Age: How COVID-19 Troubles the Boundaries of the Biomedical and Socioinformatic

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Abstract

This project reexamines contagion in the time of the internet through utilizing COVID-19 as a case study. I first look at the biomedical implications of the term *contagion* through a historical lens and then track its leakage into sociocultural theories and mass media, where the term was used in an effort to explain the seemingly irrational behavior of mobs and crowds in the nineteenth and twentieth centuries. I then chronicle COVID-19 and its existence as an Information Age virus- one that troubles the distinction of biomedical and cultural contagion, ultimately requiring a reimagining of the term. I argue that the introduction of the internet has made conceiving of contagion in purely biomedical terms impossible, and instead suggest that there is a *biomedical-socioinformatic blurring* that occurs in infectious disease today. Through interpreting contagion as a part of a constantly (re)assembling rhizome, I postulate that the internet has allowed information about an infectious disease to outpace its biomedical transmission, and that content and relationalities produced online become part of the virus itself, rendering the biomedical and the socioinformatic indistinct from one another. Finally, I suggest that the biomedical-socioinformatic virus is fundamentally political, and propose future directions for an incomplete and multiple immunity for society that finds resilience in the boundary-queering tendencies of contagion, using that logic as a framework to resist the perpetuation of oppressive ideologies and structures that contribute to the spread of both scientific misinformation about viruses and the viruses themselves.

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Introduction: COVID-19 as Revealing a Post-Biomedical Contagion

The Context

On March 10, 2020 at 7:20pm, my admittedly pedestrian undergraduate college student life jolted to a halt. It was spring break, and I was sitting at a baseball game in my hometown when the student body received this message from Duke University President Vincent Price:

> First, all on-campus classes will be suspended until further notice, and we will transition to remote instruction (video and other forms of delivery) for all undergraduate, graduate and professional schools. In order to provide time for students and faculty make [*sic*] this transition, Undergraduate Spring Break will be extended to Sunday, March 22 and classes will resume on Monday, March 23.
> (Price 2020)**.**

At first, this email was met by playful banter among undergraduates: another week to put off classwork and travel to new locales. Though North Carolina governor Roy Cooper declared a state of emergency due to coronavirus on March 10 (Cooper 2020, 1), few North Carolina residents grasped the severity of the situation. Although the SARS-CoV-2 strain of coronavirus was first identified in Wuhan, China in January 2020, and outbreaks had intensified in Asia and Europe in February 2020 as the virus was officially named COVID-19, the United States' geographic distance from the outbreaks allowed life for most in the US to continue as normal through February (Head et al. 2020, 6–7). Indeed, the magnitude of what was to come was incomprehensible; at the time of Cooper's declaration, North Carolina had just eleven confirmed cases of coronavirus ("Data Behind the Dashboards | NC DHHS COVID-19" n.d.), and Price's email seemed to suggest that campus events could resume as early as April 20 (Price 2020). However, in the coming weeks of March and April 2020, the unthinkable became reality- the United States experienced an exponential increase in cases of COVID-19 ("COVID-19 United States Cases by County" n.d.), culminating in country-wide lockdowns of businesses, schools, and airports, and cancellations of concerts, sporting events, and other in-person activities, as the

magnitude of the situation began to dawn on many (Head et al. 2020, 8–9). *Quarantine*, long a term used only in the infectious disease community, entered our vernacular, denoting a populace confined to their homes seemingly overnight (Perez 2020).

As a junior at Duke, I gradually began to comprehend that the conclusion of my undergraduate career would be vastly different to (and more disappointing than) its beginning. As a Program II interdisciplinary major with a program of study entitled "Scientific Representation", though, I realized that my self-designed curriculum was designed to analyze the implications of this pandemic and the ways in which it was represented to different audiences in the world. Though it is certainly challenging to produce scholarly work about an event as it is unfolding, it seemed foolish to not take the opportunity to examine how the COVID-19 pandemic made the confluence of science, technology, information, subjectivity, and society visible to the entire world- a confluence I've long been interested in, but had only found in the disciplinary nooks and crannies of sociology of science, gender studies, and science and technology studies.

Suddenly, issues of misinformation, the results of scientific studies, and science communication were the topics that dictated everyday life for almost everyone. The opinions of leading health experts determined national health responses (Lavazza and Farina 2020, 2), leading to policies that first discouraged the public from wearing masks, then required their use when venturing outside the home (Tufekci 2020; Dwyer and Aubrey 2020), and specified that a six foot distance to be kept from others (Sergeant et al. 2020). However, President Donald Trump's history of attacks on scientific experts on topics from climate change to chemical toxicity research, obscured behind the guise of the American conservative values of corporate freedom, set a dangerous precedent for the coronavirus pandemic (Plumer and Davenport 2019).

Indeed, the Centers for Disease Control clashed with Trump on many recommendations, as president-appointed Health and Human Services aides "demanded the right to review and seek changes to the Centers for Disease Control and Prevention's weekly scientific reports charting the progress of the coronavirus pandemic" (Diamond 2020). Accordingly, Trump's disagreements with public health officials were viewed through partisan frames, and countermovements emerged, culminating in anti-mask and anti-lockdown protests from the far-right that were encouraged by Trump and his downplaying of the pandemic's severity (Gearan and Wagner 2020; Summers 2020).

As the pandemic progressed, the theme that many introductory science and technology studies seminars begin with- that science, from its production to its reception, is fundamentally political- was demonstrated in real time. The politicization of COVID-19 illustrated that the end of the pandemic would not and could not come in the form of a "magic bullet" scientific innovation; instead, the eradication of COVID-19 would take a coordinated public health response that appealed to a diverse set of audiences across both the online and real-world spheres. Public health officials began advertising campaigns, encouraging individuals to stay home and "stop the spread", with messaging proliferating across mainstream media ("A Joint Campaign with the Government of the United Kingdom" 2020). In urban areas, citizens would cheer and bang pots and pans from their balconies during healthcare workers' shift changes (*See People around the World Cheer for Health Care Workers* 2020). The ultimate public health feat seemed within reach; epidemiologists predicted that lockdowns could control deaths from the pandemic in nine to eleven weeks if implemented correctly (Levinson, Cevik, and Lipsitch 2020, 983).

However, this coordinated, organized, and unified global public health response would never come to pass, and the idea that such a response was ever possible seems now to be intensely naive. As the months of 2020 ticked by, cases continued to increase at alarming rates, with hospitals filling to capacity in many states and countries (Lopez 2020). Rather than the "spread" stopping, it intensified in many communities, and as of the time of writing,[1] researchers are suggesting the COVID-19 may become an endemic disease (Aschwanden 2021, 520–21). As the virus began to infiltrate every place it had not yet been, healthcare workers pleaded for personal protective equipment (Jennifer Cohen and Rodgers 2020, 1), died of COVID-19 (Jewett, Lewis, and Bailey 2020), and suffered from mental health crises (Spoorthy, Pratapa, and Mahant 2020, 3). Over 127 million cases of COVID-19 have been recorded worldwide, leading to over 2.7 million deaths ("COVID-19 Map" n.d.).[2]

Why did public health messaging and state-imposed lockdowns fail? An answer to this question is well beyond the scope of an undergraduate thesis, but considering its various dimensions led me to the idea that would later take root to become this project. I was fascinated by the way COVID-19 was continuing to be treated as a purely biomedical entity that could be contained by collaboration between government officials, virologists, public health agencies, and epidemiologists, when that approach was clearly not effective. I identified a major blind spot in this approach: that COVID-19 was not only viral in the biomedical sense, but that it was going viral online too.

[1] Time of writing was March 2021.
[2] Data are as of March 2021.

The Online, the Virus, and What It Means to Be Contagious

We live in the Information Age, a term I will use quite often in this thesis, but which has a rather indistinct colloquial definition. For the purposes of this project, I define the Information Age as the time marked by the internet as not only an early military communication device, but an integral part of sociality for the average citizen. The Information Age began in the 1970s with the decline in popularity of cybernetics, a broad and ill-defined field that interrogated the connections between humans, machines, and communication (Kline 2015, 6–7). Ronald Kline details how beginning in the 1970s and proceeding into the twenty-first century, the concept of *information* became more ubiquitous but also more simplified, being used "not only as a keyword in science and engineering, but as a popular, all-purpose label to mark the new technological era" (2015, 6–7, 203). In the 1980s and 1990s, the increasing availability of personal computers and the internet cemented information as a primary term for making sense of these technological changes and their influence on society (2015, 203).

The internet's origins are bound up in a kind of paradoxical decentralization that split confidential information into packets that resided on servers in different geographic locations, making the information less vulnerable to physical attacks and strengthening control of governments over academic research in the nuclear era (Galloway 2004, 4–5). This tension between the internet's potential for control and decentralization continues into today. Social media platforms serve to decentralize knowledge production and dissemination and improve access to information while simultaneously allowing this information to be unchecked by typical knowledge authorities, reaching audiences of unprecedented size at unprecedented speeds. Alexander Galloway argues that the internet and the protocols it uses to distribute information is another manifestation of politics governing not only bodies, but "'life itself'", alongside concepts

like Deleuze's control societies and Foucault's biopolitics (2004, 81–82). Indeed, as will be detailed in later chapters, the internet facilitates the contagious spread of information about COVID-19 in ways that unseat the human body as the sole vector of the virus's transmission. It is only fitting, then, that major early disruptions in the "life itself" of the internet were named computer *viruses*.

The computer virus is characterized by its contagiousness; it can spread between computer systems without users knowing that it has inhabited their device (2004, 177). Galloway posits that the term computer virus came about in a time of intense biomedicalization in the 1980s, when the world was in the grips of the HIV/AIDS pandemic, "a moment in history where the integrity and security of bodies, both human and technological, was considered extremely important" (2004, 178–79). The computer virus reveals and exploits the structures of online networks to spread, posing "a key danger to information capitalism" (Parikka 2020, 289, 301). The biomedicalization of such programs which are transmissible yet intangible was thus a political and social process. In other words, mapping the computer programs that could infiltrate other computer systems onto biomedical conceptions of a virus allowed for their legibility within the new networks of the Information Age. The computer virus was made legible through applying biomedical metaphors to a technical object, and it is tempting to understand the Information Age biomedical virus through a similar lens. However, I argue that a virus like COVID-19 is not just a biomedical entity that is metaphorically socioinformatic; instead, the Information Age biomedical virus actually is both biomedical *and* socioinformatic. In this thesis, I argue that similar to the way that the computer virus was made legible through applying biomedical logics to a technical object, the Information Age biomedical virus cannot be adequately read and addressed unless it is considered to be as socioinformatic as it is biomedical.

This proposition- that we consider the Information Age virus as both biomedical and socioinformatic- requires that we rethink what it means for an infectious disease to be contagious in the twenty-first century. Contagion itself is not an objective biomedical concept, nor has it ever been. In *Contagious: Cultures, Carriers and the Outbreak Narrative*, Priscilla Wald describes the ways in which contagion is as much a social logic as a biomedical one:

> Contagion is more than an epidemiological fact. It is also a foundational concept in the study of religion and of society, with a long history of explaining beliefs circulate in social interactions. The concept of contagion evolved throughout the twentieth century through the commingling of theories about microbes and attitudes about social change. Communicable disease compels attention—for scientists and the lay public alike—not only because of the devastation it can cause but also *because the circulation of microbes materializes the transmission of ideas*. The interactions that make us sick also constitute us as a community.
> (Wald 2008, 2; emphasis added)

Wald's argument that the spread of a virus "materializes the transmission of ideas" was a theoretical foundation for this project (2008, 2). However, I seek to go beyond this idea, and suggest that in the Information Age, the internet enables a kind of *biomedical-socioinformatic blurring* which means that the transmission of ideas can also materialize the spread of a virus. Accordingly, considering the contagion of a virus like COVID-19 to be occurring solely in the offline sphere is inaccurate. Instead, much of the Information Age virus's transmission occurs through the online dissemination of information, meaning efforts to combat the virus must consider the online as a legitimate location of infection. This thesis intends to define and theorize Information Age contagion, constructing a theoretical framework to use in analyzing both COVID-19 and future pandemics of infectious disease.

While this thesis is largely theoretical, its implications are all too tangible, to which the 2.7 million lives lost to COVID-19 can attest. Understanding and acknowledging the fundamental role of the socioinformatic in constructing and spreading a virus like COVID-19

necessitates making space for the online and the social science of social media within the principal areas of knowledge production about pandemic infectious disease, like epidemiology and public health. This proposition may seem radical, hasty, and unnecessary to the experts whose voices are currently being privileged. However, the public health approach to COVID-19, which views the internet mostly as an instrument to be utilized to communicate messaging (Budd et al. 2020, 1187), is ineffective and inaccurate. Understanding the online is essential to understanding the Information Age virus. The internet needs to be viewed as more than just a scale model of offline society; it is a fundamental part of a society which can no longer be neatly divided into online and offline spheres. "Going viral" is not a superficial phenomenon confined to cat memes on Twitter and dancing teenagers on Tiktok, as the role of social media in planning and carrying out the riots protesting the election of Joe Biden at the US Capitol on January 6, 2021 demonstrates all too clearly (Hamilton 2021). In the context of COVID-19, information that has "gone viral" has led to movements that have facilitated the spread of the disease, as is the case with the previously mentioned anti-mask protests (Gearan and Wagner 2020; Summers 2020). Complexifying and legitimizing the internet's role in producing COVID-19's virality- a virality that leaks from the online to the offline and vice versa- is essential to understanding and controlling the disease.

A Note on Definitions

Some of the commonly used terms in this thesis have colloquial definitions but should be explicitly defined to avoid confusion.

Firstly, the boundaries between information and misinformation must be delineated. Scholars have debated the boundaries between valid information and misinformation since misinformation has existed, and as such, there is some flexibility in definitions. For the sake of

simplicity, I do not grapple with the issues of the intentionality of a statement, as many sources which differentiate unintentional misinformation from deliberate disinformation do (Treen, Williams, and O'Neill 2020, 3). Instead, I broadly consider misinformation to be an umbrella term which describes a statement which is in opposition with expert consensus at the time of its authorship (Vraga and Bode 2020, 137). Expert consensus is itself a muddled issue, as it is contingent upon social factors including the determination of who is conferred expert status, which may be different for different audiences (2020, 137). In cases where expert consensus is unclear or otherwise unavailable, the boundary between misinformation and information is determined using the "best available evidence" (2020, 138).

Anti-science is a similarly nebulous term that requires a more explicit definition for the purpose of clarity. In this thesis, I subscribe to Peter Hotez's definition of anti-science, which he defines as "the rejection of mainstream scientific views and methods or their replacement with unproven or deliberately misleading theories" (Hotez 2021). Anti-science proponents may not subscribe to more traditional institutional notions of scientific credibility, and instead "mak[e] selective use of emblems and idioms of scientific authority", utilizing alternative "experts" and methods in an effort to substantiate their claims (Lynch 2020, 55). It is important to state that despite current views and perceptions of United States political parties, anti-science beliefs are not limited to the right side of the political spectrum, and the political affiliation of people expressing anti-science beliefs may differ based upon the specific issue being discussed (2020, 54).

Finally, the term *socioinformatic* must be defined. I define socioinformatic as the realm of social interaction and information transmission online, with *socio-* comprising the connection and interaction of people and *-informatic* meaning the online infrastructures which allow such interactions to occur (Smutny and Vehovar 2020, 530). In this thesis, I argue that the interactions

that occur in the socioinformatic sphere are not simply mirrors of interactions between individuals in the offline world; instead, the online has enabled novel ways of communicating, transmitting, and relating.

A Proposition for a Refiguring of Contagion in the Information Age

This thesis, then, is a proposition for a refiguring of contagion for and in the Information Age. The first two chapters are genealogies of contagion, intentionally divided into a biomedical history and a sociocultural history to emphasize the artificial nature/culture divide that has blocked the comingling of these ideas. Chapter 1, "History and Logics of Biomedical Contagion", is a history of contagion in terms of the biomedical spread of disease. Studies of biomedical contagion intensified as the world globalized, and the seemingly uncontrollable spread of infectious diseases illustrated the erosion of state borders that isolationists had long feared. I argue that the history of biomedical contagion is colored by the medical professionals who recorded it and its resonance in popular culture, but this history is also complicated by contagion's tendency to slip through the barriers constructed to contain it. Chapter 2, "A Genealogy of Cultural and Social Contagion" tracks the use of contagion as a metaphor for the transmission of cultural material. It argues that the work of crowd theory sociologists, which was denigrated in the twentieth century for being unempirical, is necessary for understanding the internet and the phenomenon of "going viral". While more modern terms like memetics and mimetics dominate current understandings of cultural transmission, I suggest that early crowd theory sociologists' assertion that a crowd's behavior can trouble the boundaries of individual and social and allow for a more complex reading of "going viral" as representing a more-than-human assemblage that enmeshes technological, social, and material elements. Chapter 3, "Changing Culture, Changing Covid", then brings together the biomedical and the social,

utilizing COVID-19 as a case study to outline and illustrate the primary theoretical proposition of this work: that in the case of infectious disease in the Information Age, contagion is a blurring of both the biomedical and the socioinformatic. I propose that Information Age contagion is a complex rhizomatic amalgamation of the human, viral, and technological that is perpetually in flux. Continuing the viral metaphor, Chapter 4, "Resistances: Immunities and Complications of Contagion" imagines new futures for this Information Age contagion through the lens of immunity. This conclusion cautions against simplistic battle metaphors of immunity, instead suggesting a conception of immunity that opens up a multiple, complex, and resilient, yet incomplete addressing of the Information Age virus and the endemic futures of its contagion.

