Prologue

History has paid a call on Wuhan before. In 1966, Mao Zedong, the seventy-two-year-old chairman of the Communist Party, visited the city. He already had the death of tens of millions of people on his hands: the forced industrialization campaign of the Great Leap Forward led to the greatest famine in human history. Mao inaugurated that catastrophe by swimming in the Yangtze, the largest river in China, at one of its widest points, in Wuhan. Now he worried that his grasp on power was weakening. There were rumors that he was in ill health or near death. He needed to prove them wrong. He had just announced the latest stage of his plan for China, the Cultural Revolution. He would swim the river again.

A legend was concocted in the party press about how far and how quickly the old man swam that day—more than nine miles in sixty-five minutes, according to the state newspaper, which would have been a world record. Video of the event shows him doing a leisurely side stroke, surrounded by bodyguards and thousands of enthusiastic supporters who plunged in after him.

The swim was a turning point in Mao's chaotic rule, amplifying a personality cult among young people who now saw him as their champion. They became the Red Guards, the vanguard of the reign of terror that lasted until Mao's death ten years later.

Mao visited Wuhan again the following year, but this time he was greeted by insurrection. Demonstrators, some carrying iron bars, others with machine guns, surrounded Mao's villa, shouting slogans through loudspeakers and actually breaking into the compound. Mao was spirited away, but it was the most perilous moment in his nearly two decades of rule. Wuhan was purged; 184,000 citizens and soldiers were reported killed or injured in Hubei Province.

Present-day Wuhan is a city of eleven million people in the heartland of the country. Like Chicago, Wuhan is a major transportation center, a crossroads of railways and expressways; the Wuhan Tianhe International Airport is a hub of the Chinese airline system, with direct flights to major cities all over the world. It is an intensely modern city, but like all of China, it sits atop a mountain of trauma.

On December 26, 2019, at Hubei Provincial Hospital of Integrated Chinese and Western Medicine, Dr. Zhang Jixian examined an elderly couple complaining of fever and a cough—flulike symptoms—but a CT scan showed a form of pneumonia the doctor hadn't seen before. She summoned the couple's son and found that he, too, was suffering from an unknown pneumonia. She observed, "It is unlikely that all three members of a family caught the same disease at the same time unless it is an infectious disease." At about the same time, healthcare workers were falling ill with similar symptoms, indicating human-to-human transmission of the new pathogen was taking place. That fact was not acknowledged by government officials until nearly a month later; instead, authorities instructed the medical staff not to wear masks or gowns because they might give rise to panic.

On December 30, 2019, Ai Fen, the director of the emergency department of Wuhan Central Hospital, received a lab report of an atypical pneumonia. Like other doctors, Ai had noticed a stream of patients with unfamiliar pneumonias. A novel disease probably had been circulating in Hubei Province since November or possibly mid-October. Some of the cases seemed to be connected to the Huanan Seafood Wholesale Market not far from Dr. Ai's hospital. Ten of its 653 stalls offered exotic animals—including badgers, snakes, crocodiles, and pangolins—which were sold live and slaughtered in front of the customers. It was called a "wet market" because it was covered with scales and blood and water that splashed out of the fish tanks. Often, animal cages were stacked on top of each other, so that a palm civet nursing a virus might pass it to a hedgehog in the cage below. People also get infections from animals, but they are not considered human diseases unless they are shown to be transmitted from one person to another.

The lab report diagnosed Dr. Ai's patient as suffering from SARS coronavirus. That report would prove inaccurate; it was actually a previously unknown SARS coronavirus that causes a disease that would come to be called Covid-19.

Dr. Ai was used to dealing with crises—anyone who works in an emergency department has to have a steady temperament—but the lab report left her shaken. She circled the diagnosis in red and shared it with a few colleagues, reminding them to "pay attention to protecting themselves."

There was good reason for Dr. Ai's concern. Severe acute respiratory syndrome, or SARS, a coronavirus that erupted in China in November 2002, had thrown the country into its worst political crisis since the 1989 Tiananmen Square uprising. The initial response of the Chinese government and the ruling Communist Party had been to hide the outbreak, even from its own public health officers. Under the cloak of the news blackout,

SARS spread through the country, reaching Beijing the following March. Doctors in charge of the treatment had no idea what was going on, so closely held was the information, but frightened rumors spread by text messages. Pharmacies sold out of antibiotics and flu medicines. The new disease killed nearly 10 percent of the people it infected, becoming the first epidemic since HIV/AIDS dangerous enough to threaten the entire world. SARS is thought to have passed from horseshoe bats into masked palm civets and presumably into its first human hosts in the wet markets of Guangdong.

When World Health Organization (WHO) authorities were finally allowed into the country to inspect Beijing hospitals, in mid-April 2003, patients suffering from the disease were smuggled into ambulances and driven around the city or checked into hotels until the inspectors finished their tour. By that time the contagion had already skipped from China to Hong Kong, Hanoi, Singapore, Taiwan, Ulaanbaatar, Toronto, and San Francisco. That outbreak eventually reached thirty-two countries, but through heroic efforts on the part of public health officials around the world, and simple luck, the disease was contained in July 2003, nine months after it first appeared.

