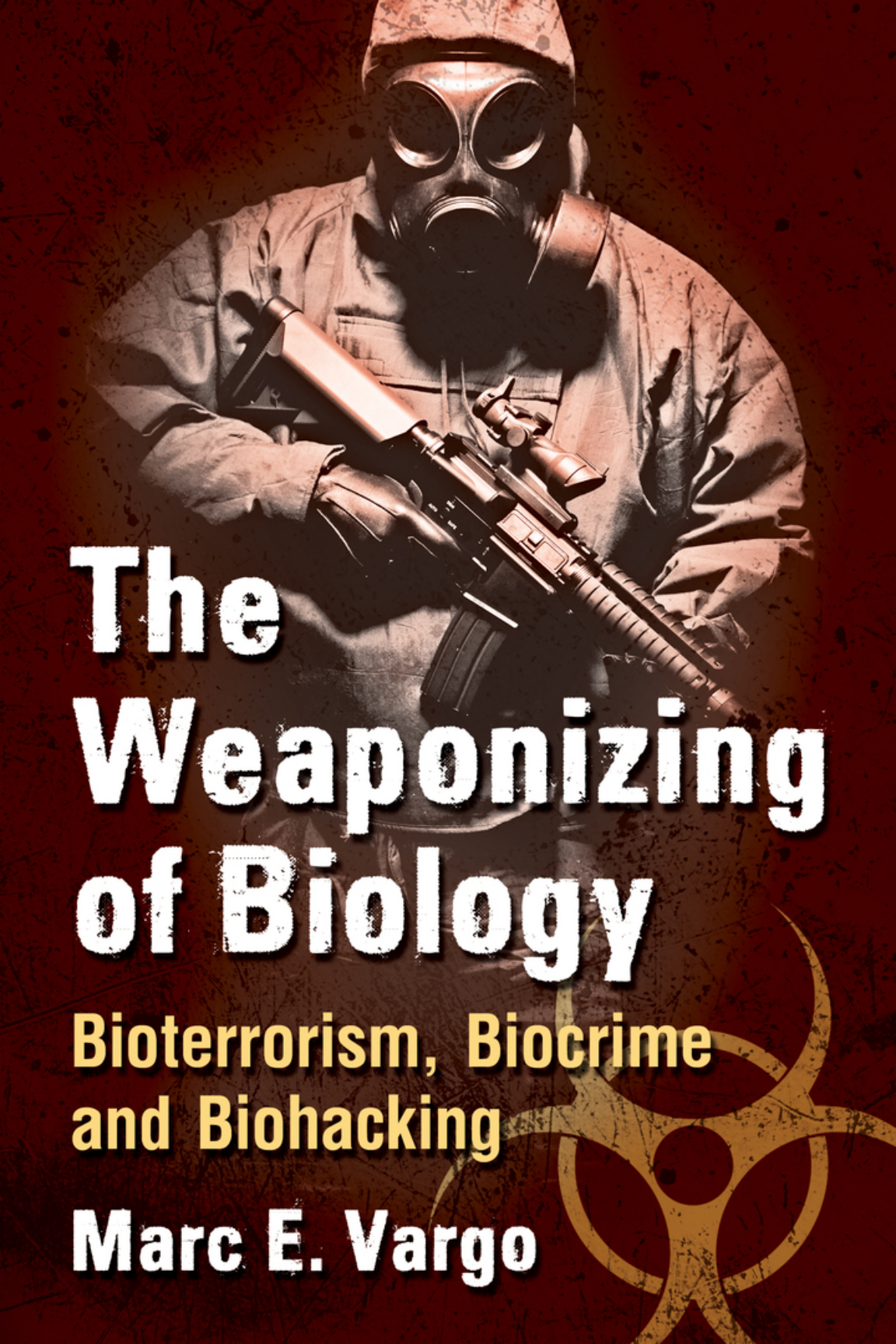

The Weaponizing of Biology

Bioterrorism, Biocrime and Biohacking

Marc E. Vargo

The Weaponizing of Biology

Also by Marc E. Vargo

The Mossad: Six Landmark Missions of the Israeli Intelligence Agency, 1960–1990 (McFarland, 2015)

Women of the Resistance: Eight Who Defied the Third Reich (McFarland, 2012)

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For Eric and Adam Vargo

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Introduction

"Evil is only good perverted," writes Henry Wadsworth Longfellow in his narrative poem, *The Golden Legend*.[1] Certainly there is truth in the renowned poet's words, with the corruption of good being readily observable throughout the course of human history, perhaps most notably when that which was intended for the benefit of humankind has been upturned and used as a truncheon against it.

The discipline of biology offers an example, a field of study in which scientists' insights into the intricacies of life have at times been misused by malevolent actors committed to delivering agony and death, and in a most insidious manner: through the spread of disease. And this is not a recent development. Biological aggression in all of its varieties has, for centuries, been a bane to humanity, a practice that cultures around the world have denounced over and again as a singularly despicable and intolerable form of violence. Yet it continues to occur sporadically in both Eastern and Western nations.

In the pages that follow, three categories of biological aggression are examined: bioterrorism, biocrime, and biohacking. Whereas the first two classifications, by definition, culminate in acts of violence, the third category, biohacking, refers to a newly-emergent movement that entails "do-it-yourself biology" (DIYbio) and to date presents only the potential for biological aggression.

The first portion of the book, Part One, examines the fundamental concepts and features of bio-aggression, and, as such, serves as a primer on the subject. The first chapter traces the history of biological warfare from its practice by Chinese warriors nearly five thousand years ago through its use in the Middle Ages and Renaissance to its manifestation in the modern era. In the course of this historical survey, a little-known attempt to deploy a virus to assassinate President Abraham Lincoln in the nineteenth century is revisited, as are pivotal advances in the state-operated biowarfare programs of Germany, Japan, the former Soviet Union, and the United States in the twentieth

century. Examined, too, is the growth of non-state bioterrorism in the present century, with a spotlight on the al-Qaeda network.

Chapter 2 centers on the various ideologies that characterize terrorist organizations—political, religious, and special-interest philosophies and agendas—together with such entities' motives, short-term objectives, and long-term goals. Emphasis is placed on the types of extremist groups that biodefense specialists believe are most inclined to use biological weapons, along with the rationales behind the experts' opinions. The discussion concludes by bringing to light a particularly devious form of assault known as a "biocrime," including the ways in which it differs from bioterrorism as well as the reasons that a perpetrator may turn to such an unorthodox mode of aggression.

Biohacking is the subject of Chapter 3, with the text tracing the origin and development of the DIYbio movement, which is currently thriving. It is one in which people from all walks of life, many of whom lack formal training in the life sciences, carry out biological or bioengineering experiments in their homes, community-based workshops, specially designed "hacklabs," or other alternative settings. The potential hazards of this largely amateur endeavor are explored, most notably the concerns voiced by professional microbiologists, geneticists, bioengineers, and biodefense experts. Among their reservations: the possibility that an experiment by a "citizen biologist" may go awry and sicken or kill a swath of the population, or that a group of rogue biohackers may deliberately target individuals or groups with a pathogen, perhaps an augmented, genetically-engineered microbe capable of producing unforeseen damage. The counterarguments of biohacking advocates are presented as well, rejoinders to what they consider their opponents' inflated fears, with such enthusiasts offering several reasons that they believe the benefits of do-it-yourself biology far outweigh the risks of a biological calamity. The discussion concludes with a look at two codes of ethics that biohacking networks have proposed in Europe and North America in an effort to help prevent biological accidents and discourage premeditated pathogenic attacks.

Turning to specific pathogens and toxins, Chapter 4 summarizes the features of those microscopic entities that the Centers for Disease Control and Prevention considers to be prospective agents in a biological offensive. These include the bacteria that produce anthrax, botulism, plague, tularemia, Q fever, and salmonellosis; in addition, the viruses that lead to Ebola and Marburg Virus Diseases, smallpox, and other conditions. The principal modes of pathogen dissemination are also outlined, specifically person-to-person, airborne, foodborne, waterborne, and vector-borne transmission.

Having covered the essentials of biological aggression, the remainder of the book, Part Two, provides an assortment of cases illustrating the diversity

of biocrimes and bioterrorism attacks. Chapter 5 revisits several of the former that occurred in the field of medicine in recent years, culminating in a detailed recounting of the notorious case of physician Debora Green and her efforts to use a lethal plant toxin as a weapon. Chapters 6 and 7, on the other hand, showcase the latter, namely two precedent-setting, large-scale bioterrorism attacks orchestrated by extremist religious sects in the United States and Japan. Lastly, Chapter 8 provides an extensive account of the deadly anthrax offensive that followed in the wake of the World Trade Center and Pentagon attacks of September 11, 2001. The text further delves into the possible perpetrators of this historic offensive, including the FBI's third and final suspect whose purported guilt remains debatable to this day.

All in all, the book, by furnishing an up-to-date overview of bioterrorism, biocrime, and biohacking, serves as a timely reminder of the dangers posed by those individuals and organizations who set out to subvert the life sciences so as to produce illness and death for their own dubious ends. As Longfellow would undoubtedly concur, biological aggression, like chemical and nuclear warfare, is a classic example of "good perverted," as well as a form of violence that carries the potential to endanger the entirety of humanity itself.

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From Ancient China to al-Qaeda

A Brief History of Biological Warfare

The unleashing of biological agents to produce illness and death is anything but new. Known as "biological warfare" and "germ warfare," individuals and armies alike have long taken part in this notorious practice, not only in foreign lands but in the United States as well. Case in point: the attempted assassination, by biological means, of Abraham Lincoln.

The year was 1864 and the Civil War had been raging for three years. A trauma for the American people, it was also a harrowing ordeal for the commander-in-chief, and not only because of the political burdens it placed on him. In the course of the conflict, Lincoln endured crushing bouts of depression, and, it is today suspected, symptoms of a genetic condition known as spinocerebellar ataxia.[1] He contracted smallpox as well, complaining of dizziness and headache as he prepared to deliver the Gettysburg Address.[2] Shortly thereafter, skin lesions and muscle cramps compounded his misery. Yet despite such maladies, the stalwart leader remained firmly at the helm, choosing, in effect, to place the dispute that was ripping apart the nation before his own health and well-being. A principled decision, it was, of course, one that would render Lincoln physically vulnerable, and this state of affairs would not go unnoticed by his adversaries.

At the opposite end of the moral spectrum, and one such antagonist, was a Kentucky physician by the name of Luke Pryor Blackburn. Described as a "Confederate zealot" by historian Andrew Bell, Blackburn had long abhorred the Lincoln administration and wished to see the president sidelined.[3] For this reason, the doctor, after a three-year stretch during which the commander-in-chief showed no sign of leaving office, decided to take matters into his own hands. Securing the tacit support of Jefferson Davis, head of the Southern "Confederate States of America," Blackburn hatched a plot he

believed would remove the commander-in-chief from the political stage once and for all; a plot that would be both diabolical and unprecedented in that it would constitute the first known attempt to transmit a grave illness to a sitting president in order to upend the nation's governance. The doctor knew that another major affliction, such as yellow fever, could bring an end to Lincoln's life.

To launch his nefarious plot, Blackburn sailed to the island of Bermuda, where a yellow fever epidemic was decimating the population. Coming ashore, he was treated to a hearty welcome by the Bermudians, who looked upon him as a godsend because he was an expert in the containment of the disease. Certainly their admiration was warranted. The doctor had previously overseen quarantines to curb outbreaks of yellow fever in New Orleans and the town of Natchez, Mississippi, with his efforts being fruitful and news of his accomplishments spreading far and wide. What the grateful Bermudians did not know, however, is that the outwardly benevolent physician had come to do more than help them control their epidemic; he had also come to help himself to the clothing and bedding of those who had already died in the course of it. An adherent of the fomite theory of yellow fever transmission, Blackburn believed the disease was spread through contact with contaminated materials.

Stuffing eight trunks with the garments and bed linens of deceased yellow fever victims, the doctor shipped the cargo to Nova Scotia, then convinced Godfrey Hyams, a dodgy shoemaker, to transport six of the trunks to the District of Columbia. Hyams was to ensure that the largest of the lot made its way to an auction house in the heart of the capital city, the aim being to inflict the hemorrhagic fever upon Washington's inhabitants, most of all its politicians. "It will kill them at sixty yards," Blackburn boasted.[4] The doctor further directed the courier to leave the remaining pair of trunks in New Bern, North Carolina, and Norfolk, Virginia, two strategically-located towns that Union troops from the North had captured and continued to occupy. Most important, though, the physician handed Hyams a valise thought to be contaminated with yellow fever, inside of which was an assortment of fresh, smart dress shirts. The assumption was that contact with the toxic valise would be sufficient to taint the new garments. "Blackburn instructed Hyams to take the valise, along with a letter, to President Lincoln as a special gift by an anonymous benefactor," writes Edward Steers, Jr. "Blackburn believed that even if Lincoln did not choose to wear the shirts their mere presence would infect him with the deadly disease."[5]

As the courier traveled down the eastern seaboard toward the District of Columbia, the physician sailed back to Bermuda and set about amassing more soiled materials of the deceased. Among the items were "clothing, poultices, blankets and sheets, many stained with black vomit," according to the

New York Times, the latter feature being indicative of internal bleeding.[6] Secure in the knowledge that Hyams was unleashing the "yellow plague" on the East Coast, Blackburn was preparing the next phase of his grim project, that of disseminating it in northern metropolises. And topping his list would be the most populous of them all, New York City. He was banking on the outbreaks to distract and demoralize the citizens of the anti-slavery states, thereby sapping their resources and their resolve to continue waging war against the Confederacy.

As it came to pass, Blackburn's scheme would not proceed as planned. For one thing, Godfrey Hyams would not deliver the valise to the White House. Panic would seize him, the shoemaker realizing the consequences he would face if he were caught trying to pass the dread disease to Abraham Lincoln. For another, the clothing and other materials Blackburn had nicked from the Bermudian casualties did not, in fact, present a danger to the public. As Carlos Finlay, the Cuban physician and researcher, would discover a few years later, yellow fever is a mosquito-borne illness.

Because the insect vector had not yet been identified in 1864, however, Blackburn thought his clandestine offensive had struck one of its targets when the disease barreled through New Bern, North Carolina, in the autumn of that year. Counted as one the worst outbreaks in the country, Blackburn's only regret was that the Union soldiers occupying the town succumbed in smaller numbers than the townspeople themselves.[7] In all, over two thousand people perished in the horrific ordeal.

It would be seven months later that Abraham Lincoln joined the legions of the dead. And while he expired from an assassin's bullet rather than from Blackburn and Hyams' flawed attempt to fell him with yellow fever, this does not diminish the fact that the pair's scheme was immoral and unethical, especially as it was designed to also transmit the disease to the citizens of North Carolina and Virginia. "Their ignorance of infectious disease," writes Steers, "in no way mitigates their guilt in attempting to unleash biological warfare against civilian populations."[8] Similarly, it makes no difference that judicial authorities, upon learning of the plot to harm the president and believing the pair had caused the New Bern epidemic, allowed them to walk free owing to a legal technicality, or that Blackburn promptly resumed the practice of medicine and eventually was elected governor of Kentucky. As an attempt by American citizens to commit mass murder on American soil for wholly political purposes, the yellow fever plot was both unprecedented and unforgivable. But while the notion of using illness as a truncheon was rare in the New World—the British military's use of smallpox-tainted blankets to infect Native Americans in the 1700s stands as the principal exception—inflicting sickness as a means of gaining an edge over one's enemies was, in centuries past, anything but unique in other parts of the world. To date, historians have traced

the practice back nearly five thousand years, and it is to these bygone times that we now turn our attention.

Pathogens in Antiquity

To begin our survey of the historical use of biological agents during periods of conflict, it will serve us well to review the basic terminology of the subject itself. "Biological warfare" (BW) refers to the use of living organisms, such as bacteria and fungi, to inflict harm on a human, animal, or plant population. Included are viruses, which most scientists consider to be nonliving entities, and which others, such as virologist Edward Rybicki, describe as hovering "at the edge of life."[9] Similar to biowarfare, and also touched upon in this survey, is "chemical warfare" (CW), which denotes the use of nonliving toxins to achieve the same ends. And lastly, "nuclear warfare" (NW) refers to the deployment of nuclear or thermonuclear devices for hostile purposes. Together, these three forms of assault constitute "weapons of mass destruction" (WMD), with each potentially capable of triggering what is known as a "mass casualty incident" (MCI). In some cases, an MCI, besides extracting a sizable human toll, may also produce large-scale property destruction and damage to the biosphere.[10] In terms of adapting a biological entity, chemical agent, or nuclear energy for such purposes, "weaponization" is the conventional term.

An early report of the latter process can be found in the ancient Chinese medical text, the *Pen-Ts'ao*.[11] Dating back to 2735 BCE, Shen Nung, a renowned herbalist and the founder of Chinese medicine, claimed that bands of Chinese warriors, while girding for battle, tipped their arrows with a deadly substance extracted from aconite, a flowering plant.[12] If Nung's account is accurate, it would make the use of contaminated arrows the oldest documented application of a toxin in wartime. As for the choice of aconite, it would have been ideal in battle since it is readily absorbed through the skin and kills right away, its victims falling ill shortly after exposure and succumbing to organ failure within a few hours of contact. Predictably, given the method's simplicity and potency, warriors and hunters on other continents came up with the poison-arrow idea as well, including the indigenous peoples of North and South America. Regarding the aconite plant itself, it acquired the nickname "wolfsbane" in some regions because of its expediency in eliminating wolves, among other predators.

In due course, and owing to regional differences in animal and plant life, additional agents were introduced into service in various parts of the world, among them curare, which produces paralysis, and a handful of substances extracted from amphibians.[13] In other cases, crude mixtures were

concocted. Scythian warriors in 400 BCE, for instance, doused their spears in a blend of manure and blood before taking them into battle. If such a mixture was unavailable, the ferocious archers, renowned for their skill in waging war on horseback, would plunge their weapons into human cadavers before engaging an enemy.[14]

Of course, human nature being what it is, what happened next was perhaps inevitable and centered on the proliferation of hair-raising tales involving lethal-arrow attacks. In fact, this particular biowarfare practice gained such notoriety that it made its way into our language: the contemporary word *toxin* is derived from the Greek word *toxikon*, meaning "(poison for) arrows," according to the Oxford Dictionary.[15] The root word, *toxon*, refers to a bow and arrow.

Also traceable to antiquity is the military strategy of fouling the water supply of an enemy camp or territory. From what historians have been able to determine, the first incident of a mass poisoning of this sort took place during a battle in China in 559 BCE, when a military unit contaminated a portion of the Ching River.[16] A successful strategy, it managed to sicken the enemy soldiers without affecting the civilian population downstream, presumably because the river diluted the toxin. Historians further inform us that the region's armies did not resort to such untoward deeds on a regular basis. "Although denying water supplies became a fundamental tactic," writes Ralph Sawyer, "military writers still deemed poisoning water sources to be an unorthodox measure."[17]

One reason the scheme was relatively uncommon in China and elsewhere may stem from societal reactions to the practice itself: tainting a community's drinking water, like the use of other biological and chemical agents both then and now, was considered to be beneath contempt. Case in point: Ancient Greece in the succeeding century (431–404 BCE). At this time, the Spartan army contaminated the wells of its opponent, the Athenians, with this odious course of action leading to a mortality rate in the thousands.[18] But while the mass murder, in the short term, helped Sparta triumph over its challenger, the maneuver backfired in the long term by wrecking the Spartan army's reputation throughout the region.[19] The victors, it seems, were disparaged for having violated the rules of war, shifting the conflict from an honorable confrontation between soldiers on the battlefield to a dishonorable, covert assault on an unsuspecting and defenseless population.

Further historical cases include the Assyrians in 600 BCE, who contaminated their opponents' wells with ergot of rye, a fungus known for causing hallucinations, seizures, gangrene, and death, while Roman and Persian documents dating from 300 BCE reveal that soldiers tossed the remains of animals into enemy water supplies in an effort to spread disease.[20] Taking the measure a step further, soldiers in twelfth-century Italy disposed of the decomposing

corpses of their fallen comrades by dumping them into their foes' water systems, again with contagion in mind.[21] And in nineteenth-century America, Confederate troops, as they were leaving Vicksburg, Mississippi, flung decaying animal carcasses into nearby ponds so as to make the water undrinkable for the Union troops who were bound to pursue them.[22]

As the centuries passed, an even more inventive form of germ warfare emerged and entailed the use of living animals. The earliest known application occurred in 1320–1318 BCE, in a region known as Anatolia in what is today the Republic of Turkey. During this period, two armies were embroiled in conflict, the Hittites and the Arzawans, with the former being the weaker force. Therefore, the Hittites, to gain an edge on their opponent, devised a clandestine scheme that entailed converting animals into weapons; in particular, animals sickened by the pathogen *Francisella tularensis*.[23] A bacterium, *F. tularensis* is transmitted mainly among hares, rabbits, and rodents, although humans may contract it through the bites of infected fleas, ticks, and deer flies, among other channels. And the result, a disease known as "tularemia," is potentially devastating. "Its symptoms range from skin ulcers, swollen and painful lymph glands to pneumonia, fever, chills, progressive weakness and respiratory failure," writes Rossella Lorenzi.[24] Molecular biologist Siro Trevisanato adds that tularemia was most likely the "Plague of the Philistines" as recounted in the Old Testament.[25]

As to how tularemia came to be a tool of biowarfare, it seems that a naturally-occurring outbreak of the illness was raging across Anatolia when the two armies went into battle, with the flurry of disease causing countless deaths as well as consternation in both military and civilian circles. And it was at this juncture that the Hittites, despite possessing no prior concept of bacterial infection, observed a connection between their ailing animals, chiefly rams and donkeys, and the sickness ravaging the area. Accordingly, they set about placing the afflicted beasts on the footpaths and roadways of the Kingdom of Arzawan, sometimes with herders to steer them through the countryside so as to spread the malady as far afield as possible. The Hittite's assumption, which turned out to be correct, was that the Arzawans would not suspect the listless creatures of being weapons of war.

By any standard, the exploitation of infected animals was an inspired idea, and it did, in fact, give the Hittites the upper hand in the conflict, if only for the moment. Either through an informer or simply by connecting the dots, the Arzawans soon discerned the relationship between the human scourge, the ailing rams and donkeys, and their Hittite enemy, and they promptly followed suit, releasing their own sickly animals into their adversary's territory. As could be expected, the epidemic worsened until the pestilence overwhelmed the entire region. As for the victor, ultimately it was the bacterium itself, which proved its worth as an instrument of biological assault.

Furthermore, owing to its effectiveness, it continued being used for such purposes for centuries to come. Even today, *F. tularensis* is on the shortlist of bacteria that experts consider the likeliest to be deployed in a biological attack.

Akin to the use of infected beasts to terrorize or kill an enemy, ancient militias also took advantage of the natural defenses of pernicious animals. A chilling example can be found in 190–184 BCE, during a confrontation between the forces of King Eumenes of Pergamon (Greece) and King Prusias of Bithynia in what is today north-central Turkey. It happened during a battle at sea, a lopsided showdown in which the Pergamonian fleet far outnumbered that of the Bithynian navy. To even the odds, the commander of the latter force, the brilliant strategist Hannibal Barca, resorted to an unheard-of tactic. An audacious scheme that would rely on the enemy's fear of pain and poison, it was, in effect, a fusion of psychological and biological warfare.

To put his idea into motion, Hannibal sent his men ashore with instructions to ensnare a batch of venomous snakes, pack them into earthenware pots, and return them to the Bithynian warships. Here, the clay vessels would be readied for the offensive. "Hannibal's idea was to terrorize Eumenes' crew so that they were unable to fight," writes Adrienne Mayor.[26]

When the moment arrived to deliver the payload, the Bithynians' method was crude but viable, with the seagoing soldiers hurling the clay vessels onto the decks of their adversaries' ships. And the action had the desired effect. "The enemy's first reaction to the smashing pottery was derisive laughter," writes Mayor, "[b]ut as soon as they realized their decks were seething with poisonous snakes … the horrified sailors leaped about trying to avoid the vipers."[27] As Hannibal had anticipated, the Pergamonians surrendered to panic and in so doing handed a victory to the Bithynian navy. The triumph did not come without a cost, though. As had happened in the past and would continue to occur in the future, the fact that biological elements had been introduced into the fight was viewed with contempt. "[I]t may have been this incident," says Mayor, "that led Eumenes to make his famous remark that an honorable general should eschew victory by underhanded means."[28]

Such controversial measures would persist, however, and would extend to other classes of animal. An illustrative case occurred during the same period in the desert fortress of Hatra, situated near the present-day city of Mosul, Iraq. Unlike Hannibal's assault, it did not involve reptiles, although the stand-in was just as unnerving and equally hazardous. The target was the invading legion of the Roman emperor Severus.

Determined to expand the Roman Empire's dominion into Mesopotamia, Severus, in 199–198 BCE, placed Hatra in its sights. Learning of his plans, the Hatreni soldiers who were posted at the stronghold set about preparing for battle, and to this end embarked upon the unenviable task of stuffing jars

with what has been described as "poisonous winged insects."[29] Yet according to historians, the vessels held more than noxious bugs; they contained scorpions as well, an order of arachnids.[30] A practical source of ammunition in that scorpions were abundant in the desert surrounding the fortress, the tactic promised to disorient and debilitate the enemy.

A potentially lethal creature, the adult scorpion can reach up to eight inches in length, being roughly the size of a coffee cup, and has a segmented tail culminating in a barbed stinger. In the most dangerous species, its venom, which is comprised of several agents, neurotoxins among them, can produce seizures, paralysis, coma, respiratory failure, and cardiac arrest.

Confident the Roman forces rushing the fortress would be stopped in their tracks at the sight of the creatures, the Hatrenis, poised atop the fortress walls, dropped the jars onto the invaders at the outset of the attack. And the incursion came to a halt. Overcome with fright as the scorpion grenades rained down on them, the Romans turned tail, the result being that Hatra preserved its sovereignty and biological warfare chalked up another victory.

While additional types of animals and their toxins would serve as bioweapons in the years ahead—the Poles' use of a neurotropic virus found in the saliva of rabid dogs comes to mind—homo sapiens would eventually be weaponized, too, and not just in the form of corpses dropped into wells.[31] It would be in the 14th century, moreover, that the most appalling utilization of humans, truly toxic ones, would take place.

The Black Death, or bubonic plague, was thundering across the Far East at this time, on its way westward toward the Crimea. In its path was Kaffa, a Crimean port on the Black Sea, which the Republic of Genoa (Italy) was temporarily inhabiting by means of a pact with the seaport's owner, a Mongolian khanate known as the Golden Horde. Enjoying a strategic location, Kaffa constituted a vital nexus between East and West, serving as a departure point for trade caravans traversing the Silk Road to China while also offering considerable control over Black Sea trade routes. And it was this port city that the Genoese built into a lucrative trade colony. But as sometimes happens in such arrangements, a conflict arose between the Muslim Mongols and the Christian Genoese, with the disagreement intensifying until, in 1346, it turned bloody.[32] At this juncture, the Genoese administration in Kaffa decided to refuse entry to all Mongols, with the Mongols, for their part, refusing to be shut out of their own city and thus laying siege to it—this, as the Black Death was descending on the Crimean Peninsula. A "perfect storm" of sorts, conditions were ideal for the weaponization of the bacterium *Yersinia pestis*, the microorganism that causes the bubonic plague.

The strategy itself was imaginative, if macabre: the Mongols placed the corpses of plague victims onto catapults and propelled them over the city walls into Kaffa. Of course, the sight was not a pleasant one, nor was the

scent. As the days passed and the human remains piled up, the stench pervaded the seaport, which is precisely what the Mongols had in mind. The process of infection not being understood at the time, the Golden Horde believed it was the odor of decomposing cadavers that caused the plague.[33] But while their theory about the disease's transmission was wrong, the Mongols' technique for deploying their human weapons was right on the mark, with Kaffa soon beset with the Black Death.

In terms of the plague's probable route of transmission, it has long been assumed that rats and other flea-carrying rodents in Kaffa gnawed on the corpses, then spread the disease to the seaport's denizens. A competing theory has recently been put forth, however, and it involves a more direct encounter with the source of *Y. pestis*. "Contact with tissue and blood," writes infectious disease specialist James Martin, "would have been inevitable during the disposal of hundreds or possibly thousands of cadavers that had been smashed on impact."[34] Whatever the avenue of transmission, the outbreak not only decimated Kaffa but also prompted scores of its residents to sail back to Italy, with the Black Death an unbidden passenger on this succession of voyages. Certainly it is true that, of the various mechanisms that have been proposed to account for the plague's arrival in medieval Europe, the bio-attack at Kaffa is a recurrent explanation. If correct, the ghoulish assault underscores a long-standing drawback of biological warfare, namely the difficulty its perpetrators face in controlling its impact. "[W]eapons that target human biological vulnerabilities are notoriously undiscriminating," writes Mayor.[35]

The unmanageable, even random, effects of biological warfare would come under better control in the 17th century, as European researchers made extraordinary advances in the medical sciences. Such revolutionary strides, while profoundly beneficial to humankind, also meant that practitioners of biowarfare could become better educated about disease and thus more able to fine-tune their delivery of it. Among the more important of these medical advances was the invention of the microscope, along with crucial enhancements to the device by the Dutch microbiologist Antonie van Leeuwenhoek. Further developments in the ensuing centuries came in the form of Robert Koch's groundbreaking bacteriological studies, Louis Pasteur's corroboration and advancement of germ theory, and Dmitri Ivanovsky and Martinus Beijerinck's discovery of viruses. Collectively, the breakthroughs of these and other scientists illuminated the mechanisms of such infections as anthrax, cholera, diphtheria, and tuberculosis; dreadful conditions that bio-warriors could now calibrate more precisely—meaning, in this context, less indiscriminately—against humanity.

Understandably, the prospect of a hostile nation misusing medical advances to commit mass murder alarmed many world leaders, the upshot being that several heads of state decided such atrocities should be prevented

at all costs. And so they took action. "These dangers," writes Friedrich Frischknecht of the Institut Pasteur, "resulted in two international declarations—in 1874 in Brussels and in 1899 in the Hague—that prohibited the use of poisoned weapons."[36] Frischknecht adds, however, that these international agreements, while well-intentioned, contained no mechanisms for enforcement and were therefore impotent.[37] In effect, they were statements spelling out the signatories' moral position on biowarfare on the optimistic assumption that participating governments would abide by them. Yet this was not to happen. Biowarfare not only would persist, but escalate, most notably during the twentieth century.

Biological Warfare in the Modern Age

It was during World War I that Germany embarked on an ambitious germ warfare program, one that made use of the bacterium *Burkholderia mallei*, which causes glanders. A disease primarily of horses, the affliction in humans can produce chest pain, abscesses in the spleen and liver, pneumonia, and death, depending on the route of infection. Although postwar investigators failed to unearth irrefutable proof that the German military had, in fact, used this pathogen against its enemies—the defeated nation's scientists likely would have disposed of the incriminating evidence at war's end—it is believed that German operatives were sent into Romania to infect horses, mules, and sheep with the bacterium.[38] The animals were set to be exported to Russia, Germany's opponent in the war, and the expectation was that the contagious creatures would transmit the ailment to the Russian people. Saboteurs purportedly infected mules and horses in France with the same microorganisms, along with those in the United States.

Also during the conflict, the German military was said to have infected cattle with cholera and anthrax bacteria, even as that nation's scientists sought to convert a wheat fungus into a bioweapon.[39] And if these efforts were not enough to lay low its enemies, German technicians ostensibly devised a technique for spreading the bubonic plague, with the military attempting to introduce *Y. pestis* into Italy and Russia.[40]

Pathogenic agents, however, were not the only unconventional weapons employed by Germany. It also was the first nation in World War I to use toxic chemicals when it discharged chlorine gas onto the battlefield at Ypres, Belgium. Shrouding the landscape and descending into the adversaries' trenches, the heavy substance caused French, Canadian, and British soldiers to succumb to asphyxiation. In response, Germany's enemies adopted the same practice, such that, by war's end, the Central and Allied Powers had released hundreds of tons of poisonous chemicals, including not only chlorine gas

but phosgene and mustard gas as well. As a direct result, well over a million men perished.

So menacing were Germany's suspected biological warfare activities, and so horrific were the chemical weapons' effects during the war, that the global community, during the interwar period, felt it necessary to formally address once again the issue of state-sponsored biochemical assaults. To this end, representatives from over a hundred nations gathered in Geneva, Switzerland, on June 17, 1925, to endorse a document titled the "Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare."[41] Known informally as the "Geneva Protocol of 1925," it was, like the two earlier pacts drawn up in the 1880s, intended to prevent the use of biologic weaponry. Yet, curiously, the 1925 version allowed the participating nations to continue stockpiling a range of pathogens, as well as continuing their research into this dubious form of warfare—provided, that is, they not deploy the results. The pact did not, however, require that their BW facilities be inspected, evidently on the assumption that the signatories could be trusted to honor the agreement. In reality, such vulnerabilities invited exploitation: while some nations, such as the United States, did not ratify the 1925 agreement—it would be another fifty years before the U.S. would do so—a handful of those that did endorse it soon violated the protocol, most conspicuously Japan.