Chapter 1: History and Logics of Biomedical Contagion

A Brief History of Contagion and Its Links to Disease

The phenomenon of contagion possesses a kind of alluring grotesqueness for people experiencing it through both ancient and modern history. Contagion and its ability to move between and beyond the individual troubles notions of subjectivity and agency that are at the core of the Western human. This invisibility of contagion- its unpredictability, and its ability to seemingly appear out of nowhere- has captivated scientists, government officials, and nonexpert citizens for as long as illness and its spread could be identified. The history of contagion is thus a project of making the process of transmission visible through the dominant disciplinary lenses and informational frameworks of each scientific era.

The idea of contagion predates not only germ theory, but modern medicine, with Galen postulating the existence of "seeds of disease" in the first century, long before the identification of the pathogens which supported his theory (Nutton 1983, 1–2). Though the processes of contagion were largely unknown, during recurrent epidemics of bubonic plague in the Middle Ages, efforts were made to subvert it; infected bodies were buried in mass graves, clothing and bedding were burned, and early versions of quarantines were instituted (Smith, Watkins, and Hewlett 2012, 35). In the sixteenth century, Girolamo Fracastoro built upon Galen's ideas of contagion, theorizing that these seeds were "airborne" and could be spread through direct touch, contact that "preserved seeds of contagion", or could also be spread "at a distance as if by some impetus" (Nutton 1983, 31–32). However, these early conceptualizations of contagion did not have a great effect on existing medical practice, as technology could not yet identify and stop the transmission of these "seeds" (1983, 28–29). The phenomenon of colonization further complicated early notions of contagion, as violent economic expansion constituted a major cause

of the spread of infectious disease between populations.[3] European colonizers often observed that indigenous peoples became sick after their arrival, but before the popularization of germ theory, these epidemics were often thought to be sent by God to ensure that the colonizers' claim to the land was realized (Kelton 2015, 5–6).

Medical practice continued to precede explanations of contagion. Variolation of uninfected individuals with pus from a smallpox patient's pustule begun in the West in the early eighteenth century (though it had been practiced much earlier in Asia and Africa), often reducing the severity of symptoms of the disease, and eventually culminating in Edward Jenner's 1797 detailing of the process of vaccination of healthy individuals with a similar yet harmless strain of cowpox (Riedel 2005, 22–24). In 1854, epidemiologist John Snow famously halted a raging cholera epidemic in London by removing the handle of a busy water pump and subsequently suggested that infectious diseases "'are propagated by special animal poisons coming from diseased persons, and causing the same diseases to others'", but was heavily criticized by the medical journal *The Lancet* for his seemingly inaccurate ideas (Snow 2008, 22–23)

However, Snow was soon to be vindicated, as the largest and most storied paradigm shift in theorizing contagion came with Louis Pasteur's conceptualization of germ theory in 1862 (Karamanou et al. 2012, 60). Suddenly, the agents of contagion were brought into relief; after millenia of theorizing about entities that had not yet been detected, Pasteur identified microorganisms as the cause of infectious disease (2012, 60). However, the mysterious character of contagion was far from resolved; with the discovery of microbes came the realizations that contagions are airborne, omnipresent, and still impossible to visualize with the naked eye (2012, 60). In 1882, Robert Koch built majorly upon Pasteur's ideas, theorizing four postulates that

[3] Colonization and its implications for the transmission of infectious disease will be further elaborated upon in Chapter 3.

could be applied to infections to tie specific microbes to specific disease processes (Blevins and Bronze 2010, e747). When taken with Jenner's vaccination process, Pasteur and Koch's contributions led to the discovery of vaccines for a number of infectious diseases including typhoid, bubonic plague, and tuberculosis, leading to vast improvements in public health (Tulchinsky and Varavikova 2014, 22). These discoveries entered public consciousness through newspapers, which were becoming cheaper and more widely circulated, planting the seeds of biological contagion in the minds of the public (Tomes 2002, 629). However, even as the understanding of microbes in the scientific community grew, studying contagion was becoming increasingly complex in a rapidly globalizing world.

With the dawn of the twentieth century came an intensification of the pace with which both contagion was being scientifically interrogated and disease itself was spreading. The discovery of antibiotics in 1909 provided medicine with a potent tool to combat contagion (Zaffiri, Gardner, and Toledo-Pereyra 2012), but they were not widely used and disseminated until 1943, with the advent of streptomycin as a treatment for tuberculosis ("Achievements in Public Health, 1900-1999: Control of Infectious Diseases" 1999). Though antibiotics represented a major achievement in fighting infectious disease, immigration, urbanization, and commercial boat and (eventual) air travel shrank the world (1999), allowing contagion to loom ever larger in the eye of Western governments (Bashford 2007, 11). Though technology was advancing, governments and scientists were unequipped to manage the 1918 influenza pandemic, which caused more deaths in its first year than all of the waves of bubonic plague combined (Avila, Saïd, and Ojcius 2008, 943). Furthermore, in the first half of the twentieth century, epidemics of infectious diseases like dysentery, typhoid fever, and influenza were frequent and intensified by overcrowding and poor sanitation in urban settings ("Achievements in Public Health, 1900-1999:

Control of Infectious Diseases" 1999). In response to worsening epidemics of infectious disease, local, state, and national health departments grew, formalizing and bureaucratizing public health interventions and attempting to make contagion visible by transposing it onto quantifiable metrics (1999). These state-run interventions included mass vaccination programs, development of antifungal, antiviral, and antibiotic drugs, improvements in sanitation systems, and education campaigns (1999). The scientific conception of contagion took root in public consciousness through these education campaigns, which included films underscoring the importance of public health interventions (Ostherr 2005, 20–21).

As public awareness and fear of biomedical contagion intensified, its control became increasingly linked to governance. The dissemination of Jonas Salk's polio vaccine was funded by the US federal government in 1955,[4] and its success at reducing polio infections led to the funding of comprehensive childhood vaccination programs ("Achievements in Public Health, 1900-1999: Control of Infectious Diseases" 1999). The mismanagement of the HIV pandemic by the US federal government in the 1980s led to the pandemic's intensification, but also led to the development of antiretroviral therapy and more robust global disease surveillance infrastructures (though the HIV pandemic is far from controlled today) (Avila, Saïd, and Ojcius 2008, 944). As a whole, by the end of the twentieth century, federal disease prevention and treatment programs appeared to be wildly successful, with the CDC stating in 1999 that the goal for infectious diseases was "eradicat[ion] from all human populations through global cooperation", with smallpox's eradication in 1977 serving as an example of the possibility of such a goal ("Achievements in Public Health, 1900-1999: Control of Infectious Diseases" 1999).

[4] While the distribution of the polio vaccine was funded by the US government, a large portion of Salk's research on polio was funded by non-state actors, especially the National Foundation for Infantile Paralysis (Wilson 2015, 398).

However, despite these scientific and bureaucratic improvements, contagion has proven to be as persistent as ever. Globalization has only intensified in the twenty-first century, contributing to the increasingly "transborder nature" of infectious disease (Bashford 2007, 11). Globalization has also increased mass livestock production, and the antibiotics given to livestock are a major contributor to the growing problem of antibiotic resistance (Boeckel et al. 2019, 1267–68). Globalization also increased intrusion into previously uninhabited areas and interactions with other species, enhancing the risk of zoonotic transmission, as seen in COVID-19 (Mackenzie and Smith 2020, 46). As the world continues to grapple with both emerging infectious diseases and resurgences of previously well-controlled diseases, biomedical contagion is clearly still firmly intertwined with civilization (Avila, Saïd, and Ojcius 2008, 946).

Enduring Cultural Relations with Contagion

Well before newspaper stories of the early twentieth century and public health films of the 1950s increased public awareness of biomedical conceptions of contagion, it captured the affective attention of the public. While absent from the sterile, biomedical histories of disease, the public's experience of biomedical contagion has both cultural and biomedical effects (Wald, Tomes, and Lynch 2002, 618). Put simply, contagion and its surrounding narratives are a "constitution and expression of our social, cultural, and political world" (2002, 621).

As scientific theories about contagion and its logics accumulated and advanced, public relation to disease changed, but a level of universality and uncertainty persists throughout the contagion narrative. Contagion narratives have circulated for as long as human-disease interactions have occurred, from the Exodus's infamous ten plagues to Boccaccio's *Decameron* in 1353 to Camus's *The Plague* in 1947 to the 2011 blockbuster *Contagion* (Ehrenkranz and Sampson 2008, 37–38; Boccaccio [1353] 1982; Camus [1947] 1991; Soderbergh 2011). Part of

contagion's narrative seductiveness is the "common susceptibility" which creates a sense of precarity amongst all members of a society (Wald 2008, 12). This uncertainty inseparably links contagion to fear; as the tagline of the Contagion movie poster states, "NOTHING SPREADS LIKE FEAR" (Conal 2011; capitalization in the original). This fear has not always been "necessarily or wholly metaphorical", as it was historically cited as a direct cause of disease (Pernick 2002, 861). Indeed, the fear of contagion was itself something to be prevented, seen in Daniel Defoe's *A Journal of the Plague Year*, in which the British government "suppress[ed] the printing of such [plague] books as [they] terrified the people" ([1772] 2009, 40). Historian of science Martin Pernick further elucidates that cultural reactions to contagion are a fundamental part of the uncontrolled spread of disease, stating that "panic could literally be seen as both an epidemic of fear and as the agent by which other epidemics spread" (2002, 861).

Intensifying Narratives of Contagion

The tandem rise of bacteriology and consumer culture brought with it mass media fascination with infectious disease and the construction of the contemporary infectious disease narrative. The collision of mass media and bacteriology exhibits our inability to rely on solely scientific approaches to make contagion legible. Instead, contagion permeates through the boundaries of the scientific and slips onto and into more legible forms. In the late nineteenth and early twentieth centuries, the cost of production of newspapers decreased, and as a result, they became longer, and their content expanded beyond necessary information to stories with entertainment value (Tomes 2002, 629). To acquire funding for their programs or awareness of their public health initiatives, scientists, public health officials, and health activists contributed to the crafting of infectious disease narratives and were often profiled and quoted in newspaper stories (2002, 630). In the 1920s and 1930s, a wire service called Science Service produced

already-written science stories for newspapers to publish (Lepore 2009). Science Service was an important institution in the nascent field of science journalism, and while its creators aimed to avoid sensationalism (Bennet 2013, 85), disease narratives, with their elements of uncertainty, mortality, and risk, amplified contagion's affective panic. As historian Jill Lepore observes, such journalism "can [itself] be virulent: spreading fast, weakening resistance, wreaking havoc" (2009). This medical journalism exemplifies Nancy Tomes's "epidemic exposé"- the sensational profiling of minor, but pathologically interesting epidemics (2002, 630–31).

Lepore profiles the journalistic depiction of a 1929 outbreak of psittacosis in the US through the lens of the epidemic exposé (2009). Newspapers began to cover the disease, also called parrot fever, after it had caused a few deaths, but the escalation of parrot fever into a true outbreak narrative came when scientist Charles Armstrong manufactured a "parrot-fever panic" to gather enough infected people to study (2009). To maintain and weaponize the panic of parrot fever, most newspapers did not print stories of recovery or corrections when an ill person was found to be infected with another pathogen, an aspect of infectious disease journalism that is eerily familiar today (2009). The real reach and death toll of psittacosis is unknown, as the panic created by the media was cast as a vast overreaction one week before two scientists died of the disease (2009). To again utilize Tomes's framing, the epidemic exposé narrative eclipsed the material conditions of the psittacosis outbreak as the lines between public service and sensational sales booster blurred (2002, 638).

Lepore and Tomes' work illuminates the role of the twentieth century confluence of mass media and scientific advancement in infectious disease identification and treatment. This convergence served as the precursor to current cultural representations of contagion. Psittacosis makes clear how cultural and social factors can "inflect—and yes, infect—every aspect of the

scientific and epidemiological processes" (Wald 2008, 262). Contagion leaks out of the scientific because it both illuminates existing connections between organisms and has the capacity to create new ties. Scientific approaches attempted to address and control these leakages through quantification, which will be discussed later. Before we can know the relationality of contagion, though, we must understand its opposition.

Contradictory Narratives of Contagion: Anticontagionism

Though contagion was rapidly becoming the primary logic through which the world of infectious disease was understood, there are numerous historical examples of alternative ways of understanding the spread of disease. In the early to mid-nineteenth century, the issue of contagion divided medical scholars into largely two camps: contagionists, who believed that disease spread between people, and anticontagionists, who advanced that it was environmental factors like air or water which spread disease, usually through ill-understood miasmas (Ackerknecht [1948] 2009, 7–9; Heaman 1995, 20). Indeed, the issue of contagionism was contentious, as according to Nancy Tomes, the period from 1865 to 1895 was "a virtual civil war over the truth of germ theory" for Western medical professionals (1998, 28). Before Koch and Pasteur's discoveries caused a major shift in scientific thinking around contagion, anticontagionists held the more popular medical opinion (Ackerknecht [1948] 2009, 8). Erwin Ackernecht postulates that this way of thinking was accepted as more plausible because the contagionist idea that "the direct passage of some chemical or physical influence from a sick person to a susceptible victim by contact or fomites or, for a relatively short distance, through the atmosphere" lacked evidence and seemed contradictory to the way diseases behaved, as when two individuals with no close physical contact would both become sick with a disease ([1948] 2009, 8). There were also political stakes involved, as contagionists advocated for state-

strengthening measures like quarantines while anticontagionists considered infection control measures an obstacle to economic growth ([1948] 2009, 9). As commissions from European governments investigated diseases like cholera and returned verdicts in support of anticontagionism, Western support for the view increased even further by the mid-nineteenth century, especially as increasingly unsanitary environmental conditions in cities appeared to support miasma theory's assertion that increased "filth" was the cause of disease ([1948] 2009, 12–13). With contagionist John Snow's article on cholera and the water pump published in 1849 and Pasteur's research on germ theory published in 1862, much of the profession again took up contagionism,[5] as the existence of microbial entities resolved many of the lingering inconsistencies in contagionist theories of transmission between individuals (Ackerknecht [1948] 2009, 14; Karamanou et al. 2012, 60). Koch's 1882 work on the postulates of infection further cemented contagionism as the dominant medical perspective at the turn of the twentieth century (Blevins and Bronze 2010, e747), but as contagionism began to bleed outside of the sphere of infectious diseases, anticontagionism mutated and began to take up new meanings.

As mentioned in the previous section, germ theory and contagion became increasingly popular in the public realm in the early twentieth century, both as an entertainment device and as a bridge between elite scientists and the public. However, a philosophy called holism was simultaneously gaining traction, aiming for a more systems-based, integrative approach to disease (Kunitz 2007, 28). Unlike anticontagionism, holism acknowledged the existence of microbes and their relationship with disease but deemphasized the role of the microbe in causing the effects of disease (2007, 29). Instead, such medical professionals argued, "'[D]isease … was

[5] For an account of a specific anticontagionist who remained an anticontagionist during this time and the social, political, and medical reasons why, see Anna Greenwood's "Lawson Tait and the Opposition to Germ Theory", which discusses surgeon Lawson Tait and his attempts to refute Joseph Lister's sanitary techniques (1998).

the individual's adaptive struggle with his or her social and/or physical environment'" (2007, 29).

