INTRODUCTION: THE MONSTER ENTERS

I write this in the first week of April 2020, in the eye of the hurricane, so to speak, while bunkered in my garage with innumerable cans of Chef Boyardee, a few pints of Guinness, and some virology textbooks. A few weeks ago I bought *The Monster at Our Door* online, since I had long ago given away all my copies. Unconsciously, I suppose, I wanted it off my bookshelf in order to exorcise the anxiety involved in its writing. But the threat of a planetary pandemic—most likely avian flu—remained very much on my melancholy Celtic mind, along with the ghost of my mother's little brother, a victim of the Spanish flu in 1918, whom she still lamented decades later.

But today we are locked nervously in our homes like the poor denizens of London in Daniel Defoe's *Journal of the Plague Year* thanks to an obscure virus that escaped from a bat and showed up in one of the world's megacities. The emergence of SARS-CoV-2, the coronavirus that

causes COVID-19, wasn't entirely surprising. Its older sister, SARS-CoV, had already scared the pants off the world back in 2003, and another deadly iteration, MERS, emerged in Saudi Arabia in 2012 and has killed almost 1,000 people. But coronaviruses, in the opinion of most scientists, were a team at the bottom of the emergent virus league, overshadowed by heavy hitters like H5N1 (avian flu), Ebola, and even the Zika virus.

The pandemic, according to my current publishers, has given new relevance to my old flu *Monster*, most of which is reprinted here. I should emphasize, however, that the threat of an avian flu outbreak and its global spread continues to be "imminent." The original flu monster, H5N1, now has even deadlier avian siblings— H7N9 and H9N2— and as the World Health Organization (WHO) warns, flu viruses have a "vast silent reservoir in aquatic birds" and "are impossible to eradicate."[1]

Moreover, as Rob Wallace has shown in a brilliant book, the factory farming of poultry for fast-food outlets has become a diabolic incubator and distributor of new flu types.[2] Given the inevitability of flu pandemics, the development of a universal flu vaccine that provides multiyear immunity against all subtypes of influenza A must be given the highest priority, despite disinterest by bottom-liners in the pharmaceutical industry.[3]

SARS-CoV-2, meanwhile, flies across the globe on unexpected influenza-like wings: a high rate of

transmissibility magnified by the number of invisible spreaders—that is to say, contagious people without easily recognizable symptoms. It also kills by viral and bacterial pneumonia in the same way as influenza. Because of these similarities, a generation of work modeling the likely dynamics and geography of an avian flu pandemic is now an invaluable resource in the battle against COVID-19. But the current virus and its mother genus, *Coronaviridae*, differ radically in some respects from the influenzas and indeed all other RNA viruses. Let's take a closer look at SARS-CoV-2.

CORONAVIRUSES: DEADLY ECLIPSES

Viruses, which are likely responsible for 90 percent of infectious diseases, are basically parasitic genes that hijack the genetic machinery of the cells they invade to make myriad copies of themselves. The small group of viruses based on DNA have a built-in proofreading mechanism to ensure accurate replication, but viruses programmed by RNA like influenzas and coronaviruses lack it. As a consequence, some species are like bizarre Xerox machines running at ultra-high speeds that constantly spit out error-ridden copies. As a recent article in *The New England Journal of Medicine* observes: "It took the genome of the human species 8 million years to evolve by 1%. Many animal RNA viruses can evolve by more than 1% in a matter of days."[4] By producing so many inaccurate versions of their

genomes such viruses have a huge advantage in resisting the human immune system because inevitably there will arise copies at least partly resistant to the antibodies produced in past infections or generated by vaccination.

Viruses—particles smaller than bacteria that easily passed through porcelain filters—were for decades the great enigmas of early modern microbiology. They were first imaged in the late 1930s, shortly after the invention of the electron microscope. Scientists were stunned by their wild array of different structures and forms. For example, influenza A—a wilder, more dangerous viral genera than influenzas B or C, which cause common colds and winter flus—looks like a naval mine (a sphere with studded spikes). The viruses that infect bacteria look like tiny Mars landers and Ebola, like a worm. The *Coronaviridae*, discovered in 1937, are tiny solar eclipses. In a photomicrograph their protruding "petals"—S proteins that allow the virus to latch onto a cell surface—definitely give the appearance of the solar corona during a total eclipse. Thus the name of the family.[5]

Coronaviruses are unusual in several respects: in the first place because their genome, a single twisted helix inside a protein capsule, is the largest RNA molecule in nature. "Nucleotides" are the structural building blocks of DNA and RNA genomes. Influenza A viruses have 14,000 packaged in eight separate segments, coding for ten to

fourteen proteins. Coronaviruses, on the other hand, have 30,000 nucleotides. Like influenza A, they also have two principal modes of evolution. The accumulation of small mutations inevitably sprouts new strains or subtypes. This process is known as *antigenic drift*.[6]

Far more dramatic—standing in the same relationship to drift as revolution does to reform—is *antigenic shift*. If an animal or human cell is simultaneously infected by two different influenza viruses, say one from a wild bird and the other a human-transmitted strain, replication can shuffle the genomic deck. Lethal segments from the wild flu can end up packaged together with segments from a flu already circulated among people that has the key for unlocking human cells. Pertinent to understanding the rest of this book, the molecules often traded in these *reassortments* are species-specific hemagglutinins (HA), the unique keys used by viruses to open host cells, and neuraminidase (NA), the escape artists that help new viruses break out of the infected cell's membrane for further spread—hence the influenza subtype formula, H*x*N*y*. As I requested in the original *Monster*, "Please remember this. It will avoid confusion later on when you meet a series of bad characters named H3N2, H9N1, H5N1, and so on." Virologists speculate that such "'reassorted" types that combine virulence with ease of infection are responsible for the flu pandemics that erupted in 1890, 1918, 1957,

1968, and 2009. The "Spanish flu" that infected fully half of the human race, however, was two orders of magnitude more deadly than the others: two percent mortality versus .02 percent.