Japan: Unit 731 (Manchuria)

It was during the 1930s that the civilian government of Japan found itself under the thumb of staunch militarists determined to transform their country into the world's frontrunner in biowarfare research and capability. It would be a development, the militarists argued, that would allow Japan to extend its borders. "They concluded that, because of its comparatively small population and limited natural resources, Japan could not achieve its expansionist objectives in East Asia unless it possessed weapons that could equalize the disparities with its rivals," writes Sheldon Harris in the *Annals of the New York Academy of Sciences*. "The militarists looked to biological warfare as a source of parity and recruited Japan's foremost scientists, physicians, dentists, veterinarians, and technicians to participate in the biological warfare program."[42]

In 1935, the classified project, under the auspices of the Imperial Army, commenced in Japanese-occupied Manchuria, with the setup being both wide-ranging and shocking in its inhumanity. Dubbed "Unit 731," the main complex was composed of over 150 buildings clustered in the remote town of Pingfan and surrounding villages. Comprised of eight major components, the Unit 731 divisions included a comprehensive bacteriological research

center, along with a facility dedicated to the mass production of pathogenic agents and another that focused on water filtration systems. The purpose of the latter was to experiment with various methods of contaminating a country's waterworks. Perhaps the most ominous division, however, was the one in which the facility's medical staff intentionally infected healthy research subjects with either conventional pathogens or those that had been artificially enhanced, the purpose being to observe the microbes' courses of action.

Of course, a warfare program having the ambition of Unit 731 required a proportionate staff, and, indeed, the number of personnel at its central site was considerable. During the decade between its inception and its closure in 1945, Unit 731 counted among its employees three thousand scientists together with scores of medical professionals and biotechnicians. As to the research itself, Peter Williams and David Wallace, two former journalists presently affiliated with the BBC, detailed the massive project in their book *Unit 731: The Japanese Army's Secret of Secrets*.[43] Describing its overarching mission, the weaponization of bacteria, they write,

> Unit 731's bacteriological research division was divided into more than a dozen squads, each investigating the warfare possibility of a wide variety of diseases. Plague, anthrax, dysentery, typhoid, paratyphoid, cholera and many other exotic and unknown diseases were studied…. Various disease vectors, mainly insect, were investigated, as were new drugs, chemical toxins and frostbite.[44]

Unit 731's pool of research subjects was another feature that the program's architects took to extremes. It set a precedent, in fact, in that it not only used human beings as guinea pigs but also killed untold numbers of them after exposing them to experimental microorganisms so the staff could autopsy the corpses and observe the pathogens' effects. Also disturbing, the dissections were often performed without anesthesia, with the victims fully conscious. "If we'd used anesthesia, that might have affected the body organs and the blood vessels that we were examining," says a present-day farmer who served as a medic at the facility.[45] In its disregard for human life, Unit 731 anticipated the Nazis' brutal medical experiments that would be conducted in the succeeding years at Auschwitz, Bergen-Belsen, and other concentration camps.

Regarding the research subjects' characteristics, many were Chinese prisoners-of-war, along with a smaller portion of Russian POWs, with over three thousand such captives perishing at the hands of the scientists.[46] An even larger number of casualties—seven thousand Japanese citizens—were drawn from more conventional circumstances, the majority of whom were either political dissidents or run-of-the-mill lawbreakers. And then there were those who had not offended the government in any way. "Unsuspecting and innocent people were also tricked into the clutches of Unit 731," write

Williams and Wallace. "Young boys, mothers and children, even pregnant women, were trapped."[47] Some were led to believe they were being hired for an unspecified task only to find themselves confined in the bowels of a government building in Harbin, a Japanese-occupied city in northeastern China. In due course, they would be spirited away to Unit 731 under cover of darkness in convoys composed of windowless trucks.[48] Awaiting them would be disease and death, occasionally in the form of artificially-induced mini-epidemics in which small numbers of research subjects would be injected with pathogens, then inserted into larger groups of healthy individuals so investigators could study the ensuing outbreaks' patterns of spread.

Besides the research carried out in Unit 731's laboratories, the staff also conducted field studies. In these experiments, human subjects were herded to a secret testing ground, strapped to poles, and exposed to toxins dispersed by means of an aerial procedure similar to crop dusting. Alternatively, rolling vehicles were used to distribute the pathogens at ground level. In all cases, the aim was to formulate delivery systems that would ensure fast and fierce epidemics. When such experiments yielded positive results, the Unit 731 staff, via the Imperial Army, would target the Chinese population using the new methods.

In one offensive of this type, Japanese soldiers, overseen by Unit 731 scientists, released plague-carrying animals into China, with the bio-attack producing an estimated thirty thousand civilian casualties.[49] In other actions, troops spiked the water and food supplies of diverse Chinese cities, sparking outbreaks of typhoid, cholera, and dysentery.

Perhaps the most sinister, however, was Unit 731's creation of disease bombs. To devise these innovative weapons, Japanese scientists packed healthy fleas into sealed chambers that held animal carcasses infected with bubonic plague. Since no other food source was available, the insects fed on the diseased remains and in this way acquired the *Y. pestis* bacterium. Subsequent to this, technicians placed the infected fleas into containers, an estimated fifteen million per "plague bomb," and released them from low-flying aircraft over Chinese cities. And, as anticipated, the targets were soon beset with the deadly illness. Hardest hit was the city of Changteh, where ten thousand people expired along with nearly two thousand Japanese soldiers who were likewise exposed during the blanket dissemination of the pathogen.[50] Yet the high mortality rate of its troops did not spur the Japanese military to pare down its attacks on China or, for that matter, to limit its offensives to Asia: there is reason to believe Japan may have been planning a similar assault on the United States, according to the *New York Times*.[51]

It was 1944 and the Christmas holidays were approaching, but for some Americans it was not the seasonal festivities that were drawing their attention but rather the unusual balloons that had begun touching down in

their neighborhoods. So they did what any concerned citizen would do under the circumstances. They phoned the authorities.

At first, the calls came from residents of San Diego, California, and Butte, Montana, but over the next three months they also poured in from the Aleutian Islands, Hawaii, Alaska, Michigan, and parts of Canada.[52] As to the balloons' origins, military officials concluded they had been dispatched from Japan owing to their construction—they were made of rice paper and silk—and because the prevailing winds would have carried them eastward to the west coast of the United States and Canada. It was, to be sure, a harrowing development, especially since the inflatables were equipped with metal boxes that contained incendiary devices. Stunned, the government decided to withhold all information about the "balloon bombs" from the public—not even a mention in passing—so as to dissuade Japan from releasing more, and possibly enhanced, versions of them. "[T]he Office of Censorship" writes Jeffrey Alan Smith, "asked American news organizations not to report on their existence so that the enemy would be deprived of information on their effectiveness."[53]

As it stood, the preponderance of balloons, nine thousand in all, failed to make it across the Pacific Ocean. Only two hundred survived the high-altitude journey. Furthermore, those that did reach the North American continent turned out to be worthless, with nearly all of their bombs failing to detonate. The few that did ignite, however, brought dire consequences. Half a dozen civilians, not knowing the balloons' metal boxes housed explosive devices, were killed when they pried them open, among the casualties being a Montana woman and a group of Sunday School children in Oregon. It was because of such incidents that the U.S. government eventually lifted the media blackout; the public needed to know the inflatables posed a danger of detonation.[54] What the public would not be told is that officials also worried that the balloons might be carrying biological agents.

Of foremost concern was the potential release of the encephalitis or yellow fever viruses, neither of which the U.S. was equipped to contain at epidemic levels. Driving this fear, military intelligence knew the Japanese had recently tried to procure the yellow fever pathogen from sources in three different countries. Accordingly, the military sent its personnel to recover the balloons' remnants for analysis, this at a time when the state of biohazard protection was still rather rudimentary. "Pathetic-sounding precautions were listed," write Williams and Wallace, with those retrieving the potentially toxic balloons being instructed to don gloves and gas masks and to tie their pant legs at the ankle—certainly not the securest of measures.[55] As it turned out, they needn't have worried, since the military's scientists ultimately concluded that the inflatables were free of pathogens.

Understandably, Japan's decision not to outfit the balloons with biological

agents mystified American military scientists. One hypothesis centered on the notion that Japan was reluctant to ignite a biological confrontation, an explanation supported in part by the words of a Japanese official after the war. "Hideki Tojo," writes Smith, "the politician and military leader who was later hanged for war crimes, rejected the idea [of a bio-attack] as too likely to bring germ or chemical retaliation from the United States."[56] Lieutenant Colonel Murray Sanders, formerly a member of the United States' chemical warfare program, offered another possibility. "The only explanation I had, and still have, is that [Unit 731 Director] Ishii wasn't ready to deliver what he was making in Pingfan; that he hadn't worked out the technology."[57]

It would be this same Japanese microbiologist, Shirō Ishii, the Allies would decide not to prosecute for war crimes when the opportunity presented itself at the end of the conflict. Rather, the United States would strike a deal with him whereby Ishii would share the findings of Unit 731's unscrupulous research program with American scientists in exchange for immunity from prosecution.[58] In a scathing essay, *An Ethical Blank Cheque*, Cambridge University historian Richard Drayton notes that Ishii not only handed over his research results to the Americans but also traveled to the U.S. government's secret biological warfare program in Maryland, presumably Camp Detrick, to serve as an advisor.[59]

United States: Camp Detrick

Originally known as Detrick Field, the site that would become America's premiere biowarfare facility began rather modestly as a regional airstrip named in honor of Frederick L. Detrick, a flight surgeon for the Maryland National Guard. In 1943, at the height of World War II, the Army's Chemical Warfare Service acquired the spot, renamed it Camp Detrick, and transformed it into a state-of-the-art biowarfare research complex.[60] And scientific inquiry flourished. Under the leadership of pharmaceutical tycoon George Merck and bacteriologist Ira Baldwin, Camp Detrick set about amassing an array of microbial agents for study, with the endeavor accelerating during the Cold War as the staff braced for an East-West confrontation. "For two decades beginning in the late 1940s," reports the *Washington Post*, "it led the U.S. government's efforts to research and develop biological weapons."[61]

By any index, Camp Detrick, at its zenith, was impressive. "[T]here [were] some 200 separate projects under way at the post," writes Ed Regis, "everything from anthrax spore production to the mass cultivation of killer mosquitoes to research on the dissemination of plant diseases such as late blight of potatoes."[62] In the mid–1800s, it had been this same "late blight," a fungal condition, that brought about the devastating Irish potato famine. Clearly, the Detrick operation was determined to be both inventive and far-

reaching. To achieve its lofty aims, moreover, it ensured that it had an abundance of staff, counting among its researchers many of the U.S. military's top figures in the life sciences. "At peak strength, 2,273 people were working at Camp Detrick, including 1,702 Army personnel, 562 Navy, and 9 civilians."[63] Despite the size of the operation, however, details of its activities were as rigorously concealed from the public as those of another wartime undertaking, the Manhattan Project.

"Secrecy was always an uppermost consideration at Detrick, and people working in one lab building were prohibited from talking about their jobs with those in the next lab, or, indeed, with anyone else," says Regis. "To ensure compliance, the Army stationed spies in the barracks to eavesdrop on conversations and report infractions."[64] Yet such tight security was warranted; certainly it would have been a coup for the United States' adversaries to gain access to the facility's research projects. And the secrecy served another function as well, shielding the Camp Detrick program from the eyes an American public that would have been taken aback by the classified research being carried out by the facility's staff at undisclosed locations across the homeland.

Compared to the earlier BW activities of German and Japanese scientists, those of American researchers were generally in line with the recognized ethical standards of the day. Citing the need for secrecy, however, Detrick scientists occasionally conducted studies without the knowledge or consent of the participants. Today, these same investigations, which involved exposure to microbial agents, would not pass muster with oversight committees. But in the mid-twentieth century, the United States was in the grip of the Cold War, survival was foremost in the minds of the Detrick staff, and ethical criteria were still evolving.

Of the studies carried out on the unsuspecting public, perhaps the most dubious ones were those involving the dissemination of biological agents in highly-populated regions. Such studies, researchers explained, were intended to bring about a better understanding of the process by which a foreign military, using airborne pathogens, could contaminate a sizable swath of the American population; information that would help the Detrick staff more effectively prepare the nation to weather such an attack. As for the methodology, a newly-established unit at the facility, the "Secret Operations Division," decided the most effective means of studying the large-scale release of pathogenic agents would entail staging a series of bio-attacks of its own, albeit benign ones.

In this unprecedented undertaking, the Pentagon, the nerve center of the U.S. Department of Defense, was the first to be targeted. Here in the summer of 1949, Detrick operatives disguised as maintenance workers strolled through the thirty-four acre structure releasing the microorganism *Serratia marcescens*. A bacterium, *S. marcescens* is infrequently associated

with respiratory and urinary tract infections, meningitis, pneumonia, and other afflictions, but six decades ago it was not known to be pathogenic to humans. For this reason, the Detrick team used the microorganism as a stand-in for the more lethal ones the nations' foes could be expected to employ during an actual attack.

In terms of its dispersal, the operatives discharged the germ from suitcases equipped with air pumps and spouts, spraying *S. marcescens* in the corridors as well as directly into the ventilation system.[65] And the outcome of the experiment was revealing: the building's air-purification process was incapable of preventing the microorganism from traveling throughout the sprawling structure. Without doubt, it was an important finding, and one that the team obtained rather easily by tracking the bright red pigment, "prodigiosin," that characterized the strain of *S. marcescens* used in the investigation. (Parenthetically, it was because of the microorganism's crimson color, which gives it a blood-like appearance, coupled with the fact that it is sometimes found in starchy foods, such as bread, that *S. marcescens* is thought to have been the source of Medieval transubstantiation miracles in which blood was believed to materialize on communion bread as it was being transmuted into the body of Christ during the Eucharist.[66])

In April 1950, Detrick scientists used the same red microorganism in a second experiment as well as adding *Bacillus globigii* to the mix, another entity thought to be innocuous. Only several years later would it be determined that it, too, is potentially harmful to humans. In the mid-twentieth century, however, when *B. globigii* was still considered safe, it was often employed as a simulant in germ warfare research because it shares certain properties with the anthrax bacterium.

The experiment itself took place aboard two Navy vessels situated off the coast of Virginia. The objective was to trace the movement of *S. marcescens* and *B. globigii* when released from the sea; specifically, from the decks of a destroyer and an aircraft carrier. And the results were daunting. It seems the wind carried the microorganisms to the coastal cities of Norfolk and Newport News, Virginia, and it did so swiftly and in significant quantities.

Building on this study five months later, scientists used aerosolized forms of *S. marcescens* and *B. globigii* in a much grander scheme, namely a mock attack on the city of San Francisco. In this unique—and once again, undisclosed—experiment, researchers sprayed batches of the two microorganisms from a brace of Navy minesweepers positioned off the San Francisco Peninsula.[67] As part of the investigation, they also released fluorescent particles into the atmosphere, because such material, being readily detectable using ultraviolet light, can be easily tracked. And sure enough, the fluorescent material was detected up to twenty-five miles in the interior of California, with each of San Francisco's 800,000 residents having inhaled an estimated five

thousand particles.[68] The findings further suggested that the *S. marcescens* and *B. globigii* had reached the metropolitan area as well.

To be sure, the ethics of the San Francisco study were problematical, yet the results themselves were informative. Their value, however, was limited by the experiment's focus on the Bay Area, meaning the findings were not necessarily applicable to other regions. Researchers therefore set about conducting additional studies in an effort to understand microbial distribution patterns in other locations, including such congested venues as the New York City subway system and Washington National Airport. "[T]he Detrick scientists would end up performing more than 200 simulant trials in, around, or upon the United States, sparing no corner of the country," writes Regis.[69] As before, those directly impacted by the experiments, the American people, would not know they were, in effect, serving as the human equivalent of lab rats.

Regarding Camp Detrick's fate, the government deemed it a permanent fixture in 1956 and christened it Fort Detrick. But although the new name would remain in place, the site's activities would change thirteen years later when President Richard Nixon, under pressure from American scientists and members of Congress, called a halt to the government's research into offensive biowarfare. "Our bacteriological programs in the future will be confined to research in biological defense, on techniques of immunization, and on measures on controlling and preventing the spread of disease," Nixon declared.[70] Thereafter, Fort Detrick became the facility it is today, home to a variety of medical research centers, among them a branch of the National Cancer Institute and the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). Fort Detrick also houses a sophisticated biodefense research center.

Here it should be noted that the United States was not alone in possessing a BW program. Other nations were pursuing such research as well, and not just investigations aimed at formulating treatment protocols in response to an attack. In some countries, they also involved the aggressive use of pathogens.

Canada, for instance, initiated such a program in the 1940s, one developed under the leadership of orthopedic surgeon and researcher Sir Frederick Banting, recipient of the Nobel Prize in 1923 for his pioneering work in extracting insulin from the pancreas for use in the management of diabetes. It seems that Banting, whose contributions to medicine have saved untold lives, was not averse to using his brilliance to take lives as well. During World War II, he became an outspoken advocate of retaliating against—that is to say, eliminating through disease—Germans, or "huns" as he called them. He believed such a response would be fitting if Germany were to first attack the Allies with biological weapons.

"It is time that the old school tie was ironed free of wrinkles & folded up & put in a box until this show is over," the Nobel laureate writes in his diary. "We have to kill 3 or 4 million young huns—without mercy—without feeling."[71]

The Canadian government subsequently granted Banting permission to set up a biowarfare program to be coordinated with those of Britain and the United States. "This would eventually lead to the production and testing of anthrax munitions in Canada," writes Albert Mauroni, Director of the U.S. Air Force Center of Unconventional Weapons Studies.[72]

USSR: Biopreparat

While Canada's cultivation of anthrax bacteria represented a stark departure for the peaceable nation, the size and scope of its enterprise paled in comparison to that of the Soviet Union, the final national biowarfare program to be revisited in this historical survey. Characterized by a plethora of secret studies conducted on the USSR's human, animal, and plant populations, the Soviet program proved to be one of the most extensive and advanced BW endeavors of the twentieth century.

Harking back to 1928, the USSR began by attempting to weaponize *Rickettsia prowazekii*, the bacterium that causes typhus. Scientists, a decade earlier, had watched helplessly as a natural-occurring outbreak of the disease delivered suffering and death to the masses, and, in due course, decided the pathogen might make a formidable weapon for use on the battlefield. To this end, they sought to liquefy *R. prowazekii*, as well aerosolize it, a project that continued for the next two decades.

Typhus, however, was just the beginning. The communist state's program made a quantum leap forward near the end of World War II, when Soviet soldiers, upon liberating Manchuria, discovered their foe's abandoned biowarfare center. Here, at Unit 731, troops gathered up blueprints of the facility, research protocols, and other materials, and handed them over to military intelligence for use in interrogating Japanese scientists being held at prisoner-of-war camps. And the next step was predictable: Josef Stalin, awed by the scope of the Japanese undertaking, ordered a Soviet version to be created. It was in this way that the USSR's comprehensive biowarfare operation came into existence, one that soon eclipsed its Asian predecessor. And it continued to expand, most dramatically in 1973 with the formation of "Biopreparat," an agency comprised of an assembly of experts whose role was to furnish scientific and engineering know-how for secret-weapons projects.

Between 1988 and 1991, Kanatzhan Alibekov, a prominent microbiologist and physician, served as Biopreparat's deputy director. After defecting to the United States in 1992, he adopted the name Ken Alibek and penned an

account of his days at the agency, a text titled *Biohazard*.[73] In it, he revisited the work performed at Biopreparat's numerous research and production facilities dating back to its inception, calling special attention to its efforts to engineer outbreaks of such bacterial illnesses as anthrax, brucellosis, glanders, plague, and tularemia. Depicting the staff as single-minded and inventive, Alibek further recounted how Biopreparat's scientists enjoyed boundless funding while pursuing research at its state-of-the-art sites; sites boasting laboratories that were, to say the least, well-stocked. Whereas other nations cultivated small amounts of pathogens for biowarfare research, the size of the Soviets' stockpiles was jaw-dropping. "Target capacity" writes Alibek, "[was] up to 100 tons of each weapon annually."[74]

Yet there was more to Biopreparat than its overarching interest in conventional bacterial outbreaks. With the cooperation of the Ministry of Agriculture, it mass-produced anti-crop weapons, along with anti-livestock agents aimed at killing cows, chickens, and pigs. Scientists at the Institute of Molecular Biology, meanwhile, sought to create novel pathogens by genetically altering viruses as well as by combining components of multiple agents. And elsewhere in the USSR, researchers brainstormed innovative methods of dispensing pathogens, including the use of cruise missiles, or "biocruises."

But even as the Biopreparat staff worked with known bacteria and viruses, including those that cause Bolivian hemorrhagic fever, Ebola, human and equine encephalitis, Marburg hemorrhagic fever, and smallpox, researchers also kept abreast of newly discovered pathogens and explored their feasibility as weapons of mass destruction. Foremost among them was *Legionella pneumophila*, a bacterium identified in 1976 and the causative agent of Legionnaire's Disease, a form of pneumonia. Another was the human immunodeficiency virus (HIV), identified in 1983 and the lentivirus responsible for AIDS. In the end, though, Soviet researchers concluded that the two pathogens, as potential biological warfare agents, were too unstable for use in the theater of war or against civilian populations. In the case of the latter microbe, there was another reason as well.

"After studying one strain of the AIDS virus collected from the United States in 1985, we determined that HIV's long incubation period made it unsuitable for military use," says Alibek. "You couldn't strike terror in an enemy's forces by infecting them with a disease whose symptoms took years to develop."[75] Undaunted, Biopreparat scientists continued to pursue methods of compromising the human immune system—until, that is, all of agency's endeavors ended unceremoniously in 1991 with the collapse of the Soviet Union and its replacement by a collection of autonomous states. Although Biopreparat's activities ceased at this juncture, however, the threat of a bioattack lingered. Only the players would change.

"In 1992," writes political scientist Leonard Cole, "Russian President

Boris Yeltsin acknowledged that the former Soviet Union had developed tons of anthrax, plague, and other forbidden warfare agents."[76] A startling admission by the new head of state, political leaders around the world respected his candor. That said, Yeltsin's unexpected disclosure raised troubling questions about the future destination of the former USSR's stockpiles of pathogens, with many observers fearing the microbes might find their way into the hands of terrorists. A distressing prospect, it is a worry that persists today, the concern that bio-weapons, historically the province of nations' militaries, may be purchased or perhaps manufactured by autonomous extremist groups. To be sure, this represents a perilous turning point in the arena of biowarfare, since it means the deliberate use of pathogens to inflict widespread harm, always a danger, has become even more unpredictable.

Bioterrorism

The apprehension that a terrorist organization might acquire biological weapons was validated in 1995 when the Aum Shinrikyo group, a Japanese doomsday cult, conducted an attack on Tokyo's subway system. In the wake of this crime, which used the highly toxic, fast-acting nerve gas sarin to kill over a dozen commuters and injure a thousand more, investigators stormed the perpetrators' compound and discovered sophisticated chemical and biological warfare laboratories. In the latter, forensic analyses revealed that the cult's members had been conducting research on the Ebola virus and the anthrax bacterium, among other pathogens. This revelation did not come as a surprise to the authorities, however; the group had earlier attempted to discharge bacterial agents from atop a skyscraper and toxic gas from a specially-equipped van. What the subway attack did demonstrate is that biochemical weapons were no longer the sole possession of nations but were expanding into non-state, terrorist circles, and that such agents could cause substantial physical harm and considerable societal disturbance.

While several definitions of terrorism have been proposed over the years, each underscoring different dimensions of the phenomenon, the Department of Defense has issued perhaps the most widely cited one: "The unlawful use of violence or threat of violence, often motivated by religious, political, or other ideological beliefs, to instill fear and coerce governments and societies in pursuit of goals that are usually political."[77] Bioterrorism, in particular, pursues such ends through the use of toxins and infectious agents to debilitate or kill human, animal, or plant populations. As to its impact, it tends to be gauged qualitatively. "The success of bioterrorist attempts is defined by the measure of societal disruption and panic, and not necessarily by the sheer

number of casualties," writes Hugo-Jan Jansen, senior advisor at the Netherlands' Ministry of Defense.[78]

In 1998, the White House became so concerned about the sudden rise in anthrax incidents in the United States—the number jumped from one episode in 1997 to thirty-seven in 1998—that President Bill Clinton issued two directives calling for federal agencies to enhance the nation's ability to respond to such threats.[79] This led to the 1999 Bioterrorism Initiative, which assigned to the Centers for Disease Control and Prevention the task of upgrading the nation's capacity to respond to a bio-assault through a set of coordinated public health protocols. Sweeping by design, the procedures integrated the activities of both non-governmental and governmental agencies at the federal, state, and local levels, and were welcomed by experts in the field as a resourceful plan of action in the event of a large-scale assault. Suffice it to say, the White House would have taken even more stringent action had it known what al-Qaeda was contemplating at precisely this moment.

The al-Qaeda Anthrax Project

The global terrorist organization al-Qaeda, established in 1988, was created to repel what it regarded as an uninvited foreign influence in Islamic lands, most notably the intrusiveness of the United States. The group also sought to derail or destroy those regional Islamic regimes it judged to be corrupt.

After relocating the organization's headquarters to Afghanistan in 1996, its leader, Osama bin Laden, doubled down on his determination to fulfill this two-fold mission, and to this end directed his strategists to pursue more sensational forms of political intimidation. In time, this would come to include not only al-Qaeda's meticulously choreographed, telegenic attack on the World Trade Center, but also its quest to attain weapons of mass destruction. "[I]f I seek to acquire these weapons," declared bin Laden in an interview with *Time* magazine, "I am carrying out a [religious] duty."[80]

Pushing ahead, the al-Qaeda leader ordered his deputy, the former surgeon Ayman al-Zawahiri, to organize and oversee a WMD program with nuclear, chemical, and biological capabilities. Al-Zawahiri, in turn, brought into the fold Rauf Ahmed, a microbiologist with the Pakistan Council of Scientific and Industrial Research, and Mohammad Atif, chief of al-Qaeda's Military Committee, to help manage the latter two components. And so it began.

In mid–1999, the team launched a project code-named "al Zabadi," an Arabic term meaning "curdled milk."[81] As one of its early efforts, researchers concocted what has been described as an insecticide-based, "home-brew nerve gas," which they tested on rabbits and stray dogs at a field camp in the Afghanistan desert.[82] The team also explored the chemical mixture napalm,

essentially a gelled form of gasoline that, when ignited, adheres to the skin and causes potentially fatal fourth-degree burns. And side-by-side with their interest in these and other crude chemical and incendiary methods was a preoccupation with weaponizing biological agents, with this presenting a further set of challenges for the team.[83]

In a persuasive letter to his superiors, Rauf Ahmed, after attending a conference titled "Dangerous Pathogens 2000" in England and touring a biosafety lab in that same country, insisted that al-Qaeda needed to entice more specialists from academic institutions if it hoped to build a robust WMD program. And the missive identified another need as well.[84] According to a précis published by the Combating Terrorism Center at West Point, Ahmed made the case that "a cover-up for the program would be needed, such as by setting up an NGO [non-governmental organization], private company, teaching institute or medical laboratory."[85]

As advised, al-Qaeda promptly attempted to recruit additional scientists and ensure that their activities had sufficient cover. The organization's biological and chemical warfare program also acquired new categories of stock, among them the bacteria *Clostridium botulinum* and *Salmonella* as well as the chemical compound cyanide. Presumably, the plan was to expose American troops in the region to the bacteria, and perhaps to the cyanide as well. "Botulism or salmonella poisoning would kill relatively few healthy young men or women," writes Pulitzer Prize-winning journalist Barton Gellman, "but would disable many of them for a time and render them vulnerable to other forms of attack."[86] Gellman adds that it would have been feasible for al-Qaeda to contaminate the soldiers' food, since local civilians prepared some of the meals.[87]

Perhaps most disconcerting, though, was the organization's fascination with anthrax. In November 2001, when members of the U.S.-led coalition stormed into Afghanistan in response to al-Qaeda's September 11th attack, they discovered a trove of bioterrorism materials in a nondescript house in an upscale neighborhood of Kabul, the capital city. The home of nuclear engineer Sultan Bashiruddin Mahmood, top al-Qaeda figures, among them al-Zawahiri himself, had been using the second floor as a meeting place to brainstorm WMD scenarios.

Scattered throughout were gas masks, laboratory equipment, and training manuals, along with booklets suggesting that an anthrax seminar had recently been conducted at the site. On hand, too, were materials detailing the U.S. military's plan to vaccinate its troops against the bacterium, along with an article about the Plum Island research facility in the United States, formerly a component of the nation's secret biowarfare program. Most telling, though, was a series of illustrations sketched on a wall. "The diagrams, in black marker pen, [were] detailed and esoteric, with pictures of helium balloons

rising on carefully measured trajectories of 10 kilometers, then apparently being shot down by a jet fighter," writes Chris Stephen.[88] The organization seemed to be toying with the idea of tricking the United States into using its own military aircraft to detonate anthrax bombs in much the same way that al-Qaeda strategists had used the United States' domestic airliners to bring down the World Trade Center.

Following another foray in 2002, this one near an airport in the Afghanistan city of Kandahar, coalition forces came across a partially-completed laboratory that al-Qaeda members had abandoned in the wake of the devastating air raids in the region. When the military's technicians analyzed the site, they detected the tell-tale traces of anthrax.[89] A disturbing finding, it would be corroborated in 2003 with the capture of Khalid Sheik Mohammed, the principal architect of the September 11th attacks. Found hiding in the home of a retired microbiologist in Pakistan, a special ops team seized the al-Qaeda mastermind along with his notebooks and numerous other items. While all of the confiscated materials proved to be enlightening, it was his computer hard-drive that was most incriminating, containing, as it did, invoices for anthrax, inventories of pathogens, and timelines for the construction of biological and chemical weapons.[90] As American experts had suspected, the existence of such documents confirmed that al-Qaeda was still considering the use of biochemical agents against the United States and its allies.

Significantly, it was this same year, 2003, that an al-Qaeda cell from Bahrain, having formulated a cyanide-based gas which it dubbed the "mob-taker," prepared to release the substance on the New York City subway system.[91] The attack, however, would not be completed. Ayman al-Zawahiri, who learned about the plot at the eleventh hour, intervened at once, commanding the cell's members to abort the mission and return to the Arabian Peninsula. And his reason for doing so speaks volumes about the al-Qaeda mindset. "Zawahiri canceled the planned attack on the New York City subway for 'something better,'" says Rolf Mowatt-Larssen of the Harvard Kennedy School of Government, "suggesting that a relatively easy attack utilizing tactical weapons would not achieve the goals the al Qaeda leadership had set for themselves."[92] The attack, in other words, would not have been sensational enough to advance the organization's global reputation. After the September 11th pageant of destruction, al-Qaeda appears to have decided its forthcoming missions should be ever more spectacular, the organization having raised its own bar. To date, it has not staged a successful biological assault, presumably because the group still has not achieved the necessary expertise.

In an appraisal of al-Qaeda's bioweapons program, including its various anthrax projects, terrorism experts René Pita and Rohan Gunaratna report that the organization has experienced only limited success in its efforts, a

state of affairs they attribute largely to its inability to recruit scientists having the necessary contacts.[93] Despite repeated attempts, the group has not been able to enlist researchers, such as those in Indonesia, who enjoy access to their homelands' reserves of pathogens.[94] This does not mean, however, that al-Qaeda will fail to attract well-connected figures in the future, nor does it rule out the possibility that the organization or another such group will secure a state sponsor that will supply it with WMDs or the tools for developing them. "Due to such sponsorship," writes Jeffrey Simon, formerly of the RAND Corporation, "[a terrorist group] could easily be provided with the necessary training, resources, and weapons."[95] Such a possibility is obviously a cause for concern.

As this chapter has revealed, humanity's propensity for inflicting illness upon its own kind is a practice that is as long-standing as it is reprehensible. Unfortunately, it is also one that shows no sign of abating. And worsening matters, the characteristics of those who engineer and execute biological assaults are expanding to include outlying elements of society that are at once atypical and unpredictable. Whereas in previous centuries it was most often a nation's military that developed and deployed biological agents, today's bio-warriors have come to include extremists, be they members of structured organizations or so-called "lone wolf" actors operating wholly on their own. In virtually every case, moreover, their targets are the same: civilian populations.

Disconcerting, too, is the fact that bio-attacks staged by terrorists are increasingly likely to succeed due to advances in society itself. The accessibility of international air travel, the expedited communication offered by the Internet, and the profound leaps taking place in such fields as genetic engineering, or "gene editing," are but a few of the developments that may help to facilitate terrorists' cultivation and dissemination of pathogens.

"While predicting … an attack with certainty is not possible," writes biodefense strategist Daniel Gerstein, "we must understand the proliferation of technology, increasing connectedness of the world, and a propensity toward more-spectacular attacks suggests the probability of such a large-scale bioterror attack will increase in the future."[96] The prospect of a sweeping bio-assault is, of course, appalling. It is also one society must address if it is to protect itself from those discontented individuals who conspire to destabilize it by unleashing a biological catastrophe.

◆ 2 ◆

Bioterrorism and Biocrime

Ideologies, Motives and Objectives

Terrorists and their organizations, including those that are inclined to use biological agents in their attacks, are not a uniform lot. They diverge in several respects, from the motives that drive their aggression to the scale of public exposure they hope to gain from their actions. In terms of size and complexity, they also run the gamut, from solitary extremists—so-called *lone wolves*—to outsized transnational organizations, just as their offensives range from hastily-staged, one-off attacks to well-orchestrated and prolonged campaigns of violence.