This mode of holistic thinking was in tension with the increasing application of the principles of contagion and microbes to a variety of apparently noninfectious diseases, including (and most notably) cancer. In *A Contagious Cause: The American Hunt for Cancer Viruses and the Rise of Molecular Medicine,* Robin Wolfe Scheffler chronicles one example of the public frenzy to understand mysterious medical conditions through a contagious lens (2019). Scheffler characterizes this United States government-funded search for a viral cause (and subsequent vaccine treatment) of cancer in the mid-twentieth century as an early example of what he calls the "*biomedical settlement*: the tacit promise that in lieu of providing health care to its citizens directly, the government could foster public welfare through biological investigations of disease" (2019, 4). Such large expectations were intensified by the "War on Cancer" in the 1970s, though these expectations were coupled with limits on what breakthroughs were possible from a technological and biomedical sense (2019, 5–7). Indeed, in an effort to render cancer a monolithic, curable entity, the contagious paradigm was overextended, and by 1978, the Virus Cancer Program, a subunit of the National Cancer Institute and the main cancer virus project in the War on Cancer, failed to identify a human cancer virus, and was shut down (2019, 126, 181).[6]

However, some medical professionals at the time advocated for a more multifaceted approach to disease treatment. For example, in 1960, physician Victor Freeman wrote an article called "Beyond the Germ Theory: Human Aspects of Health and Illness" calling for the consideration of nonbiological factors in disease outcomes (8). Freeman states that the

[6] Though human cancer viruses were later identified, such as human papillomavirus (HPV) (Scheffler 2019, 237).

sociocultural should be considered alongside the microbiological in affecting health, reflecting the aforementioned holistic principles of early twentieth century holists (1960, 10). Freeman proposes four broad categories of stress on health and enmeshes the contagious and the social through the category "turbulent and virulent change" which includes, among other items, both "epidemics" and "pathologic leaders, e.g., Hitler, Napoleon" (1960, 10). Though decentering the contagious and the microbe as the sole cause of disease and instead proposing a more multimodal version of health and disease, Freeman sought to create a more effective "plan… of control and prevention", representing an early departure from epidemiological tenets of the time, which were more narrowly focused on the microbe and its quantifiable properties (Freeman 1960, 11; Krieger 2000, 158).

Anticontagionism has both explicitly and more indistinctly influenced the thinking of some groups about infectious disease. Molecular biologist Peter Duesberg framed himself as a current-day anticontagionist, albeit in a narrow sense, when he declared that AIDS was not caused by a HIV or any other virus, but was rather the result of "long-term consumption of recreational drugs and the anti-HIV drug AZT" (1994, 118). This "AIDS denialism" has gained traction among a small circle of microbiologists and the wider public, including the former president of South Africa Thabo Mbeki, who believed that antiretroviral HIV treatment was "toxic" and announced in 1999 that his administration would not be providing antiretrovirals to South Africans, resulting in an estimated 330,000 unnecessarily lost lives from 2000 to 2005 (Kalichman, Eaton, and Cherry 2010, 2; Chigwedere et al. 2008, 412). Conversely, while not explicitly anticontagionist, core ideas of Freeman's conceptualization of health have lasted into today and have been productive in casting health as "not merely the absence of disease" ("Constitution of the World Health Organization" 1946). Today, the phrase *social determinants of health* is a popular term in healthcare fields, emphasizing the environmental, cultural, and

other nonbiological factors that may contribute to an individual's health, both in general and when referring to a specific infection or disease ("Social Determinants of Health" n.d.). Though anticontagionism may not be directly responsible for such a shift in public health paradigms, its roots in challenging the domination of microbes over human health helped create an intellectual environment more welcome to the widespread consideration of the social alongside the biomedical today.

The Networked Relationality of Biomedical Contagion

The definition of contagion has shifted greatly as the sociocultural context around disease and science have changed. Etymologically, the term first appeared in the fourteenth century and is a combination of the Latin *con* meaning "together with" and *tangere*, meaning "to touch" ("Contagion" n.d.; Hoad 2003). Biomedical contagion was initially defined by direct physical contact with an infected individual (Marcovitch 2018). This definition was then expanded to signal any communicable disease, defined as "any disease that can be transmitted from one person to another" (E. Martin 2015). However, as Pernick observes, just as contagion became more associated with microbiology by the public in the early twentieth century, it was fully replaced by the term "communicable" in formal medical lexicon (2002, 860). Put another way, contagion as a term connotes a level of relationality deemed too improper and unscientific for medicine.

Contagion links individuals, disease, and culture in an inherently and necessarily relational way. To exist, contagion requires more than one entity; to spread, contagion requires groups of individuals. The links between such individuals- their relations- become all-important to the spread of contagion, dislocating the term from its scientific lens. This relationality troubles notions of individual agency that are so central to Western subjectivity and medicine; as instead

of contagion being an entity-centric concept, it "take[s] [its] cues from some pre-existing connection that links [them]" (Whimster 2018, 4). While infection is usually cast in individual terms- that is, an entity can either be infected or uninfected- contagion cannot occur without relationality *between* entities. For biomedical contagion, these connections take the form of embodied human proximity which results in the unknowing exchange of invisible microbes. The necessity of these exchanges renders contagion a community-oriented phenomenon which paradoxically depends on this community and has the potential to alter the way communities are constructed. The COVID-19 restrictions implemented at universities, offices, states, and other institutions (Rough and Bunis 2020), as well as historical examples of quarantine requirements implemented during epidemics, such as the 42-day quarantine instituted during Philadelphia's yellow fever epidemic of 1793 (Smith, Watkins, and Hewlett 2012, 37) are prime examples of the ways that contagion can alter typical patterns of interaction and change the structure of communities. The relationalities produced by contagion ebb and flow as the contagion itself does. As such, while this chapter has already examined historical reactions to and effects of contagion, it is necessary to discuss the life course of biomedical contagion as situated in the current sociocultural context.

Life Cycle of the Modern Contagion: Its Life and Death

The contagion life course holds a formulaic kind of "dramaturgic" structure (Rosenberg 1989, 2). The beginning of any contagion's life is indeterminate to some degree. A collection of individuals will become infected with the contagion and may exhibit symptoms, but without a name to attribute the condition to, these cases are treated as anomalies and forced into pre-existing disease categories (1989, 2–3). At this stage, contagion is characterized by its elusivity; its undetectability exploits human interactions and allows it to spread insidiously. Such a

contagion is "raw" in the sense that it has not yet had characteristics projected onto it by humans situated within certain sociohistorical milieus. The invisibility of this contagion granted by the misattribution of infections as more commonly known pathologies is thus also a kind of unmarkedness, a freedom from the imposition of the inherently social projects of categorizing and controlling disease (1989, 3).

As contagion utilizes its invisibility to spread between individuals unchecked, this elusivity begins to paradoxically erode. The number of infections grows, and "[o]nly when the presence of an epidemic becomes unavoidable" is a pattern identified through public health surveillance and the contagion named and profiled (1989, 3). From this point, contagion has been given a kind of agency by the scientific institution, complete with its own name, characteristics, and public consciousness. With the contagion's visibility boosted, more institutions and authorities begin to recognize its existence, granting legitimacy to the contagion (1989, 5). As a result, the contagion's relation to the public becomes vastly different, highly dependent on the potential severity of its effects on the human. Conversely, with contagion as a discrete entity, it can now visibly impact the public (1989, 3). Through situating the contagion as an actor, it is placed in direct, overt opposition to humans, beginning the familiar discourse of the "war" against the contagion. The generals of such a war are often the unlikeliest of leaders, thrust into the spotlight by an anxious public: the "Microbe Hunters" (Lepore 2009). This archetype draws its name from scientist and journalist Paul de Kruif, who in 1926 wrote a book of the same name detailing historical Microbe Hunters (2009), who, far from scrawny, bespectacled lab geeks, are intrepid and often renegade scientists willing to push ethical boundaries on behalf of the common good (Tomes 2002, 633–34). Cast as protagonists in the dramaturgy of the contagion, Microbe

Hunters have to not only complete scientific research, but also convey complex and oft-changing findings to the public.

Microbe Hunters and the lesser-known scientists beneath them then begin their quest to understand the contagion. Before detailed, well-reviewed, and quantifiable scientific work can be undertaken, however, they complete research to discover characteristics about the contagion deemed the most crucial: its method of transmission and the groups it affects most. When these preliminary, unconfirmed findings about the contagion are released, the contagion's cultural effects begin to reveal themselves.

Information about mode of transmission is crucial to the project of assigning logics to the contagion, predicting its likely path, and quelling public unease (Rosenberg 1989, 7). At this juncture in the contagion life cycle, its power in sorting and conferring status upon bodies is realized. As the contagion begins to affect more of the population, the public's need for epidemiologic information about who becomes ill and who drives the spread of the contagion grows (1989, 5). Using the seemingly infallible and objective rationality of science to deem certain groups of the population more susceptible to the contagion than others allows for individuals to make assessments of their personal risk, helping to combat the maddening unknowability of contagion (Wald 2008, 226). Thus, this scientific quest to gain more information about the contagion, depicted by popular media as the apolitical and objective pursuit of scientific truth, is in reality grounds for the legitimization of existing power structures. Scientific findings are weaponized by the powerful, utilizing the pathological state that contagion produces to perpetuate a "framework within which moral and social assumptions could be at once expressed and legitimated" and wielded against groups lacking representation-making power (Rosenberg 1989, 5–6). Indeed, by exploiting the threat of proximity that contagion

requires and lasting associations of disease with filth and evil, marginalized groups are scapegoated as spreaders and even supposed sources of disease (1989, 6–7). The association of certain groups with the contagion varies based upon the sociohistorical context and the group making the distinction, as the group creating the association often utilizes the disease to further denigrate the scapegoated group (1989, 6–7). Syphilis in sixteenth century Europe was a prime example of this phenomenon, acquiring the name "French pox" by the English, the "Neapolitan disease" by the French, the "Polish" disease by the Russians, the "Turkish disease" by the Polish, and so on (Kucharski 2020, 72–73). This stigmatization may be a consequence of the desire to control disease through defining, identifying, and confining people who may spread it (Wald 2008, 226).

Though specific groups may be constructed as afflicted with the contagion, as the contagion continues to spread, its underlying invisibility and apparent nondiscrimination creates some semblance of universality. Contagion is concretized and embodied through the *contagious person* in an effort to circumvent this invisibility (2008, 226). As the contagion infects more people outside of stigmatized groups, the category of contagious person is reconstructed as universal. This universal *potential* of infection, no matter how minute, stokes fear in the public. While some segments of the population may emerge as more susceptible than others, *all* citizens become more cognizant of the newly heightened riskiness of their behavior in reference to the contagion, and the sheer number of individuals they come into contact with. This realization of universality, coupled with an ever-increasing number of infections, intensifies worry of the eventuality of uncontrolled exponential spread of the contagion, which has the potential to destabilize even the sturdiest of social institutions (Price-Smith 2008, 43). Faced with the

prospect of the ultimate loss of control, both authorities and individuals turn once again to the supposed objectivity of science.

The quantification of contagion is the result of these fears of destabilization. To assess the logistics of a contagion's spread, Microbe Hunters go beyond identification of the mode of transmission of contagion and quantify, simplify, and flatten a contagion's infectability. The most famous epidemiologic quantification of infectivity is the reproduction number, or number of novel infections each infected person generates, commonly called *R* (Kucharski 2020, 57). Assigning the number *R* to the contagion's infectability represents another attempt to "know" the contagion; the human embodiment of contagion is further legitimized through *R*'s statistical quantifications. A contagion's *R* is a concrete threshold of when worry should set in; if the *R* is below 1, each infected person does not generate enough infection to replace themselves, and the contagion will likely burn itself out (2020, 58). If a contagion's *R* is above 1, each infected person is expected to create more than one infection, and uncontrolled exponential growth is imminent (2020, 58). *R* schematizes the contagion into four primary characteristics, all centered around the contagious *person*: the length of time a contagious person can transmit the infection to others, the number of chances a contagious person has to spread the contagion, the probability that contact with a contagious person results in transmission, and the susceptibility of the population (on average) (2020, 62). Through reducing the quantification of contagion to these human-centered characteristics, contagion is responsibilized, and its spread becomes the fault of not an unknown, invisible foe, but of the behavior of contagious individuals (Wald 2008, 226). This individualization of contagion overlooks the relationality *between* subjects that contagion produces, leaving these spaces largely unexamined. With the contagion quantified and tethered to the body of the contagious person, epidemiologists seek to pinpoint contagious individuals and

pockets of outbreaks, representing them through maps (Riley 2007, 1298). Contagious individuals and their connections to others are flattened into uniform nodes and edges or cartographic points, and parameters are fed into statistical models to generate temporal and geospatial predictions of the spread of contagion (2007, 1299–1300). In other words, enabling epidemiological analysis requires quantifying the "average" contagious subject, and lost in this quantification are the complexities of moments of transmission that trouble the boundaries between one subject and another.[7]

As scientists render the contagion more legible and "knowable", bureaucrats are tasked with curbing its spread through instituting policies of control. As stated previously, governmental officials are often reluctant to legitimize public unease about a contagion before knowing its potential severity, lest they overreact and cause unnecessary harm, as when Egypt slaughtered all of their swine during the 2009 H1N1 swine flu pandemic (Maor 2012, 232). However, as the contagion begins to spread and gain notoriety, officials often take policy action to avoid the appearance of incompetence and negligence in the public eye before scientists can come to quantifiable conclusions (Price-Smith 2008, 148). The twenty-first century government must also navigate containing the contagion in a globalizing world which intensifies pressures to respond to contagion through both the imposition of control measures by other governments and the threat of bioweapons in acts of terrorism (Bashford 2007, 12). These control measures often invoke state public health authoritative bodies (Wald 2008, 249), whose recommendations include shutting borders (Bashford 2007, 1–2), instituting quarantines, and tracking contagious individuals (Pan, Cui, and Qian 2020, 3). As scientific research progresses, governmental bodies utilize it to further legitimize and revise these measures. The graphical representations and

[7] The ways contagion troubles the boundary of the individual will be explored in Chapters 3 and 4.

predictions generated by the aforementioned epidemiologists provide governmental bodies with publicly respected justification for tightening their control on the populace, instituting more restrictive measures on their populations. Implicit in the implementation of these "expert-informed" policies are the assumptions that knowing more about the contagion will guide future courses of action and that individual conformity to such policies "will ultimately control the epidemic" (Wald 2008, 249).

Eventually, the contagion enters its final dramaturgical act, reaching its apex, its maximum number of new infections per day (Rosenberg 1989, 8). This apex may be natural, as environmental conditions and biological qualities of the contagion may lead to an *R* below 1, causing the contagion to extinguish itself (Kucharski 2020, 58). However, in larger pandemics, the natural death of the contagion is unlikely to be swift. Instead, through a combination of scientific research and governmental control measures rendering citizens as "governable bodies", scientists and government officials finally manage to eliminate contagion's nagging persistence (Füller 2016, 343). This elimination takes the form of treatments or vaccines which prevent the contagion from spreading and, in the case of a vaccine, utilizes the contagion itself to construct vaccinated individuals as not only not contagious, but as immune, reducing the proportion of the population that a contagious person can infect (Esposito 2011, 151). After governmental officials devise a plan for the mass production and dissemination of vaccines, the combination of governance and scientific innovation has evidently won the war against the contagion. The contagion has reached the finale of its life, but not before altering subjectivities, methods of governance, and the status afforded to biomedical research.

Encores: When Contagion Doesn't Die

The modern dramaturgy of biomedical contagion appears to be mostly straightforward and formulaic, closely mirroring the prior section's narrative. However, the history of contagion shows that this story is far from a stable and universal one. This historical and social contingency exemplifies that the contagion life cycle is "constructed through different narratives which justify and shape different pathways of response" and that the definition and progression of contagion through a narrative "depends on who gets to do the defining" (Dry and Leach 2010, 8, 10). This determinism is *almost* absolute, as those with the power to define the contagion narrative can greatly affect the spread of its disease. However, some of the more biological processes of contagion appear to transcend this defining power, complicating the contagion narrative and creating entropy that the control state desperately fights to contain. These features of contagion complicate its narratives and lead to its encores and sequels.

The most obvious and impactful definable complication in the contagion narrative is the willful denial of its existence or severity by authority figures. The HIV virus was first identified as a potential outbreak in 1981, though health authorities identified only gay men as susceptible (Wald 2008, 219–20). Because the perception of the contagion was that only deviant subjects in the population were at-risk, it was initially given little media attention, and HIV caused over 600 deaths before the US government initiated a public health response (Bennington-Castro 2020). By constituting HIV as a disease for only a subset of the population, the media and governmental officials allowed the contagion to continue to spread, as the pandemic continues today, even with the advent of prophylactic antiretroviral medications (2020).

While humans may attempt to impose order on the biological complications of contagion, these complications can evade logic, rational framing, and anticipation. If the relation between a

contagion and humans represents a traditional battle, a contagion's tactics amount to guerilla warfare; strategies that use their incomprehensibility from the perspective of wartime conventions to their advantage.

One such strategy of contagion is the asymptomatic carrier. The asymptomatic carrier is the ultimately insidious form of the contagion. As stated previously, contagions are made visible and legible through their embodiment in a person. However, to be visible, the contagious person must exhibit signs of disease which signal to others that the individual may be contagious (Wald 2008, 69–70). The asymptomatic carrier possesses the ability to spread contagion while moving through the world unmarked, just as a non-contagious person would. The asymptomatic carrier eludes containment strategies like quarantines and is unaware of their disease status. The carrier presents a challenge to the responsibilization of the contagious person in not transmitting the disease, as possession of the contagion is revealed to be not always knowable (2008, 226).