A second unusual characteristic of coronaviruses is they are even more adept shape-shifters than orthomyxoviruses like influenza A. Because their genome is a single, unsegmented strand, they can't reshuffle the deck in the same manner as influenza does through repackaging separate segments of different strains. But what they accomplish is even more amazing: *recombination*, "the splicing of different parts of genes (coding for the same protein) from different species."[7] To quote from a standard virology textbook:

> *Coronavirus RNA genomes undergo a high frequency of recombination, as high as 25% for the entire coronavirus genome. This is noteworthy since the nonsegmented genomes of most other RNA viruses display levels of recombination ranging from low to undetectable.*
>
> *The ability of coronaviruses to recombine at high frequency, together with their high mutation rate (which is a property of all RNA viruses), may also enable them to adapt to new hosts and ecological niches more readily than other RNA viruses. Recombination can also occur between different coronavirus strains, providing additional opportunities for these viruses to adapt to new niches.*[8]

Before the emergence of SARS in 2002–3 (the subject of chapter four) coronaviruses were mostly of interest to veterinary science. Although two recognized human strains were believed to cause 10 to 20 percent of colds (human rhinoviruses are the major culprit), most research was focused on deadly outbreaks among pigs, cattle, turkeys and other domestic animals, especially their young.[9] Porcine Epidemic Diarrhea Virus, first identified in China in 1971, killed millions of piglets and cast a permanent shadow over pork production. In the 1990s another coronavirus, *Bovine CoV*, was shown to be the cause of several lethal cattle diseases, including the mysterious "Shipping Fever." In such cases giant feedlots and factory pig farming, where the extreme stress of confinement wrecks animals' immune systems, undoubtedly accelerated the emergence of new coronavirus types as well as their growing capacity for interspecies transmission.[10]

SARS coincided with a recurrence of avian flu (the first major outbreak had occurred in Hong Kong in 1997), with which it was initially confused. No one suspected it was caused by a coronavirus and this resulted in a flood of misinformation from major research centers. Eventually a crack team of researchers at the University of Hong Kong isolated and cultured a novel pathogen that turned out to be a previously unknown coronavirus, *SARS-CoV*. (In dishonorable fashion, the U.S. Centers for Disease Control and

Prevention [CDC] tried to claim credit for the discovery but were rebuffed by the international research community.)[11]

Unlike the animal coronaviruses, or for that matter the Spanish flu, SARS generally spared the young while killing half of infected elderly patients. It had a variable incubation period, from four days to two weeks, but only became transmissible when people were symptomatic. For this reason, the epidemic was suppressed after the adoption of comprehensive testing, contact tracing, and isolation of cases. With HIV (a retrovirus) still slaughtering hundreds of thousands of Africans in the background, SARS sounded the alarm that a new viral pandemic was nigh, one that threatened everyone regardless of their sexual mores or needle use. As Estair Van Wagner wrote in a collection of essays on SARS, global networks, and world cities:

> *SARS has made it impossible to guarantee that the borderless enclave of the identical hotels, condos, office buildings, and convention centers that facilitate the mobility of the transnational elite is disease free. In the face of a possible avian influenza outbreak … the presumption that our governance and health infrastructure have either the knowledge or power to control infectious diseases is no longer tenable and appears dangerously arrogant.*[12]

As bird flu cases grew in 2004–5, H5N1 reclaimed the stage and the White House Homeland Security Council rushed out

a National Strategy for Pandemic Influenza, complemented by a Department of Health and Human Services (HHS) report on implementation of measures. Other reports and updates (the latest in 2017) further specified investments that urgently needed to be made in detection, testing, vaccine development, protection of critical infrastructure, and so on.[13] Likewise the WHO in 2005 created an Emergency Committee, which updated its guidelines for member governments and defined their international responsibilities in such an outbreak. SARS was demoted, although it had achieved pandemic status, because it lacked flu's deadly ability to be spread by asymptomatic and pre-symptomatic individuals. Meanwhile, Ebola viruses (there are four in humans) augured an alternative biological apocalypse. Ebola disease disseminates quickly and had an early kill rate of 90 percent in some localities. Pandemic researchers were soon modeling scenarios for its spread outside Africa.

Then in 2012 the Curse of Tutankhamun struck Saudi Arabia: a new SARS-like disease caused by a coronavirus resident in Egyptian tomb bats and transmitted to humans via infected dromedary camels and perhaps by goats. Middle East Respiratory Syndrome (MERS), as it was baptized, was subsequently contracted by a Korean visitor and produced a small outbreak in South Korea.[14] By 2017 some 2,000 cases had been reported with a death rate (36 percent) inching toward Ebola levels. But the great majority of

patients had had contact with infected animals and in the minority of cases where human-to-human transmission occurred, it involved intimate contact with people already displaying the symptoms. This indicates, say scientists, that MERS has been unable to fully adapt to human transmission. On the other hand, they were startled by its unexpected talent for easily crossing species boundaries.[15]

A group of scientists in Texas quickly advanced research on a MERS vaccine, but it excited minimal interest. Earlier they had successfully developed a SARS vaccine but couldn't find a corporate or government sponsor interested in testing and manufacturing it. The lead researcher, Dr. Peter Hotez, dean of the National School of Tropical Medicine at Baylor University, told the House Committee on Science in early March that he believed the vaccine, which has been sitting in a freezer for years, might have provided cross-protection against COVID if it had been available in quantity and tested in the field during the first month of the outbreak. "There is a problem with the ecosystem in vaccine development, and we've got to fix this."[16]

But MERS did spur successful research on coronaviruses in bats. SARS investigators in 2003 had quickly identified civets—small, catlike carnivores that are consumed, ironically, because they are believed by traditional practitioners to cure flu—as the immediate carriers of the disease; then in 2005 they found bats with

SARS-CoV and realized that they were the likely source of the infection in civets, the intermediate host. Gradually the hypothesis that bats were the natural reservoir for many if not all coronaviruses became a framework for new investigations. The research discoveries since 2012 have revealed the astonishing genetic diversity of coronavirus strains circulating in different bat species. A recent audit of these studies by a team in Wuhan concluded:

> *From 55 published articles on bat coronaviruses at the time of preparation for this book chapter, more than 102 bat species from around the world have been shown to carry coronaviruses. Currently, eight bat coronaviruses have been classified as species, but more than one hundred bat coronaviruses (or strains) have not yet been classified. However, as there are more than 1200 bat species in the world, large numbers of new bat coronaviruses likely await discovery.*[17]