In the pages that follow, five broad categories of terrorism are examined, with special attention to those that experts believe are the likeliest to use microbial pathogens and biological toxins in their offensives. Discussed, too, is the less sensational but nonetheless significant realm of biocrime, which again entails the use of biological agents to commit misdeeds, albeit in a more personal vein. The aim is to furnish an overview of the types of organizations and individuals that are drawn to biological violence, as well as their aspirations in employing living organisms as an alternative to more conventional weapons.

Types of Terrorism

It was during the French Revolution that the term "terrorism" was coined, and, at that time in the eighteenth century, it carried a positive meaning. "Terror is nothing but prompt, severe, inflexible justice," writes Maximilien Robespierre in his 1794 treatise, *Justification of the Use of Terror*. "[I]t is therefore an emanation of virtue."[1] Robespierre was defending the bloody actions of France's revolutionary government, specifically its "Reign of Terror" as it came to be known in English-speaking nations. Touted as both honorable

and patriotic, the new government's deeds consisted of executing tens of thousands of citizens, aristocrats among them, who were judged to be hampering its seizure of power and, in some cases, conspiring to undermine it. The first casualty: Marie Antoinette, whom the new leadership sent to the guillotine.

Since those bygone days, terrorism has come to be defined quite differently, as an unnecessarily destructive approach to social or political change, as well as one that is adopted mostly by non-state actors. Society also views it in a profoundly dishonorable light. In fact, it is almost universally rejected except by those who engage in it and therefore strain to construe it as morally justifiable. This is perhaps most visibly the case for those religious extremists who claim that violence not only is supported by their belief systems, but is in fact necessary to advance their ideologies.

Religious Extremism

Jerrold Post, professor and director of the Political Psychology Program at George Washington University, has compiled a list of several types of terrorism, with religious extremism comprising one of the most lethal in terms of the total number of casualties.

"Religious-extremist terrorism is characterized by groups seeking to maintain or create a religious social and political order," writes Post, a system founded on "a radical fundamentalist interpretation of mainstream religious doctrines, including Islam, Judaism, Christianity, and Sikhism."[2] In such a group, the membership places its faith in a central figure, typically a cleric-leader operating outside the norm and claiming to speak for God, and it reveres this leader's directives which are purportedly based on scripture. Unfortunately, such directives call for violence against those who do not share the group's goal of the establishment of a fundamentalist society. "The radical cleric, whether ayatollah, rabbi, or priest, may draw on sacred text to justify killing in the name of God."[3] It should be noted that such groups, owing to their attraction to mass-casualty scenarios, may choose to kill their targets through the use of biological and chemical weapons, more so than nonreligious terrorist groups.[4] It is also worth noting that religious-extremist organizations, in their march to "cleanse" or refashion society, do not necessarily seek publicity and therefore may not claim responsibility for their attacks. "The religious-extremist group does not need headlines in the newspaper or the lead story on the television news," writes Post, "for its primary audience is God."[5]

In terms of structure, a religious-extremist operation often takes the form of a commander-cadre organization, with a central figure assuming a hands-on approach to its members and their illicit activities. "He trains them,

provides housing and/or salaries, provides for their families in the event that they die as 'martyrs,' and, in many cases, punishes them if they disobey his orders," writes terrorism expert Jessica Stern.[6] "A commander-cadre organization is essentially a terrorist army."[7] Contrasted with other types of religious-extremist operations, commander-cadre organizations, which tend to find a home in those nations that advocate terrorism or at least turn a blind eye it, pose the greatest danger to society because they are the best-equipped, logistically and often financially, to wage large-scale assaults. In the Middle East, numerous jihadi organizations are distinguished by their commander-cadre structures and mass-casualty aspirations.

Boko Haram. The world's deadliest terrorist organization at the present time, Boko Haram, offers an example. Surpassing even ISIS in its kill rate according to the *New York Times*, Boko Haram's formal designation is *Jama'atu Ahlis Sunna Lidda'awati wal-Jihad*, meaning "People Committed to the Propagation of the Prophet's Teachings and Jihad."[8] Operating within a commander-cadre structure, the leader of this radical Islamic organization is currently Abubakar Shekau, with the rank-and-file membership numbering well into the thousands. Notwithstanding its vertical chain-of-command, Boko Haram is flexible enough to allow a handful of its cells to function more or less autonomously, an adaptability that is thought to contribute to the group's success.

As to its objectives, the organization presently seeks to impose, in large swaths of Central Africa, Sharia law: strict religious and moral regulation drawn from the Koran and from the life and teachings of the prophet Mohammed. It is an aim, moreover, that the group attempts to achieve largely through the scope of a rifle. "[P]rivate citizens are overwhelmingly targeted, most often with firearms," reads a report from the Institute for Economics and Peace, a situation that results in "very high levels of deaths per attack."[9]

In the longer term, the transnational organization's ambitions extend far beyond Nigeria, Chad, Niger, and Cameroon, the countries in which it presently carries out its missions. "Boko Haram's ultimate objective is to bring all of mankind under *sharia* governance," reports The Clarion Project, a non-profit that monitors Islamic extremism.[10] As a commander-cadre organization, then, Boko Haram demonstrates the immense danger that a tightly-structured, monocratic terrorist operation, one claiming to adhere to a fundamentalist-religious ideology, may pose to society.

At the other end of the structural spectrum are extremist networks, both "non-virtual" and "virtual," which are comprised of individuals, groups, or sub-networks. To be found not only in religious-extremist terrorism but in the non-religious varieties as well, a network is different from a commander-cadre organization by its lack of a vertical hierarchy and conventional chain of command. It may lack a leader as well, or it may have a nominal head who

refrains from planning and executing terrorist attacks but rather stimulates the networks' participants to do so. "Leaders inspire operatives to take action on their own," writes Stern.[11]

In terms of the distinction between non-virtual and virtual networks, the former typically entails direct, face-to-face interaction among its members, whereas the latter may exist largely in cyberspace, where participants locate one another online and collaborate by means of coded or encrypted messages. Louis Beam, a white nationalist associated with the Ku Klux Klan and the Aryan Brotherhood, was an early proponent of such non-hierarchical, leader-free configurations. His 1983 essay, titled "Leaderless Resistance" and published in *The Seditionist*, argued that the moment had arrived in American society for extremists to move beyond traditional organizational structures.[12] Commander-cadre setups, he argued, were becoming outmoded and increasingly ineffective. In their place, he called for the creation of webs in which individual members plan and perform extremist acts on their own or in bands of two to three people, which Beam believed would make it more difficult for law enforcement to detect and defeat them. Regarding the response to his proposition, extremists embraced it at the time, with leaderless resistance gaining even greater traction among American activists in the 1990s and among foreign extremists in the twenty-first century, most notably in the Middle East.

Former CIA Operations Officer Marc Sageman has described how leaderless resistance, or virtual networks, emerged in Iraq after the 2003 U.S.-led invasion and occupation of that nation.[13] Scores of Iraqis, enraged by the destruction of their country, sought to join al-Qaeda's fight against the West but were unable to do so because the terrorist system had been forced underground. Their solution: create self-financed, virtual networks, and through them secure training in terror techniques and other crucial assistance. "They [had] no physical headquarters or sanctuary," says Sageman, "but the tolerant, virtual environment of the Internet [offered] them a semblance of unity and purpose."[14] Certainly this decentralized configuration, which he called a "leaderless jihad," should not be taken lightly.[15] "What makes leaderless resistance so potentially dangerous is the prospect of an individual or small cell obtaining a WMD [weapon of mass destruction] or employing innovative tactics in a particularly lethal manner," writes counterproliferation expert George Michael, formerly of the Air War College.[16]

Army of God. An example, one much closer to home, can be found in the Army of God (AOG), a U.S.–centered Christian extremist network that vehemently opposes abortion. In basic respects, the AOG illustrates the difference between a commander-cadre organization and a network arrangement. Equally important, it provides a contrast between an entity like Boko Haram that proclaims the grand aspiration of transforming society along

fundamentalist lines and the narrower objectives of many virtual networks that attempt to change a specific practice or supposed iniquity within a given population.

It was in 1982 that the Army of God came into existence, a period when the United States was already being subjected to terrorist attacks from religious-extremist groups and movements. Of the latter, perhaps the most notorious was Christian Identity, a movement that still exists today and is averse to African Americans, Jews, gay men and lesbians, and the U.S. government. The Army of God, by comparison, focuses on those people involved in the practice of pregnancy termination.

In its formative years, the aforementioned Louis Beam was associated with the AOG network, but he did not serve as its leader nor did anyone else. An anonymously-penned Army of God manual states that God is its commander.[17] The same source explains that the network's covert activists, which it refers to as "termites" and "remnants," do not communicate with each other, just as they normally do know about one another's terrorist activities.[18] As to how its members come into the fold, often they are inspired by provocative writings on AOG's website or steered into the network by like-minded people. Subsequent to this, they conceive and carry out their own attacks in the name of the Army of God.

To facilitate would-be terrorists, the AOG manual provides instructions for arson, targeted assassinations, and bomb-making, with the latter's components ranging from butyric acid, used to make stink bombs, to more dangerous materials such as ammonium nitrate and plastic explosives. It is, to be sure, potentially deadly information and the network's members take it to heart. The Army of God has claimed responsibility for numerous attacks, starting with the 1982 kidnapping of a physician in Granite City, Illinois, and continuing through a succession of shootings and bombings at abortion clinics and women's health centers across the nation.

Between its inception and 1998, for instance, the Army of God carried out twenty-four domestic terror attacks, among them armed assaults, assassinations, and explosions at abortion clinics. In one spectacular incident, a bombing was staged at the 1996 Summer Olympics in Atlanta by AOG adherent Eric Robert Rudolph, who opposed the state of Georgia's position on abortion and hoped to force the Games' closure as a means of publicizing the issue. Killed in the nitroglycerin and dynamite-propelled blast were a Turkish man and an American woman, with another 111 people sustaining injuries.

In more recent times, the Army of God, while continuing to vigorously oppose abortion, has become increasingly anti-government in its rhetoric. Then, too, it has positioned itself against the LGBT community, despite the fact that sexual orientation is unrelated to the abortion controversy. To this end, AOG "termites" have burned gay and lesbian establishments, and, siding

with their Islamic-extremist counterparts, praised the beheadings of gay men in Saudi Arabia. "Let us give thanks," said Michael Bray, an AOG minister and father of ten, referring to the barbaric custom.[19] It was Bray who was convicted of conspiracy and possession of explosives in relation to a string of bombings at abortion clinics and the offices of women's advocacy organizations on the East Coast.

The third and final form of religious-extremism that presents a threat of terrorism, including bioterrorism, centers on what social scientists refer to as "new religions."[20] Among other spiritual approaches and alternative religions, this classification encompasses new-age systems as well as certain sects or cults. Structurally, a cult is a prime example of a commander-cadre configuration in that it is an exclusive entity that revolves around the pronouncements of an authoritarian leader whom the membership may regard as tantamount to a deity. Invariably, the figure is at once compelling and controlling, and thus is in a key position to manipulate adherents' thoughts and actions. "Especially for closed religious cults, the dynamic is one of a charismatic leader who holds total sway over his followers," writes Post.[21] Not surprisingly, a principal requirement is total devotion both to the leader and to the cult's doctrines. "No doubt or doubters are permitted in these powerful hermetically sealed closed organizations."[22]

In terms of the threat of terrorism, so-called doomsday sects or cults, those uncompromising groups that embrace *apocalypticism*—the belief that the end of the world is at hand—present a particular risk. While most groups of this type are peaceful and limit their contact with society due to its supposedly corrupting influence, at least one of them, the Aum Shinrikyo sect in Japan, has adopted the opposite tack. Repeatedly, it has provoked Japanese society, seeking to hasten the so-called "end times" by triggering chaos and conflict through the use of biological and chemical weapons. Distinguished by a mélange of Buddhist and Hindu elements, this sizable organization also draws upon the prophecies of Nostradamus while embracing a handful of Christian beliefs harvested from the Book of Revelation. Since Chapter Seven focuses exclusively on Aum Shinrikyo and its bioterrorist acts, it will not be revisited at this point. Suffice it to say, the organization represents rather vividly the dangers that an extremist-religious sect may pose to a population, especially a group that has access to biological and chemical agents.

Political Extremism: Right-Wing

A second category of terrorism stems from reactionary political elements. While several varieties exist, arguably the deadliest are to be found in the more conservative or right-wing segments of society, at least in the United States. "Right-wing terrorism," says Post, "includes those groups seek-

ing to preserve the status and privileges of a 'dominant' race or ethnicity."[23] In the U.S., such groups, which encompass self-described militias, are often vehemently pro-white, standing in staunch opposition to the African American and Hispanic communities and increasingly to the Muslim community as well. Some also exhibit anti–Semitism, insisting, for instance, that a clandestine Jewish clique has a death grip on the nation. And they may evince sexist and antigay sentiments and behaviors. Whatever their preferred target, the groups insist that the "real America" is being usurped by interlopers, deviants, renegades, or inferior races, and that this state of affairs must be reversed.

The Order. One such organization, "The Order," was a domestic neo–Nazi outfit formed in 1983 by Robert Jay Mathews. Described by attorney Morris Dees as "an Aryan Nations offshoot," it sought to trigger a revolt against the U.S. government, which the group claimed was controlled by powerful and persuasive Jews.[24] To raise funds, the group's members robbed banks and carried out "mobile thefts" using armored cars, as well as operating a counterfeiting ring. In terms of their terrorist acts, they burned synagogues and performed targeted assassinations, among other crimes. Dees notes that The Order also implemented a system that Louis Beam initially proposed, one that rewarded killings. "The system gave point values for eliminating certain types of people, from 'street niggers' to race traitors to the U.S. president," writes Dees. "The murder of a street cop was worth one-tenth of a point," he adds, "while the assassination of the president counted for a whole point, the amount needed to become an 'Aryan Warrior.'"[25]

Concerning assassinations, The Order gained notoriety in 1984 for the gangland-style murder of Alan Berg, a talk-show host at a Denver radio station. Berg's liberal, on-air comments coupled with his Jewish faith caused him to rise to the number-two spot on The Order's hit list, with the host being sprayed with bullets as he stepped out of his Volkswagen Beetle on a warm summer evening. At the ensuing trial—and to considerable public consternation—none of The Order's members who were brought before the court were convicted of homicide. Two were convicted on conspiracy, racketeering, and civil rights charges, however; federal offenses that carry stiff penalties.

More recently, right-wing terrorists have included a growing number of lone wolves, who, in many instances, become radicalized through the Internet. The 2015 mass murder at a historic African American church in Charleston, South Carolina, offers an example of a right-wing attack committed by a lone wolf. In this case, Dylann Storm Roof, a twenty-one-year-old white man, shot to death nine African American men and women during a prayer service. Holding anti-black and anti–Semitic beliefs, it was reported that Roof had previously made inflammatory, racist comments on white supremacist websites, and, even more incriminating, penned an angry man-

ifesto in which he explained that it was essential for him to murder African Americans, that it was his calling.[26] "[S]omeone has to have the bravery to take [the fight] to the real world, and I guess that has to be me," he wrote.[27]

Of course, the fight about which right-wing terrorists speak is invariably a one-sided and bloody affair, with unsuspecting, unarmed citizens being singled out for assault. And this practice of attacking those who are defenseless places right-wing terrorists in close company with their religious-extremist brethren. But unlike certain religious-extremist groups—the Aum Shinrikyo sect comes to mind—right-wing terrorists appear to favor firearms and bombs over more sophisticated biological weapons, perhaps because the former are readily available, less complicated to devise and deploy, and well-suited to single assassinations or small-group killings. Accordingly, it is expected that groups of this type will continue using conventional weapons, especially since the spectacles that result, especially from bombings, are immediate, dramatic, and highly intimidating.

In terms of the future of right-wing terrorism in the United States, it has been on the increase in recent years and may well continue to rise. A 2014 survey conducted with the assistance of the Police Executive Research Forum, one that questioned nearly four hundred law enforcement agencies from coast to coast, found that seven percent of them considered right-wing domestic terrorists, such as anti-government extremists, to constitute a severe threat in their districts. By comparison, only three percent regarded Islamic extremists to present the same danger.[28] And these perceived menaces are backed up by statistics. Since the 2001 attacks on the World Trade Center and the Pentagon, the number of American citizens killed by homegrown, right-wing terrorists has far been greater than those who have died at the hands of Islamic extremists.[29] As terrorism experts Charles Kurzman and David Schanzer conclude from their post–9/11 research, "right-wing, anti-government extremism is the leading source of ideological violence in America."[30]

On this point, it should be noted that the United States is not alone when it comes to this form of radicalism. Far-right terrorism is alive and well in other countries, too. Between 1999 and 2011, for instance, Germany was home to the xenophobic, anti-government National Socialist Underground (NSU), a small but vicious neo–Nazi group that carried out lethal attacks against immigrants and law enforcement officers. Unfortunately, this brand of right-wing violence is not expected to diminish any time soon, particularly in Europe, where recent upsurges in asylum-seeking populations have sparked brutal nationalistic repercussions.

Political Extremism: Left-Wing

Less of a threat, at least at the present time, are left-wing terrorist organ-

izations. These groups, according to the FBI, "generally profess a revolutionary socialist doctrine and view themselves as protectors of the people against the 'dehumanizing effects' of capitalism and imperialism."[31] Their acts of violence, which include bombings, kidnappings, and other high-profile offenses, are most often motivated by the desire to draw public attention to their cause.

In the twentieth century, the preponderance of left-wing terrorist groups thrived between the 1960s and the 1980s, especially in Western nations. Subsequent to this, their number began to fall due partly to the collapse of the Soviet Union and the ensuing decline in communism's ideological influence. That said, far-left terrorism was a formidable phenomenon during its hardiest period, one whose deeds were perhaps best exemplified by the West German social-revolutionary group Baader-Meinhof, even today the subject of academic studies, documentaries, feature films, and popular literature.

The Baader-Meinhof Gang. Although it eventually came to be known as the Red Army Faction, the organization that was originally dubbed the Baader-Meinhof Gang was in operation between 1970 and 1998. Composed of twenty-three commando units, it quickly became successful in striking fear in the West German political establishment as well as in that nation's financial sector.

Regarding its philosophical foundation, the group maintained that West Germany was being managed by former Nazis, with the nation itself being a puppet of the U.S. government.[32] For these reasons, the group was determined to bring down West Germany's capitalistic system through a campaign of terror, one that targeted bankers, prominent members of the business community, magistrates, media figures, and U.S. military personnel stationed in that country. Its methods consisted of shootings and bombings, although Baader-Meinhof members also played key roles in the 1976 skyjacking of Air France Flight 139, arguably the most spectacular terrorist attack in modern aviation history. Then there were the kidnappings.

On September 5, 1977, Baader-Meinhof launched the mission that was perhaps the most emblematic of its disdain for capitalism and for the former Nazis who had gone on to occupy powerful positions in post-war West Germany. The target: Hanns-Martin Schleyer, a one-time member of the Hitler Youth and the Nazi Party, as well as an SS officer during Hitler's reign. By the time the Baader-Meinhof Gang caught up with him in the mid–1970s, Schleyer had become a wealthy and influential industrialist, president of the Federation of German Industries, and president of the German Employers' Association. As such, he represented everything the left-wing group despised.

It was in Cologne that the abduction took place. On a late summer's day, the limousine in which Schleyer was traveling came to a stop so that a pedestrian, a woman pushing a baby carriage, could cross the street. But once the woman, a Baader-Meinhof agent, was in front of the car, she stood stock-

still, immobilizing the vehicle along with the police escort that was shadowing it. With lightning speed, five masked terrorists riddled both vehicles with machine-gun fire, then dragged Schleyer into an idling getaway car. Killed in the confrontation were Schleyer's chauffeur and three police officers.

During the next few weeks, the Baader-Meinhof cell held their hostage in a Cologne high-rise, while demanding, in exchange for his freedom, the release of eleven prisoners incarcerated in Stammheim prison. Foremost among them was Andreas Baader, one of the group's founders. But, alas, it was not to be. On the night of October 17th, Baader, in his prison cell, was shot in the neck from a distance of twelve to sixteen inches, with officials classifying his death a suicide. And his was not the only one. That same evening, two other Baader-Meinhof prisoners were also reported to have killed themselves in their prison cells, one by shooting, the other by hanging. Naturally, suspicions arose at once that the government had ordered the prisoners' executions. Whatever the truth of the matter, "Death Night," as it became known, was followed by still another death the next day when the Baader Meinhof team, in retaliation, killed Hanns-Martin Schleyer himself and dumped his body in the trunk of a green Audi 1000. "Freedom through armed, anti-imperialist struggle," read a note left by a commando.[33]

Owing to more sophisticated police surveillance in conjunction with the reunification of East and West Germany in 1990, the Baader-Meinhof Gang gradually faded from sight, officially disbanding in 1998. All told, the group, in the course of its existence, killed thirty people, injured another two hundred, and intimidated thousands, thus making it one of the deadliest left-wing terrorist operations of the modern age.

Special Interest Terrorism

Still another source of terrorism, a source that does not fit neatly within the religious-extremist classification or the traditional left- or right-wing political designations, is one that addresses itself to a specific cause. Most often, animal rights or the preservation of the environment is the point of contention, particularly in Western European and North American nations. Of course, there are several organizations that oppose, in a peaceful and constructive fashion, the exploitation of animals and the mismanagement of the environment. Among such non-violent special interest groups are the Animal Defense League and People for the Ethical Treatment of Animals (PETA), as well as the Sierra Club and the environmental movement Greenpeace, which is provocative at times but not intentionally harmful toward others. The terrorist designation is applied only when an individual or group purposely sets out to inflict serious damage on people or property, with examples including such leaderless resistance networks as the Animal Liberation Front (ALF) and

the Earth Liberation Front (ELF), a covert web of environmental extremists.

As to the way in which their aggression manifests, it nearly always involves property destruction, not interpersonal violence, and in this sense is distinct from many religious-extremist, right-wing, and left-wing terrorist groups. By damaging public or private property, special interest groups and networks hope to draw attention to an issue, prevent the continuation of a controversial practice, or intimidate or punish a target.

In terms of their methods, when a group's concern is the environment, the term "eco-terrorism" may be used to describe its aggressive deeds. For instance, a non-terrorist organization that opposes commercial tree removal in California's redwood forests may block the roads used by a timber harvesting company so as to impede its operations. No physical harm is done to people or property, since the desired effect is disruption only. A eco-terrorist group, on the other hand, may engage in "monkeywrenching," sabotaging the companies' operations on a truly dangerous scale. For instance, eco-terrorists have driven nails and iron spikes into trees, thereby potentially destroying workers' equipment when they attempt to fell them with industrial saws. And while perpetrators have, in some cases, spray-painted the letter "S" onto the bark of sabotaged trees to warn workers away from them, most often the trees have gone unmarked.

In the most infamous episode of tree spiking, a newly-married, twenty-three-year-old mill worker in California, George Alexander, was nearly decapitated when a band saw he was operating tore into an eleven-inch nail. "The blade ripped through Alexander's safety helmet and face shield, tore his left cheek, cut through his jawbone, knocked out upper and lower teeth and nearly severed his jugular vein," writes the *Los Angeles Times*.[34] "I'm only here because my friend Rick Phillips held my veins together in the hour before the ambulance came," Alexander later said.[35] Although the victim, who was also struck in the head with a section of the tree, required plastic surgery and dentures, environmental activist David Foreman conveyed his regret about what he considered the principal victim, the ecosystem itself. "I think it's unfortunate that somebody got hurt, but you know I quite honestly am more concerned about old-growth forests, spotted owls, and wolverines and salmon—and nobody is forcing people to cut those trees."[36] Foreman is a founder of the organization *Earth First!* and the publisher of a how-to book about tree-spiking and other "eco-defense" measures.[37] Decentralized in structure, *Earth First!* has been classified as a terrorist organization by the Mountain States Legal Foundation.[38]

More than with other types of terrorist entities, biodefense experts worry that special-interest extremists might come to favor biological or chemical agents in their assaults. Unfortunately, there is a precedent for their use of microbial pathogens and biological toxins. An animal rights entity in Britain

was alleged in 1989 to have tainted grocery store products to oppose what it regarded as the commercial exploitation of animals. In the course of this program of economic sabotage, members purportedly injected supermarket turkeys with mercury so that customers would be fearful of purchasing them. They also tainted eggs, then sketched onto them a skull and crossbones to alert buyers to the risk. And in still another action, British animal rights extremists claimed to have laced Mars candy bars with rat poison. "No poison was found," writes Stern, "but Mars reported losses of $4.5 million."[39]

A similar concern—the deliberate deployment of pathogens and toxins—also applies to radical environmentalists. "Ecoterrorists would be attracted to biological weapons," writes former UN bioweapons inspector Rocco Casagrande, "because of the irony of using nature to reverse the depredations of mankind."[40] Casagrande points out that such agents additionally hold the capacity to inflict severe economic damage. "Biological agents could allow ecoterrorists to devastate genetically engineered crops, remove livestock from pristine grassland, or economically ruin a fertilizer manufacturer."[41]

In these types of attack, eco-terrorists would not target healthy crops; only genetically modified plants would be affected. Likewise, animals would not be harmed but rather "liberated" so that they might graze in less exceptional areas. Yet there does exist another terrorist element that intentionally sets out to inflict damage on the environment, and it is composed of radical political factions. Whereas environmental terrorists claim to be motivated by the desire to protect nature and ensure its preservation, extremists of other stripes turn to ecoterrorism as a means of exacting a cost from their enemies by spoiling the land and air. "Causing harmful environmental changes and this way terrorizing people, is the main goal of this type of terrorism," writes Polish terrorism expert Mirosława Skawińska.[42]

> Ecoterrorists often target natural oil producing installations. Petroleum leaking from damaged pipelines, refinery plants, petroleum mining shafts or oil carrying tankers contaminate soils, waters, [and] cause fires, which in turn cause air pollution. Countries which are listed as eco terrorists are: Kuwait, Israel, Iran, Iraq or Lebanon.[43]

Skawińska foresees the future of eco-terrorism as leaning increasingly toward the use of bioweapons, noting that, among counterterrorism experts, a "biological attack is considered to be more probable than a nuclear one, and also more deadly than a chemical attack."[44]

Unfortunately, there is also the prospect of accidents and aftereffects. A terrorist group, regardless of its type, may have no intention of visiting harm upon the ecosystem yet its attacks may result in environmental injury all the same. For instance, an offensive launched in 1981 by an Irish paramilitary organization, an action designed to cause economic harm, secondarily pro-

duced significant biological damage in the form of air and water pollution. In this case, the nature of the group was not eco-terrorist but rather nationalistic, the final category of violent extremism to be examined in this chapter.

Nationalist and Separatist Terrorism

In contrast to the aims of the religious-extremist, left- and right-wing, and special interest categories of terrorism, nationalist and ethno-nationalist groups view themselves as being engaged in a fight against subordination, as waging a war for independence and self-determination. Like them, separatist groups also seek self-determination and may further pursue the establishment of a sovereign, breakaway state.

A second distinction has to do with the groups' visibility and social integration. Whereas the members of a religious-extremist cult or a left-wing social-revolutionary group like the Baader-Meinhof Gang tend to sequester themselves from society, emerging only to perpetrate attacks and then return to the underground, the members of nationalist, ethno-nationalist, or separatist groups may be well-known in their communities. For that matter, their communities may tacitly support the extremists' illicit activities, as was the case for the Irish group mentioned earlier, the Provisional Irish Republican Army, the guerrilla element of the IRA which was most active between 1969 and 1997.

Provisional Irish Republican Army. Like the nationalist Palestinian Liberation Organization (PLO) in the Occupied Territories and the separatist Basque ETA in Spain and southwestern France, the IRA's goal was wholly political: it sought to bring to an end British rule in Northern Ireland. A unified Ireland under Irish governance was its desire. Accordingly, its targets were situated in Northern Ireland and England, although the organization occasionally carried out acts of aggression elsewhere in Europe.

In terms of the IRA's techniques, assassinations and bombings were its favored methods and included the use of car bombs as well as incendiary devices planted on buses and trains. Besides public transportation, its targets encompassed basic components of Britain's infrastructure, along with mundane entities such as telephone booths and airport parking lots. To shock the public and disrupt the tourist industry, the IRA also detonated bombs in crowded tourist venues like the Tower of London. Regarding the attacks mentioned earlier, the ones that damaged the ecosystem, they occurred in 1981 near Moville, a small port city in Northern Ireland.

Over a two-day period at the height of winter, the IRA carried out four offensives, one of them directed at a British ship delivering coal from Liverpool, England to Coleraine, Northern Ireland. Christened the *Nellie M*,

the eleven hundred-ton ship was anchored on Lough Foyle, a bay in the northernmost region of Northern Ireland. In this covert operation aimed at wreaking economic havoc, seven masked IRA gunmen stormed onto the *Nellie M*, took control of the vessel, and planted bombs below deck. As the terrorists were escaping, multiple explosions rocked the ship and sent it to the bottom of Lough Foyle. "At high tide," reads an account in the *Chicago Tribune*, "only the superstructure [main deck assembly] of the Nellie M was visible above the waters."[45] Unfortunately, the bombing not only destroyed the ship and its cargo, but it also caused considerable environmental harm, with coal dust filling the air as well as contaminating Lough Foyle and a portion of the North Atlantic to which it connects.[46]

In 1977, the IRA's paramilitary operations came to an end when the organization agreed to a ceasefire. A key element of the pact stipulated that the IRA's political arm, Sinn Fein, be permitted to participate in the Northern Ireland peace talks. In all, the IRA, in the course of its twenty-eight years of paramilitary engagement, murdered nearly four thousand people and injured tens of thousands of civilians.[47]

With the exception of its reckless actions on Lough Foyle, the IRA seems to have refrained from deliberately harming the environment in its scores of attacks over the years, and the organization is not known to have ever used biological weapons. Perhaps this can be partly attributed to the difficulty involved in developing and deploying them. Certainly this has been the case for many other terrorist groups, whether self-sufficient or state-sponsored. With increasing global access to the knowledge and materials needed to assemble a biological weapon, however, this state of play may soon change. And this brings us to an examination of the factors that may encourage or discourage future terrorist organizations and networks from pursuing a biological weapons agenda.

The Bioterror Calculation: Incentives and Disincentives

When assessing the prospects of a terrorist group adopting pathogens or toxins as weapons, it is important to take into account the societal taboo that, for centuries, has helped suppress this method of violence. Weighed against other types of aggression, biological attacks have long been regarded as among the most reprehensible owing to their stealthy, underhanded nature coupled with their potential to wipe out large swaths of the population through an uncontrolled contagion. Regrettably, it was a taboo the Aum Shinrikyo group breached in the 1990s when it dispersed anthrax in a public setting, with the sect also releasing sarin gas, a nerve agent, and the neurotoxin

botulinum. With these calculated acts against humanity, the doomsday sect opened the door, at least theoretically, to biological and chemical assaults by other extremist outfits.[48] But not only did the Aum Shinrikyo organization set a precedent by releasing pathogens and toxins in public venues; its actions also demonstrated that the organization could endure after defying this long-standing, transcultural prohibition. Accordingly, the lesson for extremist groups was a heartening one: it is possible for an organization to use bioweapons against civilians without the assault spelling the end of the organization itself. That said, there remain powerful drawbacks to resorting to such treacherous tactics.

Especially in the Middle East, a region in which terrorist groups have been known to enjoy the backing of local populations and sometimes that of states themselves, the use of biological agents may threaten to undermine such accommodating circumstances. "An attack introduces risk for the terrorist because [of] the potential for a loss of support from their constituents," says Daniel Gerstein, a strategist and policy expert.[49] Given that bio-attacks are universally rejected as an atrocious form of warfare, regional advocates of a terrorist group that decides to carry out this type of assault may thereafter shun the organization, just as a supportive state may sever its ties to an extremist entity whose actions violate the Biological Weapons Convention, an international agreement to which the state itself may be a signatory. While a terrorist group may remain intact after dispersing a biological agent, then, it may forfeit essential sources of support.

It is also worth mentioning that a terrorist organization's long-term goals may be instrumental when contemplating the use of microbial agents as instruments of aggression. Whereas an apocalyptic religious sect hoping to usher in the "end times" may have little worry about the backlash it will suffer when unleashing a lethal microorganism, a politically-oriented or special interest group may be greatly concerned about the negative repercussions that will likely ensue. And understandably so. If an extremist entity hopes to eventually take part in a country's decision-making processes, as did the Provisional IRA, employing biological weapons against unwary citizens will almost certainly guarantee that the group will never be afforded a "place at the table." A heinous act of this magnitude would negate any future overtures the group might make toward inclusion in society. This imperviousness to the social and political consequences is one reason counterterrorism experts contend that a religious-extremist entity would be more inclined to use a bioweapon than the typical political-extremist or special interest organization.

Still another aspect of the decision to release pathogenic agents has to do with the advanced skills that are required to fashion a feasible bioweapon, with experts holding conflicting opinions as to the degree to which contem-

porary extremist groups may have access to such expertise. Gerstein explains that there are two divergent camps, "one that says the necessary steps are too difficult for the terrorist to accomplish and one that says that bioterror is imminent."[50] Of the two, the prevailing opinion is that devising and deploying a bioweapon remains a very tricky feat, which presumably is why a sweeping biological attack has yet to take place on American soil.