Contagion's unknowability persists despite the narrative that human ingenuity and persistence will eventually grant experts enough information to eliminate it. Though humans have managed to eradicate specific contagions, other contagions have persisted through mutating, despite being subject to technologies like antibiotics which are specifically designed to eliminate them (Boeckel et al. 2019). Biomedical contagion's flexibility allows it to continue to impact the lives of many, even in our allegedly post-infectious disease age (Avila, Saïd, and Ojcius 2008, 946). As childhood vaccine refusals lead to measles outbreaks (Phadke et al. 2016, 1155) and the COVID-19 pandemic has politicized the usage of masks to prevent the spread of disease (Gonsalves and Yamey 2020, 1), the impact of biomedical contagion on culture and society cannot be understated. The history of contagion is more than a history of knowing the biological composition of a microbe; it is a timeline of attempts to make disease transmission

visible so that it can be controlled. Similarly, the logics of contagion were applied to cultural and social phenomena in an effort to demystify the transmission of cultural ideas.

Chapter 2: A Genealogy of Cultural and Social Contagion

Culture, Contagion, and the "Biologisation of the Social"

As the previous chapter attests, contagion was cemented as a sound medical concept to understand infectious disease in the nineteenth and early twentieth centuries. As "contagious" became synonymous with "infectious", the concept itself began to "infect" other areas of human culture. Theories of contagion diffused outward from the biomedical to the psychological, contagion was utilized to explain crowd behavior and moral degeneracy. This logic of diffusion functions to "'biologis[e]... the social'", ingraining itself into popular understandings of how immaterial cultural products spread between material bodies (Beer 2007, 534). Indeed, even as logics of contagion are applied to situations that stray further and further from the biomedical context of its origin, contagion depends on contact that demands a kind of corporeality. However, the internet presents culture with a new kind of contagious metaphor: "going viral". The concept of going viral is only legible in the Information Age, a time of unprecedented decentralization of information production and dissemination. For some, measurements of validity were replaced with quantities of clicks, likes, and views, quantifying impact (and contagion) in a novel way. This chapter will trace contagion's journey out of medicine and into culture, situating the socioinformatic phenomenon of going viral within the larger context of how contagion became a valid and core way of organizing ideas about the transfer of memes and other cultural objects.

Contagion as a Sense-Maker

Contagion became a relevant logic for understanding the transfer of human culture in an effort to comprehend, manage, and suppress group behavior that was otherwise incomprehensible and unpredictable (Bashford and Hooker 2014, 2). Incidents of widespread

noninfectious transmission of affect and behavior long predate contagion theory, beginning with mass hysteria events like the mysterious plagues of dancing that affected hundreds of people in close contact in the Middle Ages (Baloh and Bartholomew 2020, 74–75). After the discovery of germ theory, however, the human psyche could be biologized, and the unknowable and deviant could instead be analyzed and controlled through epidemiological means (Beer 2007, 541).

Accordingly, the field of crowd psychology emerged in the late nineteenth century as a response to growing worries about large-scale working-class uprisings (van Ginneken 1992, 2). At the turn of the twentieth century, a time of intense international conflict, bureaucrats became increasingly concerned with what they perceived to be the growing degeneracy of society, resulting in increased rates of crime and mental illness that could not be controlled through institutional punishment (Nye 1984, 171–72). Reflecting class conflicts across the world, the mob became a common symbol of calls for social change in many European literary works of the time, including Hugo's *Les Misérables*, Tolstoy's *War and Peace*,[8] and Dickens's *Tale of Two Cities* (van Ginneken 1992, 2). The unpredictability and speed with which mobs and crowds arose and seemingly rational and independent-minded people were overcome with the "spirit" of crowd activity worried the powerful (Beer 2007, 553). Social scientists surmised that they could mirror biological scientists' early success in managing infectious disease through similarly preventing the transmission of behavior that threatened existing class order and hierarchies (2007, 541). As anxieties about class conflict and political upheaval rose in France and the United States, and strikes intensified, medicalizing deviance became an attractive option for both

[8] Of note, science and technology studies scholar Bruno Latour's book about Pasteur, called *The Pasteurization of France* in English, was originally titled "Pasteur: War and Peace of Microbes" in French. Latour remarks on the similarities between war between nations and between microbes and people, stating "We would like science to be free of war and politics. At least, we would like to make decisions other than through compromise, drift, and uncertainty" (Latour 1988, 5).

delegitimizing the collective action of "anarchistic" crowds and justifying increasingly invasive policies of state surveillance and security (Schutz and Sandy 2011, 50; Nye 1984, 173, 179, 182).

However, before crowd psychologists could claim to dissipate a crowd, their first task was to understand "*contagium psychicum*", the spread of non-biological material from the mind of one individual to another (Beer 2007, 541). Much like biological contagion, *contagium psychicum* was depicted violently, cast as an invasion of the sovereign, moral mind by alien, perverted ideas. Such criminal and immoral ideas were thought to be perils of societies modernizing too quickly (2007, 538). As cities grew more populated and new printing technologies allowed for a greatly improved circulation of print materials, an individual was surrounded by more influences that were thought to "radically undermin[e] autonomy and independent reasoning" than ever before (2007, 561).

Just as biological scientists tried to control infectious disease by identifying those most likely to be infected, crowd psychologists offered their theories on what subsets of the population were most susceptible to ideas that were not their own. To preserve the legibility of the individual, only those who were morally or mentally impaired in some way were deemed "susceptible to the irrational and destructive impulses that surrounded them" (2007, 539). This underlying refusal to sacrifice the Western subject rendered all members of a crowd psychologically weaker than those who were seemingly immune to its criminal allure (2007, 565).

Major works in crowd psychology cemented contagion as a cogent method of understanding cultural transmission. These works were all published in the last decade of the nineteenth century and include Scipio Sighele's 1891 *La Folla Delinquente* (*The Criminal Crowd*) and Gabriel Tarde's series of five essays spanning the 1890s (van Ginneken 1992, 6).

The field's most well-known and seminal early work was *The Crowd*, penned by French psychologist Gustave Le Bon in 1895. Le Bon clarifies that unlike biological contagion, a crowd need not share the same geographic space for ideas to spread, an idea that persists into modern studies of cultural transmission ([1895] 2009, 10). Le Bon also identifies three stages of crowd formation: immersion in the crowd which causes the contagion of ideas, eventually culminating in group activity like mobs or social movements ([1895] 2009, 12–13). In other words, Le Bon argues that the crowd cannot exist without contagion, and that in a crowd, "every sentiment and act is contagious, and contagious to such a degree that an individual readily sacrifices his personal interest to the collective" ([1895] 2009, 12). As these principles contributed to the foundations of social psychology, they began to be applied to a wider array of scenarios, being used to explain not just moral corruption and mob behavior, but also more mundane cultural transfers and trends.

Contagion as a Method of Sociological Analysis

Contagion in crowds was brought to the more empirical field of sociology by Robert Park in his 1904 dissertation *The Crowd and the Public* (Locher 2002, 16). Park developed a more explicit and analytical contagion theory than Le Bon's, arguing that a crowd environment creates periods of "emergent interaction" that cause members of the crowd to reinforce norms that they perceive the crowd to have (2002, 16). Within this framework, contagion functions through a kind of "feedback loop" in which an individual imitates the behavior or beliefs of another individual until the entire crowd acts or believes a particular way (2002, 17). Park's ideas were further refined by Herbert Blumer's "The Field of Collective Behavior" in 1969 (2002, 18). Blumer postulated that an excited crowd was susceptible to *social contagion* characterized by the irrational imitation of behavior and loss of individual self-control (2002, 20). Blumer also

identified a new subtype of this contagion that becomes relevant to media and internet studies; contagion that occurs within *the mass* (2002, 20). The mass is an extension of Le Bon's assertion that a crowd can be composed of individuals that are not in direct physical contact with one another. Because this collective group of individuals cannot reference the behavior of others, they act solely "in response to an object [usually a piece of media] that has gained their attention" (2002, 20–21).

Contagion theories are no longer used in sociology to evaluate collective or crowd behavior, as the assumption that irrational behavior in crowds could spread from person to person did not match the conclusions of evaluative research (2002, 22–23). Christian Borch further attributes the decline in crowd theory to mainstream nineteenth century social theorists' (and their descendants') "double discomfort" with crowds, both with their irrational, suggestible character and the way that they unseat the individual as the primary unit of analysis in sociology (2006, 84–85). To grapple with the issues that crowds posed to both sociological thinking of the time and the political discontent detailed above, social theorists instead "re-descri[bed]… crowd behaviour in rational terms" (2006, 84). However, the concept of contagion remained salient in mass media and culture studies as scholars analyzed the phenomena of trends, fads, and other cultural materials that appeared to spread much like disease.

Contagion as a Method of Cultural Analysis and Understanding

While contagion was increasingly dismissed from the social sciences as a vague and unscientific concept in the mid-twentieth century, philosophers, cultural critics, and literary scholars continued to advocate for its utility in understanding culture throughout the nineteenth and twentieth centuries, and these foundations allowed contagion theories to persist in these fields (Lawtoo 2019, 37–38). Thinkers such as Jacques Derrida, Theodor Adorno, and Walter

Benjamin continued to grapple with the unique relationality that contagion facilitates (Puetz 2002). In their critical disciplines, the principles of contagion primarily appear in philosophical terms, as the mimetic unconscious was used to attempt to explain the seemingly automatic imitation of others' behavior. Nietzsche was also a major proponent of the mimetic unconscious as a way to explain the transfer of affect from one body to another (Lawtoo 2019, 39). Tarde argued for a somewhat biological basis of this imitation, suggesting that the human tendency to imitate is located in the nervous system (2019, 42). This Tardean concept of mimesis relies on a blurring of the boundary between the conscious and unconscious and the sovereign and interconnected subject, as this imitation "takes place at different levels of awareness" based on the subject's position in "networks or relational flows" (Sampson 2012, 7), allowing for the identification of differences in the character of contagion that spreads customs versus fashions versus beliefs versus desires (Lawtoo 2019, 44).

Mimetics continued to undergird cultural studies in the early to mid-twentieth century, with Auerbach's 1946 work *Mimesis* providing a comprehensive review of the topic in literary culture (Calin 1999, 463–64). Auerbach's identification of the continued salience of mimetic concepts of imitation and contagion in the cultural realm is evident in the proliferation of films created to correct behaviors deemed morally unclean at the time, especially in the public health sphere (G. Thibault 2016). The creation and circulation of public health films addressing topics like sexually transmitted infections and other communicable diseases was supported by the (mimetic) principle that demonstrating proper behavior would lead to the imitation of that behavior, and that such media representations could produce this imitation (Ostherr 2005, 55; G. Thibault 2016, 69).

As new mass media technologies such as the television and telephone were emerging and becoming more widely accessible in the twentieth century, biomedical contagion and cultural contagion began to intertwine in novel ways (G. Thibault 2016, 68). These new technologies artificially compressed space and time, allowing Le Bon's geographically isolated crowds and Blumer's masses to grow to unprecedented sizes. Just as the opportunities for biological contagion to spread disease increased as a result of urbanization, the rise of mass media created new opportunities for the spread of cultural material (2016, 69). Mass media also served to stoke nationalism, and Benedict Anderson's influential 1983 work *Imagined Communities* characterizes mass media as a tool for the maintenance of the socially constructed nation ([1983] 2006, 113–14, 134–35). Unsurprisingly, then, public health films exemplified authorities' increasing respect for the perceived influence of the media on the public, as public health resources were poured into social control measures rather than pharmaceutical remedies for communicable diseases (G. Thibault 2016, 72, 83). Accordingly, it is in this time period that the vernacular of contagion first bridges the biological-cultural barrier. Thibault details that "the field of epidemiology developed its vocabulary by borrowing terms from the equally nascent field of mass media (communicability, transmission, propagation), the latter also pulled from discourses on contagion to explain how media worked (spreading, infecting)" (2016, 69).

This foundational shared vocabulary means that there are not (and were not) distinct epidemiological/biomedical and communications/cultural perspectives of contagion; rather, contagion is coproduced in both the mass media and epidemiological realms, with ideas in one field leaking into the terms and theories of the other (2016, 69). As mass media was being cast in more explicitly contagious, epidemiologic terms, its mimetic utility was becoming increasingly

valuable to actors like advertisers, government officials, and news organizations who wanted to maximize audience size (2016, 80).

As mass media wielded an increasingly powerful role in conveying culture and facilitating public behavior, its influence became an increasingly studied topic across many disciplines (2016, 68). A prime example of the quest to quantify the effect of media on public opinion is the explosion of mid- to late twentieth century studies into "copycat" actions taken after national media stories of major crimes. Such studies analyzed "contagious" media mostly through the disciplinary lenses of psychology and economics (Phillips 1980, 1002). Indeed, David Phillips's 1980 paper on the increased likelihood of plane crashes after a heavily-reported plane crash identifies the shunning of social contagion by sociologists, and aims to fill this gap in research by reinvigorating the sociological study of imitation (1980).

Phillips's work on the imitation of violent behaviors could be seen as a kind of reincarnation of late nineteenth and early twentieth century studies of mental illness as a phenomenon that could spread in a society to render it diseased, ill, and deviant. This work was related to that of crowd theorists but went further by casting "biological pathologies as 'cause-symptoms' in the decline of nation-states" (Nye 1984, 331). Degeneracy, then, was a kind of feedback loop with the potential to simultaneously create further degeneracy in the community and be a symptom of the community's deviance (1984, 331–32). Such theories were useful to rapidly urbanizing nations such as Germany, France, and the United States, as they could blame increasing crime and violence on the mental health of their impoverished citizens and subsequently justify the increased regulation of the behavior of the poor "residuum" (1984, 332, 335). Phillips's exploration into contagious deviancy fits into this frame, as his study came at a strikingly similar political moment in which the United States was experiencing growing income

inequality and rising violent crime rates (Piketty and Saez 2003, 2; *The New York Times* 1981). While Phillips's attempt at sociological revival of this scholarship was largely unsuccessful, his work illustrates an ongoing, transdisciplinary fascination with the nexus of contagion, imitation, societal health and media.[9]

By the end of the twentieth century, media scholars were developing more nuanced perspectives of the specific interactions that produce media contagion, and these approaches began to reapproach the boundaries of social science. Gerard Power conducted a case study of impressions of Asian people in San Francisco during the 1900-1910 bubonic plague epidemics beginning in Chinatown using one such approach termed Media System Dependency Theory (MSD) (1995, 89). MSD complexifies contagion, viewing the interaction between audiences and media as more than asymmetric imitation. Instead, media is produced within a complex ecological system in which actors without resources are dependent upon those with resources for access to media, and those with resources are dependent upon the reactions of their audience in order to achieve certain goals, such as legitimacy or economic gain (1995, 90–91). The media system itself is dependent upon other social systems and structures which dictate why certain information is produced and why it spreads (1995, 91). Power details the interactions between the media and medical systems in his case study, detailing that both systems shared the goal of the wide circulation, uptake, and contagion of information about the disease, but to fulfill very different purposes (1995, 97). The medical system's purpose was to educate the public about the plague and prevent its further transmission, while the media system sought to provide sensational news that would boost readership (1995, 97). While MSD's ability to situate a contagious piece

[9] Arguments like Philipps's have continued to be made in reference to acts of seemingly senseless violence. An April 2021 article in *Insider* suggests that there is a "'contagion effect'" with mass shootings, and that "'it is a disease, violence, and it is contagious'" and "One event is a risk factor for another event, just like one event of COVID is a risk factor for another event of COVID" (Orecchio-Egresitz and Beckler 2021).

of media within a media system and larger social ecology improved upon oversimplified explanations of mass culture contagion, it would not be able to completely address media's shift to the decentralized sphere of social media.

The Mime versus the Meme

While mimetic principles were becoming steadily more pervasive in late twentieth century social science research, another way of understanding the spread of cultural practices entered academia from evolutionary biology: memetics. In 1976, Richard Dawkins coined the term *meme* to be analogous to *gene*, signifying a unit of cultural material that is spread through imitation (Blackmore 1998, 1). The meme was a result of Dawkins's efforts to explain the transfer of nongenetic behavioral and cultural materials in evolutionary terms (Davison 2012, 121). Memetics maintains the evolutionary character of its founder, stipulating that memes must be able to be copied, or *heritable*, able to be slightly changed or incorrectly mimicked, or *variable,* and *specific* enough to be selected by multiple organisms (Blackmore 1998, 6). Early works in memetics delineate and reaffirm the boundaries between the individual and the social that mimetics sought to transcend. In an effort to discount criticisms that memetics failed to account for human agency, Blackmore argues that memetics' definition of imitation should discount behaviors spread through seemingly reflexive means, such as "contagious yawning" (1998, 2). However, the theoretical approach of memetics was still criticized by many as being too deterministic, "crudely consign[ing], as such, the by and large capricious, unconscious and imitative transmission of desire and social invention through a population to an insentient surrender to a self-serving code" (Sampson 2011, 10).