Another coronavirus, MERS-CoV, which causes Middle East respiratory syndrome, or MERS, was first reported in Saudi Arabia in 2012. It proved to be less contagious than SARS but much deadlier, killing about 35 percent of the people it infected. Public health officials everywhere were on edge about the potential danger of coronaviruses, but fortunately MERS spread rather poorly.

The SARS contagion allowed the entire world to peer into Chinese society through the lens of a mortal disease. The international scorn directed at the Chinese government shattered the country's confidence and sidelined its ambition to take its

place at the head of the table of nations. There were reasons for the cover-up of SARS, including the fear, typical of repressive systems, of passing bad news up the ranks; a tangled bureaucracy; and the singular priority of economic growth over all other considerations; but the naked fact stood that the Chinese government was willing to sacrifice its own people and place the entire world in jeopardy, risking millions of lives, simply to avoid accountability for the outbreak.

In 2005, because of SARS, new global health regulations were instituted, requiring greater transparency. The Chinese government seemed to be entering an era of openness, but in the seventeen years since the humiliation of the SARS epidemic, that intention had not been seriously tested.

News of the novel virus circulated quickly, frustrating the government's attempts to block it. One of the doctors who received Dr. Ai's message was Li Wenliang, an ophthalmologist at the same hospital, who reposted it to former medical school classmates on a private WeChat group, warning them to tell their families and friends to take precautions but also to keep the news confidential. He suspected there was human-to-human transmission because patients were being quarantined. That same day, the Wuhan Municipal Health Commission ordered hospitals to treat patients suffering from an unknown pneumonia, apparently because victims had been turned away. It's unclear how much the central government knew until that point, but almost immediately scanned copies of the official messages were leaked onto social media.

The Taiwan Centers for Disease Control, having noticed the posts, contacted health authorities in mainland China and were told that the cluster existed but that it had turned out not to be SARS, an assertion that the Taiwanese had reason to doubt. Taiwan pressed the WHO for more information and shared its

suspicion that the new disease was likely to be communicable among humans.

Mainland China refuses to allow Taiwan to participate in international organizations, including the United Nations and the WHO, insisting it is not an actual nation but a province of the People's Republic. The WHO did send a message to its country office in mainland China to follow up on the Taiwanese request, but China wouldn't admit that the pathogen was transmissible between humans for another three weeks, which contributed to the fatal delay of so many countries to prepare for the onslaught. Left to draw their own conclusions, the Taiwanese began early screening and quarantines, which would result in a strikingly low rate of infection on the island.

On December 31, the morning after Dr. Ai posted her note, Chinese technology companies began censoring phrases on social media such as "unknown Wuhan pneumonia" and "Wuhan Seafood Market." But that same day, an official report from Hubei Province said that there were twenty-seven patients with similar respiratory symptoms in the city's hospitals, seven of whom were critically ill. The news was out.

Dr. Ai's superiors at the hospital reprimanded her for spreading rumors that might cause panic and "damage stability." When she suggested that the virus could be contagious, she was told not to discuss it with anyone. She was ashamed and terrified. When she went home, she told her husband, "If something happens to me, you will have to take good care of the children." She was haunted by the blank face of a man receiving the death certificate for his thirty-two-year-old son. Another man had arrived at the hospital too sick to get out of his car. By the time Dr. Ai went to fetch him, he was dead. "If I had known what was to happen, I would not have cared about the reprimand," she recalled. "I would have fucking talked about it to whomever, wherever I could."

Dr. Li Wenliang, the ophthalmologist who had reposted Dr. Ai's note, was charged with rumormongering that "severely disturbed the social order." He was forced to sign a confession. His punishment, and that of seven other doctors who had publicly discussed the outbreak, was broadcast on China Central Television, a clear message to others who might attempt to undermine the government's narrative. Humble and compassionate, Li had a quiet charisma that made his punishment seem notably unfair. A few days after Li returned to the hospital, he caught the virus from a patient. "How can the bulletins still be saying there is no human-to-human transmission, and no medical worker infections?" he wondered.

Chinese authorities continued to scour web pages and social media posts concerning the outbreak and forced reporters into detention disguised as quarantine. On January 11, an ER nurse at Dr. Ai's hospital became infected with the virus, but hospital authorities again denied that human-to-human transmission was occurring.

When Dr. Ai gave an interview to the Chinese magazine *Renwu* (People) in March, it was immediately removed from the internet. Some highly inventive dissidents rewrote the interview to get around the censors, using emojis, Morse code, braille, and even Sindarin, the fictional language spoken by elves in J. R. R. Tolkien's Hobbit books. By that time, however, the Chinese government had shut down Wuhan and regained control of the narrative.