As Gerstein points out in his book *Bioterror in the 21st Century*, the nation of Iraq, despite intensive efforts in the 1980s, failed to weaponize the anthrax bacterium.[51] And this was a wealthy, Middle Eastern country with a formidable WMD program, one that boasted an abundance of top-notch research scientists. It is even less likely that a band of terrorists would succeed in weaponizing a pathogen, especially in the absence of substantial state sponsorship.

In addition, there is the problem of time. Due to the numerous steps involved in crafting a biological weapon, from researching the process to acquiring and priming a suitable pathogen to assembling an effective deployment apparatus, a terrorist group would run the risk of discovery by the authorities. As is the case with any type of WMD, the longer the research, development, and implementation phases of the operation, the greater the chances of a security breach. So while a well-funded terrorist outfit might be able to conduct a protracted biowarfare program, it would risk being detected and neutralized long before a weapon could be finalized. At least this is an argument put forth by those who maintain that a bio-attack is far from imminent.

Those taking the opposite position, on the other hand, insist that it is only a matter of time before a terrorist organization launches a biological assault; that the task of creating a bioweapon, while challenging, is not necessarily a prolonged one, not anymore. Returning to our Iraq example, whereas the Middle Eastern nation was unable to weaponize anthrax in the 1980s, it might well be within the same research team's capabilities today. And this applies to terrorists as well. "Some analysts consider that terrorists could develop [biological] weapons very quickly once they set their minds to it," says Gerstein.[52] It is a state of affairs that stems, in large measure, from increased globalization and profound advances in biotechnology.

The fact is, the fields of industrial biology and biotechnology have made tremendous leaps in recent years, just as globalization, during the same period, has increased dramatically owing to a flurry of developments, among them enhanced digital communication and the growth of the Internet. As well, the open-sourcing of information, especially that which is contained in academic journals, has made crucial material accessible to virtually anyone who seeks it. And this includes groundbreaking discoveries and innovations in biological and genetic research, a potential goldmine of facts and figures

for those hoping to devise a biological weapon.

"Academic journals contain much of the information [terrorists] require, and an exhaustive literature search through sources such as *Acta Scandinavia* and the Merck Index can provide the information that they need," write defense consultants Nadine Gurr and Benjamin Cole.[53] The pair adds that the Aum Shinrikyo sect, whose operations were based at a remote location near Mount Fuji, began in precisely this manner, with a comprehensive review of the research literature together with a massive download of biological and chemical information mined from the databases of the Brookhaven National Laboratory in Upton, Long Island (New York).[54]

Predictably, biodefense experts have been quite vocal in expressing concern about the role academic journals and related resources may play in bioterrorist activities. Some have also conveyed their dismay about the Human Genome Project, specifically its overseers' decision to make available to the public fundamental genetic information. They fear that terrorists or rogue states may, in due course, exploit this material; for instance, by altering the genetic code of a virus so as to render it more resilient and infectious. A distressing development, it would depend on the group's ability to acquire the know-how to manipulate human DNA.

At first blush, obtaining the expertise to devise a biological weapon, especially one that would involve genetic engineering, might seem to be an insurmountable task. Yet to succeed at this undertaking, a terrorist group would have only to recruit a team of individuals with proficiencies in the requisite areas; it would not need to furnish its entire membership with crash courses in microbiology and biotechnology. And today, it is surprisingly easy to track down scientists having the skills to build a bioweapon, even one entailing genetic engineering.

"What was once considered to be esoteric knowledge about how to culture and disperse infectious agents has now spread amongst tens of thousands of people," write Gurr and Cole.[55] Of course, the overwhelming majority of scientists are, and will remain, thoroughly ethical in their actions, but there does exist that tiny fraction that is willing to work for a fee, motivated either by political or religious ideology or by financial need. The former USSR, Gurr and Cole point out, is illustrative. "[F]ollowing the dissolution of the Soviet Union, large numbers of engineers who had previously worked on developing WMD were made unemployed or simply not paid by the government the successor states," they write. "Some of these engineers have allegedly become available for hire."[56]

The financial costs of a biological warfare program may also enter the equation. Of the three types of WMDs—biological, chemical, and nuclear—biological weapons are the least expensive to devise. In fact, many of the pathogens that terrorists might seek exist freely in nature and may also be

found in laboratories throughout the world. And not only are they inexpensive and, with the right connections, attainable; a tiny amount of pathogenic material may be sufficient to produce extensive damage, particularly if a bio-attack leads to a contagion. By comparison, a chemical or nuclear assault impacts only those with whom the principal agent makes contact. That is to say, chemical and nuclear agents are not transmissible.

Readily available, too, is much of the equipment required to fashion a bioweapon. For several years now, experts have maintained that a terrorist cell could concoct a bio-weapon using materials purchased on the Internet or from a home improvement store. From used laboratory equipment posted for sale online—apparatuses that duplicate DNA, for instance—to "home fermenters" stocked by chain stores across the United States, assembling a BW workshop is today both viable and affordable, with how-to instruction manuals for constructing bioweapons available on the Internet.

Based on the preceding litany of advantages that terrorists currently enjoy, it would appear that an ambitious extremist operation could, with relatively little difficulty, devise and deploy a formidable biological weapon. Scientists and technicians are available for hire, pathogens are accessible, equipment is easily obtainable, and instructions are present online for the downloading. Given these developments, then, the question is why society has not already endured a succession of bio-attacks in recent years. And the answer may stem, in large measure, from fear on the part of terrorist organizations; a sobering recognition of the perils inherent in managing a bioweapons program.

"There are safety hazards for individuals working [with] these pathogens," write Gurr and Cole, who point out that "specialized state-run facilities have rigorous safety mechanisms and procedures to protect staff."[57] In the case of a terrorist group, financial constraints, time limitations, and other factors may prevent it from fully adhering to the same stringent standards required of a professional laboratory, one whose compliance is ensured through external oversight. For this reason, a terrorist group's BW project may pose a danger to the group itself, with this presumably being an overarching reason for extremists' reluctance to embark on such a program. Those creating a bio-weapon, along with other members of the organization, could find themselves its first victims, casualties of their own deadly microorganism.

Yet there is a persuasive counterpoint. Some experts argue that seasoned biological researchers and technicians would be smart enough to contain the hazards to which they might be exposed. Experienced microbiologists would know that cutting corners could cost them their lives when dealing with lethal microbes. That said, Gurr and Cole have called attention to the Aum Shinrikyo sect, whose in-house scientists, despite being well-versed in safety pro-

cedures, not only exposed themselves and others to the bacterium that produces Q fever, but then failed to follow proper decontamination procedures.[58]

Still another reason society has not suffered a greater number of bioterror attacks is believed to be due to the complexity involved in building an effective dispersal mechanism, an intricate task combining microbiology and engineering. As it stands, a bioweapon is useless unless it is paired with a viable dissemination apparatus, and this can be a very difficult task when it comes to microbial dispersal. It is because obstacles in distribution may have forestalled expansive bio-attacks in the past that a future terrorist group may decide to content itself with a scaled-down offensive or with multiple, minor bio-attacks.

"Lack of an effective dispersal mechanism will force terrorists to use any [biological] agents that they manage to develop as contaminants," says Gurr and Cole.[59] As opposed to a large-scale, "open air" attack, a terrorist cell, in a more modest and constrained operation, might place a contaminant in the air-conditioning system of a building or, alternatively, in its water supply. While illness and possibly death would ensue, the assault would be far less catastrophic than one using a method capable of disseminating a pathogen in a more expansive, generalized fashion. Of course, this does not mean that more efficient methods of diffusion will not be invented in the fullness of time, and that they will find their way into the hands of terrorists. "Technologically sophisticated groups," say Gurr and Cole, "could prove capable of developing, or acquiring, efficient dispersal methods."[60] To a terrorist group hoping to intimidate its foes and wishing to attract media attention, though, a comparatively small attack in which pathogens or toxins are used as contaminants might be regarded as a resounding success. "It is possible to conceive of an outcome from a bioterror attack that results in few casualties, yet gains significant media coverage, resulting in increased visibility for the terrorist's stated goals and objectives," says Gerstein.[61]

The Tylenol poisonings of 1982, although they involved a chemical rather than a biological agent, offer an example. In this infamous episode in which the popular painkiller was laced with potassium cyanide, the result was a relatively small number of deaths, seven, in the Chicago area. All the same, it triggered a national panic, prompted the recall of thirty-one million bottles of Tylenol, and led to permanent changes in the packaging of over-the-counter medications. Financially, the incident proved to be a nightmare for the painkiller's manufacturer, Johnson & Johnson, which not only lost millions of dollars in sales, but also found it necessary to invest $100,000,000 to restore its medications' security and salvage the company's reputation.[62] It is not a stretch, then, to suggest that a small bio-attack could produce profoundly negative effects, more than sufficient to gratify a terrorist. Then, too, it should be noted that it does not require a lone-wolf terrorist or an organized

terrorist operation to plan and execute a biological assault; an individual with a personal vendetta or other agenda can do it as well.

Biocrimes

"A person who is smart, determined, trained in basic microbiological techniques, and willing to take a few short-cuts on safety and go at a few technical problems in mildly unconventional ways, could conceivably do some horrible things," says Kyle Olson, a bioweapons analyst in Arlington, Virginia.[63] This is precisely the type of person who worries not only terrorism experts, but ordinary law enforcement officials as well, since they too may find themselves confronting men and women in their own localities who seek to commit biological offenses. It will be instructive, then, to distinguish between a bioterror attack, which is itself a crime, and what is referred to in law enforcement circles as a "biocrime."

According to physician-scientist Steven Schutzer and his colleagues Bruce Budowie and Ronald Atlas, "[a] biocrime is similar to an assault crime, except, instead of a gun or knife, the weapon is a pathogen or a toxin."[64] In the typical case, the perpetrator—usually there is only one—targets someone with whom he or she is familiar, from a spouse to a co-worker, and seeks to sicken or kill the person with a biological agent. By comparison, a bioterror attack typically involves a group of extremists going after a large number of people, most often civilians whose individual identities are unknown to the extremists themselves. Characteristically, a bioterror attack is far deadlier than a biocrime in terms of the number of casualties, as well as being considerably more indiscriminate in its targeting.

The motives are also different. The intentions that underlie biocrimes are the same as those found in other forms of assault, running the gamut from jealousy to retaliation to financial gain. A perpetrator may seek to exact revenge on a former lover or a business competitor, for instance, or may hope to benefit from the victim's life insurance benefits if death occurs. Seldom does a perpetrator's motive arise from a religious or political ideology, which is most often the case with bioterrorism.

As for legal consequences, biocrimes are typically addressed in the same manner as other types of criminal assault, such as shootings and beatings: locally and in conventional legal fashion. Bioterror attacks are treated differently. "In the US," write Schutzer and his colleagues, "acts of bioterrorism are federal crimes that are governed by different responses by law enforcement and public health agencies."[65]

At this point, it should be mentioned that hoaxes are far more common than those offenses that make actual use of pathogens or toxins. "The numerous

hoaxes that are biocrimes include white powders found in letters that proclaim the presence of anthrax, and threatening notes claiming ricin contamination of baby food," writes the Schutzer team, referring to current trends in threats.[66]

As could be expected, a claim of anthrax, ricin, or other biological agent may be remarkably effective in alarming the victim and necessitating an emergency medical assessment and subsequent monitoring. In so doing, it presumably fulfills the perpetrator's intentions. Furthermore, such a ruse can be implemented rather easily on a larger scale, and very cheaply. This was the case in the nation's first major anthrax hoax, which occurred in 1997 when a shattered petri dish that had been holding a white substance was mailed to B'nai B'rith headquarters in Washington, D.C. An intriguing suspect who claimed to be innocent: a biodefense expert with a background in counterintelligence, a man whom the *New York Times* referred to as "Mr. Z" and who was in the city to attend a bioterrorism conference. Feeling that important biodefense issues were not being addressed, he was reportedly displeased that he had been omitted from the assembly's roster of speakers. Then the anthrax scare occurred. "The next day," reports Nicholas Kristof, "Mr. Z sent a letter to the [conference] organizer saying that he was 'rather concerned' at the omission and added: 'As was evidenced in downtown Washington, D.C. … this topic is vital to the security of the United States."[67] Mr. Z added that he was eager to become more involved in the discussion. It is conceivable, then, that the ruse was designed to win a position on the conference's list of speakers.

Regarding the city's response to the hoax, more than a hundred B'nai B'rith employees were sequestered as a precaution, some were subjected to preventive, on-site decontamination, and seventeen others were hospitalized for observation. "[T]he hoax cost more than $2 million to handle, closed a major thoroughfare less than a mile from the White House for 10 hours, disrupted normal activities in the city and spread fear among its citizens," writes Ronald Bailey.[68] To those who carry out such deceptions, part of the appeal may be that the deed achieves its objectives without the hoaxer having to face the risk or expend the labor necessary to obtain and deploy a dangerous toxin or microorganism.

"The most critical step in … biocrime incidents," reads a UN document on the subject, "is the acquisition of biological agents or toxins."[69] To be sure, acquisition is a challenge for the average person who lacks access to a medical or research laboratory, and it is presumably for this reason that those who hold jobs in such settings—that is, positions that offer admittance to stocks of microbes and toxins—are vastly over-represented in the commission of biocrimes.

In the United States between 2002 and the present, the agents used in

biocriminal incidents have been "mostly pathogenic micro-organisms available to the perpetrator through their profession and/or study," reports the aforementioned UN study.[70] This being the case, it should come as no surprise that healthcare professionals, along with researchers in medically-oriented fields, comprise, by far, the largest category of perpetrators. Accordingly, they are the focus of the biocriminal case studies contained in Part Two of this book, together with comprehensive accounts of precedential bioterrorist operations in Japan and the United States.

◆ 3 ◆

Biohacking

Citizen Science and Societal Risk

Bioterrorism, as the previous chapter revealed, poses a threat to the population in the same way that small-scale biocriminal acts present a danger to specific individuals or clusters of individuals. Yet there is a third type of activity that some fear may culminate in biological violence as well, one comprised of "citizen scientists." Ranging from rank amateurs to professionals in various fields, these are people who undertake biological projects outside the walls of traditional institutional settings and thus far without regulation or oversight. Quite often, their experiments, which are characteristically benign, involve the manipulation of DNA, and are increasing in number and sophistication as biotechnology equipment becomes more affordable. As for their motives, biohackers conduct such experiments mainly to quench their curiosity, although some yearn to see their results acknowledged by the scientific establishment while others hope to market their findings and innovations.

"These hobbyists represent a growing strain of geekdom known as biohacking, in which do-it-yourselfers tinker with the building blocks of life in the comfort of their own homes," writes Jeanne Whalen in the *Wall Street Journal*.[1] Given the fanciful nature of the topic, it should come as no surprise that alarming stories about biohacking, always speculative, have appeared in the media in recent years, overwrought tales warning that it is all but inevitable that a daft or devious hobbyist will someday cook up a dangerous, artificial life form in a makeshift suburban lab. Of course, such over-the-top reports may be driven less by the desire to alert society to an impending danger and more by the determination to sell newspapers or serve as clickbait. Even so, it does not alter the fact that genuine perils may indeed be associated with biohacking, and that they may intensify in the coming years as hands-on biologists acquire greater expertise and more advanced equipment.

The fact is, those experimenting with DNA, from hobbyists with limited

education to professional engineers and information technologists, often lack training in biosafety measures.[2] In some cases, they also lack a sufficient education in biology itself, most of all genetics, and thus may not be fully aware of the potential hazards that are present in their pursuits. It is a state of affairs that constitutes a vulnerability in the biohacking movement. Says scientist Markus Schmidt of the Biosafety Working Group, a project of the Organisation for International Dialogue and Conflict Management in Vienna, Austria:

> [T]his ultimate domestication of biology could easily lead to unprecedented safety challenges that need to be addressed: more and more people outside the traditional biotechnology community will create self-replicating machines [life] for civil and defence applications; "biohackers" will engineer new life forms at their kitchen table; and illicit substances will be produced synthetically and much cheaper.[3]

Zeroing in on biohacking in particular, he adds, "An unrestricted biohacker scenario could put the health of a biohacker, the community around him or her and the environment under unprecedented risk."[4]

It should be noted that Schmidt's apprehension centers on the well-meaning practitioner whose experiments go awry. Of even greater concern is the "garage biologist" who harbors darker motives, the man or woman who deliberately sets out to inflict harm on society. Certainly the prospect of such a person is a cause for concern, especially given the history of the traditional computer hacker. Just as there has long existed within the community of computer enthusiasts a rogue element that is bent on clandestinely spreading viruses and other malicious software, so it is reasonable to expect the eventual emergence of a breed of biohacker that strives to harm others in much the same way, but through the use of microbes, either naturally-occurring or artificially engineered.

To better understand the biohacking movement and assess the extent of the threat it poses to society, it will be useful to revisit the more conventional practice of computer hacking and the path by which biology came to be associated with it.

The Genesis of Computer Hacking

Although today we associate hacking with those shadowy figures who infect our computers with an ever-changing array of malware or who slip past firewalls and make off with our personal information, the term carried a very different meaning when it originally came into use nearly sixty years ago. This was during the early days of research and development in the field of computer technology, an inventive, invigorating, and comparatively innocent period. It is one that Gisle Hannemyr, author and lecturer at the Institute

of Informatics, University of Oslo, recounted in his compelling article about the hacking phenomenon.[5]

"In the 1950s, people working with computers had much in common with artists, artisans and craftsmen," Hannemyr writes. "Skilled programmers, like all good craftsmen, had intimate knowledge and understanding of the systems they worked with."[6] An era of freedom and openness, computer aficionados ground away side by side, bouncing ideas off one another in a communal effort to advance the field. They did so, moreover, with little or no interest in financial compensation. But these halcyon days of collective creation proved to be short-lived. As the 1950s gave way to the 1960s, corporate leadership set about instituting control over this uniquely creative element of its operations, and it did so by adopting a management style in which employees were pressed into discrete areas of specialization.

"Computer workers found themselves stratified into a strict hierarchy where a 'system analyst' was to head a software development team consisting [of], in decreasing order of status and seniority, 'programmers,' 'coders,' 'testers' and 'maintainers,'" writes Hannemyr.[7] It was a pecking order that often carried over into the workspace as well, with staffers finding themselves sequestered from their colleagues. "Putting the different grade of workers in different locations further enforced the division of labor," says Hannemyr.[8] But while this management strategy was effective in bringing employees to heel and rendering their work products more quantifiable, it stifled the remarkable creativity, not to mention the *esprit de corps*, that heretofore had distinguished the same workers.

In his definitive work on the computer industry's individualists, *Hackers: Heroes of the Computer Revolution*, former *Newsweek* senior editor Steven Levy singles out one corporation that became particularly notorious for its regimentation in the 1950s: IBM, or International Business Machines.[9] "You could wander into the Computation Center … and see the stifling orderliness, down to the roped-off areas beyond which unauthorized people could not venture," he writes.[10] The buttoned-down IBM was, in Levy's words, "an empire unto itself, secretive and smug."[11] Not surprisingly, such organizations with their constraining milieus demoralized and alienated many of their more inspired employees, some of whom responded with their feet. Bright, motivated, and self-reliant, these young mavericks sought out those remaining enclaves, quite often in academic settings, where their devotion to understanding computer operations, experimentation with novel concepts, and sharing of ideas and information would still be respected and encouraged. Here, they bonded with like-minded individuals to create cohesive, innovative communities.

Three universities that became well-known for offering hands-on opportunities to such computer virtuosos were Stanford University, Massachusetts Institute of Technology (MIT), and Carnegie-Mellon University. Although

computer science departments were not yet commonplace in the early 1960s, prosperous and progressive universities, like the above-mentioned institutions, did establish computer centers where determined students could, by hook or crook, gain access to state-of-the-art technology.

For the most part, these were young men, many of them electrical engineering majors, who were intrigued by the possibilities offered by the era's computers. Skipping classes and sleeping during the day, they spent their nights at their schools' twenty-four-hour computer centers writing and implementing programs, then reporting the outcomes to their comrades the next day. At MIT, a close-knit group of students with expertise in computer science adopted the term "hacking" to describe their activities, a term dating back to the college's longstanding tradition of springing pranks on the unsuspecting. These students, however, assigned the term a new meaning. To them, hacking did not involve malicious activity; it was not an arch pursuit. Rather, it was a form of creative engagement that was at once positive and productive, one that involved informed experimentation with the new technology, the aim being to advance it. "[T]o qualify as a hack," writes Levy, a pursuit had to be "imbued with innovation, style, and technical virtuosity."[12] In its purest form, hacking was an undertaking that commanded great respect within the computer community, with its participants regarded as artisans whose accomplishments were acts of brilliance and beauty.

Among the hackers' early efforts were programs that instructed computers to play music or, alternatively, translate text from various written languages. Especially noteworthy was the invention, in 1962, of one of the first digital computer video games, *Spacewar!*, a sterling achievement for the MIT group. In keeping with the group's principles and code of conduct—the "hacker ethic," as it became known—*Spacewar!* was not created for profit. In fact, the twenty-five-year-old who devised the program, Steve Russell, made not a cent from it. Instead, the project was intended to advance the field of knowledge, and thus, from the get-go, was freely available and "hackable"—that is, open to being modified and improved upon by others. "Like any other program, it was placed in the drawer for anyone to access, look at, and rewrite as they saw fit."[13] By all accounts, these pioneering hackers were a smart, idealistic, and generous lot.

In terms of the specific components of the hacker ethic, its key elements consisted of the following:

- Information is inherently free.
- Knowledge should be shared, not copyrighted, patented, licensed, or otherwise "owned" and controlled.
- The citizenry should have free and unfettered access to computer technology.

- Hands-on learning is superior to less direct forms of learning.
- A decentralized approach is superior to a centralized, bureaucratic one.
- Hacking should strive to improve the world.
- Hackers' creations can be objects of beauty and artistry.
- Hackers should be evaluated solely on the quality of their work. Educational degrees, job titles, etc., should not be a part of the appraisal.
- Autonomy is essential. Question authority.[14]

Expanding on these principles, Finnish philosopher Pekka Himanen adds that many hackers hoped to actualize themselves through their work; that they used it, in part, to reach their potential.[15] In the same vein, they were determined to disseminate their work so that humanity, as a whole, would likewise be enhanced.

As it happened, the tone of the hacker ethic shifted over the years, and it did do so partly in response to the times. Although its original components remained firmly in place into the 1970s, it was during this decade that emphasis came to be placed on those aspects that centered on freedom and autonomy. Insisting more fervently than ever that information should be freely accessible, hackers set out to secure the digital frontier for the citizenry. In this way, the computer artisans of the 1960s became the progressive activists of the 1970s, especially after the advent of the microprocessor. This proficient circle of prodigies, for instance, played an important role in expanding citizen access to computer technology by envisioning and championing public computer terminals. Even more radically, it was from within their ranks that the personal computer was born. It should come as no surprise, then, that many of these hacker-activists, from the world-class "tinkerers" to the visionaries, came to be counted among the earliest denizens of Silicon Valley.

Of course, not every computer enthusiast of the 1970s endorsed all components of the hacker ethic. Bill Gates, for one, while instrumental in bringing affordable computers to middle-class homes, railed against the notion that information is inherently free. In 1976, the twenty-year-old cofounder of Microsoft, today among the richest entrepreneurs in the world, published an open letter explaining to computer hobbyists that it was imperative that they purchase, not share, his company's software because the revenue was needed to cover the cost of continued software development.[16] Sharing such products, Gates argued, was tantamount to stealing them, and was a practice that deprived software developers of their livelihoods even as it stifled progress. "Who can afford to do professional work for nothing?" he asked.[17] But Gates' missive was met with disdain by those hobbyists who had been sharing Microsoft products, one consequence being that a number of indignant hackers

set about designing their own software which they either gave away or sold at bargain-basement prices. To be sure, hacking—in this case, creating software for community use—was still alive and well.

It would be in the 1980s that the term would take on an altogether different meaning, a negative one in that it would be applied to activities that were malicious, even criminal. Hacking would now become synonymous with hostile deeds, as in illicitly entering computers, vandalizing them ("digital defacement"), hijacking and remote-controlling them, and stealing private information. And this new definition would endure. Today, "hacking" continues to be the most common expression for such destructive acts, with the term's more noble beginnings having long been forgotten. But not by everyone. In one area of pursuit, its original meaning lives on, as do many features of the hacker ethic itself; an area that involves the melding of 1960s and 1970s-style computer hacking with the biological sciences.

Biohacking

"Some people … call themselves *biohackers* and refer explicitly to the hacker movement and history," writes Alessandro Delfanti, Assistant Professor of Culture and New Media at the University of Toronto.[18] "[T]hese biohackers represent all the complexity and heterogeneity of hacker politics, and translate it into the world of biology."[19] Yet certain precepts of biohacking, also known as "wetware hacking" and "do-it-yourself biology," are more sweeping than those of their predecessors. For instance, a principal tenet of biohacking is that the citizenry not only should enjoy unrestricted access to information emerging from the life sciences, but that biological experimentation itself should be "democratized," to use the proponents' term.

"The kind of open science they foster," says Delfanti, "is one in which openness is not limited to open information sharing, but rather expresses a radical request for opening science's boundaries which allows entry for people who do not belong to its institutions."[20] Specifically, biohackers argue that anyone, even the person who lacks training in biology, should be able to freely conduct research in the life sciences and in alternative settings. The underlying philosophy: scientific engagement, like knowledge itself, belongs to the people; it is not the exclusive province of a scholarly elite ensconced in an ivory tower or a corporate research center.

Of course, this position may be considered reasonable or unreasonable depending on the particular activity. Most people would probably regard it as a sensible stance when applied to a neighborhood learning lab where inquisitive citizens gather to perform innocuous experiments. Such community facilities do exist, and they serve a useful function in fulfilling the public's

interest in biology and biotechnology. Although their explorations may be more advanced, these citizen scientists are not unlike those adolescents in previous decades who carried out harmless experiments with chemistry sets in their bedrooms.

On the other hand, the position that ordinary citizens, including those who lack backgrounds in the life sciences, should be in a position to conduct unchecked biological studies becomes more problematic when it is applied to biohackers who perform procedures on human tissue. For example, some of the more extreme practitioners, called "grinders" or "bodyhackers," perform minor surgeries on their colleagues, such as implanting magnets in their fingertips so they may sense magnetic fields. Other grinders, using their own bodies as experimental canvases, apply electrical current to their temples so as to stimulate the cerebral cortex and ostensibly reduce anxiety, or inject a serum into their eyes so they may experience night vision temporarily. Critics of the biohacking movement argue that such procedures are questionable at best, especially when their long-term effects have not been established and they are performed by amateurs. When examining the tenets, ethics, and hazards of biohacking, then, it is important to specify the sorts of experiments and interventions that are under discussion, since they vary considerably.

As noted at the outset of this chapter, the majority of biohackers are drawn to the applications of biotechnology, with numerous gene manipulation experiments having been performed by citizen scientists throughout the world in recent years. Some have been carried out in home laboratories, while others have been conducted in "hackerspaces" or "hacklabs," communal workspaces where do-it-yourselfers congregate. Such genetic experimentation, as it happens, is also the branch of citizen science that critics most often single out as a threat to the population. The reason for their concern: the tools of biotechnology not only make it theoretically possible for a biohacker to refashion lethal pathogens by manipulating their genetic codes, pathogens that could then be released into the population, but also because the tools themselves are widely available to the public and relatively inexpensive to acquire.

"You can pick up any recent issue of *Science* magazine, flip through it and find ads for kit after kit of biotechnology techniques," says molecular biologist Tom St. John of the Hutchinson Cancer Research Center in Seattle.[21] Remarkably, St. John made this comment in 1988 in a *Washington Post* article, one titled *Playing God in Your Basement* and likening biohacking to 1970s computer hacking.[22] Since the article's publication, the dissemination of genetic engineering techniques has continued, even accelerated, thanks in part to an economic downturn in the 2000s that prompted several struggling biotech firms to sell off their equipment to biohacker collectives.[23] In some cases, lab equipment was offered on e-commerce sites like Craigslist and

eBay, with apparatuses capable of duplicating genetic material being marketed for only a few hundred dollars.[24]

Also galvanizing those do-it-yourself biologists having an interest in biotechnology was the publication of the first draft of the human genome by the International Human Genome Sequencing Consortium. Appearing in the February 2001, issue of the science journal *Nature*, it was rightfully heralded as a profound advancement in human knowledge.[25] At once, the information was seized upon both by professional and do-it-yourself biologists, with the two groups finding it to be of immense value. And this was intended to be the case. "It's a shop manual, with an incredibly detailed blueprint for building every human cell," says Francis Collins, Director of the National Genome Research Institute in Bethesda, Maryland.[26]

Still another important contribution to the biohacking movement came with advances in "synthetic biology," an innovative, interdisciplinary enterprise situated at the intersection of engineering and biology. Synthetic biology brings together biotechnology, genetic engineering, molecular and evolutionary biology, and a handful of other fields in order to create new life forms or modify those that already exist in nature so as to endow them with unique properties and abilities. Unlike cloning, which requires pre-existing or "real" DNA to launch the process of gene duplication, synthetic biology produces DNA from scratch, meaning it is a more versatile and cost-effective means of fabricating genetic material for research purposes. Not surprisingly, it has been a boon to biohackers, with artificial gene synthesis allowing them to obtain mail-order, synthetic DNA at a reasonable price.

So it was that the biohacking movement, fueled by the publication of the human genome together with the accessibility of lab equipment and synthetic DNA, flourished. Like the 1960s and 1970s computer hackers who preceded them, do-it-yourself biologists became increasingly aware of one another and began joining forces on research projects as well as sharing laboratory equipment or pooling their resources so as to purchase it. Clearly, the movement was well on its way.

In 2008, this trend of biohackers coalescing into small groups or tight-knit communities was given a boost with the arrival of "DIYbio" ("Do-it-yourself biology"). A network for biohackers, DIYbio was created, according to Alessandro Delfanti, to provide "non-expert, citizen biologists with a collective environment and cheap and open source tools and protocols for biological research which [could] be conducted in amateur settings."[27] Although the original DIYbio headquarters was based in Boston, groups began popping up in a number of U.S. cities and beyond. Before long, biohackers from around the globe were logging on to the operation's website, *DIYbio.org*, to obtain information and advice as well as to share their experiences. In bringing together thousands of citizen scientists, *DIYbio.org* quickly became, and

remains today, one the most significant and influential online networks of its type.

Another important addition to the biohacking scene was "Genspace," the aforementioned community lab in New York City. Founded in 2009, Genspace, which still flourishes today, provides laboratory space and equipment for biohackers, along with courses in synthetic biology and other subjects. And similar to Genspace is the "London Biohackspace," established in 2011. Like other community-based hacklabs, it offers research facilities for do-it-yourself biologists and encourages all manner of individuals to use them, including artists interested in creating bio-art, along with computer programmers and engineers. And then there is the "Hackuarium" in Lausanne, Switzerland, which makes laboratory space available for do-it-yourself biologists to conduct an assortment of projects, such as innovative methods of food production. To be sure, such networks, organizations, and hacklabs serve multiple functions, furnishing meaningful and affordable opportunities for biological experimentation combined with educational programming and peer support. As well, they foster a sense of community and a concomitant sense of personal responsibility.

As to the nature of the biohackers' research projects, they run the gamut from the rudimentary to the relatively sophisticated. In the former category, ambitious bands of biohackers in their teens have concocted everything from "blinking cells to banana-scented bacteria," writes Marcus Wohlson.[28] By comparison, adult hackers in the latter category have taken on medical challenges, as in the design of microscopic agents capable of identifying the presence of pathogens. In one such case, a Venezuelan computer scientist with an interest in biology is working on a diagnostic test for the insect-borne, parasitic disease known as Chagas, his goal being to devise an "off-the-grid diagnostic rapid response kit" that would be compact and low-cost and thus suitable for use by the money-strapped, far-flung villages of Central and South America.[29]

Still another acclaimed cluster of studies entails the insertion of genes into bacteria to make the bacteria glow. Like many experiments that observers misperceive as inconsequential, even silly, these studies may in fact yield considerable benefits for humanity, food safety being one of them. Biohackers explain that such experiments could lead to a modified bacterium that would become luminous upon detecting chemical contaminants, like melamine, in food products, thereby serving as red flags to consumers. "People should have an inexpensive and portable test to make sure their food is safe," says an avid biohacker, a software engineer, who has undertaken such a project. "[N]o lab was working on this, so I said let's do it ourselves."[30]

To obtain a more precise glimpse into citizen scientists' activities, specifically in their preferred area—biotechnology—leaders of the Synthetic Biology Project of the Woodrow Wilson International Center for Scholars adminis-

tered a self-report questionnaire to biohacker communities.[31] The results, published in 2013, found that of the 359 do-it-yourself biologists who responded to the survey, approximately 65 percent had extracted DNA in their experiments, while nearly 20 percent had created synthetic genes. Over 40 percent of the total sample had genetically engineered a bacterium, with roughly 5 percent having engineered the cell of a mammal. Other types of projects involved protein purification and self-testing for the presence of specific genes. In the opinion of the study's authors, the findings indicate that biohackers, as a whole, possess viable skills and are capable of contributing meaningfully to the life sciences.[32]

Regarding the attributes of these do-it-yourselfers, the same study found that a substantial number was far removed from the popular stereotype of the youthful amateur who tinkers with dodgy microbes in an improvised basement lab. Forty-two percent of the respondents were between thirty-five and forty-five years of age, forty-six percent possessed graduate degrees in subjects ranging from jurisprudence to medicine, and thirty-five percent carried out their experiments in hackerspaces.[33] It would appear, then, that a sizable share of biohackers, at least as measured those willing to respond to the aforementioned survey, are not the untutored eccentrics so often portrayed in media reports.