Other studies indicate a large number of virulent bat viruses, capable of infecting humans, also circulate in pig populations where they have caused repeated epidemics. Given the huge, unsuspected size of these coronavirus reservoirs, SARS-CoV-2's long leap from bats to pangolins to humans should not have been surprising. And it probably wasn't to the virologists researching bats. But it was an earthquake to epidemiologists and public officials

who, expecting an influenza or Ebola pandemic, had concentrated their efforts on antivirals and vaccines for those diseases. "The emergence and rapid spread of COVID-19," wrote two international experts, "signifies a perfect epidemiological storm. A respiratory pathogen of relatively high virulence from a virus family that has an unusual knack of jumping species boundaries, that emerged in a major population center and travel hub shortly before the biggest travel period of the year: the Chinese Spring Festival."[18]

It will be some time before the evolution of SARS-CoV-2 is retraced, and it may have been a "cryptic spread" among humans before the first cluster of pneumonia cases was detected in Wuhan.[19] It's not yet known whether it is the product of *drift* or *shift* or a complex combination of the two processes.[20] Like avian flu and SARS, it erupted out of a Chinese live animal or "wet market," presumably from a stall selling pangolins, the scaly anteaters that are occasional menu items. (China's failure after SARS to ban the sale of exotic animals, including bats, in food markets is both puzzling and disastrous, although the trade is now banned.)[21] The pangolin—or whatever animal was the intermediate host—was infected by a bat and SARS-CoV-2 may be a mutated version of the same precursor bat virus that was responsible for SARS. Indeed, Australian researchers report that 96 percent of the SARS-CoV-2 genome is shared with a virus found in horseshoe bats. This may be the mother of both viruses.

COVID-19 has some striking similarities to SARS and MERS. First, they present almost identical symptoms at the outset: fever, dry cough, and aching muscles. All three cause high mortality via pneumonia and sepsis among the aged and those with immune-compromised bodies. In each case the virus is also shed in feces, and because the lining of the small intestine has similar receptors to those of the respiratory system, fecal-oral infection is possible. It remains unknown what degree of immunity is conferred on survivors of these three diseases, but, using coronavirus colds as an analogue, it is probably short-lived, perhaps only a year. So COVID is most likely here to stay as a chronic disease.

But the new virus is signally different from SARS and MERS in at least three respects. First and most importantly is its ability to be spread in a flu-like manner by people who lack recognizable symptoms. (To repeat, the transmission of both SARS and MERS has been by visibly sick people or animals.) Second, it appears to infect heart tissue, and *Kaiser Health News* reports that doctors are starting to see coronary damage in one out of five hospitalized. Apart from those who die directly from heart attacks, a small number at present, the legacy of the pandemic could be permanent heart problems for thousands of survivors.[22] Third, as researchers recently discovered, it is one hell of a tough nut:

> *SARS-CoV-2 is very strange with one of the hardest protective outer shell … among coronaviruses. This means that it might be expected to be highly resilient in saliva or other body fluids and outside the body. An infected body is likelier to shed greater numbers viral particles since the latter is more resistant to antimicrobial enzymes in body fluids. These particles are also likelier to remain active longer. These factors could account for the greater contagiousness of the SARS-CoV-2 and have implications for efforts to prevent its spread.*[23]

Although not as deadly as SARS or MERS, COVID-19's currently guesstimated 2 percent mortality rate is comparable to the Spanish flu, and like that monster it probably has the ability to infect a majority of the human race unless antiviral and vaccine development quickly come to the rescue. Even if future studies based on blood sampling for evidence of COVID-19 antibodies reveal a far greater number of positive cases than now modeled, thus significantly reducing the death rate, the earth's population is now four times larger than in 1918 and the ultimate hecatomb could still be counted in millions.

SHOUTING INTO WASHINGTON'S VOID

> *"So it's really as bad as that," said Miranda.*
> *"It's as bad as anything can be," said Adam, "all the theaters and nearly all the shops and restaurants are closed, and*

> *the streets have been full of funerals all day and ambulances all night."*[24]
>
> *Pale Horse, Pale Rider*

In this celebrated short novel written twenty years after the event, Katherine Ann Porter recorded her own near-death experience during the Spanish flu pandemic of 1918–19. She spent nine days in the hallway of an overwhelmed Denver hospital, burning with fever, drifting in and out of hallucinations. Her lover, a young lieutenant awaiting orders to leave for France, lay elsewhere, dying. Shivering on her steel gurney and given up as hopeless by her doctor, Miranda/Ann sees phantoms, soldiers, and executioners hovering over an "old man in filthy clothes":

> *The road to death is a long march beset with all evils and the heart fails little by little at each new terror, the bones rebel at each step, the mind sets up its own bitter resistance and to what end? The barriers sink one by one, and no covering of the eyes shuts out the landscape of disaster, nor the sight of crimes committed there.*

In 1918–19, despite enormous recent advances built upon the fundamental discoveries of Koch and Pasteur a generation earlier, medical science was almost as helpless in the face of the pandemic as had been the physicians, alchemists and astrologers called upon to cure the Great Plague

of 1665–66 in London. If the U.S. Public Health Service wagered everything on the distribution of an ultimately worthless vaccine, the remedy in Daniel Defoe's time was to slaughter all the cats in the city—a great windfall for infected rats. In both eras medicine chased phantoms: the plague bacillus was finally identified by Alexandra Yersin in 1894, while a full characterization of the 1918 virus waited until 2000, when an expedition brought back the frozen lungs of an original victim from the Arctic.

Today's "landscape of disaster" is eerily similar to 1665 and 1918: urban populations locked inside their apartments, the flight of rich to their country homes, the cancelation of public events and schools, desperate trips to the markets that often end with infection;[25] society's reliance upon hero nurses, the lack of beds in hospitals and pesthouses, the mad search for masks, and the widespread suspicion that alien powers are at work (Jews, a passing comet, German saboteurs, the Chinese).

But this time around there was little mystery about the identity of the microbe—SARS-CoV-2 was sequenced almost overnight in January—or the steps necessary to fight it. Since the discovery of the HIV virus in 1983 and the recognition that it had jumped from apes to humans, science has been on high alert against the appearance of deadly new diseases with pandemic potential that have crossed over from wild fauna. This new age of plagues,

like previous pandemic epochs, is directly the result of economic globalization. The Black Death, for instance, was the inadvertent consequence of the Mongol conquest of inner Eurasia, which allowed Chinese rodents to hitchhike along the trade routes from northern China to Central Europe and the Mediterranean. Today, as was the case when I wrote *Monster* fifteen years ago, multinational capital has been the driver of disease evolution through the burning or logging out of tropical forests, the proliferation of factory farming, the explosive growth of slums and concomitantly of "informal employment," and the failure of the pharmaceutical industry to find profit in mass producing lifeline antivirals, new-generation antibiotics, and universal vaccines.