FACED ONCE MORE with a new virus that had the potential to become a catastrophic pandemic, the Chinese government again failed to warn the WHO or even its own people about the dangers of the new disease until the news was already out. Several Chinese labs quickly sequenced the new virus. The genomic se-

quence is the first step toward understanding the virus and serves as a starting gun for the creation of a vaccine. But Chinese authorities ordered unauthorized labs to stop testing samples from Wuhan and to destroy existing stock. These steps slowed the flow of information about the virus, and they also impeded the science required to develop a reliable test in countries that were not given samples to work with. On January 5, a group of scientists, led by Professor Yong-zhen Zhang, at Fudan University, in Shanghai, defiantly submitted the genome to the U.S. National Institutes of Health GenBank. Thereupon, Shanghai authorities shut down Professor Zhang's laboratory for "rectification." The Chinese Centers for Disease Control did not officially release the sequence until January 10.

American intelligence would later surmise that the central government had been caught by surprise because of the duplicity of local officials, but it is also true that Chinese authorities continued to downplay the threat once they knew about it. They demanded that researchers stop publishing about the virus without government authorization and cease warning about the danger of the outbreak. They continued to deny that there was evidence of human transmission. The government refused to share virus samples with the U.S., which set back the production of the tests needed to detect the disease by a couple of weeks. The WHO field office in China was finally allowed a brief visit to Wuhan on January 20, followed by a carefully managed delegation of WHO officials, led by the director-general, Dr. Tedros Adhanom Ghebreyesus, to Beijing one week later, a month after the first case surfaced.

The government likely disguised the true mortality figures; for instance, the official death toll in Wuhan was 2,579 (later revised to 3,869), but there were social media reports that the city's eight crematoriums were operating around the clock, and

photos showing long lines of citizens waiting to pick up the urns containing the ashes of their loved ones—perhaps as many as 3,500 urns per day. One preliminary study estimated that the true death toll in Wuhan was around 36,000, nearly ten times the official figure.

Dr. Li died on February 6, the first known of the thousands of healthcare workers around the world who would perish in the contagion, including four other doctors from his own hospital. He left behind a five-year-old child and a pregnant wife. The mass mourning that greeted his death was an expression of the anguish expressed by great numbers of Chinese people. They saw Li as a whistleblower and a martyr for free speech. They laid flowers in front of the Wuhan hospital and blew whistles in his honor all over China. It was a telling indicator of the provisional nature of Communist Party rule. Before he died, Dr. Li told *Caixin* magazine, "A healthy society shouldn't have only one voice."

The coronavirus revealed China as a country struggling in the grip of one-party control, at once fearful and defiant, ambitious and proud of its rise in the world but also seething with popular resentment at the political calculations that valued the party's image over human life. The reluctance to disclose the scope of the outbreak and to share the science that was necessary to stop its spread displayed an indifference to life that is the enduring legacy of Maoism.

In Wuhan, on January 18, the traditional Chinese New Year potluck banquet took place around the city with 40,000 households participating and no authorities standing in the way. On January 20, with the number of deaths rising, Zhong Nanshan, the best-known face of China's public health community, finally confirmed that the new virus was a communicable disease. Not until then was protective gear provided to the medical teams. Two days later, China announced a total quarantine of Wuhan.

Eventually about 650 million people, nearly half the population of China, were placed in quarantine. Nothing in history compared with the scale of it. The contagion was smothered, along with dissent.

By that time nearly half the population of Wuhan had already left the city for Chinese New Year, the most important holiday on the calendar, when people return to their hometowns, visit relatives and friends, and travel for vacation. Chinese authorities estimated nearly three billion trips would be taken during the forty-day festival. An immense portion of the travelers would pass through Wuhan along their way. International students went home for the holidays. It is the world's largest annual migration.

Covid-19 was on the move.

1

"It's Going to Be Just Fine"

One minute before midnight on December 30, 2019, ProMED, a closely watched online publication of the International Society for Infectious Diseases, posted an article translated from Chinese media stating that twenty-seven cases of what was termed a "pneumonia of unknown cause" had been found in Wuhan. The Centers for Disease Control and Prevention (CDC) and the World Health Organization learned of it almost immediately.

Robert Redfield, the sixty-eight-year-old director of the CDC, was vacationing with his family in Deep Creek, Maryland, when he read the ProMED notice on New Year's Eve. Several alarming details jumped out. The pneumonia appeared to be associated with a seafood market in Wuhan. Patients suffering from the pneumonia were placed in isolation, which was prudent, but suggestive that the health authorities were concerned about human-to-human transmission. "Whether or not it is SARS has not yet been clarified," the document said, "and citizens need not panic."

On January 3, 2020, Redfield spoke with his counterpart in

China, George Fu Gao. Like many similarly named organizations around the world, the Chinese Center for Disease Control and Prevention was modeled on the American original. Redfield had heard that the first twenty-seven reported cases included three family clusters. It was unlikely that each of them had been simultaneously infected by a caged civet cat in a wet market. When pressed, Gao assured Redfield that there was no evidence of human-to-human transmission. It seemed to Redfield that Gao was only just learning of the outbreak himself. Redfield offered to send a team of CDC disease detectives from the U.S. to investigate, but Gao said he was not authorized to invite them. He told Redfield to make a formal request to the Chinese government. Redfield did so, and immediately assembled a team of two dozen epidemiologists and disease specialists, but no invitation ever arrived.