In terms of biohackers' values, the most strongly embraced entails a respect for, and insistence upon, unrestrained access to information; a reverence, as mentioned earlier, that was prevalent among the 1960s and 1970s computer hackers. Based on the notion that scientific knowledge belongs to all of humanity, this crucial underpinning of the citizen science experience has been a provocative one since the movement emerged, and it still raises the hackles of those who oppose hands-on biology. This is especially the case for those having corporate interests, as evidenced by a game-changing legal battle in 2013 that centered on open-access DNA research. Since the court's decision affected the biohacking movement, which was indirectly drawn into the matter, it will be useful to briefly revisit this pivotal case.

Proprietary Conflicts

As previously noted, the sequencing of the human genome by a global team of researchers (Human Genome Project) was intended to provide scientists with information that would help in their investigations into the genetic components of numerous medical conditions, the ultimate aim of such studies being to more effectively prevent, diagnose, and treat disease. Since the sequencing of the genome was undertaken for the sake of humanity, the draft was made publicly available in 2001, with the final version being released two years later.

A genome contains all of an organism's genes. In the case of the human genome, it is composed of a long strand of DNA molecules that contains an estimated twenty-one thousand individual genes. So whereas the international team of researchers placed the genome itself in the public domain, it would be up to subsequent researchers to locate and identify, or "isolate," the specific genes contained on it. When those in the scientific and biohacking community sought to do this, however, they soon clashed with advocates of intellectual property rights, who argued that corporations' genetic research programs, upon isolating specific gene sequences, should be permitted to patent these genes along with any tests or treatments based on them. And the corporations were willing to go to the mat in order to do so.

Without hesitation, private firms filed thousands of patents in an effort to secure exclusive rights to genes and thus enrich themselves. And it is certainly true that there was a great deal of money to be made. Within twelve months of the draft of the genome appearing in print, bioinformatics professor Richard Belew reported that "[g]enome projects are already generating huge wealth."[34] Yet the rapid emergence of proprietary databases for genetic discoveries, while profitable for the companies that possessed them, carried a downside in that they prevented other researchers from studying the patented genes. The upshot was that the field of genetics suffered, while the costs of certain genetic tests skyrocketed due to the market control afforded by the licenses.

In due course, the matter found its way to the U.S. Supreme Court, which ruled on the exclusivity issue in the landmark case of the Association for Molecular Pathology v. Myriad Genetics, Inc.[35] The crux of the court's decision: a gene cannot be patented because it already exists in nature. While a scientist may isolate a gene carried on the genome, the scientist did not create it. In the same way that an astronomer who discovers a planet does not own the planet, so identifying a gene sequence does not, in itself, grant one possession of it. The court added, however, that "complementary DNA" or c-DNA—an artificial product—can be patented, since it does not exist in nature but instead is assembled in a lab.

As this battle was raging, advocates of intellectual property rights presented a handful of arguments to buttress their case, one of which sought to drag the practice of biohacking into the dispute. Claiming that society would be better served if private entities held exclusive rights to genes, corporate representatives warned that citizen scientists, through open-sourcing, could otherwise gain access to genetic information and use it against society. "[O]pen-source biology could … prime the arsenals of would-be 'bio-hackers' who might dream of creating, say, a virus that could wipe out half the residents of Manhattan," writes a journalist giving voice to such concerns.[36] Truth be told, the lawyers' prediction was quite a stretch, with biohacking being introduced into the dispute mainly as a scare tactic. Since the publication of

the human genome and the plethora of genetic studies that have ensued, there have been no known cases of citizen scientists using this information for devious purposes. All the same, critics of lay biological research, especially that which entails genetic engineering, have continued to voice their anxieties about the practice of biohacking.

Peril or Promise

As should be apparent by this point, attitudes toward do-it-yourself biology cover the spectrum. Proponents argue that citizen scientists, by working openly and cooperatively, are in a position to help solve some of humanity's greatest problems, from air pollution to cancer. Opponents, meanwhile, insist that furnishing the public with potentially dangerous information along with the tools to act on it is the epitome of poor judgment, a path to disaster. It could be argued, of course, that both stances are extreme due to the limitations that currently exist in much do-it-yourself biology. Taken together, though, these polarized positions illustrate the key issues in the debate about the perils and promise of non-traditional biological experimentation.

Arguments Against Biohacking

Those who oppose lay biological research contend that it poses a threat to society, especially when it entails genetic experiments undertaken by self-educated hobbyists. Among such opponents are molecular biologists, geneticists, and other scientists who have accumulated considerable experience in precisely those fields in which many biohackers strive to participate. These critics are not waging a turf war; it is not a case of credentialed scientists jealously guarding their professions from interlopers, with do-it-yourselfers being looked upon as competition. Rather, it is a case of those who have substantial knowledge of, and experience in, a particular field of study pointing out the problems that may arise when this same field is accessed by those having less knowledge and experience, coupled with little or no regulation, guidance, or oversight.

In terms of specific issues, critics have expressed numerous worries about biohacking over the years, with Dustin Holloway recently organizing these concerns into three broad categories. A bioinformatics engineer at the Dana Farber Cancer Institute, Holloway is also a fellow in the Medical Ethics division of Harvard Medical School.[37]

The first set of concerns centers on laboratory safety measures and the fact that citizen scientists, particularly those with little or no training in biology, may not be familiar with standard lab procedures; they may not be acquainted

with the protective measures that should be in place even when working with benign microbes. Naturally, this becomes a bigger worry when the stakes are higher—when the microorganisms are infectious, for instance—since the same unfamiliarity may result in the biohacker, and perhaps others, becoming ill and spreading disease.

The second concern pertains to genetically-modified bacteria and viruses. Critics draw attention to the fact that equipment is now available for biohackers to fashion microscopic agents that do not exist in nature, one problem being that certain characteristics of these novel microbes may not be understood, such as their ability to replicate. Accordingly, a citizen scientist might not be able to recognize and contain any unique risks that might arise from, say, an enhanced bacterium. As public policy analyst and author David Bollier has said about studies in which DNA is manipulated, "the 'genetic pollution' that could result from slipshod genetic engineering could be irreversible and calamitous."[38]

Those who oppose biohacking also warn that a do-it-yourselfer could deliberately engineer a dangerous microorganism with which to target specific individuals. In a very real sense, the situation is comparable to the modern-day practice of computer hacking. "Some commentators have noted that 'hacker ethics' did not prevent the masses of malware in the cyber world," says Catherine Jefferson, a researcher at King's College in London.[39] And it is true: the productive experimentation with computer technology that emerged in the 1960s and 1970s was eclipsed by the malicious computer hacking that surged in the 1980s and persists at the present time. It therefore is not unreasonable, nor does it constitute fear-mongering, to predict that a small subset of do-it-yourselfers will eventually break away from the biohacking community and attempt to engineer harmful microbes so as to traumatize or sicken others. Depending on the nature of the microorganisms and their intended effects, such deeds could constitute prosecutable biocrimes.

And third, critics express concern about the prospect of a full-scale bioterrorist attack organized and executed by biohackers, a type of assault designed to frighten the general population while incapacitating or killing a sizable segment of it. Such a development might involve biohackers marketing their services to a domestic terrorist organization or, alternatively, functioning autonomously to intimidate the government or citizenry. "While there is no evidence that DIYbio represents a national security threat of this sort," writes Holloway, "bioterrorism is a risk that policy makers must consider when developing regulations for citizen science."[40]

The bioinformatics engineer adds that the public release of information detailing specific techniques of genetic engineering has contributed to this concern, an issue that Hillary Clinton addressed in 2011 at the Biological Weapons Convention in Geneva while serving as Secretary of State. Acknowledging

that the sharing of gene-synthesis information "obviously has many benefits for research," Clinton proceeded to warn that "it could also potentially be used to assemble the components of a deadly organism."[41] Certainly there have been a number of projects over the years that have involved the genetic manipulation of the deadly influenza viruses, a handful of which have ignited worldwide debate over the dangers they pose.

One set of studies was published in 2012 by scientists in the Netherlands, Japan, and the United States, and centered on a man-made microbe, a genetically-modified version of the avian influenza virus.[42] Considered by many in the life sciences to be the most terrifying microbe ever created, far more frightening than Ebola and other naturally-occurring viruses, this particular "supervirus" could kill up to 400,000,000 people if it were to escape from the lab. And it was this unnerving prospect that led to a dispute about the judiciousness of the research.

"This work should never have been done," declares molecular biologist Richard Elbright of Rutgers University.[43] Elbright's opinion is shared by scores of scientists who feel that the studies' disadvantages outweigh their advantages. They argue that while the projects may have helped facilitate the development of treatments for use if the avian virus eventually mutates into a lethal, cross-species agent, the studies themselves, by genetically concocting the threatening supervirus itself, may actually have hastened the probability of a catastrophic event. Equally ill-advised, they add, was the publication of the research procedures in the pages of the journals *Nature, Science*, and *Cell*.

Another series of studies that came out in print in the 1990s and 2000s recounted scientists' reconstruction of the virus that set off the Spanish influenza pandemic in the early twentieth century, an epic contagion that took the lives of fifty million people.[44] The research made use of the original 1918 virus that had been kept frozen in a level-3 biosafety lab, with scientists using the genome to reconstruct the historic microorganism and documenting the process by which they did it. As with the response surrounding the avian flu research, reaction to the Spanish flu studies was stormy, particularly the research team's decision to publicly reveal the nuts and bolts of the gene-sequencing process used to recreate the virus.

"Not surprisingly," writes Jan van Aken, formerly of the Hamburg Centre for Biological Arms Control, "the publication of the Spanish influenza research triggered a controversial debate within, but not exclusive to, the scientific community, as arms-control experts questioned whether it was wise to publish a detailed account of its genome and recipe for resurrection."[45] The latter group, arms-control experts, is composed of specialists in several fields, many of whom are convinced that rogue states are eager to exploit such research and that the publication of the influenza studies unwittingly handed over to these hostile entities the instructions for a biological weapon.

As noted earlier, there is also the apprehension that biohackers could likewise act on descriptive material of this sort. Opponents speculate that one or more do-it-yourself biologists could restore a pathogen of extraordinary virulence, one that could culminate in a pandemic capable of decimating humanity. And it is such hair-raising forecasts that rile advocates of citizen science. "I am really sick and tired of folks waving this particular red flag," says Ellen Jorgensen, the molecular biologist who co-founded Genspace.[46]

Arguments for Biohacking

Jorgensen, a leading supporter of citizen science, is one of several advocates who insist that the trepidation surrounding biohacking is, on the whole, without foundation. Explaining that many of those who engage in home or community-based biological studies have much to offer society through their research, they say it is wrong-headed to attempt to curb, contain, or prohibit biohackers' activities. If anything, these proponents maintain, do-it-yourself biology should be promoted.

Adherents of citizen science also point to historical figures, some of our greatest minds, whose inventions and discoveries in makeshift studios, workshops, and laboratories advanced humanity. Sometimes referred to as "gentleman scientists" in the past, such do-it-yourselfers included inventor and statesman Benjamin Franklin, as well as mathematician and father of the mechanical computer Charles Babbage, and Babbage's close friend and colleague, naturalist Charles Darwin. "Darwin may have been the original do-it-yourself biologist," says bioengineer Drew Endy, "as he didn't originally work for any institution."[47]

Jumping ahead to the early 1970s, Apple Computer co-founders Steve Jobs and Steve Wozniack created their first circuit boards not in a high-tech, corporate workspace but in Wozniack's bedroom and in Jobs' garage. And figuratively linking such early, home-based pursuits to contemporary biohacking is fellow computer aficionado, Microsoft's Bill Gates, who recently stated that, if younger, he would be among today's biohackers.[48] "If you want to change the world in some big way," says Gates in a *Wired* interview, "that's where you should start—biological molecules."[49] So while a case could be made that biohacking is different from most other do-it-yourself endeavors in that it has the potential to cause harm to others, even to the population at large, the basic argument itself is beyond dispute: monumental discoveries and inventions have been made, and will continue being made, by people besides those credentialed figures working in conventional academic and industrial settings.

Then, too, proponents of biohacking point out to those having concerns about the practice that it is not necessarily within the expertise of citizen

scientists to carry out cutting-edge genetic research, as in the reconstruction of the 1918 influenza virus. And even if they do possess the requisite skills, the equipment that is presently available for use in alternative labs might well be inadequate for such radical tasks. "It's misguided to think that everything that a professional lab can do will also be possible in a home setting," says Jason Bobe, director of Harvard University's Personal Genome Project.[50] To date, the potentially transformative genetic projects that citizen scientists have undertaken have proven to be largely unsuccessful, although this could change in the years ahead.

As for the worry that those involved in hands-on biology will stage a bioterror attack, supporters of the biohacking movement explain that large-scale biological aggression is far more difficult to execute than is commonly believed. Accordingly, it would most likely be perpetrated by a hostile nation or a well-funded terrorist organization, not by a biohacker or a team of hackers. Finally, regarding laboratory accidents and calculated biocrimes, advocates call attention to the fact that a progressive segment of the biohacker community is championing the adoption of educational and self-regulatory guidelines to help ensure that biohacking remains safe and legal. Of course, given the libertarian principles held by a sizable portion of the community, it should not come as a surprise that some biohackers firmly reject this idea, their objection being that it violates the essence of the do-it-yourself experience. Others contend, however, that such measures could help stave off a far more intrusive development, namely the imposition of government protocols and the monitoring of home and community-based labs by state and federal officials.

As it stands, biohackers in Europe are already barred from operating informal genetics laboratories without a license, a prohibition that has not been enacted in the United States. "In America," reports *The Economist*, "the FBI has opted for a more enlightened approach."[51] It is one that operates on the astute assumption that the governmental policing of biohackers would almost certainly drive a substantial share of them underground, presumably the most dubious. Accordingly, the FBI has taken a different course: it permits citizen scientists to conduct biological research without formal scrutiny. Equally progressive, it looks upon them as potential allies in the "war on terror" and seeks their collaboration since they are singularly well-placed to assist in foiling biocrimes and bioterror operations. As Marcus Wohlsen puts it, those in the biohacking community are "the eyes and ears in the best position to know if one of their own [begins] veering the wrong way."[52]

In terms of the FBI's carefully calibrated entry into the world of citizen science, it began in the summer of 2006 with the establishment of the Weapons of Mass Destruction Directorate, or WMDD. The directorate, which still exists today, is composed of representatives from the fields of intelligence

and law enforcement in consort with experts in biological, chemical, and nuclear weaponry, with its mission being to oversee federal investigations into impending attacks that involve weapons of mass destruction. To this end, the directorate interfaces not only with governmental and industrial entities, but also with the biohacker community.

A document from the WWMD explains its function as it pertains to citizen scientist groups.[53] "These groups believe advances in science and biotechnology, just like the computer revolution, can be pursued in a home garage or community meeting place and outside of traditional academic and industrial settings," reads the document. "WMDD operates an initiative to develop partnerships with the amateur biology community in order to garner their assistance in preventing, detecting, and responding to incidents of misuse, particularly for nefarious purposes."[54]

The agency accomplishes this task by referring biohackers to the WMD Coordinator if they wish to report suspicious activities, a situation that might arise if a do-it-yourselfer had reason to believe that a fellow hacker was engineering a microbe to be used in a bioterror attack. Yet the directorate's connection to the biohacking community extends beyond the reporting of possible criminal activity to encompass relationship-building events and educational offerings as well. For instance, the WMDD assists do-it-yourself biologists with security and safety issues, while groups like DIYbio and Genspace, in turn, welcome representatives of the directorate to their facilities and enlighten them about various aspects of hands-on biology. It seems that many biohackers consider it a smart move to the work with the directorate; that it is to the movement's benefit to help prevent mischief, since, if one of its own were to engage in a harmful stunt, it could stigmatize the entire do-it-yourself community and cause external constraints to be placed upon all biohackers.

That said, this alliance with the FBI is not without its share of detractors both at home and abroad. The prominent German biohacker Rudiger Trojok, for one, has gone so far as to compare the agency's presence to that of the Stasi in the former East Germany, the tyrannical secret police who intruded into every aspect of citizens' lives.[55] And yet, such differences of opinion notwithstanding, it seems the American biohacker community largely accepts the FBI's nominal involvement, while the federal agency appears to have developed genuine respect for the citizen science movement itself. Considering that those who engage in hands-on biology have thus far conducted themselves in a responsible, conscientious manner, it is understandable that they have earned the agency's approbation. And this brings us to the subject of biohacker ethics.

In 2011, DIYbio held a series of meetings in various cities, the purpose being to devise a code of ethics for North American biohackers in conjunction

with one for those in Europe. Drafts of the two codes were published in 2013 and have since come to attract adherents in numerous citizen science networks and organizations.[56] For the most part, the documents reflect the state of biohackers' values, principles, and standards of conduct in Western nations.

Both codes share five core concepts, specifically, the need for biohackers to understand and engage in safe laboratory practices, share research data and other information and knowledge, use their research projects solely for peaceful purposes, practice and advocate for open access to information and decentralized biotechnological research, and help educate the public about biotechnology's benefits for humanity. The North American code further stresses the inherent value of "tinkering," depicting it as spirited experimentation capable of leading to meaningful scientific advances. It also calls for citizen scientists to be respectful of the environment. More extensive and in some ways superior is the European ethical code, which adds that citizen scientists should be aware of their own limitations, responsive to the concerns of the community, accountable for their actions, and respectful of all forms of life.

In their emphasis on autonomy, open access, shared knowledge, and peaceful and productive experimentation, both the North American and European codes harken back to the "hacker ethic" of the 1960s and 1970s computer enthusiasts. And like the original hackers whose inspired tinkering changed the world in positive respects, so may biohackers, with greater expertise and more sophisticated equipment, eventually do the same.

As for those harboring sinister motives, such malicious do-it-yourselfers will almost certainly materialize sooner or later. To suggest otherwise is naïve. Humanity has always contained a destructive component, a bad seed that invariably manifests itself, and there is no reason to believe the realm of citizen science will somehow be immune. In terms of the extent to which this rogue element will cause significant biological harm, it remains to be seen, just as it is not yet known how the biohacker community will respond to such a disturbing turn of events. Until that time, however, sustained networking by biohackers, together with the internalization and promotion of meaningful ethical standards and a constructive, respectful relationship with law enforcement appears to be the most judicious course of action.

◆ 4 ◆

Pathogens, Toxins and Their Weaponization

Science Subverted

The number of microorganisms that cause disease in humans is substantial—an estimated 1,400 viruses, bacteria, and protozoa have been identified thus far—but only a small subset is believed to appeal to prospective bioterrorists.[1] Even so, it is a subset that carries the potential to inflict all manner of harm on the human population. To rank the degree of hazard such agents and their toxins pose to national security, the Centers for Disease Control and Prevention has created three broad classifications for use by public health and biodefense organizations. Known as Biodefense Categories A, B, and C, they pertain to a pathogenic agent's characteristics and capabilities, as well as to society's ability to act in response to its appearance in the population.[2]

In this chapter, the CDC's classification scheme is examined, including a sampling of those entities that constitute each of the categories and their means of transmission, symptoms, and mortality rates. In several instances, relevant bioterrorism-related issues are highlighted as well. Subsequent to this, the coverage explores the current methods, as well as the challenges, of transforming a biological agent into a viable weapon.

Pathogens and Toxins

Biodefense Category A

The pathogenic organisms and toxins that comprise Category A present the greatest threat to the nation's biosecurity. These are agents that have high mortality rates and can be spread effortlessly from person to person (e.g.,

plague) or easily disseminated through other means (e.g., anthrax). Most also carry the potential for airborne transmission. In addition, they place an immense burden on public health agencies in that they require special action, even extraordinary measures in some cases. And because they are easily transmitted and deadly, their mere appearance in the population promises to trigger alarm and create social havoc—an objective of terrorists of all stripes. Six such biological agents and the diseases they produce are discussed below, beginning with anthrax, the bacterium that was deployed in the bioterror campaign that followed the attacks on the World Trade Center and the Pentagon on September 11, 2001.

Anthrax. Among the pathogens that bioterrorism experts consider to be the most formidable is *Bacillus anthracis*, the agent that causes anthrax infection. Long regarded as a high-probability bioweapon, it is one of the likeliest pathogens to be used in a future bio-offensive.

While practically anyone, anywhere, could be exposed to anthrax in the course of a bioterror attack, some people, by virtue of their occupations or circumstances, are at a greater risk of exposure. These include members of the military, as well as postal workers who may come into contact with the bacterium in the course of a mail-related bioterror attack. Also at risk are men and women whose work puts them in contact with certain types of animals, with veterinarians, ranchers, and farm hands falling into such occupational categories. Laboratory workers also may have reason for concern, specifically those who are assigned to biosafety labs. And individuals who inject heroin have an elevated risk of infection, with anthrax cases recently emerging among injectable drug users in Scotland, England, Denmark, and Germany. In these incidents, it is suspected that the drugs were contaminated with anthrax spores. If so, it is plausible that heroin consumers could also contract the infection by smoking or snorting the tainted product.

The pathogen *B. anthracis* is spread through four different routes. First, it can enter the body when a person inhales, which leads to "pulmonary" or "inhalation anthrax." The most lethal form of the infection and therefore one that might appeal to bioterrorists, the microorganism is pulled deep into the lungs, where it lodges. As to the initial indicators, they resemble those found in other infections: flu-like symptoms, most notably a mild fever, muscle stiffness and achiness, fatigue, headache, and upset stomach. In some cases, sore throat may be present as well, along with chest discomfort and hemoptysis (i.e., coughing up blood). Shortly thereafter, the person may experience a period of outward improvement that lasts a day or two before suffering a sudden, final collapse, during which the individual's fever climbs sharply and the person finds it difficult to breathe. The illness may culminate in shock due to decreased blood flow. Meningitis or respiratory failure may result, too. While the U.S. Food and Drug Administration reports that

untreated inhalation anthrax is fatal at least eighty percent of the time, the affliction, on the upside, cannot be spread from person to person.[3]

The second mode of anthrax infection is gastrointestinal, and like other forms of the illness, is rare. Gastrointestinal anthrax is caused by eating the raw or undercooked meat from an infected animal, and it is fatal between twenty-five and seventy-percent of the time in the absence of antibiotic therapy.[4] Symptoms may include fever, sore throat, swelling of the neck, severe abdominal pain, vomiting, gastrointestinal bleeding, diarrhea, hematemesis (i.e., vomiting of blood), and hematochezia (i.e., blood in stools). As with inhalation anthrax, the condition is not contagious.

The third route of infection occurs when the pathogen enters the body through an abrasion, sore, or cut on the skin, and is termed "cutaneous anthrax." The most common and most treatable form of the infection, cutaneous anthrax is characterized by itching at the site, along with swollen or tender lymph nodes near the region and a patch on the skin that progresses to a bump. This, in turn, develops into a large black sore, one the victim may initially mistake for a spider bite. Unlike other forms of the infection, cutaneous anthrax can be spread from person to person if direct contact is made with the lesion. Fortunately, the condition is readily treatable with antibiotics, with the mortality rate in such cases estimated to be twenty percent.[5]

The final route of infection is "injection anthrax" and occurs when an individual injects drugs, thus far heroin, contaminated with anthrax spores. "Symptoms may be similar to those of cutaneous anthrax," reads a CDC précis on the subject, "but there may be infection deep under the skin or in the muscle where the drug was injected."[6] For this reason, it may be difficult to recognize the condition in its early stages, a period when the bacterium, because it was injected, spreads rapidly throughout the body. And not only can the initial diagnosis be tricky; treatment of injectable anthrax often requires surgery, according to physicians in Germany familiar with its course of treatment.[7] Regarding the mortality rate, it is estimated to be thirty percent with treatment.[8] To date, no cases of injection anthrax have been reported in the United States.

Botulism. Another potential tool of those seeking to incapacitate a segment of the population is the bacterium *Clostridium botulinum*, an agent that produces several neurotoxins, four of which—toxins A, B, E, and F—sicken or kill humans. "Botulinum toxin A is the most toxic substance known to mankind," says Walter Biederbick, Head of the Centre for Biological Security at the Robert Koch Institute in Berlin.[9] Virtually anyone can be exposed to the entity that results in botulism, with injectable drug users being at a higher risk for a particular form of it, one known as *wound botulism*.[10] In this type, an injection site, most often that of a black tar heroin user, becomes infected.[11] Other forms include *foodborne botulism,* brought about by eating bacteria-

tainted food and colloquially referred to as "food poisoning"; *infant botulism*, which affects those under one year of age; and a man-made version of the illness known as *inhalation botulism*.

Regarding their distinguishing properties, the foodborne variety is associated with preserved foods that are low in acid, like canned corn or beets, and those that are inadequately prepared, such as fish, ham, or sausage that has been undercooked or processed improperly. With prompt anti-toxin treatment, the mortality rate for foodborne botulism is five to ten percent, although this figure climbs to nearly fifty percent if the condition remains untreated or if the anti-toxin is delayed, according to the World Health Organization and a USAMRIID study.[12]

In terms of the remaining forms of the infection, infant botulism is by far the most common type in the United States and comes about when an infant ingests *C. botulinum* spores, which may be present in soil, honey, corn syrup, and other products. Once the spores have been consumed, they germinate in the gut and produce toxins. (The adult immune system is able to detect these spores and prevent them from germinating). Fortunately, the mortality rate for infant botulism is very low, since those who contract the infection are nearly always hospitalized and treated in a timely manner. In this respect, the condition is different from the remaining form of the illness, one having a potentially astronomical mortality rate.

This last type, inhalation botulism, is linked exclusively to bioterrorism and requires that the bacterium be intentionally aerosolized. It is this process that increases its lethality exponentially. "Some authors have estimated that as little as 1 g of aerosolized [Botulinum neurotoxin] could lead to the death of over 1.5 million people," says McGill University neurologist Colin Chalk.[13] Accordingly, the prospect of a bioterror organization creating an airborne variety of botulism is one of the principal apprehensions of those whose responsibility is biodefense.

As for the clinical presentations of the two types of botulism that bioterrorists might deploy, foodborne and inhalation, they are largely identical, with neurotoxins in both forms producing an acute paralytic condition. Symptoms may include vertigo, ptosis (i.e., drooping eyelids), visual anomalies, dilated pupils, slurred speech, difficulty swallowing, and descending flaccid paralysis.[14] Since the neurotoxins block nerve functions and prevent muscle contraction, the muscles become unresponsive and limp, with the body assuming a floppy appearance.[15] In foodborne botulism, additional symptoms typically consist of abdominal cramps, nausea, vomiting, and diarrhea. Regardless of the route of infection, though, botulism, particularly if anti-toxins are not administered rapidly after the onset of symptoms, may culminate in respiratory paralysis and death.

Although *C. botulinum* is available in nature, it nevertheless remains a

challenge for potential bioterrorists to obtain the particular strain that produces neurotoxins most easily and efficiently.[16] That said, if the perpetrators did succeed in acquiring the desired strain, instructions are available on the Internet that would help guide them through the reproduction of the neurotoxins.

Ebola and Marburg. Another set of diseases that invites the concern of biodefense experts are two that, until recently, were designated "Hemorrhagic Fevers." Today they are known as Ebola Virus Disease (EVD) and Marburg Virus Disease (MVD), and are acute afflictions caused by filoviruses, one of four families of pathogens that produce often-fatal hemorrhagic conditions. The remaining families consist of arenaviruses (e.g., Lassa Fever), bunyaviruses (e.g., Hantavirus Pulmonary Syndrome), and flaviviruses (e.g., Dengue Fever).

Individuals who are at the greatest risk of contracting Ebola or Marburg are those who live or work in regions of Africa that have endured recent outbreaks of the diseases, along with researchers and lab technicians in other parts of the world who conduct research on animals exported from such areas or from the Philippines. At heightened risk, too, are those who provide care to family members or others who are suffering from EVD or MVD, and those who prepare the bodies of the casualties.

As for transmission, infection occurs when a person makes contact with the blood or bodily fluids of a person suffering from Ebola or Marburg, or with the sufferer's items that have been contaminated by these substances. Although it has not yet been confirmed, sexual contact, particularly male to female contact, is also suspected of being a route of infection.[17] Less often, transmission occurs through contact with an infected primate, such as when butchering, cooking, or eating it. Regarding airborne transmission, an international team of scientists studying an Ebola outbreak in Africa in 2015 raised the possibility that the virus could eventually mutate into an airborne agent, adding that it is probably already spreading by this route in certain instances. "It is very likely that at least some degree of Ebola virus transmission currently occurs via infectious aerosols generated from the gastrointestinal tract, the respiratory tract, or medical procedures," reports the team.[18] Even so, the pathogen continues to be classified as a blood-borne agent, not as an airborne entity, with the World Health Organization maintaining its stance that the virus is unlikely to mutate into a form that permits significant airborne transmission in the foreseeable future.[19] Lastly, it should be noted that neither Ebola nor Marburg is spread through the water supply.

Although these two diseases are comparable in presentation, an important difference exists between Ebola and Marburg in terms of their mortality rates. The WHO estimates the death rate for Ebola to be ninety percent, whereas that of Marburg ranges from twenty-four to eighty-eight percent.[20]

It is believed that recent advances in the treatment of Ebola will reduce its elevated mortality rate, although it remains to be seen the extent to which they may do so.

Concerning the symptoms, both conditions, the presentations of which may vary from person to person, begin abruptly with the virus targeting the immune system. Initial features include fever, headache, muscle stiffness and cramps, nausea and vomiting, and profound weakness.[21] Sore throat may be present as well. In EVD, this period is referred to as the "dry phase," during which diagnosis may be difficult since the symptoms are not unique to hemorrhagic fever. A few days later, however, additional symptoms emerge and are more telling, such as a rash on the individual's back and chest along with a blank expression in the eyes, since the virus is now affecting the nervous system, including the brain. Finally, multiple organ systems become implicated, blood vessels become damaged, and the body becomes unable to regulate itself. Severe hemorrhaging may result in massive internal bleeding, with blood loss also occurring through the eyes, body orifices, and sites of injections. Death occurs within a day or two of the onset of this last cluster of symptoms, known as the "hemorrhagic syndrome."[22]

Here it should be noted that a person suffering from Ebola or Marburg Virus Disease may not experience hemorrhaging, despite the popular image of the afflictions. "Typically, the Ebola virus leads to hemorrhagic syndrome about 30 percent to 50 percent of the time," says microbiologist Angela Rasmussen.[23] Those infected by the Marburg virus do not necessarily progress to a hemorrhagic stage either, although when this does occur, it usually happens a few days later than is the case with Ebola.

Unfortunately, neither EVD nor MVD are treatable with antiviral drugs. Instead, treatment is supportive and instituted in response to the emergence of specific symptoms. In nearly all cases, such measures include fluid replacement while also addressing secondary infections as they emerge. Depending on the symptom presentation and the availability of medical facilities, they may also involve blood transfusions, kidney dialysis, and other interventions. Encouragingly, several treatments are currently in development, as is a vaccine, SV-EBOV, for Ebola Virus Disease.[24]

As bioterror agents, Ebola or Marburg could be devastating, although it would be difficult to weaponize and deploy either pathogen. That said, this did not stop the Japanese religious sect, Aum Shinrikyo, from acquiring samples of the Ebola virus for use in its bioterrorism research. "In 1992," writes Dina Maron in *Scientific American*, "they sent a medical group of 40 people ostensibly to help provide aid during an Ebola outbreak in the Democratic Republic of the Congo."[25] The true reason: to snatch vials containing the virus. Luckily for the Japanese population, the sect's subsequent Ebola studies were never completed.

Plague. Another prospective bioterror agent that has, for centuries, terrified the human race is that which causes plague. A bacterium known as *Yersinia pestis*, the pathogen is most often found in rats, chipmunks, prairie dogs, and the fleas that feed on them. When these animals, in turn, bite humans or other animals, the infection is transmitted, with the result being the grave illness known as *bubonic plague*. Fortunately, the disease rarely spreads from person to person, and it seldom occurs in Western nations. On the other hand, the pathogen that causes bubonic plague, if the infection remains untreated, may multiply in the bloodstream and cause *septicemic plague*, or it may travel to the lungs to produce *pneumonic plague*. And what is most significant about the latter condition, also known as *inhalation plague*, is that it can be transmitted to others when an infected individual coughs or sneezes, thereby causing the bacterium to become airborne. And this is a deadly matter. Whereas untreated bubonic plagues carries a fifty percent mortality rate, that for untreated pneumonic plague approaches one hundred percent.[26] Bioterrorism and biowarfare experts agree that pneumonic plague would present a significant threat to the human population.[27]

As it stands, the chances of a person contracting any form of the plague through natural means is extremely low, with a very small number of cases being reported annually, mostly in Africa. All the same, those who live or work in rural or semi-rural areas of the United States, enjoy camping as a hobby, or, like veterinarians, work with animals, do face a minuscule risk.