While mimetics and memetics both seek to explain the transfer of cultural materials, the meme, not the mime, became undoubtedly ingrained into internet culture. Though the internet

meme lacks a universal definition, Patrick Davison's declaration that it is "a piece of culture, typically a joke, which gains influence through online transmission" gives it a basic coherency (2012, 122). The term *meme* has been used to describe pieces of internet culture for as long as the internet has produced culture (Shifman 2014, 17). While mimetics remained theoretically dense and difficult to understand, Dawkins's characterization of memes as individual units of culture made the concept useful for understanding the agentic shift in media production caused by the internet (Jenkins 2014). In other words, the internet allowed users of any status to produce cultural materials for dissemination to any sized audience without the physical resource constraints of print media or the budgetary restrictions of television, and the unit of the meme helped academics and publics alike understand this shift (Shifman 2014, 18). The application of the meme to the internet made sense, as Dawkins's analysis identified three characteristics important to how memes spread, and the internet facilitated the improvement of each: unlike print media, memes could be perfectly copied online, memes could be copied much more easily, and the longevity of memes was improved by their storage in permanent online archives (2014, 17–18).

However, Dawkins's meme was viewed by many as too deterministic to properly encapsulate true cultural transmission. To Dawkins and other early memetic theorists, human agency did not play a role in a meme; instead, cultural transfer is biologized, casting memes as hereditarily "travel[ing] longitudinally down generations, but… travel[ing] horizontally too, like viruses in an epidemic" (Blackmore 1999, ix). While this view may seem perfect for this work's exploration of extrabiological contagion, I too advance this criticism and argue that our thinking of the spread of culture online needs to advance beyond the meme.

Post-Meme: Contagion at the Digital Frontier

While the meme has become a core piece of internet vernacular and theory, the tenets of mimetics have also experienced an Information Age resurgence. The rise of the internet has been coupled with a reentry of contagion into the academy and even into the "harder" sciences, such as computer science. The concepts of mimesis, suggestion, and the "psycho-physiological" have also become relevant again, boosted by the discovery of mirror neurons at the end of the twentieth century (Lawtoo 2019, 41). Social contagion has again become a studied and exciting concept, with Blumer's crowds being replaced with social media sites like Facebook and Twitter (Mitchell and Münch 2019, 107). As Peta Mitchell and Felix Münch write, the explosion of research into social networks online has flattened contagion, reducing it to an ahistorical "algorithmic proces[s] for modeling the spread of information" (2019, 109).

This simplification of contagion demonstrates that neither modern mimetics nor memetics appear to have a nuanced understanding of the phenomenon of the cultural and social meanings of "going viral". While the internet meme has dominated our understanding of the spread of culture online, its theoretical underpinnings are too simplistic to understand the spread of culture in the time of newer social media technologies. Digital contagion is more than social contagion occurring online (2019, 107). To properly analyze contagion as it occurs online but affects the material world, then, we must develop a more complex theoretical lens.

The modern phenomenon of "going viral" is a challenge to memetics and mimetics alike, as it further complexifies longstanding debates about the role of human agency in cultural transmission. To be contagious in 2021 involves creating cultural material that both satisfies the desires of others *and* appeals to complex technological algorithms. The introduction of nonhuman actors into the curation of online content constructs going viral as a more-than-human

assemblage, a concept unexamined by either mimetics or memetics. The more-than-human assemblage of going viral is distinct from the Dawkins-esque idea that humans mechanically replicate memes. Depicting humans-as-machines fails to recognize the role of the computing machines in helping to produce virality. Instead, humans-as-machines interact and assemble with machines themselves. Units of information on the internet are no longer popularized wholly through peer-to-peer imitation and copying of content shared on message boards;[10] instead, their spread is due to a more complex ecology of cultural, technological, and social processes dictated largely through enigmatic algorithms. Ezekiel Dixon-Román details the capacity of such algorithms to erode the boundaries of human and technical agency through his concept of *algo-ritmo*, "an agency that is both enabled and bound by the material and discursive limits of digital architectures while also immanently reconfiguring social borders and boundaries and re-shaping and re-making the bodies and actualities of those orders" (2016, 487). In other words, as social media algorithms make predictions and take action based on such predictions, helping to filter and control what content spreads, they change the social reality that they are embedded within (Matzner 2019, 4). In making content designed to go viral, then, humans must make choices that appeal to the black box of a platform's algorithm, which do not necessarily reflect the preferences of people. This shift in audience from human to more-than-human has changed content creation, as reflected in a blog post found on a social media marketing website that states that "Marketers often look at social media algorithms as roadblocks. But rather than try to fight with algorithms, it's more prudent to *understand how to craft the sorts of posts that algorithms*

[10] This is admittedly an oversimplification of the early internet. The infrastructures of the early internet do not necessarily represent full peer-to-peer imitation- there were relations that suggest that the computer-cum-human assemblages I characterize as a recent development *could* have been occurring much earlier. For example, Charlton McIlwain's *Black Software: The Internet and Racial Justice, from the AfroNet to Black Lives Matter,* is a look at the role of the early Internet in facilitating, constituting, but also constraining Black community and activism, especially on the AfroNet, a network of Black people made possible by the internet (2020).

want to see" (Barnhart 2021; emphasis added). Digital virality, then, is more than the individual imitation of mimetics or the self-replication of a meme. It is an unstable, uncertain, and multiple practice that resists formulas and generalizations, opening the door for a revival of more complex disciplinarily resistant notions of cultural transmission.

Sociologist and philosopher of science Bruno Latour's description of Tarde's influence on the modern theoretical method of actor network theory highlights how Tarde's multifocal view of networks is a necessary component of analyzing culture in the twenty-first century (2002, 4). To Latour, Tarde's refusal to treat *the social* as a one-dimensional monolith which is unanalyzable except when utilizing hierarchies of actors with strict boundaries (such as the individual, the group, and the institution) is incredibly relevant and necessary in the Information Age (2002, 4, 7).

Following Latour (and Tarde), I propose we eschew viewing contagion and transmission through the restrictive units of memes or individuals, instead creating a more multiagential, holistic understanding of cultural transmission on the internet. According to this thinking, "structure is only *one* of the simplified, routinized, repetitive element [sic]" in an immensely complex and ever-changing landscape of contagious cultural material (2002, 8). The internet has highlighted the Tardean blurring of the boundaries between the individual and the social and has also enmeshed the technological, allowing for unprecedented traceability as one can track cultural material through the online space as it diffuses from one mind to an ecology of more-than-one-mind actors (2002, 11). This traceability is itself an integral part of this production of cultural material, as it both provides a constant threat of surveillance which may change behavior (as with the "the internet is forever" adage) and enables a kind of detailed fossil record of the online actions which serve as the raw materials for the refashioning of culture. As such cultural

material leaks outside the individual mind and into the traceable space of the internet, it destabilizes, becoming susceptible to influence from any number of human and more-than-human actors, just as a virus may mutate when exposed to various environmental conditions (2002, 9, 15). The leakage of online interactions into the material world reveals the precarity of the "social", exposing its status as "only a tiny set of narrow standardised connections which occupies *only some of the monads some of the times*" (2002, 10; emphasis added). Following these theoretical principles, I advance that going viral is an apt term to describe the ecology, the "chaos, [the] brew" of the spread of cultural material online and its material consequences (2002, 10).

Going Viral: A Microhistory of Viral Logics Online

The language of virality appears to have been first applied to online media by cultural theorist Douglas Rushkoff in his 1996 work *Media Virus! Hidden Agendas in Popular Culture* (Sampson and Parikka 2020). Rushkoff outlines the phenomenon of the "Internet viral manifesto", a term which utilizes the characteristics of the infectious computer virus to describe the spread of an online message (1996, 249, 254). Through documenting "the growing effort by computer users to exploit the viral media to conduct viral ideas", Rushkoff provided the foundation for the dominating logics of "going viral", foretelling the future of shareable content online (1996, 253).

"Going viral" was further examined using a model that universalized the virus to apply its logics to a wider range of digital culture. Understandings of contagion in the online sphere have become especially pertinent as the global economy experienced neoliberal financialization and subsequent digitization in the 1990s that increased the importance of and reliance on online financial systems, increasing the potential of computer viruses to "'mak[e] banks sick' and

annihilating the infrastructural basics of organized society" (Parikka 2020, 301). In the early twenty-first century, a model of viral digital culture was advanced by Jussi Parikka and Tony Sampson, who underlined the universal virus's "transversal contagion", or the idea that "going viral" constitutes a complex assemblage of relational and environmental factors (2020). According to this model of virality, the relations produced by contagion can (re)produce and alter the subjectivities of those within the virus's ecology (2020). The worldmaking potential of such an ecology is evident in "the very real viral event of Covid-19 [that] is currently producing its own reality according to which our habits and worlds must bend and adapt" (2020).

Developing a complex conception of digital virality and its material consequences is essential for the forthcoming analysis of the ramifications of social media discussion of COVID-19 on the offline world. Such an analysis is necessarily a "digital-materialist contagion theor[y]", as it considers "going viral" to be no longer divisible into online and offline spheres (Mitchell and Münch 2019, 112). Following Peckham, I advance that further insight can be gained on the workings of this contagion through the "viral chatter" analogy (2019). Viral chatter is a term typically used to describe an infectious disease that develops through repeated animal-human contacts, and Peckham extends this term to illustrate the "incessant low-level and fast-paced" communications between the biological virus and the social, networked response to a virus (2019, 141, 148). The following chapter will critically examine this chatter and its relation to the phenomenon of going viral through the lens of the COVID-19 pandemic.

Chapter 3: Changing Culture, Changing Covid

COVID-19: The Medical Context

While obvious, it cannot be overstated: the COVID-19 pandemic is a unique event in the modern history of contagion. When compared to other recent pandemics, the power of COVID-19 to rapidly and vastly alter social relations demonstrates the ways in which contemporary forms of social and technical organization have fundamentally altered the spread of infectious disease.

COVID-19 is principally set apart from other recent pandemics in its virulence. At the conclusion of the H1N1 pandemic, 18,500 official deaths were recorded, though epidemiologists estimate actual deaths could be as high as 575,000 (Gomes da Costa et al. 2020, 1798); at the current time of writing (March 2021), the COVID-19 pandemic has claimed over 2.7 million lives ("COVID-19 Map" n.d.).

While the 2009 H1N1 pandemic caused a brief period of mass panic, social distancing measures were never recommended by medical authorities, so restaurants, concerts, and schools remained open as normal throughout the pandemic (SteelFisher et al. 2010, 1). The COVID-19 pandemic was instead characterized by fast-moving and monumental changes across many different institutions. Initial media coverage of the COVID-19 outbreak in January 2020 fixated on the case fatality rate (CFR) of COVID-19, which was reported to be 15%, or 6 of the first 41 patients reported (Rajgor et al. 2020, 777; C. Huang et al. 2020, 497). While the COVID-19 CFR has since been lowered as more detailed statistics are compiled, the initially high figure led to increased media attention on the virus (Head et al. 2020, 5; Rajgor et al. 2020, 776). The first case of COVID-19 in the United States was reported on January 20; on January 23, the Chinese government placed the region of Wuhan, the alleged epicenter of the outbreak, into lockdown

(Head et al. 2020, 4–5). News coverage and COVID-19 cases both increased in February 2020, with the coronavirus officially receiving the moniker COVID-19 and the first cluster of patients in the US being identified in a Washington nursing home (2020, 6–7). In early March, the media narrative began to shift towards one of uncontrolled contagion, as COVID-19 spread beyond Asia to Western Europe (2020, 7). On March 11, the World Health Organization officially declared COVID-19 a pandemic (Adhanom 2020). With that official designation, just three months from the first reported case of COVID-19, the world shuttered seemingly overnight (Head et al. 2020, 8). As cases of COVID-19 skyrocketed, lockdowns and shelter-in-place orders were announced in European countries, then in the United States, and restaurants, schools, and stores closed indefinitely (2020, 8–9). The world entered a state of quarantine not seen since the Spanish flu pandemic of 1918. While early twentieth century citizens could only access the outside world through newspapers and telephones, isolation in the time of COVID-19 would be broken by the internet ("How Telephone Operators Helped People Connect During the 1918 Flu Epidemic" 2020).

As increasing numbers of people were forced into quarantine, another unique feature of the COVID-19 pandemic became apparent: a large number of people were acquiring information from non-mainstream, non-traditional sources (Cuello-Garcia, Pérez-Gaxiola, and van Amelsvoort 2020, 198). While misinformation about H1N1 was spread through the internet, social media platform use was much less popular than in 2020, as the number of Twitter accounts has risen from 30 million in 2010 to 330 million in 2019 (Tankovska 2021). COVID-19 is the first large-scale pandemic of the Information Age, allowing for an unprecedented examination of the ways in which social media platforms have changed public reception, dissemination, and interpretation of information. The disinformation proliferated on the internet

about COVID-19 has been termed an "infodemic" by public health officials (Cinelli et al. 2020). Depoux et al. note that "a striking particularity of this crisis is the coincidence of virology and virality", as information about the virus reached many parts of the world before the disease did (2020, 1).

However, while the term *infodemic* implies a connection between contagion and information, I argue that casting online information about COVID-19 as its own epidemic separable from COVID-19 is not substantial enough. Instead, this information and the material behaviors and consequences it encourages are fundamentally part of the pandemic itself. When viewed through this more integrated framework, WHO Director General Dr. Tedros Adhanom's comment that "misinformation on the coronavirus might be the most contagious thing about it" takes on critical new meanings (2020).

COVID-19: The Political Context

While social media facilitates the spread of information from unverified sources, the existence of social media platforms does not automatically imply or cause the proliferation of *mis*information. Mere access to a platform for information dissemination may help facilitate the production of misinformation, but the unseating of the scientist and the expert in favor of the (alleged) everyman is entrenched in a much larger, older, and more complex political context. The global turn towards neoliberalism as a primary "regulative force, political rationale, and mode of governmentality" in the late twentieth century has constructed accumulation as the primary logic of society, resulting in the privatization and monetization of almost every facet of life (Giroux 2008, 589–90). Neoliberalism is defined in this thesis as the late twentieth century dissembling of New Deal era welfare programs to "enhance corporate profit rates" through promoting "policies of fiscal austerity, privatization, market liberalization, and governmental

stabilization" that concentrated power upwards (Duggan 2003, xi–xii). While part of neoliberalism involves the apparent depoliticization of economics as a purely technical field, neoliberalism is fundamentally political and cultural, so neoliberal authorities only value the academic and scientific opinions of experts who advocate for policies that result in increased centralization of wealth and power (2003, xiv). This neoliberal brand of rationality has increasingly disregarded the role of scientists and experts who complicate and oppose the short-term production, accumulation, and upward filtration of capital, cautioning against the long-term consequences of such models (Giroux 2008, 590; Merkley 2020, 26). This antagonistic relationship is strikingly exhibited by the oil industry's campaigns to discredit scientists whose research demonstrated evidence of anthropogenic climate change at the end of the twentieth century (van den Hove, Le Menestrel, and de Bettignies 2002, 7).

The denigration of experts was further accelerated by neoliberalism's collision with populism. In the unrelenting neoliberal quest for the consolidation of capital, the powerful willfully condone and encourage "social exclusions, widespread human suffering, and ongoing collective misfortune" (Giroux 2008, 598). As the masses are presented with opportunities to accumulate wealth that are increasingly more convenient and rapid *in theory*, they are simultaneously reduced to "redundant and disposable" individuals by neoliberalism, and access to resources becomes increasingly unattainable in practice (2008, 600, 604). Some members of alienated classes grow increasingly frustrated with traditional politicians and begin searching for politicians who break the mold of the stereotypical bureaucrat (2008, 600). Often, these politicians purport to be "average Joes", valuing the opinions of laymen over those of allegedly overeducated elite experts who are often blamed for the financial struggles of middle- and lower-class people (Merkley 2020, 27). Lord Chancellor of the United Kingdom Michael Gove

illustrated this populist tenet perfectly in 2017, famously stating "I think the people of this country have had enough of experts with organisations with acronyms saying that they know what is best and getting it consistently wrong" (Portes 2017).

However, the populist politician often has other motives for the refusal of science and experts. Often involved in businesses that benefit from narratives that oppose scientific consensus, populist politicians frequently have ulterior motives for constructing their own knowledge program that denigrates statistics and facts. The COVID-19 pandemic has provided more than a handful of examples of this phenomenon, most notably when Georgia Senator Kelly Loeffler profited off the sale and purchase of stocks related to oil and video conferencing software at the beginning of the pandemic as she simultaneously downplayed the crisis's severity to the public (Kertscher 2020). Put another way, it is in the personal interest of many populist politicians to construct an arena where misinformation is not only welcomed but valued and viewed as a legitimate resistance to perceived corruption of elite technocrats. The result is a concerted campaign to claim that nefarious actors have influenced the Western knowledge program that underpinned many policy decisions in the twentieth century, with some populists even calling for an outright departure from technocratic values (Merkley 2020, 28). This disavowal of the traditional delineation of fact and fiction is an incredibly potent biopolitical technology of power for the neoliberal populist, allowing them to nimbly but covertly manage both the bodies that comprise their base and the marginalized bodies which are rendered increasingly disposable in times of economic hardship (Giroux 2008, 602–4).[11] As the violent insurrection at the United States Capitol building incited by Donald Trump's provably false claims of election fraud demonstrates, this alternative program of knowledge is convincing to a

[11] It must be noted that as economic inequality worsens, these two populations increasingly overlap with one another.

sizable segment of those hurt by increasing economic inequality, which was ironically caused in part by decisions of the conservative proto-populists that paved the way for the rise of current populist leaders (Benkler et al. 2020, 1; Jay et al. 2019, 419–20).