The specter of SARS hung over both men. Gao was teaching at Oxford during the 2003 outbreak. He returned to China the following year to head the Institute of Microbiology at the Chinese Academy of Sciences, and in 2017 he was appointed director of the Chinese CDC. A widely published and world-renowned virologist and immunologist, Gao was hired as part of the intense investment that China made in medical science after the SARS debacle, establishing almost from scratch the world's largest reporting system for health emergencies and infectious disease outbreaks, building clinics and specialty hospitals, expanding research budgets, and providing free universal healthcare for its citizens. In short order, China appeared poised to become a leader in global health. The Chinese CDC was a critical part of that design, and its main mission was to detect emerging diseases, including anything that looked like SARS. But in the face of the new disease, the Chinese public health system had once again totally failed. There was no way of really knowing how many people were infected.

When Redfield first spoke to Gao, the "unknown pneumonia" was presumed to be confined to China, not yet posing an imminent threat to the rest of the world. In fact, the virus was already present in California, Oregon, and Washington State, and within the next two weeks would be spreading in Massachusetts, Wisconsin, Iowa, Connecticut, Michigan, and Rhode Island—well before America's first official case was detected.

In another conversation that first week of the new year, Dr. Gao started to cry. "I think we're too late," he told Redfield. "We're too late."

MATTHEW POTTINGER WAS getting nervous. As the Trump administration was entering its final year, he was one of the few who had been there from the start. Perhaps his durability stemmed from being so hard to categorize. Fluent in Mandarin, he had spent seven years in China, reporting for Reuters and the *Wall Street Journal*. He left journalism at the age of thirty-two and joined the Marines, a career switch that confounded everyone who knew him. In Afghanistan, he co-authored an influential paper with Lieutenant General Michael Flynn on improving military intelligence. When Trump picked Flynn to be his national security adviser, Flynn lured Pottinger to be his Asia director. Scandal evicted Flynn from his job almost overnight, but Pottinger stayed, serving five subsequent national security chiefs. In September 2019, Trump appointed Pottinger deputy national security adviser. In a very noisy administration, he had quietly become one of the most influential people shaping American foreign policy.

Pottinger is of medium height, with blue eyes, his dark blond hair still cropped in a military cut. His eyebrows are a brighter blond, lending him the quality of appearing extra awake. In 2003, he was in China reporting on the SARS cover-up for the

Wall Street Journal. Now, when Chinese authorities were assuring the U.S. that there was little evidence of human-to-human transmission, that the virus was fragile and would not stand up to warmer weather, and that the situation was under control, familiar alarms were ringing in Pottinger's mind.

He was struck by the disparity between official accounts of the novel coronavirus in China, which scarcely mentioned the disease, and Chinese social media, which was aflame with rumors and anecdotes. Someone posted a photograph of a sign on the door of a Wuhan hospital saying that the emergency room was closed because staff were infected. Meantime, the WHO—relying on Chinese assurances—tweeted that there was no clear evidence of human-to-human transmission, countering a statement made the same day in a press briefing by a WHO scientist who said the opposite.

The National Security Council (NSC) addresses global developments and offers the president options to consider. On January 14, Pottinger authorized a briefing for the NSC staff by the State Department and the Department of Health and Human Services, along with CDC director Redfield. That first interagency meeting to discuss the situation in Wuhan wasn't prompted by official intelligence; in fact, there was practically none of that.

The next day, two hundred guests assembled in the East Room of the White House to witness the signing of the first phase of the U.S.-China trade deal. Cabinet members and corporate leaders mingled with members of Congress, governors, Fox News stars, and the Chinese delegation. "Together we are righting the wrongs of the past and delivering a future of economic justice and security for American workers, farmers, and families," the president said, in front of a bank of American and Chinese flags. He called Chinese president Xi Jinping "a very, very good friend."

On January 20, the coronavirus officially arrived in America. "This is a thirty-five-year-old young man who works here in the United States, who visited Wuhan," Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases (NIAID), said on a Voice of America broadcast. "There was no doubt that sooner or later we were going to see a case. And we have." President Trump took note of the event at the World Economic Forum in Davos. "It's one person coming in from China, and we have it under control," he remarked. "It's going to be just fine."

COVID-19 ARRIVED in America at a vulnerable moment in the nation's history. The country was undergoing a wrenching political realignment, brought to a head by the 2016 election of Donald Trump, whose policies on trade, deficit, alliances, and immigration were at odds with traditional Republican conservatism. His election pulled the country further into a cataclysm of identity politics, shrinking the GOP into a pool of aging white voters who felt disparaged, resentful, and left behind. The #MeToo movement had ignited an edgy dialogue between the sexes. As the stock market soared, long-delayed questions of income disparity and racial justice were pressing forward. Every dissonant chord among the parties, the races, and the genders was amplified within the echo chambers the fractured communities had made for themselves.

Into this turbulent, deeply troubled, but prideful society, the coronavirus would act as a hurricane of change, flattening the most powerful economy in the world, leveling not the physical cities but the idea of cities, strewing misfortune and blame and regrets along with the tens, the hundreds, the thousands, the hundreds of thousands of obituaries. No country would es-

cape the destruction the virus inflicted, but none had as much to lose as America. Wealth and power breed hubris, and perhaps Covid-19 was the force that America needed—to be humbled, to reckon with itself, to once again attempt to create the democracy it had always intended to be.