Forest destruction, whether by multinationals or desperate subsistence farmers, eliminates the barrier between human populations and the reclusive wild viruses endemic to birds, bats, and mammals. Factory farms and giant feedlots act as huge incubators of novel viruses while appalling sanitary conditions in slums produce populations that are both densely packed and immune compromised. The inability of global capitalism to create jobs in the so-called "developing world" means that a billion or more subsistence workers (the "informal proletariat") lack an employer link to healthcare or the income to purchase treatment from the private sector,

leaving them dependent upon collapsing public hospitals systems, if they even exist. Permanent bio-protection against new plagues, accordingly, would require more than vaccines. It would need the suppression of these "structures of disease emergence" through revolutionary reforms in agriculture and urban living that no large capitalist or state-capitalist country would ever willingly undertake. A cadre of brilliant medical researchers, public-health doctors, and informed journalists—Paul Farmer, Richard Horton, Laurie Garrett, Rob Wallace, and many others—have been trying to teach us for years about these systemic connections. As Wallace emphasized a few years ago, "the agroeconomic impacts of global neoliberalism are foundational, felt across biocultural organization, down so far as the virion and molecule."[26]

A much larger chorus of voices, many shouting from the highest rooftops of government, have warned that a catastrophe such as the one that we are now living through loomed on the horizon and perhaps was imminent. The successive debuts of avian flu (1997, 2003–present), SARS (2003), Swine flu (2009), MERS (2012), and Zika virus (2015), as well as the recent Ebola epidemics in the Congo and West Africa, produced surges of research and attracted smart biotech start-ups who tried, often unsuccessfully, to find venture capital to back the development of promising new antivirals and vaccines. The specter of avian flu, as I

mentioned earlier, had led to the adoption of an official U.S. national strategy and the emergence of a new genre of scientific literature: report after report warning of a coming pandemic and the need to prepare to meet it.

But preparedness was a stop-and-go cycle and politicians often backtracked from their own policies. In 1998, for instance, the Clinton administration created a National Pharmaceutical Stockpile under CDC management expressly to deal with the pandemic threat. In 2003 the Bush administration changed the name to the National Strategic Stockpile and handed control over to Homeland Security (DHS) and HHS. Its inventory then included 105 million N-95 respirators, 100 million of which were distributed by the Obama administration during the swine flu (H1N1) emergency in 2009. The Obama administration, however, failed to replenish the mask stockpile, arguing that a better and cheaper solution was to help the private sector develop the production capacity to meet surging demand in a pandemic crisis. Trump's DHS and HHS officials, many of whom were political appointees with little experience in public health administration or even medical science, were content to leave the stockpile depleted while neglecting the proposed investments in private-sector alternatives.

Trump also scrapped the hard-earned wisdom of those who had fought previous major outbreaks. Following

the terrifying Ebola outbreak in West Africa in 2014, field reports and analyses from a number of different U.S. agencies were synthesized in a memorandum by NSA analyst Christopher Kirchhoff and sent to Susan Rice, Obama's national security advisor. After the combined forces of the WHO and various medical nonprofits failed to contain the initial outbreak, the CDC, USAID, and other U.S. agencies attempted to fill the gap, but their own lack of coordination only produced more chaos. Finally, considering the outbreak a tier-one national security emergency comparable to the civil war in Syria, President Obama established a White House Ebola Task Force and mobilized the Pentagon, who, in inimitable fashion, conceptualized their mission as the equivalent to fighting terrorists. In the end 2,800 troops were sent to Liberia to build laboratories, hospitals and barracks for the hundreds of U.S. Public Health Service's doctors and lab workers.

The sobering lesson learned from this experience, Kirchhoff concluded, was that "gaps in preparedness and capacity surfaced in every major agency tasked with health and security in the U.S." (He later told an interviewer that "Those of us in the Ebola response knew we got lucky, not only because the pathogen wasn't airborne, but because the outbreak happened where it did in the world. We knew that we probably wouldn't get lucky again.") Kirchhoff made a case for a whole spectrum of reforms, but stressed

that only "a single person accountable to the President for response efforts, working within the NSC framework, is a model that works in *extremis* cases." Rice and Obama agreed and the Directorate of Global Health Security and Biodefense was created inside the National Security Council with the specific responsibility of monitoring and advising the executive branch about the pandemic threats. Its first "czar" was Beth Cameron, a State Department veteran who reported directly to Rice.[27]

The directorate survived the change of regimes, but in 2018, when John Bolton became Trump's third National Security Advisor, he told his leader that there was no need for a separate pandemic group and that it was more efficient to fold its work into a single NSC center for weapons of mass destruction and biowarfare. He started by purging a counterpart pandemic planning group in DHS, then in a night of long knives, closed the NSC directorate and fired most of its staff, starting with its head, Rear Admiral Timothy Ziemer. Bolton's ruthless destruction of the two directorates evoked a storm of protest from medical experts and former Bush and Obama officials. The Center for Strategic and International Studies took up their case and convened a commission that included Julie Gerberding, the head of the CDC during the George W. Bush years, and Kelly Ayotte, a former Republican senator from New Hampshire. Just weeks before the

outbreak they published a report "sounding the alarm that the U.S. government is caught in a cycle of crisis and complacency" in regard to preparing for a pandemic. The first step, they urged, was restoring expert health leadership on the NSC.[28]

At almost the same time, a report from the Council of Economic Advisors (CEA) warned that existing vaccine production technologies were out of date and incapable of meeting needs during a pandemic. With incredible prescience they forecast that a pandemic could incapacitate a large portion of the workforce, require the hospitalization of as many as 4.3 million people, and kill half a million. Pondering the failure of the pharmaceutical industry to modernize vaccine development, they offered a compelling explanation that any radical economist would likely agree with:

> *There is a key misalignment between the social and private returns from medical research and development and capital investment in pandemic vaccines. R&D and investment costs are only recouped by sales when the pandemic risk occurs. Part of the value of vaccines that can mitigate future pandemic risks, however, is their insurance value today that provides protection against possible damage. This insurance value accrues even if the pandemic does not occur in the future, and it implies that the social value of faster production and better vaccines is much larger than its private return to developers. This divergence leads to an*

> *under-provision in vaccine innovation because it does not get rewarded for its insurance value. Second, pandemics represent a risk with a small probability of occurring but with large and highly correlated losses across the population. The rarity of influenza pandemics and the fact that the last serious one in this country occurred a hundred years ago may lead consumers and insurers to underestimate the probability and potential impact of a future influenza pandemic. Moreover the risk cannot be effectively pooled because everyone is at risk concurrently.* [29]

This analysis, of course, applies with equal force to the reluctance of Big Pharma to develop new antibiotics and antivirals, as well as to the insurance industry's refusal to provide pandemic insurance.