The symptom presentations of the three forms of plague differ in important respects. In bubonic plague, a dark eruption occurs at the site of the bite within a week, accompanied by profound swelling of nearby lymph nodes. The victim next experiences fever and chills, while purple blotches begin to appear on the body, the consequence of hemorrhaging beneath the skin. As the condition progresses and impacts the nervous system, various neurological and psychological anomalies may occur.[28]

The above-mentioned symptoms are in contrast to those produced by septicemic plague, in which the victim breaks out in a rash and dies within twenty-four hours. "This form of plague is always fatal," Mike Ibeji says of the septicemic variety, "but very rare because it is flea-borne and the victim is usually dead before transmission can occur."[29]

The third form of plague, pneumonic, is of greatest concern to those in the realm of biodefense. Despite the fact that it is the least common form of the disease, it presents the most serious threat due to its transmissibility. Then, too, antibiotic therapy must be initiated within twenty-four hours of symptom onset or the victim is unlikely to survive.

In terms of its clinical presentation, pneumonic plague manifests abruptly with weakness, high fever, headache, nausea, and vomiting, as well as with breathing difficulties and a cough, often containing blood. Within

forty-eight hours, the patient may go into shock, and respiratory failure may lead to the person's demise. While the Black Death, which killed fifty million Europeans and a total of 200,000,000 people worldwide in the fourteenth century, has traditionally believed to have been the bubonic plague, medical historians have recently raised the possibility that pneumonic plague may have played an important role in the epic contagion owing to its extremely swift spread. Such is its profound virulence.

Smallpox. Extremely virulent, too, is smallpox. A scourge that was officially eradicated worldwide in 1980, biodefense experts warn that if terrorists were to obtain and deploy the fearsome pathogen, the ensuing contagion could sicken or kill millions as it has done in the past. Certainly it is true that the ancient disease, which is caused by the *variola virus*, has decimated human populations over the past three millennia, with smallpox having a mortality rate of thirty percent and being easily transmitted. "In the past, natural smallpox was usually spread through close contact of less than 6 feet, with an infected individual spreading aerosolized viral particles, or through contaminated clothing or bed linens," says Jennifer Brower of the RAND Corporation. "There were occasional cases of transmission over larger distances," she adds.[30] For these reasons—and because most medical professionals today have no experience diagnosing smallpox, a disease for which there is still no treatment—the variola virus would constitute a daunting biological weapon.

Regarding its symptoms, smallpox begins with a prodromal phase characterized by high fever (101–104° Fahrenheit), malaise, headache, muscle cramps, and occasionally nausea. In the ensuing stage, which manifests a few days later, a rash appears in the mouth and tongue, spreading to the face, limbs, and other parts of the body, and then turning into fluid-filled bumps. "People often say the bumps feel like BB pellets in the skin," reads a CDC description of the disease.[31] Still later, the bumps or pustules develop a crust, fall off, and leave behind the disease's telltale scars on the skin.

Three additional forms of smallpox exist besides the conventional type. These consist of "modified smallpox," a less severe form that occurs in those who have been previously vaccinated; "malignant smallpox," in which the lesions are flattened rather than raised, a condition that is associated with an impaired immune system and has a high mortality rate; and "hemorrhagic smallpox," in which bleeding occurs through the skin and mucous membranes. This form, too, is the result of a defective immune system and is usually fatal.

Fortunately, there does exist an effective vaccine against smallpox. And while there is no specific treatment for the disease other than supportive care, administering the vaccine to an individual who has been exposed to the virus may be effective if symptoms have not yet emerged. In addition, ongoing research on oral antiviral medications is yielding encouraging results.

In terms of biological aggression, efforts have already been made to weaponize the smallpox virus, most notably by the USSR prior to its dissolution. This is one reason that governments around the world have destroyed their stockpiles of the pathogen—to prevent its weaponization should it fall into the wrong hands—with the only remaining samples being housed in two high-security research facilities in Russia and the United States.[32] That said, recent genetic-engineering research protocols that entail synthesizing the smallpox virus (i.e., reconstructing it from scratch) present a cause for concern. Drastically limiting the world's stockpiles of the dangerous microbe while, at the same time, permitting laboratories to reconstruct it strikes many biodefense experts as counterintuitive. "The problem is that we have got a lot of people with a lot more talent working in biological laboratories around the world and a lot of them are very well-trained and the potential for mischief here is much greater," says Donald Henderson, Dean Emeritus of the Johns Hopkins School of Public Health.[33] Henderson is also the former director of the World Health Organization's global smallpox eradication program.

Tularemia. More treatable than smallpox is tularemia, a bacterial infection that targets small mammals, but which humans can contract through contact with wild animals or from insect bites. In many cases, mammals, like rabbits, become infected, then spread the pathogen to other species. In other instances, tick and deer fly bites are the means of infection, as is the handling of infected animals. As could be predicted, hunters, veterinarians, and others having exposure to animals are at an elevated risk for the disease.

The causative agent of the disease, *Francisella tularensis*, can enter the human body through mucous membranes or impaired skin, and can also be contracted by eating contaminated food or drinking tainted water. Of greatest concern to biodefense experts, however, is infection by inhalation. "The organism is dangerous because it can be released as an aerosol to cause large tularemia epidemics in both human and animal populations at the same time," says biologist Amy Kraft. "*F. tularensis* is extremely infectious in humans, requiring inhalation of only ten to fifty organisms to cause severe, incapacitating, and sometimes fatal results."[34]

As to symptoms, there are half a dozen tularemia syndromes, all of which typically commence with a cluster of symptoms that include the sudden onset of high fever accompanied by muscle and joint pain, coughing, headache, and fatigue. Depending on the syndrome in question, the infection may spread to the lymph nodes or, if the pathogen enters the bloodstream, it may impact the internal organs and skeletal muscles. Fortunately, treatments are available and the mortality rate is comparatively low. All the same, the illness can be a long and uncomfortable one, and as an epidemic it could deliver a substantial blow to the population, this being among the reasons that experts warn that it would make an attractive bioweapon.

Biodefense Category B

The pathogenic microbes that make up Category B constitute less of a national biosecurity threat than do those contained in Category A, yet they may still pose a problem for society. These are agents that have low mortality rates but high incidence rates, meaning they may not kill their victims but can nevertheless sicken a substantial portion of the population. In addition, the pathogens and toxins are fairly easy to disseminate. And while Category B agents do not call for the exceptional public health measures like those in Category A, they do require that the CDC place increased emphasis on ensuring the accuracy of its identification and diagnostic procedures, while also stepping up its disease surveillance measures.

Category B contains over twice as many pathogenic agents as Category A, with the entities themselves being a rather diverse lot. From mosquito-borne pathogens like the *St. Louis Encephalitis Virus*, they extend to water- and foodborne bacteria, viruses, protozoa, and fungi, such as the pathogenic *Escherichia coli* (*E. coli*), *listeria monocytogenes,* noroviruses, and the *Shigella* bacterium. This classification also contains the microorganisms that produce typhoid fever, glanders, and brucellosis. As for the trio of Category B diseases to be examined below, they consist of Q fever, salmonellosis, and West Nile viral infection. (It should be noted that West Nile infection is contained in Category B of the bioterrorism classification system of the National Institute of Allergy and Infectious Diseases (NIAID) rather than that of the CDC. The two government agencies maintain their own categories of potential bioterror agents, with considerable overlap.)

Q fever. The illness known as *Q fever—Query Fever*, formally—is brought about by *Coxiella burnetii*, a bacterium transmitted through the secretions of sheep, goats, and cattle. Humans contract it by drinking the milk from an animal that carries the pathogen or, more often, by inhaling contaminated air in the vicinity of such animals. The human population is extremely susceptible to *Coxiella burnetii*, with only a tiny number of organisms being sufficient to infect a person; a feature that could make it a desirable tool for bioterrorists.

At greatest risk of infection are those who live in rural areas or, like farmers and many veterinarians, have routine contact with barnyard animals. Also at risk are cattle ranchers, workers at meat processing plants, and researchers who conduct animal research. Regarding the mortality rate, it is, of course, zero for those in whom Q fever is asymptomatic, low for those having the acute form of the malady (<2 percent), and higher for that small portion whose condition progresses to the chronic form of the ailment. According to French biologist Didier Raoult, the death rate for the latter group is between one and eleven percent.[35]

As could be expected, the clinical presentation differs in the malady's acute and chronic forms. Symptoms of the former consist of headache, sensitivity to light, myalgia, high fever, nausea, and chest and abdominal pain. In some cases of acute Q fever, complications set in and may involve the liver, lungs, or brain, most often in the form of hepatitis, pneumonia, or meningitis, respectively. Worse still are the symptoms of the ailment's chronic form, in which the infection recurs several months or years later with a reemergence of the aforementioned features coupled with complications such as bone infection or infective endocarditis, an inflammation of the lining of the heart's chambers and a condition that may necessitate cardiac surgery. For both the acute and chronic types of Q fever, antibiotic therapy is the treatment of choice.

Salmonellosis. An illness that, while unpleasant for the sufferer, usually does not require antibiotics or other measures is salmonellosis, which, like botulism, is often referred to as "food poisoning." Most often caused by the bacterium *Salmonella enterica* (*S. enterica*), a species of the *Salmonella* genus, this pathogen is responsible for nearly 1.4 million cases of food poisoning in the United States each year.[36] The principal risk group: children under five years of age, although anyone may contract the infection, particularly the elderly or those with compromised immune systems.

In humans, transmission of *S. enterica* occurs when a person eats the products of an infected animal, such as milk or eggs, or food made from such an animal, like pigs or poultry. Less frequently, the ingestion of contaminated green vegetables may expose one to the microorganism, while in other instances tainted water is the route of infection.

As to the clinical presentation, it is usually one of fever, abdominal cramps, nausea, vomiting, and diarrhea; a cluster of symptoms that emerge twelve to thirty-six hours after exposure and lasts up to a week. Antibiotic therapy is seldom required for salmonellosis, although severe cases may necessitate hospitalization, particularly if diarrhea leads to dehydration. In such a circumstance, electrolyte replacement and rehydration may become necessary.

As an agent of bioterrorism, salmonella offers certain advantages. Because it sickens rather than kills, it is an ideal agent for alarming a population, causing physical discomfort, and triggering social disruption, but without committing mass murder. The pathogen is also a pragmatic entity, one that can be introduced rather easily into the food supply. Illustrating its viability, Chapter Six contains a case study in which the salmonella bacterium was slipped into salad bars in an Oregon town, an act of domestic sabotage that caused over seven hundred illnesses.

West Nile Virus. The final Category B agent to be examined is a one that has received considerable media attention in recent years, the *West Nile Virus* (WNV), which made its unwelcome U.S. debut in 1999 at the Bronx Zoo. An insect-borne pathogen, it is spread to humans and animals most

often by mosquitoes. In terms of risk groups, the chances of contracting the infection is greatest for those who live in regions having large mosquito populations or whose work or hobbies take them outdoors. As for those who do become infected, the chances that their conditions will progress to the more dangerous West Nile Neuroinvasive Disease is increased if they suffer from hypertension, cancer, or kidney disease. And there are additional contributors. "[D]iabetes, as well as older age and male sex, appears to be a significant risk factor for development of WNV neuroinvasive disease," writes research scientist Cynthia M. Jean of the California Department of Public Health.[37]

Concerning the presentation and course of the illness, West Nile infection produces no symptoms, or only negligible ones, in seventy to eighty percent of the cases.[38] The remaining twenty percent may experience fever, aching muscles and joints, rash, and diarrhea, but the symptoms usually do not require medical intervention and subside within a few days. Even so, the person may continue to experience weakness for several months. Unfortunately, in one percent of West Nile infections the individual develops a serious condition, as noted above, which may come to include encephalitis (i.e., inflammation of the brain) or meningitis (i.e., inflammation of the protective membranes, or meninges, that cover the brain and spinal cord). Additional features may consist of tremor, partial paralysis, seizures, stupor, or coma. Death results in a minute percentage of the cases.

As a potential bioweapon, WNV has its advantages and its drawbacks, according to Eric Croddy, analyst at the U.S. Pacific Command in Pearl Harbor. Perhaps its primary advantage is its fairly straightforward weaponization. The virus "could be spread by infecting animal hosts, harvesting mosquitoes that carry the virus, and releasing these insects upon densely population areas," he writes.[39] A significant disadvantage, however, has to do with the effects of this process. They remain largely unknown at this time, with scientists having yet to determine the long-term impact of the microbe's recent arrival on U.S shores. "From the bioweaponeer's perspective," says Croddy, "it is unclear how many infections among targeted populations would result, to what degree infections could be sustained, and whether or not the whole exercise would be worth the expenditure of time and resources."[40] Regardless, West Nile remains on the NIAID's list of possible bioweapons, and, like other potential agents, could, at least in theory, be genetically modified to produce a WNV variant with enhanced adaptability and virulence, thereby making it a stronger, more reliable candidate for inflicting harm on a population.

Biodefense Category C

The third and final classification, Category C, contains those pathogenic agents that have recently emerged or re-emerged in the human population

and which cause infectious diseases. Bioterrorism experts suggest that terrorists could convert these pathogens into bioweapons, even though there is no reason to believe that they have an interest in doing so at this time. And because this has not yet happened—and because there is no compelling reason to believe it will occur anytime soon—only thumbnail sketches of a handful of such agents will be presented at this juncture. Suffice it to say, they concern the U.S. biodefense community because they are obtainable, capable of being weaponized, able to be widely disseminated with relative ease, and, in some cases, carry high mortality rates. As such, they could significantly impact a population's health and well-being if a bioterror organization were to decide to exploit them.

Since the late 1960s, researchers have identified over fifty new infectious agents, according to medical geneticist Jianli Dong, who offers several reasons why such pathogens arrive suddenly in the human population or, alternatively, dramatically increase their earlier presence.[41]

> Some of the conditions favoring emergence include human behavior (eg, cyclosporiasis), new technical products (eg, toxic shock syndrome), blood transfusion (eg, hepatitis C virus), movement of exotic animals (eg, monkeypox), nosocomial transmission creating large outbreaks (eg, Ebola hemorrhagic fever), deforestation (eg, Venezuelan hemorrhagic fever), and increased populations of reservoir and vector species (eg, white-tailed deer and *Amblyomma americanium* ticks transmitting human monocytotropic ehrlichiosis).[42]

In other cases, the microorganisms have been around for centuries and have undoubtedly caused illness in humans, but they remained unidentified until recent scientific advances made their detection possible.

Among the pathogens that are contained in Category C is the human coronavirus, dubbed SARS-CoV, the microbe that produces the Severe Acute Respiratory Syndrome (SARS). This disease, which brings on a ferocious form of pneumonia, first appeared in China in 2002 and was formally recognized by the international scientific community in 2003. That same year, a small number of U.S. residents contracted the infection as well.

A similar Category C pathogen is responsible for the Middle East Respiratory Syndrome (MERS), a viral illness that made its debut in Saudi Arabia in 2012, before blazing across the Arabian Peninsula. This acute respiratory ailment, which is caused by the human coronavirus MERS-CoV, reached the United States in May 2014. Although the number of U.S. cases has remained very low, the virus is still propagating and circulating in the Middle East despite ambitious public health efforts to contain it, according to Hamid Y. Hussain of the Dubai Health Authority.[43] And this is worrisome owing to the seriousness of the illness. "[T]he case fatality rate is extremely high and [the] mortality rate [is almost] 40%," writes Hussain.[44]

Still another Category C pathogen—or pathogens in this case—are the

bacteria that produce Multidrug Resistant Tuberculosis (MDR-TB). Formidable microorganisms, they are impervious to two medications, isoniazid and rifampin, widely regarded as the most effective drugs to treat tuberculosis.[45] Of course, an untreatable TB epidemic would be a social, political, and medical nightmare, this dread illness that can be spread through a cough or a sneeze.

Additional emergent pathogens in Category C include hantaviruses (bunyaviruses), which may lead to a grave respiratory condition known as Hantavirus Pulmonary Syndrome; the H1N1 virus, which causes a severe form of influenza; the insect-borne Chikungunya virus, which produces Chikungunya Fever in humans; and the Nipah Virus (NiV), a Henipavirus that causes Nipah Virus Infection, a daunting illness that can kill both animals and humans through such complications as encephalitis and severe respiratory conditions. At present, many other pathogenic agents are contained in Category C, a classification that is continually being updated to reflect the arrival of threatening biological agents that could prove appealing to organizations that wish to engage in bioterrorism.

The Weaponization of Pathogens and Toxins

As one would expect, a prospective bioterror attack that would inflict any of the illnesses described in the foregoing section is a reason for vigilance, but contrary to the sensationalized scenarios that the popular media so often depict, devising and deploying a bioweapon is no simple matter. Most terrorist groups are clearly not in a position to pull off such a feat. As we have noted, the types of agents most apt to be converted into biological weapons are pathogens—living organisms that reproduce within the victim—or their derivatives, toxins, which are not alive and do not reproduce but may nevertheless sicken or kill the person. And neither pathogens nor toxins are easily transformed into weapons of mass destruction.

Choice of Pathogen. Of these two broad groupings of agents, pathogens and toxins, perpetrators would most likely select pathogens, since they tend to be more destructive to a population. "Gram for gram," write Nadine Gurr and Benjamin Cole, "[toxins] are less deadly than certain living pathogens because they do not reproduce themselves within the victim, and since they are not contagious they cannot spread beyond the victims that are immediately exposed."[46]

Within the category of pathogens, moreover, are four subcategories of infectious entities, two of which, bacteria and viruses, are the most apt to be used in bioterror attacks. And here again, important differences are readily apparent. "Although it takes hundreds or thousands of bacteria to infect a

person, it may take as few as one to ten viral organisms to infect the same person," says Albert Mauroni.[47] Then, too, vaccines have been developed to prevent many bacterial infections, while antibiotics are widely available to treat those that nevertheless manage to occur. By comparison, there are no vaccines to prevent most viral infections and only a few medications to treat them, with supportive care being the standard intervention until the illness runs its course or the victim succumbs. Still, bacteria carry a distinct advantage for would-be bioterrorists. "[B]acteria are often more sturdy than viruses," says Mauroni, "which die off quickly in the natural environment if not incubating in a host."[48] And it is this last feature, bacteria's greater resilience in the natural environment, that contributes to their value as weapons.

Weaponization. After having selected a pathogen or toxin, the perpetrators must next come up with the proficiency to convert it into a weapon. In the event that bacterial entities are chosen, such as powdered anthrax spores, they must be isolated, cultivated, and concentrated, then dried, milled, and aerosolized, a complex undertaking far beyond the capabilities of most terrorist groups. The organization would therefore need to hire or otherwise secure the services of those who possess such highly specialized skills and who have access to the necessary equipment.

Lastly, a decision must be made, when weaponizing a biological agent, about its means of delivery. Depending on the entity and the circumstances of the envisioned attack, the options may be limited. Some agents can only be spread by direct contact with other people or other life forms, such as insects; others require the ingestion of food or water; and still others must be inhaled. What is *not* a consideration is the use of an incendiary device, since the explosion would kill the pathogen. In the succeeding pages, each of these five methods of delivery will be explored, beginning with deliberate human contact with an intended victim pool.

Transmission: Person-to-Person

Perhaps the simplest method of triggering an epidemic is by setting loose the bioterror equivalent of suicide bombers, or what Rohit Puskoor and Geoffrey Zubay refer to as "suicide carriers."[49] These are individuals who permit a terrorist organization to infect them with a pathogen, then surreptitiously introduce the microorganism into the target population.

A smallpox epidemic could be initiated in this manner, according to Puskoor and Zubay, since the disease is readily spread by sneezing or coughing in the vicinity of other people. "Although it seems likely that infected carriers would be too ill and the rash too noticeable for terrorists to be able to infect a large number of people without detection," they write, "the disease

is mild enough in its early stages that the rash could be disguised and an infected carrier could be given drugs to moderate symptoms."[50] Furthermore, it would not require an army of suicide carriers to conduct an effective operation. "A few infected individuals in densely packed cities, distant from one another, could infect enough people to cause major epidemics."[51] As to the calculated positioning of smallpox carriers in various metropolises, the strategy would be to overburden the public health system. Fortunately, the fact that the world's only remaining vials of smallpox, being stored in high-security repositories, are inaccessible to terrorist organizations means it is highly unlikely that this particular scenario will ever come to pass, although an outbreak of SARS or similar disease is a realistic possibility.

As Columbia University's Joseph Ward and Maria Garrido caution, suicide carriers hoping to initiate an epidemic of Severe Acute Respiratory Syndrome could infect themselves with the virus that causes it, "then travel on multiple airplanes or otherwise put [themselves] into contact with many people."[52] And while the ensuing illnesses would probably not prove fatal to the preponderance of the victims, their massive number would still cause social instability, including economic strain brought about by temporary reductions in the workforce. Moreover, because most SARS cases are not fatal, the suicide carriers would themselves have a reasonable chance of survival. "[T]hey might not die, and they might not even be suspected of acting as terrorists," write Ward and Garrido."[53] And yet, the possibility of survival notwithstanding, the consequences for those who knowingly transport infectious diseases are grim, so grim as to discourage potential carriers from participating in such a mission. Bioterrorists planning an attack of this type might therefore decide to substitute "vectors," or animals, for human carriers.

Transmission: Vector-Borne

A vector, or "carrier," is an organism that is capable of transmitting an infectious disease from an animal to a human or between humans.[54] Most often, the vector is a mosquito that feasts on an infected animal and, in the process, contracts a pathogen, which it then transmits to the entities it feeds upon, human or animal. Other insects that spread disease in this way include, but are not limited to, ticks, fleas, and sandflies. It is, moreover, a mode of transmission that public health officials take very seriously. "Vector-borne diseases account for more than 17% of all infectious diseases," reports the World Health Organization, "causing more than 1 million deaths annually."[55]

Among such infections that affect humans are Lyme Disease, tularemia, encephalitis, Q fever, and a dreadful illness known as Crimean-Congo Hemorrhagic Fever, all of which are transmitted by ticks. Plague, typhus, and Rocky Mountain spotted fever are also vector-related illnesses, being transmitted

by fleas. And mosquitoes spread numerous diseases, among them yellow fever, malaria, Zika Virus Disease (ZVD), Chikungunya, Dengue fever, and encephalitis. This last condition, encephalitis, will serve as an example of the way in which bioterrorists could exploit this infective process.

To devise a biological weapon that would, for instance, cause West Nile encephalitis (WNE), the vector-borne method might involve enclosing a large number of mosquitoes in a room with an animal infected with the virus. By feeding on it, the mosquitoes would contract the pathogen, with the next step being to capture and contain the insects. "To collect the newly diseased mosquitoes, the temperature of the room [would] be lowered, which [would] induce a mosquito hibernation state, allowing the mosquitoes to be gathered in inconspicuous containers," explains Salwa Touma.[56] Subsequent to this, the containers would be transported to the target region, which might consist of a handful of points in a major metropolitan area, then opened to release the insects. Soon, an outbreak of WNE would unnerve the city.

Although West Nile encephalitis is not contagious, the abrupt appearance of an excessive number of cases would likely trigger a public health emergency, one that might go initially unrecognized as a terrorist offensive. "If this form of weaponization were carried out in warmer months," adds Touma, "suspicion would be decreased; hospitals would be contaminated and the number of cases would be uncontrollable by the time terrorism could be implicated."[57]

To make the virus in this scenario even more dangerous, the pathogen could be genetically modified it to enhance its lethality, assuming the biotechnologists working with the terrorist organization possessed the know-how and state-of-the-art equipment to do so.

Transmission: Foodborne

Another means by which perpetrators may sicken or kill unsuspecting citizens involves poisoning the food supply, a method that has been successfully employed in several biocrimes and a small number of bioterror operations. Pathogens, such as the *Salmonella enterica* bacterium, and toxins, like ricin and *Clostridium botulinum*, are strong candidates for food contamination, since they are not necessarily difficult to obtain and they produce dramatic symptoms when ingested. All the same, the majority of pathogenic microorganisms are only effective as bioweapons, or at least at their most damaging, when they are inhaled, injected, absorbed, or taken into the body through other means. As Kira Morser and her colleagues point out, however, it might be possible to genetically engineer one or more of the latter pathogens to enable them to function as food contaminants as well.[58]

While many experts contend that it is comparatively easy to poison a

population by tainting the food supply—they point to *Salmonella enterica* as being easy to isolate and cultivate—others insist that foodborne bio-attacks are actually quite difficult to accomplish and seldom fatal.[59] This is especially the case for those that make use of bacteria, since standard food preparation measures usually neutralize them. "Cooking, boiling, pasteurization, and other routine safety precautions are generally sufficient to kill pathogenic bacteria," says Jonathan Tucker.[60] But as a 1984 bioterror offensive in Oregon revealed, tainting salad dressings, coffee creamers, fruit, and vegetables with a slurry that contains *S. enterica* is sufficient to poison scores of unwary diners.

Of course, a foodborne bioterror operation would not necessarily need to kill masses of people to achieve its aims, namely attracting news coverage, alarming the population, or otherwise disrupting society. "For rogue groups wishing to spread panic," says Morser, "causing people to doubt the safety of anything they might eat could be a very powerful psychological tool."[61]

Transmission: Waterborne

The same holds true when people have reason to suspect that their drinking water may be contaminated. The fact is, there are numerous pathogens and toxins that are effective as bioweapons when introduced into the water supply, with some of them, such as the bacteria that cause cholera and shigellosis, functioning remarkably well in this medium. Not only that, biological agents that are usually disseminated in other ways can sometimes be altered to serve as waterborne bioweapons as well.

To use a pathogen or toxin to this end, four criteria must be met, according to Donald Hickman of the Air War College at Maxwell Air Force Base.[62] Generally speaking, the perpetrator must be able to produce and distribute the agent in a sizable enough quantity to ensure it will be destructive to the target population. It must also be capable of retaining its structure and virulence once it is deposited in a watery milieu. Moreover, the agent, if it is a pathogen, must remain infectious in drinking water, since this will be the final medium before human consumption. And lastly, it must be able to survive the chlorination and filtration that occurs at water processing facilities.

As it happens, the latter—chlorination and filtration—comprise one of the chief obstacles to implementing a successful water-based bioterror operation, the other being the moderating effects of dilution. Together, these actions will thwart the vast majority of water-based attacks.

Looking more closely at the role of dilution in particular, its mitigating effects can be seen in those cases in which the perpetrating organization hopes to harm a population by releasing pathogens or toxins in a river, lake, or other large body of water. In such instances, the immense amount of water

will eclipse the comparatively tiny amount of pathogenic material, neutralizing it or at least markedly reducing its harmfulness. Ensuring the success of a bio-attack of this sort, then, would likely require a considerable quantity of pathogens or toxins, far more than a terrorist group might be able to obtain without being detected. This is why most such outfits would probably turn to another mode of attack. "Targeting of large bodies of water such as water supply reservoirs would be impractical," write Dickinson Burrow and Sara Renner.[63]

As an aside, it is worth noting that the diluting effects of air are even greater than those of water, since open air, unlike a lake or reservoir, has no physical boundaries. Thus, an airborne attack, depending on the type of agent used, might well require a vaster amount of pathogenic material. Then, too, water, compared to air, carries additional benefits as a medium for a biological assault. "[I]n many cases," writes Hickman, "the materials are more stable (protected from ultraviolet and temperature extremes, although exposed to chlorine.)"[64] Even so, this last factor, chlorination, should not be underestimated.

As it stands, the list of pathogens that are capable of being weaponized and functioning as threats in water is a fairly long one, and includes the bacteria that cause plague, tularemia, salmonella, shigellosis, anthrax, and Q fever, among others. However, the chlorine that is normally present in a large, treated water supply will inactivate many, if not most, of these agents, with the notable exception of anthrax spores. A study by Jon Calomiris at the Air Force Research Laboratory in Edgewood, Maryland, has demonstrated the resilience of such spores when exposed to the customary quantities of chlorine used in many water processing plants. "The data seem to suggest that anthrax spores can tolerate water treatment, can attach to pipes or biofilms within the pipes, and could pass through pipe systems to reach the consumer tap," Calomiris told an audience at the 2006 meeting of the American Society for Microbiology.[65] Not only do the spores resist chlorine at its standard level of use, however, they also remain stable in water for up to two years.[66] For such reasons, larger concentrations of chlorine would become necessary in the face of a suspected anthrax attack, or, alternatively, the use of substitute disinfectants for protracted periods of time.[67] Naturally, it would be necessary to shut down the water supply until it was deemed safe again.

As for toxins, several can serve as contaminants in water, although, again, chlorine inactivates many of them, even botulinum neurotoxin. But one that is not neutralized is ricin. Impervious to chemical disinfection when the customary levels of chlorine are used, it could be deployed successfully in a bioterror offensive.[68] In an attack of this type, either larger quantities of chlorine would be necessary to deactivate the ricin or the contaminated water would need to be subjected to the process of reverse osmosis.

Taking into account the neutralizing effects of filtration and chlorination, it would be imperative for a terrorist organization hoping to pull off a water-based offensive to devise a means of ensuring that its pathogen or toxin avoided both of these processes. One way the group could do this is by temporarily disabling the water-processing plant's operations so that the agent would not be exposed to either procedure. Another would be to introduce the agent into water that has already been treated; that is, contaminate it at post-processing points located nearer to the target population. "[T]hese might include finished water storage facilities, vulnerable points in the distribution system, or even bottled water," write Burrows and Renner.[69]

Regarding the bio-attack's presentation, because a water-based operation is, by its nature, insidious—its arrival is not heralded by a sensational event, such as a bombing—it could impact the population long before anyone realized its occurrence was intentional. "The first evidence of attack is likely to be a flood of sick or dying at the emergency room," writes Hickman. "By the time water is recognized as the source, identification and quantification of the agent could take days if not weeks."[70] Moreover, public health and counterterrorism agencies could face further challenges if the attack were to be executed by a sophisticated organization having access to a variety of microorganisms and toxins coupled with the ability to customize them. "[T]he adversary could tailor the effect based on his objective," says Hickman, "using chemicals or fast acting pathogens for a quick kill, or slower incubating pathogens for delayed effects."[71] The advantage of fast-acting agents is that they can accomplish their mission—harming or killing the victims—before the authorities are able to detect and eliminate them. The advantage of slower-acting agents, on the other hand, is their ability to enter a much larger portion of the population before the attack is discovered and contained. Said differently, a lengthy delay between contracting an infection and symptom formation gives the pathogen more time to reach a greater number of potential victims.

Transmission: Airborne

Arguably the swiftest way for a pathogenic agent to sweep through a population and affect the largest number of people is via the airborne route, with some experts maintaining that this may be the sole means by which a pathogen or toxin could function as a true weapon of mass destruction given the current state of our technology. "The only potential way to inflict mass casualties with a BW agent is by disseminating it as a respirable aerosol," writes Jonathan Tucker, "an invisible cloud of infectious droplets or particles so tiny that they remain suspended in the air for long periods and can be inhaled by large numbers of people."[72] Although the biodefense community

continuously monitors developments in person-to-person, waterborne, foodborne, and vector-borne routes of disease transmission, its top concern centers on an airborne attack.

Airborne pathogens or toxins are potentially capable of reaching a vast, heavily populated region if properly deployed, with aerosolized agents tending to be extremely lethal to the victims. The latter is due partly to the microbes' compactness after weaponization. "The particles of bioweapons are very small (approximately 1–5 microns in diameter), and because they are light and fluffy they do not fall to earth very quickly; given the right weather conditions a bioweapon will drift for up to a hundred miles," write Gurr and Cole.[73] Once the particles are inhaled, moreover, another feature comes into play. "Their tiny size means that they are sucked deep into the lungs, where they stick to the membranes and then enter the bloodstream where they begin to replicate."[74] This is why a pathogen, when inhaled, can incapacitate a victim so rapidly, as opposed to being swallowed or introduced through a mosquito bite. That said, aerosolization can be an extremely intricate process, one that can sometimes be accomplished only by professionals working in highly specialized laboratories. And there is a second challenge inherent in this method of transmission: airborne pathogens and toxins, after having been successfully weaponized and released into the atmosphere, must contend with the effects of the physical environment.

The fact is, the preponderance of pathogenic agents are degraded by exposure to oxygen, sunlight, heat, and/or humidity, as well as being neutralized by shock or dehydration. The Ebola virus, for instance, is rapidly deactivated when it makes contact with air, while the bacteria that cause plague and tularemia are incapacitated by the ultraviolet radiation of the sun's rays. Similarly, the pathogen that produces botulism is degraded by warm temperatures and humidity. And then there is the weather, with a rainy day washing away any bioweapon that a terrorist group might release into the atmosphere. Not that an arid day is without its downside. "On a summer day," says Mauroni, "the winds would probably carry a released agent straight up and disperse it without causing any casualties."[75] For such reasons, biodefense experts believe a night-time release of an aerosolized agent would meet with the most success, a period of several hours during which heat, moisture, and ultraviolet radiation would be at their lowest levels.[76] As an alternative, an early-morning release on an overcast day would also be effective.[77] Then again, a perpetrator could deploy an airborne agent in a confined space, such as an office building or subway, where it would avoid exposure to wind, rain, and other elements, while also having immediate access to a concentrated victim pool. Such scenarios, it should be pointed out, have been openly discussed in the biodefense community for several years, as well as appearing in books and articles available to the public.