On the other hand, America's moment at the forefront of history might have passed, and Covid-19 was a blow it was no longer strong enough to fend off. Rival powers—with China at the top—were competing for control of the new millennium. This was a challenge to democracy, which was America's cause in the world. The alternative to American preeminence was not a globe full of mini-Americas but a world dominated by tyrants. Freedom was at stake, as it always is, but America had tied itself into a political knot. The cyclonic forces of fascism and nihilism gained in power as the center weakened. The only thing that kept democracy from winding up in a suicidal brawl of self-interest was a sense of common purpose, but the pandemic exposed that the United States no longer had one.

In those early days, when politics mattered most, few paid attention when nature entered the ring. It had been a century since the last great pandemic, which was nursed in the trenches and troopships of the First World War and spread even into tropical jungles and Eskimo villages. That flu lasted two years and killed between forty and a hundred million people. Back then, scientists scarcely knew what a virus was, so how could they fight it? By the twenty-first century, however, infectious disease was considered a nuisance, not a mortal threat to civilization—at least, this was a common assumption among the elected officials who were charged with protecting the country. This lack of concern was reflected in the diminished budgets that nourished the great institutions that had led the world in countering disease and keeping Americans healthy. Hospitals closed; stockpiles

of emergency equipment were not replenished. The specter of an unknown respiratory virus arising in China gave nightmares to public health officials, but it was not on the agenda of most American policymakers. In January 2017, days before Donald Trump was inaugurated, Dr. Fauci had warned there was "no doubt" that the incoming president would be dealing with an infectious disease outbreak. "We will definitely get surprised in the next few years," he predicted.

And yet there were so many reasons to feel complacent. In October 2019, the Nuclear Threat Initiative, together with the Johns Hopkins Center for Health Security and the Economist Intelligence Unit, compiled the first-ever "Global Health Security Index," a sober report of a world largely unprepared to deal with a pandemic. "Unfortunately, political will for accelerating health security is caught in a perpetual cycle of panic and neglect," the authors observed. "No country is fully prepared." Yet one country stood above all others in its readiness to confront a novel disease: the United States.

During the transition to the Trump administration, the Obama White House handed off a sixty-nine-page document called the "Playbook for Early Response to High-Consequence Emerging Infectious Disease Threats and Biological Incidents." A meticulous, step-by-step guide for combatting a "pathogen of pandemic potential," the playbook contains a directory of the government's resources in time of need and is meant to be pulled off the shelf the moment things start to go haywire.

At the top of the list of dangerous pathogens are the respiratory viruses, including novel influenzas, orthopoxviruses (such as smallpox), and coronaviruses. The playbook outlines the conditions under which various government agencies should be enlisted. With domestic outbreaks, the playbook specifies that "[w]hile States hold significant power and responsibility related to

public health response outside of a declared Public Health Emergency, the American public will look to the U.S. Government for action when multi-state or other significant public health events occur." Questions concerning the severity and contagiousness of a disease, or how to handle potentially hazardous waste, should be directed to the Department of Health and Human Services (HHS), the Federal Emergency Management Agency (FEMA), and the Environmental Protection Agency (EPA). Is there evidence of deliberate intent, such as a terrorist action? The FBI has the lead. Have isolation and quarantine been implemented? How robust is contact tracing? Is clinical care in the region scalable if cases explode? There are many such questions, with decisions proposed and agencies assigned. Because the playbook was passed to a new administration that might not be familiar with the manifold resources of the federal government, there are appendices describing such entities as the Surge Capacity Force in the Department of Homeland Security, consisting of a group of FEMA reservists and others that can be called upon as "deployable human assets." The Pentagon's Military Aeromedical Evacuation Team can be assembled to transport patients. HHS has a Disaster Mortuary Operational Response Team, with the dry acronym DMORT, consisting of "intermittent federal employees, each with a particular field of expertise," such as medical examiners, pathologists, anthropologists, dental assistants, and investigators.

The Trump administration jettisoned the Obama playbook. In 2019, HHS, headed by Alex M. Azar Jr., conducted an exercise called Crimson Contagion. It involved a number of government agencies, including the Pentagon and the NSC; healthcare organizations and major hospitals, such as the Mayo Clinic; public groups with a specific interest in healthcare, including the American Red Cross; and twelve state governments. The exercise sce-

nario envisioned an international group of tourists visiting China who become infected with a novel influenza, and then spread it across the world. One of the tourists, a middle-aged man, returns to Chicago with a dry cough. His son attends a crowded public event, and the contagion races through America. There's no vaccine and antiviral drugs are ineffective. Within a few months, the hypothetical flu kills 586,000 Americans.