But in the blizzard of warnings and dire predictions in the two years before the pandemic, there were also some rays of sunshine. Thus at the beginning of 2018, lead researchers at the Vaccine Research Center of the National Institutes of Health heralded a revolution in vaccine design based on recent advances in next generation sequencing, rapid monoclonal antibody recognition, the application of AI to biological design, and atomic-scale protein engineering. But making these "fast vaccines," the researchers explained, would require a new scale of investment and international collaboration, plus an expanded network of observatories in areas of high biodiversity where

animal-human transmission is most likely. The following year researchers from the Center announced that the holy grail was in sight: "As a result of these advances, high-level, broad, and durable immunity against the large universe of influenza viruses may now be within reach."[30] Meanwhile Halyard Health, a firm commissioned by the Obama administration three years earlier to update the technology of N-95 mask manufacture, had succeeded by fall 2018 in building a prototype machine that could produce 1.5 million masks per day, ten times the current industry maximum. This would meet the surge demand for masks in a pandemic as correctly foreseen and calculated by Obama's HHS.[31]

"Fast vaccines," a universal flu shot, high-speed mask production—bells should have rang out, but they didn't. The mask technology bore the fatal stamp of an Obama program—all of which Trump had vowed to drive a silver stake through—and the other breakthroughs involved the kind of urgent science-driven investments that most Republicans frowned upon in the same way as they derided clean energy and universal health care. In any event, the administration was preoccupied with more urgent health-related issues such as junking Obamacare and kicking more than one million people off food stamps. The CDC also came under the knife and its global health section "was so drastically cut in 2018 that much of its staff was laid off and the number of countries it was working

in was reduced from 49 to merely 10." A parallel attempt to eliminate the $252 million that Obama had committed to rebuilding health systems in three Ebola-ravaged countries was ultimately blocked by Congress.[32]

And just three months before the Wuhan outbreak, it axed funding for USAID's Emerging Pandemic Threats PREDICT program, which had been established after the avian flu scare in 2005. A highly lauded pet project of both the Bush and Obama administrations, PREDICT was both a pioneer viral early warning system and an aid program training local medical professionals to recognize novel infections and monitor zoonoses (animal outbreaks) that might be transmitted to humans. Its ultimate goal was the preemption of future pandemics through identification and surveillance of dangerous viruses. According to *Science*, PREDICT over the years had "discovered more than 1000 viruses from viral families that contain zoonoses, including viruses involved in recent outbreaks, and others of ongoing public health concern." This total included 160 potentially dangerous coronaviruses identified in bats and other animals. (The total size of the global reservoir of animal viruses with the potential to become human infections is vastly greater. The Global Virome Project, a major international collaboration, estimates that there are 1.6 million unknown viruses circulating in wild animals, half of which have zoonotic potential.)[33]

THE APOCALYPSE IN SIX EASY STEPS

Nobody knew there would be a pandemic or epidemic of this proportion. Nobody has ever seen anything like this before.
President Donald Trump, March 16, 2020

Someday—if and when we emerge from our pandemic fallout shelters—diligent journalists will reconstruct in detail Trump's craven abdications, tantrums, lies, and sundry high crimes and misdemeanors during this crisis. For now, it is possible to summarize the major factors responsible for the catastrophic meltdown of the federal response in the first three months of the pandemic.

First, there was no continuity of leadership experience from the Obama era or even from the first two years of Trump's presidency. In the last days of the Obama White House, the president's homeland security advisor, Lisa Monaco, invited her incoming counterpart, Tom Bossert, to co-organize a large-scale test of the country's preparedness to deal with a viral pandemic. She was concerned whether the lessons were passed on to the Trump Cabinet and agency heads. "Crimson Contagion," which took place just a week before the Inauguration, was coordinated by HHS with the participation of a dozen federal agencies and twelve states. Its storyline supposed that an avian flu outbreak in China was brought back to the United States by tourists. The exercise revealed innumerable problems

arising from the friction of competing agencies and officials as well as the cacophony of demands from governors and mayors. "But the problems," according to a *New York Times* investigation, "were larger than bureaucratic snags. The United States, the organizers realized, did not have the means to quickly manufacture more essential medical equipment, supplies or medicines, including antiviral medications, needles, syringes, N95 respirators and ventilators, the agency concluded." Among the participants from the new administration, in addition to Bossert, were Rex Tillerson, John F. Kelly, and Rick Perry, all of whom reportedly accepted the lessons of the simulation. The White House did not, and by 2019 all of the leaders who took part in Crimson Contagion, as well as the author of the CEA report, had either resigned or been fired. The Trump administration is its own fifth column.[34]

Second is the shocking incompetence and poor judgment of the CDC, which declined the use of the coronavirus test kit developed for the WHO by a German firm. It has been the consensus of experts internationally that the immediate response priority in a pandemic is widespread testing, contact tracing and isolation of positive cases. This has been done successfully in South Korea, Germany, Singapore, and Taiwan, as well as in China following the fatal mistakes in January that forced the total closure of Wuhan. All these countries had quickly produced ample

stockpiles of WHO-type test kits. The CDC, on the other hand, opted to design its own test kit, which it unveiled on January 24. But the third stage component of the test was flawed and gave false results. The entire month of February was thus wasted while the CDC tinkered with the kit rather than switching to the available WHO design. (The use of an alternative test kit developed by Stanford scientists at the beginning of the month was blocked by FDA red tape.) "Had the United States," concluded an investigation by the *New York Times*, "been able to track its earliest movements and identify hidden hot spots, local quarantines might have confined the disease."[35]

The same disaster may be repeating itself in the case of a blood test for immunity, a procedure that could certify which people can safely return to work. Germany is preparing to conduct trial tests, hoping it will allow its specialized metallurgical industries to roar back to life and revive its lucrative exports to China. Other countries in Europe and Asia are not far behind Germany. "The U.S., by comparison," according to a *Los Angeles Times* investigation, "hasn't come up with a coherent plan for large-scale antibody testing, which health experts say could dash chances for a return to public life and leave health officials with few options for managing the pandemic other than severe social restrictions until a vaccine or drug therapy is available."[36] Such a delay would have the most

dire consequences for an economy already plunging into a 1932-like depression.