Turning to the various biological agents that are capable of being aerosolized, bioterror experts express an abundance of concern about the anthrax bacterium. Certainly their worry is not misplaced. Besides North America, naturally-occurring anthrax is available in Australia, Africa, Asia, and southern Europe, frequently in the soil. In addition, it is better able to withstand sunlight and aridity than many other airborne bacteria, as well as being more adaptable to extreme temperatures, both low and high. All in all, it is a remarkably hardy microorganism. "In ambient conditions," writes Anuj Mehta, "the anthrax spore can survive for decades, if not longer."[78] And still another plus for bioterrorists is that the agent, unlike other microorganisms, does not proclaim its presence. "[A]nthrax is extremely attractive as a bioweapon because the aerosolized form has no odor, is essentially colorless (depending on the method of aerosolization), and is virtually undetectable," Mehta adds."[79]

This brings us to the "Amerithrax" offensive, a case in which anthrax-laced letters were dispatched to media and political figures in the wake of the September 11th attacks on the World Trade Center and Pentagon. In this malevolent episode, anthrax was converted into a powdered bioweapon, the pathogen being so finely milled that its particles literally floated in the air. And this near-weightlessness contributed to the weapon's lethality. When suspended in such a manner, spores can be carried long distances by air currents and, of course, inhaled, with their tiny size permitting them to lodge intractably in the lungs. In Chapter Eight, the Amerithrax episode, the first anthrax attack in the nation's history, is recounted in detail, including a look at the manner in which the pathogen was converted into such a remarkable weapon.

Even more fearsome than aerosolized anthrax is the engineering of a hybrid entity—a "superbug"—that could likewise be disseminated through the air. It is already suspected that some nations have attempted to devise microorganisms of this sort, with perhaps the scariest such concoction being a supervirus known as "Ebolapox." According to a source who played a role in the former Soviet Union's biowarfare program, there is reason to believe the USSR may have created such an entity by splicing together segments of the Ebola and smallpox genomes, the result of which would be a hybrid that is more robust and deadlier than either the Ebola virus or the variola (smallpox) virus alone.[80] "A weapon composed of Ebolapox," write Rohit Puskoor and Geoffrey Zubay, "would possess the violent hemorrhaging and high fatality rate characteristic of the Ebola virus and the contagiousness of the smallpox virus."[81] Symptomatically, its features would include hemorrhaging under the skin, which would cause the skin to blacken as part of a condition known as pruritic smallpox or "blackpox." Not surprisingly, Ebolapox would probably kill up to a hundred percent of those who contracted it.[82]

Certainly bioterror organizations, by manipulating the genetic codes of other airborne pathogens or toxins, could enhance their lethality as well. For instance, pathogens' resistance to environmental conditions, such as radiation and desiccation, could be augmented, thereby increasing their survival time when released into the atmosphere. For bacterial and viral entities in particular, their resistance to medical interventions—vaccines, antibiotics, and antiviral medications—could be enhanced, rendering them even more resilient. To be sure, advances in genetic engineering, while profoundly beneficial to humankind, may well permit bioterrorists to transform existent airborne pathogens and toxins into even more pernicious tools of aggression. And this applies equally to those biological agents that spread from person to person or through insect bites, the water supply, food products, and other means.

In the succeeding chapters, the calculated exploitation of the bacteria and viruses that cause typhoid fever, AIDS, hepatitis C, shigellosis, anthrax, and salmonella poisoning will be illustrated through real-life cases in which they were deployed against targeted individuals or populations. Included, too, will be an episode in which ricin, one of the deadliest toxins in existence, was used as a murder weapon, and another in which the nerve gas sarin, a chemical agent and weapon of mass destruction, was deployed after perpetrators failed to execute an assault using infectious microorganisms. Five of the cases are classified as biocrimes while the remaining two constituted acts of bioterrorism. Collectively, they demonstrate the diverse motives for, and methods of, attack that have been explored in the preceding chapters, together with the pathogens and toxins that perpetrators most often select for their reprehensible campaigns to bring harm to the unsuspecting.

◆ 5 ◆

Bad Medicine

Biocrime in the Healthcare Professions

A biocrime can be committed by most anyone provided that the person has access to a biological agent such as a bacterium or virus, possesses the technical know-how to perform the deed, and has the opportunity to carry it out. The biocriminals whose acts are the focus of the present chapter not only fulfill these criteria rather handily, but are also believed to comprise the largest category of perpetrators.

The fact is, biocrimes in the United States are committed to a disproportionate extent by those who work in medical settings, precisely the types of men and women most of us would never expect to intentionally inflict harm on others. With a modicum of reflection, however, it becomes apparent why healthcare workers would, in fact, be among the most frequent offenders. From hospitals to dental clinics, medical facilities are home to an array of pathogens, some of them potentially lethal, with those who work in such settings being well-versed in the illnesses these sorts of entities produce.

Then, too, a healthcare milieu offers a ready-made victim pool, since those with whom medical professionals interact on a routine basis—patients—are, by definition, ill or at least registered to receive medical treatment. As a 2001 editorial in the *British Medical Journal* suggests about biocriminals in the medical sphere, it is plausible that "all walks of life have people with the potential to murder … (but the) key difference may be opportunity."[1]

It is certainly easy to spot the rich possibilities that a medical environment offers the would-be biocriminal. In such a setting, a prospective target, especially if seriously ill and hospitalized, may be bedridden, weak, sedated, and isolated from others; vulnerable circumstances by any measure. In addition, the potential victim's medical team, family, and friends, since they already perceive the person as being in the sick role, may not be suspicious of a change or worsening of his or her symptoms. Surely it is a fact that even in the most dramatic cases, meaning those in which a biocrime leads to a

debilitating malady or death, the questions that arise invariably focus on the reason that the patient's original ailment took such a devastating turn. Accordingly, the standard response, particularly when the emergent features are inconsistent with those of the preexisting ailment, is to perform an expanded workup; a conventional search for a natural cause in an effort to reconcile the disparate symptoms.

Still another reason that healthcare workers, compared to those in other professions, may be inclined to execute biocrimes centers on the profound trust that is customarily placed in them and in medical institutions in general, a trust demonstrated by patients' unthinking submission to invasive measures. "Only in a healthcare setting will normal people allow a stranger to stick them with a needle and administer potentially injurious substances," says Kenneth Iverson, a bioethicist and physician who practices emergency medicine in Tucson, Arizona.[2] Surely it is true that patients routinely entrust their lives to the staffs of medical facilities, where they encounter steady streams of caregivers about whom they may know nothing other than the names printed on the workers' badges. For the individual wishing to use pathogenic microbes to effect a crime, then, a medical setting offers a remarkable assortment of tools coupled with myriad opportunities and the blind trust of the potential victims.

As to the occupations of the perpetrators, research has shown that nurses make up fifty percent of the offenders, with the crimes, in these studies, being defined as those that employ either biological or chemical agents. A smaller share of offenses, roughly twenty-five percent, are carried out by physicians.[3] It should be noted, though, that the latter number may be misleading; that the figure may actually be higher but that doctors are simply more effective at ensuring their deeds go undetected as well as being better insulated within the medical hierarchy.[4] In terms of the remaining twenty-five percent, it is comprised of dentists, opticians, nurses' aides, and orderlies, among others.[5]

Regarding the victims, patients are highly represented, of course, although fellow medical professionals have also been targeted, as have romantic partners. Family members have likewise found themselves in the crosshairs, most often spouses. And in a handful of instances, perpetrators have targeted a diversity of individuals, as was the case in Chiba, Japan, in the mid–1960s.

Biocrime Files

The Mitsuru Suzuki Case

Doctors, nurses, patients, family members, and even a military officer were the victims of Mitsuru Suzuki, a physician who embarked on a residency

in microbiology only to find himself galled by what he described as "the seniority system which prevails in medical circles."[6] Angry because he felt that the higher-ups in his training program at Chiba University Hospital in Eastern Japan were discriminating against him—Suzuki was convinced they were treating him unfairly because he had graduated from a medical school other than the one at Chiba University—he was further irritated because his spot in the residency was unpaid and, he suspected, temporary. For this reason, he felt the need to extract revenge. But Suzuki had another pressing need as well: he was conducting bacteriological research and required more participants. So it was that he came up with a means of satisfying both needs, a plan that was both crafty and creative, not to mention criminal. He decided to punish the "enemy"—the medical establishment—by exposing both healthcare workers and patients to pathogenic bacteria, thereby transforming them into valuable research subjects. It was shortly before Christmas in 1964 that he put his devious plot into motion.

Purchasing a sponge cake at a shop near Chiba University Hospital where his residency was based, Suzuki contaminated it with *Shigella dysenteriae*. How he obtained this agent which causes bacillary dysentery has never been determined. Later that day, he presented the cake to four of his colleagues at the hospital, who soon became ill and were admitted for treatment. According to Iverson, hospital officials suspected that the resentful resident was behind the poisoning episode, which came to be known by the Agatha Christie–like nickname, the "sponge cake incident."[7] Even so, they did not take action against him because they didn't want to embarrass Chiba University Hospital. Certainly the ensuing publicity would not have buoyed the institution's image as a place of healing, but by leaving the perpetrator unaware that officials were now suspicious of him, he felt sufficiently confident to continue poisoning those in his surroundings.

The summer of 1966 would prove to be a very busy one for Suzuki, since it was during this season that he decided to inoculate an assortment of foods with *Salmonella typhi*, the bacterium that causes typhoid fever. He obtained the pathogen from one of his patients, as well as gaining illicit access to it from Japan's National Institute of Health where he also trained on occasion. "I wanted to see how a mass outbreak of disease might develop from the planted bacilli," he later said.[8]

To this end, he introduced *S. typhi* into bottles of a soft drink that contained a milk base and to which his coworkers had easy access. Soon, sixteen of them were diagnosed with typhoid fever. In four of the cases, Suzuki went even further, administering a "medicine" he claimed would ease their discomfort. Unbeknownst to these colleagues, he was actually injecting them with *S. dysenteriae*, meaning they would come down not only with the symptoms of typhoid but dysentery as well.

Curious about other avenues of infection, Suzuki, a short time later, introduced *Shigella* into the nasogastric tube of a patient at a clinic affiliated with the Kawasaki Steel Plant. Such a direct route more or less guaranteed the target would be laid low with a severe case of dysentery, and quite rapidly.

Finally, at the end of summer, the treacherous resident discovered a means of infecting his victims that he would thereafter use in most of his crimes. Having poisoned an internist with *S. typhi* on September 4th with a contaminated cake—innocently enough, the internist shared it with two others, who also become ill—Suzuki began injecting bananas with the bacillus. And he found that this method worked particularly well. In fact, it was so effective that, by year's end, he had caused twenty doctors and nurses to develop typhoid fever by means of adulterated bananas, along with two of their relatives and eight of his own distant relatives. Another thirteen patients at Chiba University Hospital also consumed his tainted bananas, as did a nurse at another hospital. In a particularly unfortunate turn of events, the latter shared the fruit with the deputy director of the Mishima Social Insurance Hospital, a doctor by training, who succumbed to typhoid fever shortly thereafter. Yet even as these maladies were piling up, medical authorities did not point the finger at Suzuki. An investigation, when one finally was set into motion, would be the result of an anonymous tip to the Ministry of Health and Welfare, according to Iverson's account of the case.[9]

In the meantime, Suzuki proceeded with his campaign. Throughout early 1966, he adulterated various medications with *S. typhi*, along with a barium solution that was subsequently distributed to a pair of clinics. He also laced tongue depressors with the bacillus, as well as mandarin oranges that he left in the nurses' break rooms. He even infected a plate of clams served to a military officer.

Largely out of control now, Suzuki next infected his brother and sister-in-law, along with several family friends. And as the numbers of illnesses soared, he phoned local hospitals, under another name, and instructed them to be on the lookout for a rise in typhoid cases. He appears to have been tracking the speed and spread of the outbreak he had initiated.

All told, Suzuki's actions took the lives of four people and infected 120 others.[10] Ensuing estimates were higher, however, with as many as a dozen dead and over four hundred infected.[11] Yet when the time came for the doctor to face the music, the legal system was curiously anemic. In the spring of 1966, Suzuki was indicted on thirteen counts of intentional infection primarily in the form of food contamination, but, inexplicably, he was not charged with murder.

At first, he fessed up to the crimes. On having second thoughts, however, or perhaps deferring to legal counsel, he subsequently withdrew his confession

and plead innocent to the charges. In due course, a court found him not guilty on all counts. A puzzling verdict, it may have stemmed, at least in part, from a lack of evidence other than that which was circumstantial. But this is not the end of the story.

In 1982, the case was reopened in large measure because the Japanese medical community's outrage over Suzuki's engineered outbreaks had never subsided. His peers did not believe that justice had been served. And this time the outcome was different: the earlier verdict was reversed, the physician was found guilty, and his medical license, revoked. Furthermore, he would spend the next six years behind bars.

The Diane Thompson Case

Legal action in the United States would be swifter and more severe in the case of Diane Thompson, a clinical laboratory technician at the St. Paul Medical Center in Dallas. Like other medical employees having access to pathogens in the workplace, Thompson's job placed her in proximity to frozen strains of *Shigella dysenteriae*, the same microorganism Mitsuru Suzuki had used in his crimes. Unlike the Japanese physician, however, the twenty-seven-year-old American laid her first trap outside the hospital.

Enmeshed in a romantic relationship having more than its share of ups and downs—Thompson once slashed her boyfriend's tires and dumped sugar in his gas tank—the lab tech decided in 1995 to assault him on another front, a gastrointestinal one.[12] Drawing on her expertise, she contaminated a syringe with an undisclosed pathogen, then used it to extract a sample of his blood. She also laced his food with an unnamed microbe, one that produced fever and diarrhea suggestive of *S. dysenteriae* infection. So severe were these symptoms that it was necessary to hospitalize him. Yet even now Thompson had the upper hand. Because she had access to stool samples and lab test results, she was able to swap his fecal sample with that of another patient, falsify his records, and thereby confound his course of his treatment. "Thompson," writes biowarfare expert Raymond Zilinskas, "managed to fabricate his laboratory reports to prevent the correct diagnosis of his illness."[13] At the time, the boyfriend did not know she had orchestrated his malady, but others did know, or so it was claimed. Thompson's defense attorney would later state that the lab tech's supervisors were aware of her scheme to poison her boyfriend yet did nothing to prevent her from carrying it out.[14]

Just as Mitsuru Suzuki, after infecting four colleagues and believing he had gotten away with it, went on to infect hundreds more, so Thompson, after successfully sickening her boyfriend, proceeded to do the same to her colleagues. On October 29, 1996, a Saturday morning, she dispatched an email to several coworkers at the medical center inviting them to enjoy blueberry

muffins, doughnuts, and other treats in the break room. She also continued reminding them about the pastries throughout the morning, even escorting three of them to the break room where she watched them eat the tainted treats. And although some of the targets were only slightly acquainted with Thompson, they had no qualms about accepting her seemingly generous offer. No one suspected anything foul was afoot. In all, thirteen people consumed her breads and pastries.[15]

By the following evening, all of these coworkers were suffering from gastroenteritis, with four of them requiring hospitalization. But with circumstances pointing to the lab tech as the likely perpetrator of the crime—not only had she supplied the pastries, she had also used a bacterium rarely found in the United States but that was present in the medical center's pathogen bank—she soon confessed. During the legal proceedings, Thompson appeared both confused and distraught, and claimed she did not know why she had sickened her colleagues. In the end, a court convicted her of aggravated assault and four felony counts of tampering with consumer products. Sentenced to four concurrent twenty-year terms, she is scheduled for release in 2018.

In terms of the aftermath of the laboratory breach, the St. Paul Medical Center, among other measures, tightened its employees' access to the facility's store of pathogens. As to Thompson's method, medical authorities are still not sure how she devised her bio-weapon from the frozen bacterium pilfered from the laboratory, but they do have an idea. It seems the subject became a matter of speculation at her trial, where a rather simple technique was proposed. "[S]everal microbiologists and medical technologists … said it would be easy to thaw and then grow the bacteria in a solution that could be applied to food as a mist," reports the *Associated Press*.[16]

A similar question, that of method, arose in the case of another medical technician in the Midwest in the mid–1990s, Brian Stewart, who would likewise be charged with a crime involving a pathogenic microbe. As in the Diane Thompson affair, this man's method was never proven, yet there was little doubt about how he had done it, at least in the eyes of the court. So convincing was the prosecutor's circumstantial evidence, in fact, that a conviction was handed down after only a few hours of deliberation by the jury.

The Brian Stewart Case

Employed by Barnes Hospital in St. Louis, Stewart was a twenty-six-year-old phlebotomist, a technician who extracts blood for transfusions, donations, and medical tests. At times, his position placed him in contact with blood or blood products that contained HIV, the lentivirus that leads to AIDS, and for Stewart this apparently proved to be a tempting set of circumstances.

According to the court, it was a situation he would eventually exploit in an exceptionally repugnant attempt at murder, the target of which would be neither a patient nor a fellow medical professional but rather someone much closer to home: his infant son.

Stewart, a resident of Columbia, Illinois, a small town twelve miles south of St. Louis, was dating a woman, Jennifer Jackson, who in 1990 unexpectedly became pregnant. After eschewing the abortion that Stewart recommended, the pair married and a few months later brought into the world their son Bryan.[17]

In the months that ensued, the infant's development was problem-free but Stewart and Jackson's marriage was not, and before long they found themselves on the brink of divorce. By chance, it was during this same period, the winter of 1992, that eleven-month-old Bryan was hospitalized for asthma at St. Joseph's Medical Center in Lake Saint Louis. And it was while preparations were being made to release the infant, who had largely recuperated, that Stewart made his move. He was purportedly convinced that divorce was imminent and he had no intention of paying child support for the next seventeen years.

It was on February 6, 1992, a cold Thursday morning, that the phlebotomist showed up at St. Joseph's to visit his son. A lab coat was draped over Stewart's arm, one that was described as unusual given the season.[18] Its presence was also inexplicable, since Stewart worked at Barnes Hospital, not St. Joseph's, meaning there was no reason for him to be carrying it in the first place. Prosecuting attorney Tim Braun would later contend that the garment concealed a syringe and a vial of HIV-infected blood. "The inference that we would have is that he had blood in there," says Braun, "and if somebody looked in the pocket of the coat, he would say, 'Oh, I had that left over from my other job' or 'I forgot to take that out.'"[19]

According to Jennifer Jackson, Stewart arrived at the hospital room and suggested she get a drink while he visited their son.[20] And it was when she returned from the cafeteria a few minutes later that she found Stewart sitting in a rocking chair with Bryan in his lap, the infant wailing uncontrollably. Stewart had injected the baby with HIV-tainted blood while his wife was out of the room, published reports contend.[21]

Two hours later, Bryan become intensely ill. The reason for his sudden turn for the worse perplexed his doctor, who described the infant's symptoms as similar to those observed when a person receives a transfusion of incompatible blood. Bryan had not undergone a transfusion, however, therefore the physician was unable to understand what she was witnessing.

As it turned out, Bryan would suffer an ever-worsening succession of medical problems in the ensuing months and years, his still-developing immune system being unable to resist the onslaught triggered by the virus. Then, when he was five years old, his immune system collapsed entirely and

multiple life-threatening conditions emerged. What had brought about these problems remained a mystery, however, until Bryan was tested for HIV infection and, in short order, diagnosed with "full-blown AIDS" as it was referred to in 1996. When the boy presented at Children's Hospital in St. Louis where the diagnosis was made, his T-cell count was zero, his temperature was 105 degrees, his liver and spleen were severely damaged, and his digestive system had ceased to function. He was nearly deaf as well, a side effect of the ten daily medications he required, some of which he received through a tube inserted in his abdomen. At this juncture, doctors predicted he had three to five months to live. And while every effort was being made to ease his suffering and prolong his life, attention was also coming to bear on how he may have contracted the infection.

Among the possibilities that were ruled out were blood transfusions, since he had never received one. Sexual abuse was also eliminated by means of an interview and a physical examination. And needle-stick injuries were excluded, although there had been two intravenous drug users living in his home at one point. Both were tested and neither was found to harbor the virus, however. In short, no standard means of infection could be established. But there did remain another possibility, one that pointed directly to Brian Stewart, and it was anything but standard.

After purportedly infecting Bryan in early 1992, Stewart ended his relationship with Jackson in August of that same year. Jackson stated that during their breakup Stewart denied that Bryan was his son and said he would not be providing for him. And he told her why. "You won't need to look me up for child support anyway, because your son's not going to live that long," he said.[22] He then gave an estimate that was right on the mark, saying the child would not live past five years of age. And he told a family friend the same thing, a woman who would later testify against him in court.[23] As if this weren't enough, Jackson said her ex-husband threatened to have her, Jackson, eliminated as well, boasting that he could arrange it without being caught.[24]

As it happened, DNA testing confirmed that Stewart was indeed Bryan's biological father, and twice Jackson found it necessary to take legal action against him to obtain child support payments. Then, in 1998, a lengthy investigation wrapped up, with Stewart being charged with first-degree assault, a charge that would be upgraded to murder if the boy perished before the trial.

As to the rationale for the assault charge, it centered on the sequence of events that Stewart's visit to Bryan's hospital room appeared to set into play, along with his subsequent prediction that his son would not live past five years of age. Then, too, the phlebotomist had a powerful financial motive to commit the crime, together with the means to do it and the opportunity to pull it off.

As it came to pass, young Bryan did not die. Thanks to the advent of

HIV protease inhibitors in the mid–1990s, he received a drug cocktail that averted his death and handed him a quality of life better than that which he had ever known. For the first time, he was genuinely healthy. Still alive and well today, his viral load—the amount of HIV in his system—remains so low as to be undetectable on nucleic acid amplification tests. To further differentiate himself from his estranged father, he has since changed his name to Brryan with a double "r," has a girlfriend, and oversees the non-profit organization he founded, called "Hope Is Vital" (HIV). As well, he serves as a speaker for Upward Bound Ministries.[25] "I went from full blown [AIDS], on my death bed, given five months to live, and here I am 19 years old, living on 15 years of borrowed time," Bryan said in 2011.[26]

His father's life would not be as auspicious. Found guilty by a jury, the judge in the case, Ellsworth Cundiff, handed down the maximum sentence, life in prison. "I believe when God finally calls you," Cundiff told the phlebotomist, "you are going to burn in hell from here to eternity."[27]

Unfortunately, Stewart was not alone in using HIV-contaminated blood in an attempt to take the life of someone close to him. A handful of other episodes occurred in the 1990s, the most significant of which culminated in a landmark criminal case, the State of Louisiana vs. Robert J. Schmidt. In a story carried by newspapers around the world, prosecutors sought to introduce into evidence the findings of a phylogenetic, or evolutionary, analysis of HIV in an effort to establish a link between two individuals diagnosed with the intractable infection. If allowed into court, this innovative form of DNA analysis would set a precedent and thereafter constitute a formidable tool in cases centering on biologically-based crimes.

The Richard J. Schmidt Case

A forty-four-year-old gastroenterologist, Richard Schmidt, at the time of his alleged offense in 1994, was living with his wife and three children in Lafayette, Louisiana, a relaxed Southern city nestled in the heart of Creole and Cajun country. Unbeknownst to his spouse, he had a fourth child elsewhere in the city, a son named Jeffrey, the mother of whom was a thirty-one-year-old nurse, Janice Trahan. Since 1984, Schmidt and Trahan had been having an affair, with the pair also working together at the same hospital and with Schmidt occasionally serving as the nurse's personal physician.

According to Trahan's account, the two had previously decided to divorce their spouses and marry each other, but while she carried out her end of the agreement, Schmidt did not follow suit. Exasperated, the nurse announced that she was ending their affair, and to underscore her decision began dating another man. This was when criminality erupted in what was already a troubled relationship.

It was on August 4, 1994, a humid night in St. Louis, that Schmidt showed up at his estranged girlfriend's home, uninvited, unannounced, and unwanted. In a darkened bedroom, she lay sleeping, with their three-year-old Jeffrey beside her. Schmidt, who in the past had given Trahan vitamin B-12 injections to help manage her fatigue, told her he had come to give her another one. This time, however, she refused it. So he proceeded all the same. "Before she could do anything more, he jabs her in the left arm," says District Attorney Michael Harson.[28] Because the room was dark and the injection swift, Trahan was unable to see the contents of the syringe. At once, Schmidt left the house and the couple never had physical contact again. The affair was over, and this had been the physician's parting gift.

Court documents reveal that Trahan described the August injection as being qualitatively different from the previous ones. Not only did it hurt as he administered it, but her arm remained painful the next day to the extent that she asked a colleague to examine it. Something wasn't right, Trahan felt.[29]

Twelve days later, on August 14th, she began experiencing flu-like symptoms, a transient reaction some people experience shortly after exposure to HIV. It indicates that the body has detected the virus's presence and begun creating antibodies in an attempt to eradicate it. Trahan's symptoms included fever, malaise, and swollen lymph nodes.

In the months that followed, she experienced other bouts of illness and for this reason sought Schmidt's opinion. Even though she had broken up with him, the two still worked together and Schmidt was familiar with Trahan's medical history. And his response was to order lab tests. Shortly thereafter, Schmidt told Luis Mesa, a lymphoma specialist and a consultant in Trahan's case, that the blood work had included a test for HIV antibodies, the results of which revealed that she wasn't infected.[30] This second doctor subsequently made a note of these findings in Trahan's medical chart so there would be a permanent record of them. What Mesa did not know is that no such test had actually been performed. Schmidt had knowingly provided false information about the HIV status of his former lover and nurse who, on a daily basis, was in close contact with the hospital's patients.

Finally, in December, the still-ailing Trahan was evaluated by yet another doctor, and this one ordered an HIV test despite the fact that her chart showed she had recently received one. To Trahan's dismay, the findings confirmed that she did in fact carry the human immunodeficiency virus, a baffling development since she had not, to her knowledge, been exposed to the microorganism.

As things stood, the results of an HIV test she took in the spring of 1994 were negative, meaning the infection had to have occurred in the summer or autumn of that year. Taking this information into account as well as reviewing her symptom history and lab data, pulmonologist Ernest Wong, another

of her physicians, was able to hazard a guess as to the precise date of transmission. "Dr. Wong estimated that Trahan had been infected with HIV in the first week of August 1994," states a court document.[31] Certainly it appeared that the flu-like symptoms she experienced approximately two weeks after the August 4th injection had been her body announcing its detection of the virus. Accordingly, Trahan began to suspect that the inordinately painful shot Schmidt have given her may have been responsible for her condition.

Contributing to her worries, a further workup revealed that she also was infected with the hepatitis C virus (HCV), which, combined with the HIV in her system, placed her at grave risk. And while it was possible she could have become infected with both pathogens at the hospital where she worked, it was unlikely considering that her duties did not place her at elevated risk. "Trahan was not in an 'exposure prone' job such as surgery, nor was she exposed to HIV patients," reads a document from the Louisiana Court of Appeal.[32]

Without delay, Trahan secured representation, with her legal team seeking a DNA analysis of the HIV in her system along with that of the sole AIDS patient in Schmidt's caseload, a man named Donald McClelland. But what Trahan's attorneys were seeking—a meaningful comparison of the viruses harbored by Trahan and McClelland—was something of a long shot due to the mutability, the inconstancy, of the human immunodeficiency virus itself.

Whereas DNA testing had already been used successfully in other legal cases to identify or exclude suspects, there was a problem when using it to compare HIV samples from different individuals. "HIV," states an *ABC News* report on the Schmidt case, "mutates immediately upon being transmitted to another host, and it continues mutating at a very rapid rate."[33] This means the virus in Trahan's bloodstream would not be identical to that of McClelland because several months had elapsed and the viruses had continued to change independently. For this reason, a procedure was needed that could, in effect, look back in time to determine if the distinctive strains carried by Trahan and McClelland had evolved from the same "family"; that is, a technique that could reveal if the two pathogens shared a common ancestry when compared to other strains of the virus. And this is where phylogenetics entered the picture, defined by the Oxford Dictionary as "the branch of biology that deals with phylogeny, especially with the deduction of the historical relationships between groups of organisms."[34]

Starting in September 1995, a research team led by Michael Metzker set about performing phylogenetic analyses of thirty samples of HIV, Metzker being an associate professor of molecular and human genetics at the Baylor College of Medicine in Houston. For the study, he and his team obtained HIV from Trahan and McClelland, along with twenty-eight additional samples drawn from HIV-infected individuals in the Lafayette area. In a blind

study design to prevent bias, one in which the researchers were initially kept in the dark about which sample belonged to which participant, the team compared the genetic sequences of the thirty samples to determine if any of them appeared to be related. And the results were stunning. It seems the genetic sequences of two samples were extremely similar, the ones belonging to Trahan and McClelland.

Two years later, fresh blood samples drawn from Trahan and McClelland were sent to the University of Michigan laboratory of David Mindell, a molecular geneticist. The purpose was to double-check the Metzker analysis. And, indeed, Mindell's phylogenetic analysis confirmed the findings obtained by the Metzker team.

Here it is worth noting that the researchers stressed that these phylogenetic findings did not explicitly prove that Trahan had received McClelland's virus. A direct match would be necessary to establish such a connection, and, as noted earlier, such a correspondence was not possible. But the analysis of the gene sequences did reveal that they were located on precisely the same part of the phylogenetic tree, whereas if they were unrelated they would have been situated on different parts of the tree. "The close relationship between the victim and patient samples," writes the Metzker group in the *Proceedings of the National Academy of Sciences*, "[was] supported by both the genes that we examined, using all major methods of phylogenetic analysis (parsimony, minimum evolution, and likelihood), and a broad range of evolutionary models."[35]

The question now was whether the DNA findings would be admitted as evidence in a court of law. The defense team opposed it, among other arguments insisting that the comparison of Trahan and McClelland's viruses was unreliable since HIV is a changeable microorganism, and, additionally, that contamination may have occurred. In response, the prosecution's experts reiterated the strength of the microorganisms' degree of likeness—"as closely related," testified one scientist, "that two individuals could be"—while stressing that their phylogenetic procedure was highly reliable, that it was designed expressly to take into account the virus's changeability, and that the Trahan-McClelland analysis had been repeated by an independent molecular geneticist and contamination was not an issue.[36] Upon hearing these arguments of the prosecution and defense, the judge decided to allow the DNA analysis into the proceedings as circumstantial evidence, circumstantial because it did not, in itself, prove unequivocally the existence of a connection between Trahan and McClelland's viruses. The court then turned its attention to other evidence.

The additional material exhibited at the trial, which took place in the autumn of 1998, included a notebook Schmidt appears to have hidden in his office, a record of the blood samples extracted on the premises during the

summer of 1994. All of the logbook's entries were accompanied by stickers indicating they had been forwarded to laboratories for testing, except for two: a blood sample drawn from Leslie Louviere, a hepatitis C patient, and one from Donald McClelland, the AIDS patient mentioned earlier, whom Schmidt purportedly phoned at home and asked to come to his office and provide a blood sample. The date of the Louviere blood draw was August 2nd, while that of McClelland was August 4th, the same date that Schmidt injected Trahan at her home. Prosecutors drew attention to a notation in Schmidt's logbook that instructed his staff to affix lavender stoppers to this particular set of samples.

Offered as evidence, too, were billing statements revealing that the two patients' insurance companies had not been charged for these August blood draws. Instead, the fees had been canceled by hand on the billing forms that Schmidt's office typically submitted to insurers.

In terms of Schmidt's defense, namely that Janice Trahan was a scorned lover who had leveled her allegations against him in order to wreck his life, it failed to sway the jurors. Similarly, they rejected the defense team's attempts to paint Trahan as a sexually vigorous woman who may have contracted HIV by having had sex with other men and not disclosing it to the court, just as they discounted the claim that the results of the phylogenetic analyses were unreliable.

In the end, the jury found the doctor guilty of attempted second-degree murder, and the judge, having the latitude to sentence him to anywhere from ten to fifty years in prison, chose fifty. A few weeks later, Schmidt surrendered his license to practice medicine in the state of Louisiana, while patients Donald McClelland and Leslie Louviere, whose medical conditions had become public knowledge owing to the legal proceedings, filed their own lawsuits against the gastroenterologist.

In the summer of 2015, Schmidt, who still maintains that he is innocent, sought parole, but the three-member panel denied it by a unanimous vote. If he exhibits satisfactory behavior, he will be eligible for early release in 2023, at which time he will be seventy-four years old.

Janice Trahan, for her part, survived and remarried. At Schmidt's 2015 parole hearing, she attended and spoke out against his discharge from prison.[37]

In the years since the case concluded, the crime and resultant legal proceedings have enjoyed a certain renown. Besides inspiring an episode of the American crime-drama series *Law & Order* and being reenacted in the documentary-style television show *Forensic Files*, it also proved to be a case for the law books. The fact is, Louisiana vs. Schmidt set a precedent in that it marked the first time that phylogenetic research, the basis of which is the concept of evolution, was allowed into evidence in a United States courtroom.

As such, it represented a turning point in the legal recognition of the scientific merit of evolutionary theory, as Metzker and his team pointed out in a journal article about their research. "It is ironic," they added, "that this case originated in Louisiana, which enacted the Balanced Treatment for Creation-Science and Evolution-Science Act in 1982."[38] (Five years later, this law would be overturned due to its unconstitutionality.)

In their journal account, Metzker and his colleagues also spelled out some of the ways in which the field of phylogenetics holds considerable promise in helping to protect the public. "[T]hese studies have broad applications for the identification of putative sources of existing and new pathogens that can cause food-borne infections," they write, "and hazardous agents that can be used for the purpose of biological warfare."[39] From a forensic science perspective, then, Louisiana vs. Schmidt was significant in that it validated, and imbued with respect, an important new tool for use by the American legal community in detecting and identifying biological agents employed in biocriminal and bioterrorist assaults.