The Trump administration's own exercise was spookily predictive of what was to come, including how chaotically the government would respond. Federal agencies couldn't tell who was in charge; there was a lack of production capacity for personal protective equipment (PPE); ventilators were in short supply; and states were frustrated by their attempts to secure enough resources. Cities defied a CDC recommendation to delay opening their schools. Businesses struggled to figure out how to keep their employees working from home. The longer the hypothetical contagion went on, the more bollixed the government response became. The Public Health Emergency Fund was dangerously depleted; needles, syringes, hospital-grade N95 masks, and other medical essentials were in limited supply and difficult to restock because of an absence of domestic manufacturing capacity. The report on the exercise was briefed to Congress but kept under wraps. By the time Covid-19 arrived in America nothing meaningful had been done to address these shortcomings.

One could say that the Trump administration was in an enviable spot at the beginning of the pandemic. It had a step-by-step playbook that could serve as a guide through bureaucratic snares that accompany such a disaster. It had been alerted to its own failings by the Crimson Contagion exercise. And it was blessed with institutions that were envied and admired throughout the world. Beyond the matchless government medical and research institutions such as the CDC, National Institutes of Health, Wal-

ter Reed National Military Medical Center, the U.S. Army Medical Research Institute of Infectious Diseases, and the Biomedical Advanced Research and Development Authority, America also commands the world's top medical schools and many of the largest pharmaceutical companies. When the Trump administration came into office, it was handed the keys to the greatest medical-research establishment in the history of science.

Robert Kadlec, the assistant secretary of HHS in charge of preparedness and response, had led the Crimson Contagion exercise. He would later admit, "We knew before the movie started it was going to have a bad ending."

2

The Trickster

"I JUST LOVE infectious diseases," John Brooks, the chief medical officer of the Covid-19 response team at the Centers for Disease Control and Prevention, admitted. "I know diseases are terrible. They kill people. But something about them just grabs me."

Each generation has its own struggle with disease. Brooks's mother, Joan Bertrand Brooks, developed polio in 1939, which left her with a lifelong limp. Like many survivors her symptoms improved in her young adulthood and then returned, forcing her to rely on an electric scooter. Her legs were covered with surgical scars, and her right leg was noticeably shorter than her left. "She spoke about that experience often, and how she was teased, stigmatized, or blatantly discriminated against outside of that community," Brooks recalled.

For Brooks, who is gay, the disease of his generation was HIV/AIDS. He grew up in Washington, D.C., in the Logan Circle neighborhood, which had a large gay population, and watched men he knew disappear. "Guys would get thin and

develop lesions and then be gone. It was scary." The fact that science offered no solution was on Brooks's mind when he decided to become a doctor. The day he was accepted at Harvard Medical School, he and his mother went to lunch on K Street to celebrate. Afterwards, they dropped in on a ten-dollar palm reader, who said she saw him marrying a tall Swedish woman and flying around the world with their three children in their private jet. "We had a good laugh," he said. "I should have asked for a refund."

In 2015, Brooks became chief medical officer of the HIV/AIDS division at the CDC. Every researcher who has dealt with HIV has been humbled by the various manifestations of this horrid disease. "At every turn, there was something different," Brooks marveled. "All these opportunistic infections show up. What in the world is this all about? Very cool." The experience helped prepare him for the many tricks that Covid-19 would present.

THE CDC WAS FOUNDED in 1946, as the Communicable Disease Center. Atlanta was chosen as the site because it was in the heart of what was called "the malaria zone." Five years later, America was declared malaria-free. The organization's mission broadened to attack other diseases, including typhus and rabies; it led the charge that wiped out polio in the U.S. In 1981, the CDC reported the first cases of AIDS in Los Angeles. The CDC also addressed workplace safety, and it joined with the National Institute of Justice to create the first survey, in 1994, of violence against women. Year after year, the organization—rechristened the Centers for Disease Control and Prevention—maintained a reputation as the gold standard for public health, operating above politics and proving again and again the value of enlightened

government and the necessity of science for the furthering of civilization. During the twentieth century, the life span of Americans increased by thirty years, largely because of advances in public health, especially vaccination.

When I was a young reporter, I wrote several stories that took me to the CDC. It sits on the edge of the campus of Emory University. I was awed by the recondite learning of the scientists I met there. I attended an annual meeting of the Epidemic Intelligence Service, a swaggering group of Ivy League postdocs and buckaroos in bolo ties who journeyed into hot zones to investigate outbreaks of diseases that could cripple civilization. They struck me as courageous, ingenious, and noble, and they regarded the institution they worked for as somehow sacred.

The CDC has expanded from the days when I used to haunt it; it's now like a midsized college with numerous departments and more building underway, including a new high-containment facility to store all the most dangerous diseases in the world. Lab animals—mice, ferrets, monkeys—inhabit the cages inside the Biosafety Level 4 chambers. Humans move around like deep-sea divers in inflated suits, tethered to an overhead airflow system. The Emergency Operations Center—a large, bright room, with serried rows of wooden desks facing a wall of video screens—exudes a mixture of urgency and professional calm.

Brooks directed the Covid-19 task team with Greg Armstrong, a fellow epidemiologist. Armstrong oversaw the Office of Advanced Molecular Detection, a part of the CDC's center for emerging and zoonotic diseases—those diseases that come from animals, as coronaviruses typically do. Humanity's encroachment into formerly wild regions, coupled with climate change, has forced animals to migrate from traditional habitats. That has engendered a host of new diseases, including Ebola, Zika, West Nile, Nipah—just to mention a few that have arisen

fairly recently. At first, SARS-CoV-2 presented itself as a typical coronavirus, like the common cold, spreading rapidly and symptomatically. In fact, this new virus was more like polio, in which most infections are asymptomatic or very mild, with fever and headaches. The cases that doctors actually see are about one in every two hundred infections. Stealth transmission is why polio has been so hard to eradicate.