Third, the "stay at home" and "social distancing" strategy is a second-best approach made necessary by the failure to implement early testing and detection. Indeed "flattening the curve" is a poor substitute for preventing its exponential increase in the first place. As a last resort measure, it requires immediate and comprehensive implementation, but Trump fiddled and stalled, leaving it to Democratic governors and mayors to try to put out the fire. Even as the president was compelled by public opinion to grudgingly approve limited application of urban quarantines and then a widespread shutdown of non-essential workplaces, hardcore red-state governors (eight at time of writing) have resisted shutdowns with the same stubborn zeal as their predecessors resisted racial integration. They have been co-conspirators in a viral spread that is bound to take tens of thousands of lives, especially in the Deep South.

Ground zero for the outbreak in the region was the Mardi Gras at the end of February that attracted a million celebrants. This was a bit like the masked ball in Poe's *Mask of the Red Death* and the dancers were not all wearing red. According to the *Washington Post*, "New Orleans Mayor LaToya Cantrell [a Democrat] said canceling or curtailing Mardi Gras was never considered. Federal agencies that

are part of planning Mardi Gras every year—including the FBI and Homeland Security—did not raise concerns about the coronavirus, she said. Federal officials who walked the parade route with members of her administration were focused on terrorist attacks."[37] Most of the visitors were from other parts of Louisiana and neighboring states and returned home with the virus to seed outbreaks in smaller towns and cities lacking the laboratories, ICU nurses, and ventilators to treat COVID. The regional medical centers in larger cities like New Orleans, Baton Rouge, and Jackson (Mississippi) that normally play that role are now overwhelmed and unable to accept critical cases from their rural peripheries.

Fourth, all the competent responses in other countries had ample inventories of personal protective gear—N-95 masks, gowns, and goggles—available to assure the safety of firefighters, postal workers, bus drivers, and police, as well as medical staff. Especially in East Asia, the world center for the production of such supplies, the use of surgical masks by the general public during flu season is an old custom, and it was an easy step to require that everyone going outside their home wear a mask. In contrast, the United States provides a catastrophic counterexample. Nothing I think better symbolizes state failure than the fact that on the same day that Trump was making his usual boasts about the country's unparalleled scientific and technological might, the *New York Times* devoted

a full page to "how to sew your own mask." Millions of Americans are now doing so, in the absence of products that cost mere pennies to manufacture. The shortages of N-95 masks, as well as throat swabs and testing reagents, come at an incalculable cost in the wake of the test kit fiasco. Countries that had all these essentials available not only saved thousands of lives, but were able to safely maintain essential parts of the economy.

Despite the fact that the Korean War–era Defense Production Act is invoked thousands of times each year by the Defense Department to ensure that contractors meet their deadlines, the Trump White House, cheered on by the U.S. Chamber of Commerce, has refused to use it to accelerate the manufacture of these lifeline products. (The revolutionary Halyard Health mask machine meanwhile gathers dust.) This fatal decision to rely on the president's rapport with corporate leaders rather than nationalize production as in wartime goes hand in hand with the break in precedent of putting Mike Pence and Jared Kushner in charge of the response over continuing the tradition of letting the CDC coordinate the mobilization with the aid of a uniformed logistics expert from the Department of Defense. The result is Katrina writ a hundred or even a thousand times larger.

Fifth, the now-depleted National Strategic Stockpile was created to allow Washington to directly aid stricken cities and regions in a health emergency. Kushner's recent

assertion that mandate was only to supplement state inventories is a blatant falsehood, designed to pass the buck and rationalize the White House's refusal to take decisive leadership in addressing all the shortages and production bottlenecks. Although the Trump administration has been a power grab in almost every sense, it has consistently rejected power's responsibilities. Thus the Trump Doctrine: states and cities should forage on their own for ventilators and protective supplies. As Maryland's ex-governor Martin O'Malley caustically observed, "that is a Darwinian approach to federalism; that is states' rights taken to a deadly extreme."[38]

Moreover, Trump's oft-repeated claim that most states had access to abundant medical resources is the opposite of the actual case. Across the country, the 2008 recession had been a bloodbath for local health departments, trimming their workforces by a quarter and closing a dozen major public-health laboratories. The loss of experienced public health nurses in particular has come back to haunt many localities. Fiscal austerity also became a pretext for reducing or eliminating states' own emergency medical stockpiles. The blame, as the case of California illustrates, falls on both parties. In response to the threatened 2005 avian flu pandemic, Governor Arnold Schwarzenegger and the Democratic leaders of the legislature spent hundreds of millions of dollars to stockpile 2,400 portable ventilators, 50 million respirators, and materials

to assemble 21,000 additional hospital beds. They also invested in three state-of-the-art 200-bed mobile hospitals that could be up and running within 72 hours of a disaster. But Schwarzenegger was succeeded by a notorious penny pincher named Jerry Brown, who in 2011 crossed out the annual allocation of $5.8 million to maintain the stockpile. While the state's chief medical officer and others wept, the strategic supplies and field hospitals, specifically mandated for viral emergencies like COVID-19, were either given away or sold off.[39]