In *Designs on Nature*, Sheila Jasanoff details other ways in which politicians and policymakers make use of certain framings of biotechnology to satisfy their electorates (2005). She examines case studies from embryonic stem cells to genetically modified foods, declaring that "the central questions of citizens' rights to intervene in technological innovation, and the terms on which citizens might be entitled to do so, were addressed, tacitly or explicitly, in the framework of national politics" (2005, 121). I argue that in a similar way, the twenty-first century political environment fostered conditions that encouraged the creation, spread, and use of online misinformation for political gain. Such anti-science attitudes are thus not simply examples of irrationality- instead, they may represent intentional attempts to set the boundaries of political groups. These boundaries "are instrumental to securing resources and power" and may be used politically to convince voters that one party's beliefs are more accurate "understandings of the environment in which they are embedded" than the opposition's beliefs (Tan 2021, 9).

The move away from traditional standards of expert-centric knowledge production and validation is not only restricted to politicians; indeed, this biopolitical technology of control has bled into many facets of society, even insidiously influencing the very institution it claims to oppose: scientific research. Neoliberalism has monetized scientific research, effectively creating markets where funding is dominated by metrics like the number of views and citations a specific paper garners, which motivate scientists to generate as much attention as possible for their research (Nelson 2004, 462–63). The internet has allowed for a decentralization of knowledge production and dissemination, allowing scientists to subvert long-held standards of peer review

and external validation, procedures which are perceived by some resistant scientists as located within elite, outdated, and bloated networks of scientific power (Berquist 2017, 1–2). Eager to be the first scientist to publish research about a popular topic, scientists have taken to publishing their research in forums such as research repositories specifically designed to forgo any review process, called *preprint servers* (Shehata, Ellis, and Foster 2015, 1). These preprint servers do allow for increased equity in visibility of research and increased opportunities for collaboration between researchers, as they are open-access and not hidden behind a paywall (as is the case with many journals) (Fry, Marshall, and Mellins-Cohen 2019, 2). However, for nonscientists who are not familiar with the differences between preprint servers and journals, such repositories may have the illusion of peer-reviewed credibility and can fuel misinformation as a result (Timberg 2021). A prominent example of this phenomenon is a paper released on online repository Zenodo by virologist Li-Meng Yan which alleges that the Chinese government commissioned the creation of the COVID-19 virus in a laboratory (2021). Despite condemnation from major American scientists and journals, Yan was heralded as a brave resister by conservatives, and her paper spread widely in far-right circles online, since her research lent credibility to their unsubstantiated xenophobic claims against the Chinese government (2021).

Though preprint servers are gaining popularity, the lack of moderation of misinformation is a much more urgent issue on social media platforms. Complex philosophical questions about what constitutes misinformation and how misinformation should be labeled or removed from social media platforms have sparked accusations of censorship and mass migrations to less mainstream platforms (Stewart 2021, 4–5). Indeed, Parler, a social media platform founded on American conservative principles valuing freedom of speech, touts lack of moderation as one of its primary benefits (Aliapoulios et al. 2021, 1). The right to “freedom of speech” is itself

contingent upon specific historical and political environments, further complicating issues of content moderation on social media platforms which exist in multiple countries (Brown and Peters 2018, 525). Because of these complexities, social media platforms are unable to effectively moderate scientific information, and misinformation is often spread without cited sources (Goel and Gupta 2020, 2). This unlinking of information from its creator allows for populist anti-intellectualism to prosper, as conspiracy theories are often strengthened by their anonymity, supporting the underlying populist principle that government elites are lying to maintain their unjust hold on power (M. Thibault 2016, 393–94).

COVID-19: The Case Study

The medical and political context within which COVID-19 is embedded make it an ideal case study for the examination of a new kind of Information Age contagion. This biomedical-socioinformatic relationship is much more than that of a parallel pandemic/infodemic. Instead, this updated conception of contagion recognizes that, as Joost Van Loon suggests, "it may be analytically infeasible to divide real and imaginary risks associated with outbreaks within network ecologies" (Sampson 2018, 158). Examining contagion in informatic, social, political, and biological worlds that are becoming increasingly inseparable necessitates a return to the Tardean tendency to consider contagion as eschewing disciplinary boundaries (Lawtoo 2019, 44). Through this lens, viruses can no longer be constructed as apolitical genetic material wrapped in a protein casing ("Definition of VIRUS" n.d.). The reality of COVID-19, or any infectious disease in the twenty-first century, is not strictly biological; to understand COVID-19, we must grant the socioinformatic the same importance as the biomedical. Viruses are not neutral organisms that merely *reveal* the politics of the societies they are embedded within, a narrative that is all too common in COVID-19 media. Viruses *themselves* are political,

possessing a socioinformatic footprint which contributes to hegemonic politics as much as they are shaped by them.

The contagiousness of microbes in the Internet Age is still invisible and persistent, but contagion has transcended terrestrial limits. Both information and misinformation propagated on social media platforms are contagious, catalyzing widespread behavioral change, as with both the adoption of civilian mask-wearing after the CDC reversed ots initial recommendation against masks and began to recommend them in April 2020 and with the subsequent refusal of many Americans to wear masks to protect others from the spread of COVID-19 (Molteni 2020; Kiska and Weiss 2020; Taylor and Asmundson 2021, 3). Bound up in every moment of transmission of COVID-19 from an unmasked person to a masked one, a moment that could have been prevented, are politics: the confluence of the populist values that cast scientists as an enemy, the misinformation that social media platforms did not address, and the replication of existing patterns of marginalization which dictate what kinds of people can forgo safety recommendations without consequences. Information technologies are a fundamental part of these politics, and as such, are a fundamental part of the contagiousness of COVID-19 (and subsequent infectious diseases). As previously mentioned, existing research on socioinformatic contagion and biomedical contagion consider these processes separable by their realms- as the infodemic and the pandemic; instead, I will argue that a rhizomatic, transdisciplinary approach to contagion can help make its complexities more legible (V. Martin 2017, 6–7). For contagion's most integral, interesting complications exist in its *intermezzos*- the spaces between: its "interbeing[s]", interactions, intermedia" (Deleuze and Guattari 1987, 25).

COVID-19: The Contagion

This case study for conceiving of contagion as a biomedical-socioinfomatic rhizome must adequately address an important question to prove its salience: *How has the internet constructed a different COVID-19 than if COVID-19 had occurred before its advent?* I argue that while the links between biomedical and socioinformatic contagion were still present before the internet, the internet has allowed for information transmission to greatly outpace disease transmission, shifting the logics of contagion and granting the socioinformatic more influence in the gestalt composition of a disease's contagiousness (Depoux et al. 2020, 1). In essence, the internet has helped to construct the environment through which disease spreads as a rhizome through the "deterritorialization" of information, allowing for the near constant assemblage and reassemblage of both human and information nodes that would otherwise have remained disconnected (Deleuze and Guattari 1987, 21). Some critical theorists have opposed the conception of the internet as rhizome, suggesting that because the internet is primarily driven through search engines, which employ hierarchies to organize information, a rhizomatic conception of the internet is inaccurate to how it actually functions (Hess 2008, 35). However, I contend that it is social media, not search engines, that contribute most heavily to the irregular connections that make the biomedical-socioinformatic rhizome possible. Another potential objection to casting the internet and specifically social media as a rhizome is the concept of heterogeneity; seemingly, all users are homogeneous as single human individuals (Deleuze and Guattari 1987, 10). However, a more in-depth examination of a social media ecology that includes automated bots, accounts run by groups or corporations, and content from varying platforms, media, and sources finds that the internet is heterogenous (Chu et al. 2012, 811; Mamic and Almaraz 2013, 858). Furthermore, the collision of biomedical and socioinformatic

contagion is itself a conjunction of heterogeneous elements (Deleuze and Guattari 1987, 242). Though content mediation and algorithmic constraints do exist on social media platforms that limit the randomness of interaction required for a true rhizome, I argue that this model is still useful for making sense of an Information Age contagion that is much more than a cyclical feedback loop (Wang and Huberman 2012, 3–5).

Put more simply, addressing contagion in the Information Age is not as simple as tallying the number of online mentions of a disease or its symptoms, and the theoretical underpinnings of our conceptions of contagion should instead reflect a more holistic understanding of interactions between the biological, social, and technological. Early experiments in digital epidemiology illustrate the consequences of overemphasizing the role of any one dimension of the biomedical-socioinformatic rhizome.

In the late 2000s, Google released Google Flu Trends, a digital epidemiology initiative which sought to track cases of seasonal influenza based on an algorithm that used search data to predict cases in the coming weeks (Lazer et al. 2014, 2). However, in 2009 and again in 2013, the program reported predictions for flu cases that were much higher than observed case numbers (2014, 2). The supposed culprit of the errors was increased searches by healthy people driven into panic due to increased media coverage of influenza, both during the 2009 H1N1 pandemic and the 2013 flu season, which was forecasted by experts to be severe (Butler 2013, 155–56). Researchers also identified that Google's algorithm shifted in 2012 to suggest diseases to users who searched for symptoms that matched their diagnostic criteria, which could have further increased searches for influenza (Lazer et al. 2014, 4). The Google Flu Trends algorithm could also have been influenced by intentional searches by groups who stood to gain from public panic about influenza (2014, 4). Google Flu Trends is a microcosm of the larger internet ecosystem,

but it illustrates the necessity of conceptualizing the relationship of biomedical and socioinformatic contagion as an immensely complex one, not to be oversimplified as big data.

Instead, as stated in the previous section, the complexities of the symbiotic biomedical-socioinformatic relationship call for an entirely different theoretical approach than the assumptions that underlie digital epidemiology. Digital epidemiology represents a singular still image of the high definition video of this extremely complex phenomenon, casting the internet as merely society flattened onto a screen. I argue that this relationship transcends the insight that internet activity can help epidemiologists identify outbreaks. The internet is much more than a cartographic representation of COVID-19's spread; instead, the internet is itself both a product and an influencer of the societies it is embedded within (Fuchs 2008, 123). Furthermore, as a "technological infrastructure enables and constrains human cognition, communication, and cooperation", the internet and social media platforms specifically are uniquely situated to create and alter societal norms and knowledge (2008, 122). Social media platforms enable a biomedical-socioinformatic ecosystem "with no verticality, no transcendence... only space, a perpetually redesigned space" (Fournier 2014, 121). Through making this system possible, the internet influences biological contagion to an even greater extent than commonly recognized societal factors of contagion like urbanization do. The internet is a fundamental part of the COVID-19, just as its protein spikes are (Y. Huang et al. 2020, 1141).

Decentering linear conceptions of cause-and-effect from the relationship between the biomedical and the socioinformatic in COVID-19 and instead treating the internet as opening new non-hierarchical relations allows for a necessary, yet radical reconceptualization of what contagion means when an infectious disease is entangled within the World Wide Web. Indeed, Heidi Larson's prediction that "the next major outbreak… will not be due to a lack of preventive

technologies. Instead, emotional contagion, digitally enabled, could erode trust in vaccines so much as to render them moot" can be read through this rhizomatic framework (2018, 1). Biologically, though COVID-19 was a novel virus, researchers were equipped with the basic scientific technology to identify it relatively quickly; within three months of the first cluster of cases in Wuhan, China, the virus was classified as SARS-CoV-2 (Kim et al. 2020, 1–2). It is at this point that, in a Camusian world of intense hierarchies and impermeable borders,[12] the identification of an airborne virus could have led to immediate lockdowns, both of information and people. However, for the contagion of COVID-19, the internet opens up the possibility of what Deleuze and Guatarri term "lines of flight", or "infinitesimal possibilit[ies] of escape" (Deleuze and Guattari 1987, 21; Fournier 2014, 121). The internet has fostered the ideal environment for these leakages in control, both of information about COVID-19 and the virus itself, structuring and restructuring contagion as an ever more complex, interwoven, inseparable assemblage of factors. Deleuze and Guattari observe that "[w]e form a rhizome with our viruses, or rather our viruses cause us to form a rhizome with other animals" (1987, 10). The internet interposes the socioinformatic into this relationship, allowing contagion to create new forms of relationality. The dimension of contagion that has perhaps been most complexified by the internet is the carrier; the transmitter of contagion, that, rather than being restricted to a human form, is now its own assemblage of human and more-than-human factors (Müller and Schurr 2016, 1).

[12] In *The Plague*, Camus describes a town that shuts its borders to all people and goods as a disease begins to spread both within and outside of the town ([1947] 1991). The isolation is absolute as the town shuts its gates indefinitely.

COVID-19: The Carrier and Colonizer

Fully examining the biomedical-socioinformatic rhizome of COVID-19 requires a return to the carrier, the organism that possesses the potential to render contagion's intermezzos visible and knowable. However, the unidentified, asymptomatic carrier troubles the binaries of infected/uninfected, diseased/healthy, and contagious/benign, further obscuring moments of transmission and the character of contagion. In other words, a complicating feature of COVID-19 is that a significant portion of people are considered asymptomatic carriers;[13] that is, they do not experience symptoms of disease, but can transmit the disease to others (Pollock and Lancaster 2020, 1–2). These individuals are more likely to be assigned the identity of *super-spreader*, as they can infect many others as they go about their activities as normal instead of isolating once they experience symptoms of COVID-19. Super-spreader is not a term invented during the COVID-19 pandemic, however. The term's origins are in network theory, where it is defined simply as "the nodes in a network that can maximize their impacts on other nodes" (Madotto and Liu 2016, 1). Such super-spreaders can be but are not necessarily directly tied to a large number of other nodes in the network; they may also bridge two networks that would not otherwise interact (Valdez et al. 2018, 2). An asymptomatic carrier may become a high-impact node in or between networks unknowingly, working in a high-contact job while the virus replicates in their body and leaks into the air they exhale, for example. Accordingly, the asymptomatic super-spreader calls into question matters of blame and intentionality that are typically associated with the transmission of diseases. Patients with diseases with tangible symptoms are often stigmatized for "knowingly" spreading disease, as with alleged "Patient

[13] Estimates of what proportion of COVID-19 cases are asymptomatic have varied greatly, from 17-20% of cases to 80% (Pollock and Lancaster 2020). However, it is clear that a significant number of cases are only identified because of a positive test result.

Zero" Gaétan Dugas, a flight attendant who was accused of bringing HIV to the United States (though this theory was later disproven using genetic evidence) (Jon Cohen 2016, 1013). NBA player Rudy Gobert was similarly maligned in the media after he tested positive for COVID-19 after intentionally touching press conference microphones at the beginning of the pandemic, a gesture intended to mock safety precautions (Bagley 2020). However, because contagion functions at peak insidiousness and efficiency in asymptomatic super-spreaders, remaining invisible in such individuals unless they complete a COVID-19 test, the spread of the virus may never be traced back to these individuals. In this way, the COVID-positive asymptomatic super-spreader demonstrates contagion's ultimate transcendence of human agency, as it occupies bodies not to affect individuals, but to spread between them. The biological super-spreader is joined by another classification of super-spreader, the *remote carrier*, that replicates this queering of agency in the space between the online and material worlds. Just as asymptomatic COVID-19 patients unknowingly leak virus into the air, online super-spreaders may leak information that unknowingly leads to the infection of others, all while being uninfected with the disease.

The movement of the asymptomatic carriers embodies a "line of flight", allowing contagion to terraform the topology of the rhizome (Fournier 2014, 121). The historical difficulties of tracking carriers of contagion detailed in Chapter 1 are only magnified when the carrier becomes a more-than-human technosocial assemblage. The physical movement of individuals may be restricted, but the internet has opened up the category of carrier and the modality of the carrier's transmission, allowing for a contagion to spread between entities that are not in close physical proximity with one another. It is this movement that gives the Information Age biomedical-socioinformatic rhizome its dynamicity as "a map that is always

detachable, connectable, reversible, modifiable, and has multiple entryways and exits and its own lines of flight" (Deleuze and Guattari 1987, 21). While a COVID-19 infection cannot be transmitted from one online user to another, ideas, norms, and values systems can be carried from one community to another, gradually altering a susceptible population's conception of reality. A hypothetical version of such a scenario follows.