Armstrong was in Salt Lake City conducting a training on genetic sequencing when he happened to read an article on the website of the *New England Journal of Medicine* titled "Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia." The authors, mostly associated with the Chinese CDC, were among the first to describe the means of human contagion of the new virus, a development that didn't surprise Armstrong: "Anybody with any experience could tell you it was human-to-human transmission." Then he took a look at Table 1, "Characteristics of Patients," which noted the original source of their infection. Of the Chinese known to have contracted the virus before January 1, 26 percent had no exposure to the Wuhan wet market or to people with apparent respiratory symptoms. (In the following weeks the proportion of people with no obvious source of infection surpassed 70 percent.) Armstrong realized that, unlike SARS or MERS, there were probably a lot of asymptomatic or mild infections with the SARS-CoV-2 virus. That spelled trouble. Contact tracing, isolation, and quarantine were probably not going to be enough. These telling details were buried in Table 1.

Viruses circulate in our bodies all the time, but not until a virus causes an infection do we begin to talk about disease—when HIV becomes AIDS, or SARS-CoV-2 becomes Covid-19. Confoundingly, a person can be infected and show no symptoms; that person still does not have the disease but he is carrying the

virus, which is how Covid spreads asymptomatically. The moment the carrier starts to cough or run a fever because of the virus, we can say he has Covid-19 disease.

It wasn't clear yet how infectious SARS-CoV-2 was, but because it is genetically related to SARS and MERS, the immediate assumption had been that, as with those diseases, people would not be contagious unless they were symptomatic, and that anyone who got infected would manifest some kind of illness. SARS had spread slowly. The time between infection and the onset of symptoms, called a serial interval, was about eight days, and the carrier wasn't contagious until then. SARS-CoV-2 spread twice as fast, which was alarming, but what was totally confounding was the discovery of a "negative serial interval," which meant that some people were showing symptoms before the person who infected them.

The CDC's early guidance documents didn't mention that possibility, because the evidence of asymptomatic spread in January and most of February was deemed insufficient. "Frankly, from a public health perspective, you want to lead with facts that reassure people," said Brooks. "It scares people if it sounds like you don't know anything." Later, many people at the CDC would wish that they had been able to better explain their early directives. "In the beginning, for every mathematical analysis that indicated a shorter serial interval than incubation period, others reported no difference," Brooks observed. "When the science changed, we changed. And our recommendations changed, too." But by that time, the CDC had been muzzled by the Trump administration.

"THERE ARE THREE THINGS this virus is doing that blow me away," said Brooks, marveling at the resourcefulness and agility

of his adversary. "The first is that it directly infects the endothelial cells that line our blood vessels. I'm not aware of any other respiratory viruses that do this. This causes a lot of havoc." Endothelial cells provide a protective coating inside the blood vessels, sealing off the cell like a Ziploc bag. They modulate blood pressure and serve as traffic cops, using sticky proteins to nab passing immune cells and direct them where they are needed when a threatening virus is present.

With coronaviruses, the vulnerable spot for infection in humans is the ACE2 receptor. If the virus is the key, the receptor is the lock it's looking for. ACE2 receptors are enzymes found in the lungs and kidneys as well as in the gut and the brain, accounting for the many manifestations of the disease in humans. They are also abundantly present in the endothelial cells. The virus binds to these receptors, hijacking the cell's machinery to make copies of itself, thereby killing the cell and scouring the thin cell wall, which generates turbulent blood flow. Powerful chemical contents get dumped into the bloodstream, stirring up inflammation elsewhere in the body. Brooks had never seen that condition before.

The second surprise was hypercoagulability—a pronounced tendency to develop blood clots. Brooks was reminded of Michael Crichton's 1969 best-selling thriller, *The Andromeda Strain*, in which a pathogen causes instant clotting, striking down victims in midstride. "This is different," Brooks continued. "You're getting these things called pulmonary embolisms, which are nasty. A clot forms; it travels to the lung, damaging the tissues, blocking blood flow, and creating pressures that can lead to heart problems." These clots can cause strokes, even in previously healthy young people. Brooks referred to an early report documenting autopsies of victims. Nearly all of them had pulmonary thromboses—clots in the lung—but until the autopsy,

no one had suspected the clots were even present, let alone the probable cause of death.

"And the last one is this hyperimmune response," said Brooks. Infectious diseases frequently kill by triggering an excessive immune-system response. Brooks gave the example of pneumonia: The body doesn't die because the bacteria eats the lung; it's because the body overreacts by flooding the lung with white blood cells, which carry antibodies but also clog up the lungs with fluid, "and you drown."