Six, Trump's CDC, still reeling from the test kit fiasco, has abdicated a principal role in vaccine development as have Big Pharma and the WHO. Within the White House, moreover, there has been no visible enthusiasm for the kind of public "moon shot" effort that so many scientists deem necessary. Instead the leadership vacuum has been filled by the Coalition for Epidemic Preparedness Innovation (CEPI), a nonprofit headquartered in Oslo that was launched three years ago by the Gates Foundation, the Wellcome Trust, and the governments of Norway, Germany, and Japan. Led by Richard Hackett, one of the principal authors of the 2005 *National Strategy for Pandemic Influenza*, the CEPI funnels investment to ambitious startups and small-to-medium-sized firms that it believes have the talent to advance innovations like mRNA technology and now a vaccine for SARS-CoV-2. The research community it funds has become a hothouse

where molecular biologists and biotechnologists, in an ever-expanding global collaboration, are sharing ideas with astonishing speed and openness as they struggle to move candidate antivirals and vaccines to the testing stage.[40]

But CEPI and similar collaborations do not have the funding to accelerate the transition from the laboratory to production line. A COVID vaccine, it is estimated, would require an investment of at least $2 billion to roll out the tens of millions of vaccinations that are required just to cover the elderly and chronically ill. In an editorial for *Science*, Seth Berkley, another longtime crusader for vaccine research, set parameters for what was immediately needed: "If ever there was a case for a coordinated global vaccine development effort using a 'big science' approach, it is now."[41] Such a viral Manhattan Project would require at least three things: dynamic U.S.-China cooperation such as existed during the Ebola epidemic,[42] direct government funding and production of the vaccine and other life-saving drugs (an idea endorsed by Senator Elizabeth Warren), and world-class scientific leadership at the helm. From a Trumpian perspective, however, you might call those the "three anathemas."

THE SCREAMING STREETS

Social distancing is a privilege.
It means you live in a house large enough to practice it.

Hand washing is a privileged too. It means you have access to running water.
Hand sanitisers are a privilege. It means you have money to buy them.
Lockdowns are a privilege. It means you can afford to be at home.
Most of the ways to ward off Corona are accessible only to the affluent.

In essence, a disease that was spread by the rich, as they flew around the globe will now kill millions of the poor.[43]
Dr. Jagadish J. Hiremath

In Defoe's *Journal of the Plague Year*, one of the most disquieting images is that of a poor street, its doomed residents locked inside their slum tenements, screaming. Whether these "incessant roarings" came from victims' agonies (the later stages of plague are incredibly painful) or were the wails of mothers over their dead children, or children over their dead mothers, was impossible to distinguish. But all of London screamed for eighteen months.

It seems inescapable that the great sickly slums of Africa and South Asia—Khayelitsha, Kibera, Dharavi, Makoko, and so on—will soon be screaming. Up until now, the coronavirus infections in East Asia, Europe, and North America have been only marginally more deadly than the flu among healthy, well-fed people under 50.

But immunologically there are two distinct humanities. In the first, only the elderly and chronically ill have been led up the pyramid steps to be sacrificed to COVID-19. In the other, where malnutrition, disease, and contaminated water compromise the immune systems of people of all ages and respiratory ailments are legion, the carnage is likely to become more widespread and indifferent to demography. Poverty, density, and hunger, in other words, will likely reshape the pandemic.

To take the case of Africa first, 237 million of its sub-Saharan population are chronically undernourished and half of the deaths of young children are the result of hunger. Moreover, UNICEF has recently warned that the number of children under five who show evidence of stunted growth has been increasing by millions over the last twenty years.[44] (This is why we must distrust the claim that since the population of Africa is the world's youngest, with over-65s comprising only 3 percent of the population—versus 23 percent in Italy—the pandemic would pass over without great mortality.) Malnutrition, like chronic illness, becomes deadly when coupled with severe viral infections.

The history of the Spanish flu teaches a grim lesson about the co-morbidity of hunger and infection. Almost 60 percent of global mortality (that's at least 20 million deaths) in 1918–19 occurred in the Punjab, Bombay, and other parts of western India, where grain exports to

Britain and brutal requisitioning practices coincided with a major drought. Resultant food shortages drove millions of poor people to the edge of starvation. They became victims of the sinister synergy between malnutrition—which suppressed their immune response to infection—and rampant bacterial, as well as viral, pneumonia. In a similar case, British-occupied Iran, several years of drought, cholera, and food shortages, followed by a widespread malaria outbreak, preconditioned the death of an estimated one-fifth of the population. (See chapter one.)

In addition to hunger, COVID-19 in Africa will feed on a host of other vulnerabilities. HIV/AIDS has killed 36 million Africans over the past generation and researchers estimate that there are currently 24 million cases, alongside millions suffering from the "white plague"—tuberculosis. Throttled by neocolonial debt since the 1980s and by a quarter century of wildly destructive civil wars in west and central Africa, much of the continent's medical infrastructure is in ruins and five of the six nations judged to have the world's worst health care are in Africa. One of them is Nigeria, where medical treatment for 206 million people is now almost entirely privatized and beyond the reach of the poor.[45] With exception of South Africa, moreover, none have the existing capacity to treat more than a handful of critical COVID-19 cases. Kenya, a country well-known for exporting nurses and doctors, has exactly

130 ICU beds and 200 certified ICU nurses to treat 50 million people. Sudan, with a similar population, has but 30 beds.

Without local public health "fire departments," the recent Ebola outbreaks quickly grew into firestorms that were only put out with massive international aid. The United States alone spent $6 billion to build emergency hospitals from scratch in the affected countries. Japan and China also provided major assistance. This time around, with South Africa and Ethiopia in the leadership, the whole continent is crying out simultaneously for medical aid as well as debt relief for their sinking economies. But the response from the big guns of Europe, North America, and Japan, as well as the IMF and World Bank, has been tepid at best. China, whose interest in Africa might be described as quasi-imperialist, has rushed to fill the vacuum, but the vast demand for medical aid exceeds its capacities. As for Washington, "America First" means "Africa Last." To date, even the progressive wing of the Democratic Party has remained silent about our responsibility to aid Africa.

There's also some possibility that mass infection in slums and poor countrysides could flip a switch on coronavirus's mode of infection. In the veterinarian research mentioned earlier that looked at coronavirus epidemics among domestic animals, the investigators discovered two different routes of infection: fecal-oral, which attacked

stomach and intestinal tissue; and respiratory, which attacked lungs. In the first case there was usually very high mortality, while the second generally resulted in milder cases. Multiple studies confirm that SARS-CoV-2 is being shed copiously in feces and accumulated in sewage.[46] In African and South Asian slums, of course, fecal contamination is everywhere: in the water, in homegrown vegetables and as windblown dust. (Yes, shit storms are real.) In addition, most of Africa's slum communities are built in low-lying areas that flood during the rainy season. Raw sewage, often in open ditches, then spreads everywhere, even into homes. All of this favors the enteric route and raises the question of whether, as in the case of animals, this will lead to more lethal infections, possibly across all age groups?