A viral Youtube video posted on Facebook of a man vaping while wearing a surgical mask to supposedly (and incorrectly) demonstrate that masks are ineffective at trapping aerosols containing COVID-19 circulates (Kertscher 2021). A Facebook user, D, finds the video compelling evidence against mask mandates, and posts a link to the video on his public Twitter account for his followers, who include fellow fans of the sports teams the D likes, users who share D's political beliefs, D's friends and family, and others to view. Though D's followers did not initially engage with D's account for biomedical content, they are now susceptible to viewing D's post. Furthermore, if D's tweet gains traction through retweets, increasing its reach, even users who never made a conscious choice to follow D will be exposed to the anti-mask video. If even one user that views D's tweet decides to forgo a face mask and happens to be COVID-19 positive, the probability of transmitting the virus to another individual increases significantly, even if the other individual is wearing a face mask themselves (Brooks and Butler 2021, E1–2; Ueki et al. 2020, 4). Without even being positive for COVID-19 themself, D has the potential to become a carrier of COVID-19, remotely assisting in the spread of the infection between two individuals that D has never met. This scenario can be replicated many times on the internet, creating intermezzos where none would have previously existed. The biomedical-socioinformatic rhizome faces not only COVID-19's biomedical asymptomatic carrier, but a new generation of remote carrier: individuals whose immune systems may never actually encounter the virus but

can still contribute to its spread. To fully understand the remote carrier requires a microhistory of the colonial relations bound up in the notions of the biomedical carrier.

The carrier has historically been associated with colonialism and the oppression of marginalized peoples, and any exploration of the carrier that does not examine its functionality as technology of neocolonialism fails to fully situate its role in transmission of material- whether cultural, biological, or technical. Historical examples of colonial carriers are abundant, including Europeans carrying smallpox to indigenous peoples in the Americas and tuberculosis to indigenous African and American peoples (Kelton 2015, 4–5; Brynildsrud et al. 2018, 1). These diseases, termed "'virgin soil' epidemics" by historians, were often deadlier to indigenous peoples than Europeans, as most Old World diseases were novel viruses in newly colonized environments, so indigenous groups often had no immune protection against such diseases (Noymer 2011, 178–79; Dobyns 1993, 273–74). In the nineteenth and twentieth centuries, colonizer/carriers also catalyzed changes to the way indigenous societies operated and socialized, imposing hegemonic "civilizing" policies that helped facilitate the spread of infectious disease through encouraging the movement of people through industrialization (Greene et al. 2013, 44; Tilley 2016, 744). In other words, the policy decisions of colonizer/carriers increased the likelihood of contagion spreading through non-biological means.

Though colonizer/carriers were largely responsible for the introduction of novel diseases to their colonies, colonial subjects were often blamed for the spread of native diseases to colonizers (Greene et al. 2013, 43). While the colonizer/carrier's inherent power in determining the narrative of colonization allowed for their anonymity, invisibility, and immunity from blame, the colonial subject/carrier made contagion visible to the colonizer, allowing colonizers to legitimate their stereotypes of native populations as possessing "backward morals and

unhygienic behavior" (2013, 43). In the United States's late nineteenth to early twentieth century military occupation of the Philippines, for example, Filipino natives were constructed as carriers of their own, and their status as carriers of diseases which had a greater likelihood of harming US troops reinforced conceptions of indigenous peoples as "potentially unhygienic *insurrectos*" (W. Anderson 2008, 59). The categories of colonizer/carrier and colonial subject/carrier both support colonial notions of white supremacy and inherent inferiority of the colonial subject, with the colonizer/carrier bringing novel contagions from the colonizing nation and further contributing to the spread of contagion through structural changes to native societies and the colonial subject/carrier identity being assigned to native peoples to further justify the necessity of civilizing processes.

Similarly, the remote carrier in COVID-19 manifests as a neocolonial technology of control embedded within the larger biomedical-socioinformatic rhizome. The replication of the colonizer/carrier and the colonial subject/carrier is evident in the early epidemiologic findings of COVID-19. The neocolonizer/carrier in COVID-19 is epitomized in the United States by the White, far-right spreader of misinformation on social media. These right-wing networks are even more colonial than more mainstream information networks in the way that they take content and ideological pillars from far-right sources and bring such material to more popular social media platforms (Poole, Giraud, and de Quincey 2020, 4), with the goal of "red-pilling", or indoctrinating previously nonpolitical users with "the truth" of alt-right extremism, resisting the alleged brainwashing of mainstream politics (Davey, Saltman, and Birdwell 2018). However, these attempts to resist the contagiousness of more common public opinions actually make alt-right communities more likely to participate in the contagious spread of misinformation, as initial findings demonstrate that Republicans are more likely to share misinformation about COVID-19

on social media (Lazer et al. 2021, 9).[14] COVID-19 denialism on the far-right is rendered normal, acceptable, and contagious because traditional standards of scientific evidence are not valued or respected, as is typical of the relationship between populism and anti-science attitudes demonstrated earlier in this chapter (McKee et al. 2020, 2–3). This culture of denialism of COVID-19 severity, safety precautions, and public health initiatives leaks onto social media platforms, and, as with the example provided earlier in this section about circulating anti-mask rhetoric, the remote carrier could influence individuals whom they possess no real-world relational ties with to engage in behavior like refusing to social distance and wear face masks, increasing the likelihood of the spread of COVID-19. The remote neocolonizer/carrier spreads both specific misinformation about COVID-19 and, more implicitly, their underlying populist value system through the biomedical-socioinformatic rhizome (2020, 3–4). Both of these streams of contagion have detrimental effects on the lives of the groups that populism and white supremacy oppress (Meer 2019, 501–2).

Misinformation about COVID-19 can travel via remote carriers from neocolonizers to neocolonial subjects, metamorphosing within the biomedical-socioinformatic rhizome to become information that could change the opinions of people of color, creating new remote carriers. Far-right circles originated the conspiracy that philanthropist Bill Gates is profiting from COVID-19 disease surveillance, and when this information was circulated on social media platforms, remote carriers spread this claim through the rhizome to Black Twitter, which altered the misinformation to match its predominant value system, "cast[ing] the virus as a black population reduction device" which amounted to "racial population shaping" and characterizing social distancing as additional license for police violence (Ross 2020). The spread of information that contributes to

[14] As the COVID-19 pandemic is ongoing, data are preliminary and not comprehensive.

COVID-19 denialism from remote neocolonial/carrier white supremacists to communities of color is itself perpetuating white supremacy, as systemic violence against people of color has contributed to structural inequities and shortfalls of funding in healthcare in communities of color (Gracia 2020, 518–19). Furthermore, much like the historical colonial subject/carrier, Black and Brown people are disproportionately blamed for the spread of the disease, as when Nebraska Governor Pete Ricketts cited immigrant meatpackers (who are predominantly Black and Brown) as the cause of the state's rising COVID-19 cases (Stella 2020). Hidden beneath this statement is the reality that people of color are "overrepresented in some of the lowest paying vocations and have fewer jobs with employer-provided benefits" especially healthcare (Gracia 2020, 519). When these structural disadvantages meet information sources from post-asymptomatic neocolonizer/carriers that encourage COVID-19 denialism, higher rates of COVID-19 infections, debilities, and deaths will result among people of color than White people. This prediction is supported be preliminary statistics on life expectancy changes in the first six months of 2020, as Black individuals experienced a life expectancy decline of 2.7 years from mid-2019 to mid-2020, Hispanic individuals experienced a decline of 1.9 years, and White individuals experienced a decline of 0.8 years (Arias, Tejada-Vera, and Ahmad 2021, 1–2). COVID-19 and the carrier relationships it enables functions as a neocolonial instrument within the biomedical-socioinformatic rhizome, ultimately culminating in the oppression and death of people of color. That COVID-19 is entangled within this web is fundamentally political; contagion is politics by other means.

COVID-19: The Cyborg

In *Cyborg Manifesto*, Donna Haraway details the erosion of the discrete boundaries of human/animal, nature/culture, and physical/non-physical, instead invoking the cyborg, "a hybrid

of machine and organism" (Haraway 2006, 117, 119–20). The biomedical-socioinformatic rhizome necessarily renders COVID-19 a cyborg, an ever-changing amalgamation of technical, social, biological, and medical parts. This chapter has sought to advance that our thinking about COVID-19 suffers without conceiving of the virus as an element in an infinitely complex rhizomatic structure that also includes but is in no way limited to the internet, social media platforms, and individuals.

This chapter has also insisted that COVID-19 as a virus *is* political. To again quote Haraway, the "cyborg is our ontology; it gives us our politics" (2006, 118). Comprising key structural components within the biomedical-socioinformatic rhizome are the elements I have elaborated upon, all of which are political in nature: digital epidemiology's overemphasis on the internet as a mirror to the "real world", the influence of populism on views of science, the reproduction of colonial relationalities that culminate in the disproportionate deaths of people of color. Additionally subsumed within this rhizome are more hidden, political elements of sociotechnical society, particularly the internet's inseparable ties with capitalist extraction and production, which contribute to the conditions behind the construction and governance of the social media platforms that enable the category of remote carrier (Mezzadra and Neilson 2019, 148). That these politics are obscured is not merely coincidental; as cyborg, contagion is by definition "ubiq[uitous] and invis[ible]" (Haraway 2006, 121). The vaporous invisibility associated with contagion throughout history and throughout this thesis is finally legible when considering contagion as cyborg. Through this cyborgian framework, contagion has always troubled the boundaries between technology and human, as a virus, itself a nonliving entity, enters the body's cells to reproduce, utilizing the human's biological manufacturing plants for the reproduction of genetic material alien to the body (Deleuze and Guattari 1987, 10). As

contagion was applied to fields outside of biology, it also queered the boundary between self and society and conscious and unconscious, raising questions of the limits of human agency and individuality (Lawtoo 2019, 44). The introduction of the internet only increased the potential for the entangling of the human, the social, the biological, and the informatic. Such contagion in COVID-19 amalgamates the algorithmic and the anthropological, allowing for the remote carrier to produce potential transmission events without carrying the disease or even being fully human,[15] problematizing traditional notions of agency and intervention in infectious disease. While an asymptomatic carrier could be identified through testing and forced to isolate, a remote carrier's role in transmission may be so abstract and nebulous that they may never be identified,[16] and even if they are identified, the meaning, utility, and possibility of quarantining a carrier that is neither fully online nor fully offline present their own challenges.

Though potentially radical, this rhizomatic troubling of boundaries, contagion's cyborgian "ether, quintessence", may frustratingly lead to the reproduction of existing hierarchies and modes of power, as is evident in the activity of the neocolonial remote carrier (Haraway 2006, 121). However, conceptualizing contagion as rhizome enables lines of flight and contagion as cyborg enables "transgressed boundaries, potent fusions, and dangerous possibilities" (Fournier 2014, 121–22; Haraway 2006, 121). Within the complications of contagion lie the possibility of resistance. Through COVID-19, we can begin to imagine a politics of contagion that reimagines biomedical-socioinformatic borders, an idea I will explore in the final chapter of this thesis.

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[15] As is the case with "bot" Twitter accounts that retweet misinformation (Shao et al. 2017).

[16] It is understandable to think that tracing a remote carrier's online activity is easier than an asymptomatic carrier's movements, since that tracking requires the asymptomatic carrier to be physically tested. However, by "abstract and nebulous", I am referring to the way that the remote carrier's online activity may affect behaviors in ways that are not explicitly traceable or explicitly online but still have the capacity to change behavior, like viewing a social media post and not interacting with it or viewing a post on a friend's device while logged into their account.

Chapter 4: Resistances: Immunities and Complications of Contagion

Blurring Immunity

The biopolitical implications of the complex, ever-changing relationship between the biomedical and socioinformatic realms will last far beyond the conclusion of the COVID-19 pandemic. This relationship is a useful way of thinking more broadly about the natural world and its inevitable interactions with technology in the Information Age. The double network element of the Information Age virus- the idea that infectious diseases spread in networks and online information about the virus spreads in networks- makes it an especially salient example of the relationship between the biomedical and the socioinformatic, but this model can also suggest broader implications for an ontology of the biological. This thesis has sought to build upon the work of Latour, Deleuze and Guattari, and Haraway to trouble the idea that the biological is an impermeable sphere of knowledge. Indeed, in 1985, Haraway remarked that "there is no fundamental, ontological separation in our formal knowledge of machine and organism, of technical and organic" (2006, 144). COVID-19 has underscored the relevance of this decades-old theoretical work, as analyzing the virus from a purely biological perspective would produce (and has produced) major blind spots in reckoning with the pandemic.

If, as argued in the previous chapter, the virus is indeed political in its own right, and the virus's politics cannot be analyzed without considering its life in the online world, conceptions of immunity to the biomedical-socioinformatic virus must be analyzed through a similarly multimodal lens. Indeed, the biomedical-socioinformatic blurring proposed in the previous chapter renders a purely biomedical-public health plan to quell the COVID-19 pandemic a stopgap. Yes, vaccinations will eventually stamp out COVID-19 if delivered widely enough (Powell 2021). However, immunizing ourselves against COVID-19 will grant us antibodies, but

a biomedical technology alone will not and cannot address the online networks of information that have generated an increasingly numerous population of anti-science advocates, preventing many from becoming vaccinated at all (Hotez 2020, 505–6). Online misinformation that creates opportunities for the increased spread of infectious diseases will become a fixture of future pandemics, so an important question remains: *What does immunity look like in the context of the biomedical-socioinformatic pandemic?*

The blurring of the biomedical and socioinformatic that characterizes twenty-first century viruses also troubles traditional conceptions of the term immunity. Immunity is typically conceptualized as preserving the boundaries and sanctity of the self-contained, neoliberal subject, maintaining a border that assures that malicious invaders remain outside of the body, allowing the body's systems to continue operations as normal (Davis et al. 2016, 131–32). However, viewing immunity as a strategy for preserving borders and binaries is unhelpful for addressing the complex bio-techno-social interactions that occur within today's networked society. In a world where "the machine is us, our processes, an aspect of our embodiment", an effective conception of immunity cannot be purely biological (Haraway 2006, 146). Rather, an immunity that can address future pandemics in the Information Age must eschew the allure of absolutes, and instead embrace porousness and flexibility. This *network immunity*- "the idea that immune systems depend not on simply rejecting what is not-self, but on productive, ongoing relations with the other" is itself a kind of resistance to the one-dimensional thinking that has plagued our conceptions of infectious diseases, causing our responses to disease to lag behind the rhizomatic bio-techno-social world that continues to assemble and reassemble before us (Davis et al. 2016, 132).

The ever-changing biomedical-socioinformatic rhizome of COVID-19[17] necessitates a flexible, adaptable immunity; an immunity that opens up the rhizome instead of preserving notions of body sovereignty that do not and cannot exist in a world that is cybernetically connected (Haraway 2006, 120). Before an immune response even occurs, however, the virus itself's ability to resist the stability of discrete definitions, characteristics, and laws must be examined. The mutations and complications inherent to a virus complexify immunity even in strictly biomedical terms, and the Information Age virus's socioinformatic elements compound these complexities, allowing the virus to remain slippery, unable to ever be fully conceptualized and addressed before its biomedical and socioinformatic characteristics shift.

Complications and Mutations of the Biomedical-Socioinformatically Blurred Virus

COVID-19's power to trouble artificial and socially-informed boundaries is revealed within its atypical cases and emerging strains, both of the virus and of information about the virus. These complications generate a vast array of responses to the virus which all feature different amalgamations of the biomedical and socioinformatic elements of the virus. The virus itself is not a singularity, replicating itself billions of times with perfect accuracy. Instead, the virus confronts a myriad of both biomedical *and* socioinformatic factors that constitute it in very different ways each time it interacts with humans. While many encounters with the virus look strikingly similar- an individual comes into contact with someone with the virus, begins experiencing symptoms, and receives a nasopharyngeal swab test, which returns a positive result, followed by one to two weeks of unpleasant, but not unbearable symptoms- each interaction occurs between a particular human and a particular virus, each with unique features. As the popular news media highlighted again and again, lamenting the COVID-19-induced deaths of

[17] And of future pandemics, which will also be biomedical-socioinformatic in character.

young, otherwise healthy people, every pattern or rule assigned to the virus and to people experiencing it has exceptions and complications (Shapiro 2020).