Some patients require kidney dialysis or suffer liver damage. The disease can affect the brain and other parts of the nervous system, causing delirium and lasting nerve damage. Covid can also do strange things to the heart. Hospitals began admitting patients with typical symptoms of heart attack, including chest pains and trouble breathing. "They do the EKG, and the EKG says this person is having a heart attack," said Brooks, "but their coronary vessels are clean. There's no blockage." Instead, an immune reaction has inflamed the entire heart muscle, a condition called myocarditis. "And there's not a lot you can do but hope they get through it." A German study of 100 recovered Covid patients with the average age of 49 found that 22 of them had lasting cardiac problems.

Even after Brooks thought SARS-CoV-2 had no more tricks to play, a sneaky aftereffect totally confounded him. "You get over the illness, you're feeling better, and it comes back to bite you again." In adults, it might just be a strange rash. But some children develop a multi-organ inflammatory syndrome. "They have conjunctivitis, their eyes get real red, they have abdominal pain, and then they can go on to experience cardiovascular collapse." Some of the children don't even remember being ill until then. "They were asymptomatically infected," Brooks said. "So it's weird."

3

Spike

When I was around six years old, I woke up one morning and couldn't get out of bed. My legs wouldn't move. I was paralyzed from the waist down.

This was during the polio era, in the early 1950s. My mother came in because I wasn't ready for school. I remember the alarm in her eyes. In those days, doctors made house calls, and he entered my room carrying his black physician's bag, sat on the edge of the bed, stuck a thermometer under my tongue, and checked my pulse. There was little else he could do. The terror of polio haunted children and parents everywhere. It was common to see young people in leg braces or wheelchairs; those imprisoned in iron lungs we only heard about.

I was lucky. It wasn't polio; it was possibly a severe allergic reaction to a tetanus shot I had had a few days before, caused by the tetanus antitoxin, which is harvested from horse blood. Horses were so important to the production of antibodies that many of the great pharmaceutical companies began as horse farms. It might also have been a dangerous disease called Guillain-Barré

syndrome, an autoimmune disorder sometimes associated with infections such as influenza, Zika, and dengue fever—but so far not Covid-19. After a day or two, I could move my legs, but the memory was searing. Naturally, I have a wariness about vaccines. I'm not supposed to take flu shots, for instance, which in rare instances are associated with Guillain-Barré.

I remember, as a child, collecting coins for the March of Dimes, which was founded by President Franklin D. Roosevelt, who was crippled by polio (although more recent scholarship suggests he may have been misdiagnosed, and that he actually had contracted Guillain-Barré syndrome). Millions of dimes, many of them contributed by schoolchildren, established the National Foundation for Infantile Paralysis and led to FDR's profile being put on the dime.

Since 1796, when Edward Jenner created the first vaccine, for smallpox, the field of public health has been dogged by anti-vaccination movements. They are sometimes inspired by moral or religious sentiments, citing the use of animals or fetal tissue; or they may be swayed by political notions of individual liberty; but the main argument is the threat of disease caused by the vaccine itself. In 1998, there was a paper published in *The Lancet*, one of the world's oldest and most respected medical journals, by Andrew Wakefield, a British doctor, that purported to show a link between the Measles Mumps Rubella (MMR) vaccine and the development of autism. Numerous other studies have contradicted the findings, and *The Lancet* withdrew the paper in 2010, after investigations showed the original study was fraudulent and that Wakefield had been bankrolled by a lawyer trying to raise a class-action suit against vaccine manufacturers.

Wakefield's medical license was revoked. The disgraced British doctor did what so many have done: he moved to Austin, my town. Texas was a fertile field for anti-vaccination propaganda. In

2003, lawmakers passed new rules allowing anyone to refuse to vaccinate their children. The number of unvaccinated children in Texas is estimated to be more than 100,000.

The anti-vaxxers have prompted an upsurge in childhood diseases, especially measles, one of the most contagious diseases ever known. It used to infect nearly every child in America by the age of fifteen, killing from 400 to 500 of them each year, and hospitalizing about 48,000, some with serious secondary infections, such as encephalitis. Thanks to an effective vaccine, the United States was declared free of measles in 2000. And then it came back. In 2019, nearly 1,300 cases were reported, many of them in religious communities, such as among the Amish and ultra-Orthodox Jews.

In 1955, more than 200,000 American children received a polio vaccine containing a live virus that had not been properly inactivated; 40,000 of them got polio, 200 were paralyzed, and 10 died. The legacy of that awful disaster led to more effective government oversight of vaccines, but it also generated a flood of lawsuits that caused many pharmaceutical companies to back away from vaccine development. A heroic international effort over decades has led to the point that this incurable disease is on the verge of extinction. Vaccines did that. And yet, of the cases that still occur each year, most of them are the result of vaccination. Only a few cases of wild poliovirus continue to turn up—169 in 2019—primarily in Afghanistan and Pakistan, where vaccination rates remain low. The conundrum is this: The oral polio vaccine, which is easy to dispense, consists of three attenuated polio viruses, and a child receiving the vaccination may infect other children who haven't been vaccinated. There is an injectable vaccine made of an inactivated virus, which is safer, but until polio is fully eradicated, oral vaccines will continue to be administered. The only way to stop the spread is to vaccinate more children.