LESSONS FROM WUHAN

A recent article in the journal *Infection* discusses the reasons behind China's apparent success in suppressing the first wave of COVID-19. Although public authorities in Wuhan initially tried to cover up the outbreak and censor the press, once Beijing realized the scale of infection and the rapidity of its spread, it moved aggressively. The draconian quarantine of Wuhan and nearby cities along with national travel restrictions dramatically slowed transmission to the rest of China. This allowed thousands of doctors,

nurses, and emergency personnel from all over China to pour into Hubei, where construction crews were building huge emergency hospitals literally overnight. Initial shortages of test kits, respirators, and protective gear were quickly overcome as the government aggressively ramped up their production.

According to Chinese reports, corroborated by the WHO, the number of cases has been held to under 1 million out of the 57 million population of Hebei: an attack rate of only 2 percent, much lower than expected.[47] By contrast, Governor Newsom recently wrote to President Trump that California's experts are predicting a population infection rate of 56 percent (25.5 million cases) over the next eight weeks.

It is, of course, the case that as China relaxes the quarantine and sends workers back to offices and factories the infection could come roaring back, in the absence of a vaccine. There are warning signs that this may already be occurring as Chinese citizens bring the infection back from Italy and other hot spots. The three Asian countries that like China have suppressed local outbreaks—Taiwan, Singapore, and South Korea—face the same threat. Thus the return to work is a controlled experiment and all four countries are well aware that they may have to quickly slam on the brakes again, albeit with further damage to their economies.

Trump's inner circle, whose envy of China is limitless, claimed for much of March that they too would soon relight the boilers and return people to work by Easter. The president's cheerleaders at Fox News started chanting "the cure is worse than the disease" while the Republican Party's king of fools, Texas lieutenant governor Dan Patrick, bravely volunteered to sacrifice the elderly to COVID if necessary to keep the economy generating profits. Having lost control over the pandemic, they seemed to be seriously weighing achieving herd immunity by putting a large portion of the workforce in its path while the Fed printed money to revive Wall Street. It was an idea with almost Hitlerian overtones that Trump grudgingly retreated from after Anthony Fauci scoffed at it.[48] It also signaled to Beijing that Washington was in complete disarray.

Western reaction to China's management of the crisis veered between discordant stereotypes. During the early weeks in Wuhan local leaders conformed to the image of a corrupt bureaucracy with wooden legs. (Something very similar had happened in 2003.) But the massive intervention of the central government and the rapid extinction of outbreaks in other parts of China was widely attributed to the efficient power of a quasi-totalitarian surveillance state. Both perceptions were in some part true, but they tell only part of the story. As Republican senator Bill Cassidy of Louisiana, a senior gastroenterologist, emphasized

meanwhile Trump accused Chinese president Xi Jinping of engineering a cover-up: Chinese medical scientists have been "outstanding" in quickly sharing crucial information with the world medical community. Indeed, their constant stream of reports and statistics has become the informational foundation for doctors and researchers everywhere.

At the same time, China and Cuba are the only countries currently rising to the challenge of providing significant medical aid and expertise to poorer nations. Cuba's internationalist doctors have for decades been the first on the scene of dangerous outbreaks in the Third World, suffering heavy casualties in recent battles against Ebola in West Africa. They are the reliable shock troops, but the Chinese bring in the heavy artillery—a promised conveyor belt of medical experts, test kits, protective gear, and so on. While Italy's European sisters, in what may be the death blow to the European project, close their borders and refuse to share supplies, China is preparing a massive medical rescue operation in loose coordination with Russia. Most tellingly, Chinese foundations have sent New York a thousand of the vital ventilators that Trump has failed to deliver.

Beijing, of course, is playing hegemonic politics and burnishing its image at a time when Washington has placed a "stay away and don't call" sign on the Statue of Liberty, and the WHO is crippled by the inaction of the

big Western governments. The Trump regime, meanwhile, acts in character: continuing to build its border wall despite the health risk to workers, cutting off vital medical aid to north Yemen in the midst of a famine, doubling down its economic blockades of Cuba and Iran, and turning a blind eye to the imminent disaster in Africa. But to an ordinary Liberian farmer or Kenyan mother, or for that matter an elderly Italian locked inside an apartment, what matters are not promises but masks, medicine, and lots of doctors' boots on the ground.

In recognizing China's achievements, however, we should avoid learning the wrong lesson: state capacity for decisive action in an emergency does not necessitate the suppression of democracy. Despite what many talking heads are claiming, putting a million Uighurs in reeducation camps was not a precondition for quelling the coronavirus in Hubei, nor has the Big Brother practice of surveilling all the jaywalkers in Chinese cities and scoring their "social credit" proved essential to the success of the national quarantine. Certainly the Communist Party's pervasive presence in daily life—90.6 million members organized into thousands of workplace and neighborhood committees—was a decisive factor in the total mobilization against COVID, but this mainly confirms the critical importance of grassroots organization and preparedness, not the necessity of a police state. Repression, although

used viciously against the original heroic whistleblowers in Wuhan—now "disappeared"—has otherwise played little role in China's success.

Still it's inevitable that the rightwing leaders in the White House, Downing Street, Beit Aghion, and elsewhere will seize every opportunity, as they did with 9/11, to appropriate new authoritarian powers, exploiting the consequences of their own inaction and disastrous leadership to set more precedents for closing public spaces, banning assemblies, and even suspending elections. A case in point has been Israeli prime minister Benjamin Netanyahu's use of the emergency to hobble parliamentary assemblies and let Shin Bet, the country's internal security service, tap everyone's phones. In Hungary, another "coronavirus coup" has given President Viktor Orban the power to rule by decree without a time limit, as well as to muzzle the opposition press. Thus dictatorship returns to Europe for the first time since the death of Franco.

That's why we need to be debating democratic models of effective response to present and future plagues, ones that mobilize popular courage, put science in command, and use the resources of a comprehensive system of universal health coverage and public medicine. Otherwise we cede leadership in this age of constant emergency to our tyrants.