The boundaries between subject categories of at-risk and low-risk, infectious and non-infectious, and sick and well are troubled as complicated assemblages of human, machine, and viral parts come together. As mentioned in the previous chapter, a Twitter account could be infectious in the sense that it spreads misinformation about COVID-19's transmissibility, convincing a group of people to engage in behaviors like gathering with others, creating a population with an increased chance of exposure to COVID-19. Conversely, if an individual who tests positive for COVID-19 immediately isolates to avoid exposing others, they could be positive for the virus but non-infectious. For some, their status as infected is discovered only through a test that depends upon an assemblage of machines, human actors, and narrow mathematical thresholds to generate a result. These asymptomatic positive individuals, then, are experiencing pathology, but, if not for a test, lack *awareness* of such pathology, and thus would not know to adjust their behavior. Once a positive test renders the individual pathological, however, the individual must behave as though they are sick, even if they detect no change in their affective experience throughout their quarantine. For others, though, instead of being ignorant to the infection in their body, it has instead lingered, bringing body systems into awareness that were previously functioning silently in the background. This phenomenon of "Long Covid" leaves its sufferers in a state of liminality, as their initial infection has waned, but their experience of quotidian life has changed drastically, often affecting their neurological, pulmonary, and cardiac function (Mahase 2020, 1). Long Covid as a concept was constituted online, as survivors experiencing non-respiratory and long-lasting symptoms of COVID-19 were dismissed by their doctors and instead found a community, and notoriety, on Twitter (Callard

and Perego 2021, 2–3). The creation of the *long-hauler*- the subject who is partially recovered from their initial infection of COVID-19 but identifies as having a worse quality of life more than two months after infection, as over 40% of one group of survivors did (Mahase 2020, 1), was birthed in the socioinformatic realm, but is beginning to be recognized as a legitimate biomedical subject (Callard and Perego 2021, 2–3).[18]

While the biomedical-socioinformatic virus can produce widely different experiences in humans, human-driven activity also has the potential to alter the virus. The identification of new mutated variants of COVID-19 in late 2020 and early 2021 has left public health officials on high alert ("About the Variants" 2021). The increased attention on mutations has caused public health messaging to reiterate the importance of stopping the spread of the virus, but with another motivation: that "'the virus can't mutate if it can't replicate'" (Sheehan 2021). Through the framework of biomedical-socioinformatic blur, online interactions could play a role in inducing these genetic changes in the disease. Put differently, online misinformation could not only be leading to more infected humans, but it could produce a virus that is more physiologically infectious.

These complications and mutations[19] demonstrate that the biomedical-socioinformatic virus is multiple and enigmatic, troubling dichotomies, borders, and treatments. If we hope to live through and with each biomedical-socioinformatic virus we experience, our conceptions of immunity must be similarly multiple and flexible.

[18] Perhaps the sheer number of long-haulers and their association with the COVID-19 pandemic will help popularize non-curative attitudes towards disability caused by infectious disease. In "Of Cures and Curses: Toward a Critique of Curative Reason", Bharat Jayram Venkat advances treating the treatment of illness as a "dynamic counterpoint", and as the scope and length of Long Covid for its sufferers becomes clearer, such approaches may gain popularity in biomedicine (2018, 277).

[19] Detailed in COVID-19, but also applicable to future biomedical-socioinformatic pandemics.

(Auto)Immunities

When speaking of immunity in relation to COVID-19, common responses tend to be binary, simplistic, and individualistic; the presence and detection of antibodies in an individual's blood constitutes immunity, and immunity can only be acquired through prior infection or vaccination (Spellberg, Nielsen, and Casadevall 2020, E1–2). However, upon further examination, this immunity is complex, especially at a community level. In his work *Immunitas*, Roberto Esposito remarks on the complexities of the immune system, defining it as "the hub that connects various interrelated entities, species, and genera such as the individual and the collective, male and female, human and machine" (2011, 167). The term *herd immunity* has been heralded as the last step in eradicating COVID-19, but new data suggest that the complications and mutations of the virus detailed in the previous section including vaccine hesitancy and inequity, new variants of virus, immunity waning in previously infected people, and behavioral alterations post-vaccination may render COVID-19's eradication impossible (Aschwanden 2021, 520–22). Instead, COVID-19 may become an endemic disease, one which demands the constant reproduction and remaking of immunity (2021, 520–21).

Accordingly, an immunity of the biomedical-socioinformatic virus must be cross-media and cross-modal, addressing a complex, rhizomatic ecosystem that combines biology, science, humanity, and the internet. In *Virality: Contagion Theory in the Age of Networks*, Tony D. Sampson outlines the risk of oversimplifying conceptions of immunity into purely oppositional terms:

> Likewise, categories of opposition and identity, derived again in this case from biological infection and immunity, impart a concentrated rhetorical ordering of contagion theory and real practices. Nowhere is this more evident than in the problematic viral discourses surrounding network security, in which the recourse to immunological analogies and metaphors of disease shape the network space by way of igniting public anxieties

> concerning an epidemic "enemy" that is "undetected, and therefore potentially everywhere."
> (Sampson 2012, 4)

While first represented by COVID-19, this new biomedical-socioinformatic logic will present itself again, and without imagining possibilities for a new kind of immunity, humans will be just as susceptible to future pandemics. As COVID-19 demonstrates, because the biomedical-socioinformatic virus escapes dichotomies, any immunity produced will be neither absolute nor static. As such, to reconstruct immunity, we first need to interrogate the sick/well binary.

In *On the Normal and the Pathological*, Georges Canguilhem questions typical definitions of health and pathology. Instead, Canguilhem proposes that health is "the possibility of tolerating infractions of the habitual norm and instituting new norms in new situations" (1978, 115). Accordingly, a healthy immunity does not necessitate invulnerability. In fact, for Canguilhem, expecting invulnerability is naive in an environment where social factors can alter and inform the classification of pathological or normal; instead, the ability to tolerate changes and adapt to them is paramount (1978, 118). Following Canguilhem, then, an immunity to the Information Age virus could attempt to *avoid pathology*, which constitutes a reduction in the size and quality of the world one can inhabit, and *maintain health* in the sense of preserving the size and quality of conditions one can tolerate (1978, 115). As previously stated, though, this casting of immunity is not possible within the biomedical-socioinformatic landscape. Though Canguilhem's notions of health and pathology allow for the uprooting of immunity from its biomedical origins, the internet has allowed for COVID-19 sufferers to experience ever-changing and simultaneous healthy and pathological states. In other words, COVID-19's biomedical-socioinformatic blur troubles this binarization of health and pathology, as Long Covid patients may have the size and quality of their physical world drastically reduced, but find a very large

and supportive online community of long-haulers to share experiences with (Callard and Perego 2021, 1–2). Notions of immunity are further troubled by the contagion's queering of the boundaries of self, as Esposito remarks that "contagion… combines, overlaps, soaks, coagulates, blends, and clones" bodies, muddling the boundaries between immunity and community (2011, 168).

If COVID-19 can render individuals and communities simultaneously pathological and healthy, then, how is immunity possible? Any conceptions of immunity to biomedical-socioinformatic viruses must address the intermezzos between the biomedical and socioinformatic and consider the socioinformatic as a legitimate environment for infection, inoculation, and immunity. This thesis has sought to demonstrate that the internet, especially social media, can and does alter the biomedical spread of infectious disease. The socioinformatic is a fundamental part of the COVID-19 virus; it follows, then, that any strategies to immunize against COVID-19 *must* involve the socioinformatic. The internet is already and will continue to be an agent in spreading the biomedical-socioinformatic virus. The internet can also be and has been an agent in helping to produce immune responses to such a virus, spreading public health messages and providing a venue for the public shaming of those who refuse to follow safety recommendations, even placing one nurse in Oregon on leave after she posted a TikTok video stating that she still traveled and did not wear a mask in November 2020 (Kiska and Weiss 2020; Hauser 2020). For the internet to reach a more comprehensive immune potential, though, its role in influencing such viruses must be taken more seriously and effective messaging about the virus must be tailored and delivered to specific audiences, a task that has yet to be accomplished on scales large enough to be impactful, as is evident in the COVID-19 pandemic. However, the internet can also be a weapon against the authority of science, further weakening the community

against the biomedical-socioinformatic virus. Through the proliferation of anti-science rhetoric and worldviews, the Information Age world is undermining its own efforts to be healthy, inhibiting the range of conditions it can adapt to. In other words, the internet may be constructed as a kind of immune system, enabling a society to develop a precarious yet effective and flexible immunity to the biomedical-socioinformatic virus through the widespread rapid dissemination of information that could lead to positive behavioral changes in individuals, cast here as antibodies. However, the sheer size, speed, and accessibility of information on the internet, which could be a protective, helpful response under the proper conditions, can also simultaneously and paradoxically open up new possibilities for the transmission of the virus through spreading political ideologies that devalue science, catalyzing behavioral changes that can contribute to the spread of the disease. In essence, the internet enables an unprecedented level of messaging to be delivered to individuals, and this messaging factors into an assemblage of each individual's political, environmental, biological, and other factors to cause a wide range of behavioral responses that may be protective, destructive, or neutral to the health of a society.[20] When individuals take actions that circulate content that encourages behaviors that may spread the disease, such as anti-vaccine content, this constitutes autoimmunity: "a force that turns against its own essence, causing the destruction of everything that surrounds it and, ultimately, itself" (Esposito 2011, 182).

Autoimmunity itself troubles the health/pathology, sick/well, and community/immunity dichotomies, as the body's immune system functions too well, attacking the very tissues it is intended to protect; paradoxically, the otherwise healthy body is deemed pathological by its own

[20] As an aside, an emblematic non-biomedical example of autoimmunity as "the [attempted] destruction, through self-destruction of the entire body it is intended to defend" is the storming of the Capitol building by self-proclaimed patriots on January 6, 2021- citizens, here constructed as cells, attacking the symbolic organ of democracy in their national body (Esposito 2011, 184; Hamilton 2021).

hypervigilant surveillance system. Esposito writes about this phenomenon through a biopolitical lens in *Immunitas*, positing that immune processes delineate communities and solidify their boundaries, but also necessarily risk injuring them through an autoimmune reaction (2011, 181–84). In a biomedical-socioinformatic immunity, then, autoimmunity can occur when our immune response is too inflexible and too unwilling to consider that large-scale foundational ideological shifts away from traditional Western values of scientific evidence are occurring and are important (Hotez 2020, 506). Through allowing scientific misinformation on social media to proliferate with very few effective interventions from social media platforms or independent actors, we are leaving ourselves vulnerable to an autoimmune, anti-science response. Because of biomedical-socioinformatic blurring, the spread of anti-science worldviews is as much a biomedical issue as it is a socioinformatic one, and knowledge about how these worldviews are built and how to address them should be pursued with the same ferocity as studies of viral genetic codes and clinical trials of vaccines produced to combat them. Without this knowledge, the internet infrastructure that makes the rhizomatic biomedical-socioinformatic landscape possible could begin (and has begun) to attack itself, proliferating anti-science sentiments through the community to the extent that any chance of immunity, even a flexible, multiplicitious, nonbinary immunity, is destroyed.

On Resistance, and Resistance to Resistance

Building an immunity to the biomedical-socioinformatic virus risks the production of resistances to that immunity if the virus is viewed as a one-dimensional adversary, instead of another component of the Information Age environment. Treating the immune system as a solid border that maintains sovereignty is not simply inaccurate, as previously argued. This perspective can also cause harm, leading to shortsighted all-or-nothing efforts to produce

immunity, and, as evidenced by the anthropogenic production of drug resistant bacteria through the inappropriate and excessive overuse of antibiotics (French 2010, S3–4), can eventually produce a virus that is uniquely hyperweaponized to undermine any protective effect of established immunity.

Instead of striving for the sterility that inevitably backfires to create a more resistant and dangerous virus, a biomedical-socioinformatic immunity must allow for continued exposure to and relations between society and virus. This proposal is distinct from calls to open up the world and let herd immunity for COVID-19 build without intervention- the argument made by the signees of the "Great Barrington Declaration" (Kulldorff, Gupta, and Bhattacharya 2020). Continued exposure is *not* unmediated, unmitigated exposure. Instead, enabling more complex, flexible conceptions of immunity can allow for the incorporation of protective elements from multiple areas of the biomedical-socioinformatic rhizome, including the online. This multimodal immunity is essential to effectively address COVID-19 and future biomedical-socioinformatic viruses.

By refiguring the term resistance to mean a refusal of common conceptions of immunity, we can open up lines of flight necessary to grapple with the intricacies of the biomedical-socioinformatic virus. The COVID-19 virus has already infiltrated society beyond the biomedical, and whether or not it has appeared in an individual's body, it has likely altered their subjectivity. To eradicate the COVID-19 virus in the biomedical sense, then, does not reverse the changes it has wrought. Knowledge produced and online connections made during this crisis, whether by or between long-haulers or anti-maskers, will and has proliferated beyond the biomedical, and failing to reckon with these interactions allows the virus to continue to inflict damage on society. This fundamentally political character of the virus necessitates a similarly

political conception of immunity. Just as the biomedical and socioinformatic are inextricably enmeshed and blurred, then, successful conceptions of immunity should allow for the constant reterritorialization of a space of exchange between the virus and the community (Fournier 2014, 121–22). This space of immunized exchange is distinct from that of contagious transmission detailed in the previous chapter. If considering biomedical-socioinformatic contagion as cyborg allows for the *legibility* of the boundary-queering capacities of contagion, a cyborgian immunity must account for the complicated, category-defying states such a contagion produces, facilitating the *remodeling* of these interactions between the biomedical-socioinformatic virus and society. Esposito elaborates on this network immunity, summarizing such radical community-based approaches by stating that "the body is understood as a functioning construct that is open to continuous exchange with its surrounding environment" (2011, 24). Esposito supports this conclusion most principally by underscoring the ever-changing nature of such an immunity, stating that "[a]rguing that maintaining organic integrity is only a secondary, derivative function of the immune system while its main function is to define the identity of the subject... as the *ever-changing product of a dynamic, competitive interaction with the environment* rather than a definitive and inalterable given" (Esposito 2011, 185; emphasis added). This notion of immunity enables society to grapple with the pervasive and dynamic bio-socio-technically intertwined effects of COVID-19 and future viruses. Facilitating a multifaceted and adaptable response to different dimensions of the virus will provide a precarious, yet potentially effective immunity-not against the virus's presence, but against its worst effects. Such an immunity resists aforementioned dominant perspectives on immunity that strive to preserve sterility and perpetuate conditions that render the virus and society more dangerous, with xenophobia being the most damaging (Hardy 2020, 657–58). These conditions flatten the complex assemblage of

biomedical, socioinformatic, and political factors that comprise immunity and who can achieve it in effort to preserve not only homogeny, but hegemony, foreclosing new forms of relationality between a society and a virus that are both embedded within the biomedical-socioinformatic rhizome. In contrast, a community-oriented immunity opens up the possibility of resilience while interacting with the biomedical-socioinformatic virus.

On Tolerance, Resilience, and the Endemic Futures of Contagion

Unseating the self as the principal unit of relationality within interactions between the biomedical-socioinformatic virus and society allows for a reimagining of what contagion is and what it may be. If the self is altered through interactions with a virus that is invisible and nonlocalizable, flowing between biomedical and socioinformatic realms, then the virus has a near constant potential for reformulations of self-identity (Esposito 2011, 187–88). An immune response should seek to harness these moments of exchange, "act[ing] as a sounding board for the presence of the world inside the self" (2011, 188).

Immunizing a society in the age of the biomedical-socioinformatic virus involves acknowledging this perpetual becoming as a potential for resilience (2011, 188). That is, if we can no longer delineate ourselves online from offline, sick from well, pathological from healthy, asymptomatic from unexposed, we must learn to adapt to these liminal conditions. To wage a violent, bloody war against a biomedical-socioinformatic virus amounts to an autoimmune attack on ourselves, inseparable in the blur. Instead, an immunity of the biomedical-socioinformatic should make use of a common trope in critical studies: it should make the strange familiar, but it should also seek to make the familiar strange. Such an immunity, then, is represented by tolerance, a phenomenon wherein the immune system behaves bizarrely, not attacking a foreign object and instead treating the abnormal presence, which it should immediately attack, with

familiarity (2011, 185–86). Contrary to the non-biomedical connotations of the term, I argue that tolerance does not necessitate allowing the foreign presence to cause harm to the body unmitigated. In Chapter 3, I detailed the harm that this could and does cause, both more generally, in the ways that neglecting the internet's role in contagion contributes to an incomprehension of the ways in which the biomedical and socioinformatic interact rhizomatically and more specifically, with the alt-right remote carrier contributing to the continued neocolonial oppression of marginalized groups. Tolerance does not mean that we must allow the status quo to continue. Tolerance in its most oppositional, precarious form, according to Esposito, is the constant maintenance of the immune system to avoid an autoimmune response, which is "the natural impulse of every immune system" (2011, 183–84).

Instead, a biomedical-socioinformatic, Information Age tolerance can push society towards a *resilient* community, one that can more aptly address a virus through a kind of nested resistance: resisting the reinscription of oppressive, marginalizing, contagious and contagion-spreading ideologies through resisting hegemonic definitions and conceptions of the societal self that provide an optimal environment for both ideologies and biomedical-socioinformatic viruses to spread (2011, 188). Under tolerance, then "the parasite is noise, but only as a potential bifurcation point that can open up towards new systems" (Parikka 2020, 306). This new immunity, with the capacity to enable the construction of these new systems and relations, can allow us to grapple with the virus holistically, strengthening aspects of the biomedical-socioinformatic landscape that allow us to avoid harm from the virus[21] and interrupting relations with the virus that create and perpetuate existing forms of harm, hegemony, and disinformation (Haraway 2006, 131). While the biomedical-socioinformatic blur has complicated relations

[21] Harm here is taken to mean harm including, but beyond biological debility- especially emphasizing the harms of colonization and xenophobia that overly-biomedicalized conceptions of viruses in the Information Age obscure.

between society and viruses to the degree that this immunity will always be partial, much like the in-between immunity of the Long Covid sufferer, it is in this precarity that the capacity and impetus for resilience lies.

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