As noted in Chapter Four, biological attacks can be executed using a microbe—a living organism such as those that cause AIDS, anthrax, or plague—or a toxin, which is the poisonous product of a living organism. In the latter category, a toxic agent of considerable concern to biocrime and bioterrorism experts is ricin, a fast-acting, lethal poison that, in some countries, is easy to obtain. Then, too, the means by which it may be weaponized is not exactly a closely held secret. "In the underground terrorist literature, there are simple cookbook solutions of how to do this," says Drew Campbell Richardson, supervisory special agent with the FBI.[40]

Accordingly, the final case to be revisited in this chapter, a case that will be covered at some length, focuses on ricin. In this respect, the crime is different from those that have been presented thus far, all of which employed microorganisms rather than their toxins. Also unlike most of the previous cases, the crime occurred in a non-medical setting despite the fact that both the perpetrator and the victim were physicians. And lastly, the episode, perhaps more than any of the preceding ones, illustrates the remarkable degree of psychopathology that may be present in the medical professional who seeks to commit a biologically-based crime. The case is that of Debora Green, and it has long been noted for its meticulously crafted, and excessive, cruelty.

The Debora Green Case

Throughout most of her brief medical career, Debora Green was a doctor whose abilities were respected by her peers and her patients. It was when she was twenty-eight years old, however, that her emotional stability came into

question while she was practicing emergency medicine at Jewish Hospital in Cincinnati, Ohio. It seems that she complained of being bored with her training program and, at the same time, began displaying over-the-top outbursts in the emergency room. Among other triggers, insignificant medical problems, because they failed to interest or challenge her, led increasingly to tantrums. And such idiosyncrasies were not minor league. Green's self-centeredness coupled with her hair-trigger temper soon undercut her ability to perform on the job writes Ann Rule, author of *Bitter Harvest*, a book offering an in-depth look at the physician and a key source of material for the present discussion.[41]

As it stood, Green's fiery, erratic disposition was not an entirely new development. She had always had a "temper problem" but was able to control it so that it did not intrude into her career, according to her second husband, Mike Farrar, a man four years her junior and a resident in internal medicine at the University of Cincinnati College of Medicine when he met her. Farrar recalled that he first became aware of her overblown outbursts in the early years of their relationship.

"She was very volatile; she would fly off the handle and do things that were really embarrassing," he says.

> I remember one time she got into an argument in a Kroger parking lot with two people who took the space we were headed for. Debora got out of the car and just gave them hell. I was shocked. I asked her, "What are you *doing*?" … (S)he walked with them all the way to the door.[42]

As could be expected, such emotional instability eventually created problems in the Jewish Hospital emergency room, where Green found herself increasingly at odds with her colleagues and patients. "Her bedside manner," writes Rule, "was more confrontational than comforting."[43] In the early 1980s, then, Green made the decision to leave the field of emergency medicine and seek a change of direction, and to this end embarked on a residency in internal medicine. Once again, though, her unapproachability together with her explosive outbursts compromised her effectiveness.

In due course, Green became further detached from those around her, as well as losing interest in arguably the greatest love of her life, the practice of medicine itself. No longer devoted to her training, she spent more and more time at home with the couple's two small children, Tim and Kate. It did not come as a shock, then, when the skilled physician with a purported IQ of 165 failed her hematology and oncology boards on two occasions. "She was the strangest doctor I've ever worked with in my life," said a colleague at this point.[44]

Mike Farrar, by comparison, was warm and enthusiastic, well-liked by his colleagues and patients, and successful in his career. Upon completing a

three-year residency in internal medicine, he served an additional year as chief resident of the same program, then completed another three-year residency in cardiology. Subsequent to this, he was appointed to the faculty of the University of Cincinnati School of Medicine and named medical director of the facility's heart transplant unit.

On the home front, meanwhile, he and Green continued to struggle as a married couple. Whereas their problems began on their Tahitian honeymoon when Green, rather than have sex with him, decided to read a book, tensions mounted in the ensuing years and were compounded by the stresses inherent in their medical careers.[45] Partly for this reason, they decided to make a fresh start in Kansas, where Farrar, in the summer of 1986, was offered a plum position in a practice near the town in which he had spent his childhood.

Here in the heartland, Green joined a private practice, with her area of expertise being oncology despite her lack of certification in this specialty centering on the treatment of cancer. When the group practice decided not to retain her services at the end of her first year, she opened a practice of her own, but it failed to prosper and therefore she took a job with a peer review organization. When this likewise failed to pan out, she worked out of her home as an independent reviewer, scrutinizing medical records that were mailed to her, before finally throwing in the towel and ending her medical career altogether.

By this point, the couple's third child had been born, a daughter named Kelly, even though the marriage itself was now hollow. Contributing to the pair's difficulties, Farrar discovered that Green was using narcotics, which, he believed, she might be obtaining by writing the prescriptions and misrepresenting herself as a patient at local pharmacies.

In the months that followed, conditions at home steadily worsened in tandem with Green's mental state. "Sometimes she beat herself on the head with books, or beat on her thighs until she left bruises," writes Rule. "Or, worse, she behaved the same way in a public place while their children cringed and strangers stared at her."[46] According to Farrar, Green also tried relentlessly to turn their children against him, filling them with distortions designed to instill a hatred of him. So it was that the cardiologist, no longer able to cope with the situation, announced in 1994 that he was moving out of the house and planned to file for divorce. And Green's response was as frenzied as he had anticipated, replete with "screaming, a lot of profanity, hitting herself," says Farrar. "It was awful."[47] Little did he know that matters would get even worse.

Shortly after leasing an apartment, Farrar received an urgent phone call at work. It seems the family's home was on fire. A mysterious incident that eventually was dismissed as accidental, the cardiologist's colleagues were

convinced that Green had torched the house. Whatever the case, the couple reconciled in the wake of the crisis and purchased a new residence in the same neighborhood.

It was with this jumble of troubles festering in the couple's background that Green and Farrar volunteered in 1995 to help chaperone a group of sixth-graders on a summer trip to Peru. Their son Tim was to be among the youths. As for the itinerary, the excursion would entail a week in the jungle and another week on the Amazon River, with Farrar providing medical care for the group.

Also on this trip was a woman, a former nurse named Margaret Hacker, who was in many respects in similar emotional circumstances as Farrar.[48] "She was a married woman," writes Rule, "and she was a confused and miserable married woman."[49] Margaret's husband, who did not accompany her, was a clinically depressed anesthesiologist who would soon commit suicide by over-sedating himself.

In the tropical forest and on the river, Farrar bonded with this woman who shared his personal anguish while helping him treat illnesses in the group. But although the two became close, they did not make love during the trip. This would happen only after they returned to Kansas in what would prove to be an intense, meaningful relationship. It was one that offered them an island of respite from the distress of their marriages—until, that is, Green discovered the affair, which occurred when she hid under the bed and eavesdropped on a phone conversation between them. She did not confront them about their relationship, however, preferring instead to address it in a far more twisted manner.

It was a few evenings later, after Farrar had returned home from work, that Green hatched her plot. Explaining that she and the children had already eaten dinner, she handed him a chicken salad sandwich that she had set aside specially for him. And even though their relationship was broken beyond repair at this point and marked by constant quarrels, Green, on this night, sat in the kitchen with her disaffected husband and talked to him while he ate his meal. She was also ready with a reply when he complained that his sandwich tasted bitter. "We all had them—and nobody else's tasted funny," she told him.[50]

A couple of hours later, Farrar was stung by a burning sensation in his stomach, followed by diarrhea and vomiting. Intermittently during the next few days, waves of pain and nausea swept over him, causing him to be unable to perform his job. He did not suspect Green of poisoning him, however, despite their ruptured relationship and the fact that she was a spiteful woman with a bachelor's degree in chemical engineering. Then, too, he was unaware she had found out about his extramarital affair. Given his recent travels, he believed that he must have contracted a tropical disease in Peru, since he had

only been back from South America for a few weeks and there was still time for an ailment to manifest. Farrar therefore was relieved when his symptoms began to subside four days later, although the forty-year-old physician remained concerned about them, especially since an extensive medical workup had failed to identify their cause.

A few days later, the symptoms erupted again, but even more severely this time perhaps because he was now in a weakened state. As to their nature, they entailed "shaking rigors" and "torrential" vomiting—"twenty or thirty episodes over a few hours"—accompanied by a 104.4 fever and dehydration.[51] Worsening matters, as Farrar's condition spiraled downward, he developed an infection that spread throughout his bloodstream, a serious complication known as *sepsis*. "[H]is physician considered his condition life-threatening," reads a court document.[52] Fortunately, the treatment team, as before, managed to stabilize him in the intermediate care unit and a week later discharged him to the family home to recuperate. He had no way of knowing his ordeal was far from over.

The third time it happened was on August 25th shortly after he enjoyed a home-cooked spaghetti dinner. "He was home for a few hours, when, after eating, he became violently ill again," court papers state.[53] Readmitted to the hospital, Farrar received treatment until September 11th, during which the etiology of his condition still could not be determined. Even though all manner of tropical diseases were considered, most notably an atypical form of typhoid fever as well as "tropical sprue" or gluten-sensitivity enteropathy (GSE), intentional poisoning was not explored as the causative agent.[54] As so often happens in such cases, the members of his medical team, including those specializing in infectious diseases, assumed they were looking at a naturally-occurring illness, not an attempted homicide.

Discharged once again from the hospital, Farrar rejoined his family, with Green wasting no time serving him a plate of ham and cornbread. Even though he was beginning to intuit a connection between his wife's meals and the onset of gastrointestinal symptoms, he was still not sure if she was trying to murder him. He wondered instead if their stressful marital life might be triggering the features of his ailment. But what convinced him of the former hypothesis came about a few hours after dinner, when he again found himself in dire shape and back in the hospital, where he would remain for several days.

Looking thin and wasted after a thirty-pound weight loss—the formerly healthy doctor weighed only 125 pounds at this point—he returned yet again to the family home. Suspicious that his wife had contaminated his food and having renewed his decision to seek a divorce, Farrar nevertheless felt it best to stay in the house temporarily because he was worried about their children. His concern was that Green, who was steadily deteriorating, might endanger them, especially since she had taken to drinking heavily and spent

a considerable amount of time inebriated. In fact, it was because he came home one day to find her unconscious that he decided to place her in the Menninger Clinic in Topeka. To this end, Farrar phoned the police on September 24th, who transported Green to a local emergency room for an initial assessment, which, to no one's surprise, did not go well.

Whereas the cops, according to the *Associated Press*, described Green as "drunk, profane, bizarre but cooperative" when they arrived at the couple's residence, her ensuing conduct in the emergency room was anything but compliant.[55] Pamela McCoy, the physician who evaluated her, recalls that Green quickly spun out of control, spitting at Farrar and calling him a "fuck hole."[56] Court documents add that Green also warned him about the divorce and custody battle she believed was on the horizon. "[Y]ou will get the children over our dead bodies," she told him.[57]

Certainly the prospect of death was already on Farrar's mind, but in the form of Green committing suicide. And it was during this ugly spectacle in the emergency room that he told McCoy about a disturbing discovery he had made a few days earlier when he looked through his wife's purse. Although he was searching for pills that she might use to kill herself, he instead found a collection of items that made no sense to him. Inside her bag were several packets of seeds from the castor bean plant, along with vials of potassium chloride and syringes. At the time, the connection between seeds and ricin, the highly toxic protein they contain, did not come to mind, although Farrar knew the beans were not for gardening since his wife had no interest in this pursuit. Regarding the potassium chloride and syringes, suicide once again did not appear to enter the picture, although Farrar realized that Green, if she had wished to kill him rather than herself, could have injected the chemical into his catheter while he was receiving intravenous fluids in the hospital. Yet she had not done so in the face of numerous opportunities. So it was, then, that the odd assortment of items stumped him. He did note, though, that a sales receipt for the castor-plant seeds dated back to early August when he first began experiencing gastrointestinal symptoms, and he shared this information with the emergency room staff on this fraught autumn night.[58]

Subsequently admitted to the Menninger Clinic, Green was diagnosed with bipolar depression and prescribed Prozac, Klonopin, and Tranxene. Four days later, however, she checked out of the facility and returned home to a husband who was now wise to her efforts to murder him. While she was away, it seems he had looked into castor-plant seeds and ricin poisoning and was sure she had tried to kill him. Accordingly, he moved out of the house after Green returned, leased an apartment nearby, and continued his relationship with Margaret. And then the unthinkable happened.

The date was October 23, 1995. Green and their three children were living in the family's three-story, eighteen-room estate in Prairie Village, a

moneyed enclave situated in the Kansas City metropolitan area near Mission Hills and Country Club Plaza. Ten-year-old Kate, who had been training with the State Ballet of Missouri, was set to perform the role of Clara in the upcoming Nutcracker Ballet, while seven-year-old Kelly was to play an angel. Tim, for his part, was engrossed in sports.

On this fateful evening, Farrar took the children to a hockey match, after which he left them with their mother and drove back to his own apartment. But Green's alcohol abuse continued to gnaw at him, prompting him to phone her three hours later to discuss her drinking, which they both knew could interfere with her psychiatric medications. "[H]e told [her] she had better straighten up or he would call [the] authorities," reads a court document.[59] Farrar further revealed that he knew she had been poisoning him and had decided to seek custody of their three children.[60] "[H]e also told officers that he was very angry during the conversation and that it ended abruptly about midnight."[61]

Twenty-one minutes later, a Prairie Village police dispatcher received an anonymous phone call: the family's house was engulfed in flames. Tim, Kelly, and Kate were trapped inside, while Green stood outside, watching it burn. When Tim pleaded for help on the intercom, his mother told him to "stay in the house and let the professionals rescue you," rather than instruct him to climb out of his bedroom window.[62] As a result, the thirteen-year-old was consumed by the inferno, as was Kelly and their two beloved dogs. The deaths were due to a combination of heat and smoke inhalation.

Kate, on the other hand, took matters into her own hands and jumped from a bedroom window and onto the garage. Here, she looked down at her mother, who held out her arms and motioned for her daughter to leap into them. When Kate jumped, however, Green did not catch her, although the ten-year-old was not seriously injured in the fall.

In the aftermath of the blaze, Mike Farrar was so devastated by the deaths of his son and daughter that the authorities handed over Kate to his parents for temporary care. Even so, he was able, within twenty-four hours, to file for divorce and seek sole custody of his surviving daughter. He also refused Green's request to stay at his apartment until she could make arrangements for other lodgings.

Tellingly, Green, rather than appearing traumatized like her husband, was described as "talkative, even cheerful" in her interview with the police in the hours after the fire, an interview in which she already seemed comfortable speaking about Tim and Kelly in the past tense.[63] Soon, she would also be observed to chant phrases about their deaths, her behavior betraying a profound instability.[64] But while her reaction to the calamity was the polar opposite of that of her husband, the two did share an intense interest in the police inquiry into the conflagration that took their children.

The following month, the investigation wrapped up and yielded unmistakable evidence of criminal activity. Not only had accelerants been used at multiple locations in the house, but the escape routes the children would most likely use had been doused with especially large quantities of combustible material. And virtually all of the evidence, including a charred book found in the remains of Green's bedroom, a book recounting a family that was purposely burned to death, pointed to Green herself. In view of that, she was promptly charged with arson, along with two counts of first-degree murder and two counts of attempted first-degree murder. Bond was set at three million dollars.

In due course, Green confessed to the crime, although her legal team argued that she was not in control of herself on that terrible night and therefore should not be held accountable for her actions. What surprised observers, though, was one of the counts of attempted murder: it pertained not the fire, but to the doctor's efforts to poison her spouse.

When Farrar, in the moments after the tragedy, told investigators his wife had poisoned him on four separate occasions, they sent samples of his blood to the county crime laboratory, as well as to the FBI lab in Quantico, Virginia, and the Naval Research Laboratory in Washington, D.C. The purpose was to test for evidence of ricin poisoning; for instance, by testing for the presence of antibodies to the toxin, which would indicate that he had been in contact with it. And here it is important to note that exposure to ricin, unlike many other toxins, is nearly always deliberate. In fact, international treaties to which the United States is a signatory classify it as a chemical and biological weapon and prohibit its use.[65] Therefore, it was highly significant to the criminal case against Green when the analyses confirmed that her husband had indeed been poisoned with this protein of the castor oil plant.

Unfortunately for Farrar, while the lab tests were being performed, the sepsis with which he had previously been diagnosed recurred, meaning there was still bacteria lurking in his system. Weak and at times unable to work, he sought medical attention in mid–November, during which a battery of tests, including an echocardiogram, confirmed the presence of *Streptococcus viridans* in his bloodstream. Also diagnosed was endocarditis, an associated infection of the lining of the heart. On November 22nd, he underwent surgery at North Kansas City Hospital to repair a leaky mitral valve and install a catheter so he could receive, in his own apartment, intravenous antibiotics while he recuperated. His recovery would not progress as hoped, however.

In early December, the distraught cardiologist found himself suffering from a new set of symptoms, severe headaches being the most disruptive. And both he and his medical team were understandably concerned. To his doctors' dismay, a cerebral arteriogram revealed the presence of a brain abscess that most likely had been initiated by the heart surgery a few weeks

earlier. Presumably, material loosened during the previous procedure had traveled to the right frontal lobe of his cortex. Without delay, he underwent a craniotomy and the abscess was drained. Furthermore, because it was a risky procedure that he might not survive, his lawyers videotaped his testimony prior to the operation. As it turned out, though, the surgery was successful, such that his taped deposition was discarded and he testified in person in the case against his wife.

To avoid the death penalty, Green agreed to a plea deal in which she would serve a minimum of forty years in prison with no possibility of parole. And, sure enough, she did go willingly to a Kansas penitentiary, although she later attempted to reclaim her innocence by blaming Tim, her deceased son, for having set the house afire, as well as Farrar and the woman with whom he was having an affair. Her efforts were to no avail, however. Also futile was her attempt in 2015 to have the plea deal vacated so that she might have a new sentencing hearing. Unsuccessful unless an appeal overturns the decision, the one-time physician will remain confined until at least 2035.[66]

Regarding Mike Farrar, he survived the multiple poisonings and their long-term effects, although did require additional hospitalizations in the months after the incidents and his two open-heart surgeries. In terms of his relationship with Margaret, the woman to whom he had become close while in Peru, it did not endure. On a more positive note, he was awarded full custody of his daughter Kate, and, moving beyond the malevolence that had nearly cost him his life, eventually returned to the practice of cardiology and to a more peaceable life. In 1997, Mike married an attorney.

The only remaining issue—or more precisely, question—is how Green extracted the ricin from the castor-plant seeds, since simply eating them does not result in poisoning. Unfortunately, she did not provide the details of her method in spite of having plead guilty to the crime. And yet, her silence on the matter notwithstanding, various possibilities have been considered, with the two likeliest techniques having been described by Seth Carus of the Center for Counterproliferation Research at the National Defense University. "Green must have prepared the beans in a way that exposed the ricin inside," says Carus, "or she extracted the ricin from the beans and then added the toxin to the food."[67] Whatever her method, it was undoubtedly an intricate and rather tricky one. And while Green may not give away her secrets, the ordeal itself has drawn further attention to the dangers posed by this plant toxin. Alongside this increased attention to ricin as a murder weapon, the Debora Green case, a horrific example of filicide and attempted mariticide, has also served to remind us of the way in which an individual who is well-versed in fields such as chemical engineering and internal medicine may misuse their knowledge to inflict pain, illness, and death upon others, a dreadful desecration of the Hippocratic Oath.

◆ 6 ◆

The Oregon Conspiracy

Salad Bars, Salmonella and the Orange People Sect

In Oregon, at the end of the Oregon Trail, sits Wasco County, which in the 1980s was home to 13,640 people.[1] Over half of this number was made up of new arrivals to the area, an unconventional assemblage whose members hailed from around the world and dubbed themselves "Rajneeshees."[2] Dressed in orange, red, and violet garments so as to mirror the colors of the sunrise, they were ensconced in a sprawling commune, where they lived in accordance with the teachings of Bhagwan Shree Rajneesh, an Indian guru who had also recently relocated to Wasco County. It would be in the summer of 1984 that his operation would abruptly bring even more people, four thousand of them, to this rustic region in which John Wayne westerns were once filmed, with their arrival contributing to the political, social, and legal conflicts that were already inundating this rural area.

For several weeks, members of the sect, which the local media depicted as a cult, had been traveling to cities from coast to coast in an effort to bring back to the Oregon collective as many homeless people as possible, preferably male veterans. The plan was to use these newcomers, all of whom were at least eighteen years old and therefore of voting age, to pack the local voter rolls so the sect could manipulate a crucial election. Of course, this meant the Rajneeshees would need to control the newcomers' actions, most of all in the voting booth, which appears to have been accomplished by requiring them to vote pro–Rajneesh if they hoped to remain at the settlement. The Rajneesh medical staff also medicated many of the new arrivals with Haldol and other pharmaceuticals.[3] "As the homeless people were bused into the commune," writes Hugh Milne, the guru's former bodyguard, "the Rajneesh medical unit ordered huge supplies of tranquillisers and mood-altering drugs."[4]

Before the sect's leadership would face accusations of voter fraud, however, it would first have to contend with a more immediate matter: where to house the thousands of street people it had brought onto the premises. And the solution, it turned out, was to place them in an oversized tent city situated on the commune grounds, as well as in the tiny, makeshift houses that also dotted the property. And this turn of events would spark yet another face-off between the Rajneeshees and the local population in a larger conflict that had been brewing for nearly three years.

Owing to the sudden influx of thousands of indigents to the local region—a hostile incursion in the eyes of Wasco County's original residents—three county commissioners were required to travel to the Rajneeshees' enclave to inspect its living quarters. The law required that the lodgings comply with official housing regulations. Unfortunately, the visit would mark the sect's first known venture into biological aggression.

On August 19th, the three men, Wasco County judge Bill Hulse, commissioner Ray Matthew, and commissioner Virgil Ellett, drove to the commune, which was located in a rural area twenty miles from the nearest town. Rambling and verdant, the Rajneeshees had cultivated the land, creating an oasis in the formerly overgrazed terrain. As the officials neared it, however, members of the sect stopped the men's vehicle and instructed them to proceed in a van provided by the commune, with a belligerent Rajneeshee telling the commissioners, "Snakes should sit in the back seats."[5] In this manner, the three men continued on to the site, inspected it for violations (of which there were many), then returned to their own car. Curiously, though, it now had a flat tire. And it was not the first time an official vehicle had encountered problems at the site. Only a few weeks earlier, Wasco County planner Dan Durow, whose position required that he also inspect the commune, found the road blocked by heavy equipment belonging to the Rajneeshees, who claimed it had somehow malfunctioned.

So it was that the three officials stood beside their car while a sect member replaced the tire, a brief interval during which a pair of colorfully-clad Rajneeshee women arrived on the scene flourishing a pitcher of water and three glasses. The one who had prepared the drinks called herself Ma Anand Puja—she was born Dianne Yvonne Onang in the Philippines—and was a nurse as well as the secretary-treasurer of the Rajneesh Medical Corporation. Each of visitors accepted the glass that was offered to him and drank the cool water on the scorching summer day.

As things stood, one of the officials, Virgil Ellett, was well-disposed toward the sect while the other two were critical of it. And corresponding to their views, Ellett would remain in fine health after drinking the water whereas his fellow commissioners, Matthew and Hulse, would have a very difference experience.

After leaving the commune, Matthew traveled a hundred miles away to a cabin at Camp Sherman to spend the evening. And it was here that he awoke during the night suffering from a ferocious illness. Unaware of the cause, the seventy-one-year-old man remained alone in the cabin for the next two days recuperating from the puzzling affliction.

In a neighboring town, meanwhile, an acute illness also roused Bill Hulse from sleep, with the commissioner vomiting so uncontrollably that his wife rushed him to the emergency room. Here, medical tests revealed the existence of a "highly toxic substance" in his kidneys, a substance that was later determined to contain *Salmonella* bacteria.[6] Hulse, for one, was not surprised. Given the chain of events, he was convinced that Puja had poisoned him, and he even made a public statement to this effect. As to the severity of his illness, it was life-threatening. "Hulse remained in the hospital four days," reports *The Oregonian*, "with doctors telling him he would have died without treatment."[7]

The Rajneeshees, for their part, denied poisoning the men and chided them for making what the sect insisted were false allegations. Much later, however, the Rajneeshees would fess up to the crime.

The following year, the woman who was behind the poisonings, Ma Anand Puja, headed up another plot, one in which she slipped onto the eighth floor of St. Vincent Hospital in Portland clutching a syringe loaded with a drug that would trigger cardiac arrest. Her plan: inject it into the intravenous tube of Wasco County commissioner James Comini, who had undergone ear surgery and was recovering in an isolation room.[8] The sect's membership was convinced that he and other officials were determined to expel it from the region. Luckily for Comini, Puja's plan to assassinate him failed, since he wasn't connected to an IV line when she entered his room. So it was that the ill-intentioned nurse rejoined the hit squad that awaited her in the hospital parking lot for the two hundred mile drive back to the commune. "The murder scheme was just one of many increasingly desperate attempts to save the guru's empire," writes investigative journalist Les Zaitz, who would eventually land on the sect's hit list, too.[9] It was an empire whose Oregon operation became the sect's international headquarters starting in July of 1981 with the arrival of the spiritual leader Bhagwan Shree Rajneesh, a purported mystic who offered an alluring philosophical approach that fused Eastern spiritualism and Western capitalism.

The Rise of Rajneesh

Rajneesh was born Chandra Mohan Jain on December 11, 1931, in the town of Kuchwada, situated in the heart of India. Upon completing high

school, the son of a cloth merchant attended Hitkarani College two hundred miles away in the city of Jabalpur, but owing to conflicts with the faculty, soon transferred to the newly inaugurated D. N. Jain College in the same city. It was during this period that the young scholar later claimed to have found enlightenment. Graduating with a degree in philosophy, he proceeded to obtain a master's degree, then secured a teaching position at Raipur Sanskrit College in Raipur. Once again, though, tensions arose between Rajneesh (Jain) and the school's administration, tensions that were mainly ideological in nature, prompting the future guru to relinquish his teaching position and accept a professorship in philosophy at the University of Jabalpur.

While he was performing his academic duties at this time, Rajneesh also spearheaded a spiritual movement that would prove to be rather controversial. "In long monologues that drew eclectically on Zen Buddhism, Hindu traditions, progressive psychology, Gurdjieff, and Nietzsche, [Rajneesh] proclaimed a doctrine of self-fulfillment without and beyond constricting rules and narrow morality," writes Carl Abbott. "Enlightened capitalism and the pleasures of the world were to be embraced and combined with open-ended spiritualism, crafting an ideal that he called Zorba the Buddha."[10]

In terms of the inner growth process itself, the professor and nascent spiritual leader taught that satisfying one's physical needs is intricately associated with spiritual development and enlightenment. He further insisted that the need for sexual gratification was a singularly important one. "Among his teachings was the notion that sex was the first step toward achieving 'superconsciousness.'"[11] Rajneesh thus became a vocal proponent of "free love"—the immersion in, and celebration of, the human sexual experience with one or more partners outside of conventional social parameters. This stood in opposition to traditional marriage, according to the guru, which led to possessiveness.

Then again, free love, as taught by Rajneesh, was intended to apply to heterosexuals, the spiritual leader having little concern for his LGBT devotees. Despite his outward exhortations about sexual liberalism, Rajneesh's understanding and acceptance of same-sex relationships remained mired in the prejudices and ignorance of earlier centuries and therefore were excluded in his enthusiastic encouragement of natural, uninhibited sex. In fact, he eventually suggested that gay people should remove themselves from society. "There are deserts, there are islands uninhabited," he said. "Just give them to homosexuals."[12] As for contact between gay and straight people, Rajneesh taught that segregation should be absolute. "[T]here should be no communication between them."[13]

In certain respects, Rajneesh's model, notwithstanding its extreme homophobia, shared similarities with that of another pioneer of the era, American psychologist Abraham Maslow, who in 1943 proposed a hierarchical

theory of motivation. Maslow believed that a person's physical requirements must be satisfied before the individual can fully advance to higher-level needs, such as those involving love, self-actualization, and spirituality. But whereas Maslow's theory won acceptance from his peers, or at least their respect, Rajneesh's ideas provoked disdain, not least because he encouraged his followers to seek out and rejoice in unrestrained sexual activity. Then, too, his views on prosperity were at odds with traditional Eastern thought. "He believed that wealth, which more traditional gurus shunned, was actually the precondition for spirituality," writes American psychiatrist James Gordon, who traveled to the ashram to scrutinize and study with the religious figure. "Only wealthy people living in a wealthy community had the freedom and leisure to transform themselves."[14] While Rajneesh's emphasis on the material world would alienate traditionalists, it would attract seekers who were eager to embark on a fresh path; a path that, in several respects, was in line with the counterculture of the 1960s and the emerging human potential movement.

Into the 1970s he continued to draw devotees, even as he dropped his birth name, Chandra Mohan Jain, and became Bhagwan Shree Rajneesh and made his home at an ashram in the ancient city of Poona. It was a religious community that scores of his followers had forged, men and women who lived, worked, meditated, and studied in accordance with the guru's teachings and referred to themselves as "sannyasins," or disciples. By all accounts, they were devoted to Rajneesh and embraced his teachings on an array of subjects, among them the significance of what was termed "dynamic meditation." Incorporating physical movement, such as dance, into the contemplative experience, dynamic meditation, which is still practiced by devotees today, is a five-phase process unique in its fusion of the physical, mental, and spiritual.

As could be predicted, Western media soon became besotted with the colorful religious leader, most notably his tantalizing prescription of free love. Accordingly, the press wasted no time saddling Rajneesh with the tabloid nickname "sex guru." It was a perspective that was furthered, if unintentionally, by those in the United States who were personally familiar with life at the ashram in Poona and who described it as a "continuous orgy."[15] Clearly, the spiritual leader's Western disciples remained devoted to him and to his distinctive philosophy upon their return from India. When James Gordon met with some of Rajneesh's sannyasins in San Francisco in the late 1970s, he found them quick to laud their spiritual mentor as well as rather haughty. "They seemed as a group self-consciously hip," Gordon writes, "and smug about the man they breathlessly called 'Bhagwan.'"[16]

By this point, the organization had set up meditation centers in several countries, among them the United States, in what was turning out to be a

thriving global enterprise. But the principal ashram in Poona, which now had six thousand sannyasins, was also attracting its share of opposition from the public because of its controversial practices and escalating scandals. Among the numerous complaints against the sect was the physical violence that was said to be typical of its encounter groups. It was a notorious feature that author, professor, and literary and social critic Christopher Hitchens underscored when he visited the Poona ashram to film a BBC documentary about the spiritual hermitage.[17] The filmmaker appears to have been taken aback by the cruelty that he observed in the ashram's encounter groups, aggression that was often directed at the female participants. Hitchens writes,

> In a representative scene, a young woman is stripped naked and surrounded by men who bark at her, drawing attention to all her physical and psychic shortcomings, until she is abject with tears and apologies. At this point, she is hugged and embraced and comforted, and told that she now has "a family." … It was not absolutely clear what she had to do in order to be given her clothes back, but I did hear some believable and ugly testimony on this point.[18]

The treatment of male participants was likewise brutal, Hitchens reports, even more than for the females. "In other sessions involving men, things were rough enough for bones to be broken and lives lost," he writes, although the case on which the latter allegation is based remains unconfirmed.[19] As could be expected, such practices shocked the public and fueled the rage of the local community, with the same hostility being on display in the United States as well. When *Time* magazine described Rajneesh's ashram as the "Esalen of the East," Richard Price, co-founder of the esteemed Esalen Institute in Big Sur, California, vehemently rejected the comparison, with "particular attention to the violence endemic in the Poona encounter groups."[20]

Other scandalous features that riled opponents included the sect's alleged entrapment of powerful figures in dubious sexual situations, as well as the guru's fleet of Rolls-Royces; this from a man who asked his followers to dispose of their material possessions upon joining his operation. As for the intensity of the critics' animosity, it was excessive at times, even to the point of causing the Rajneeshees to become suspicious of outsiders and hence more guarded, more isolated from the population at large.

Worse still, acts of violence, including bombings, began to occur, although it is unclear whether they were the work of opponents attacking the operation or the sect's own sannyasins committing the crimes and pinning the blame on outsiders. A pair of arson attacks directed against the ashram's bookstore and health clinic, for instance, was blamed on outside adversaries, although many believed the Rajneeshees had burned their own businesses in order to feign victimization while cashing in on the insurance.[21] "The fortuitous nature of the fires and the bombings made me see the 'steadily mounting anti-sannyasin violence' in a new light," says Hugh Milne, the aforementioned

bodyguard for Rajneesh. "[I]t became clear that it was all being engineered so that it would look as though we were being persecuted."[22]

Then, too, cash was an issue for the ashram and a generous insurance pay-out would surely have been welcomed. Although the Rajneesh Foundation banked tens of millions of dollars that the operation earned from its various business ventures, it nevertheless owed the Indian government four million dollars in unpaid taxes.[23] This is because the government had revoked the Foundation's tax-exempt status once it discovered that the operation was bringing in a staggering amount of revenue yet without performing charitable services. By all accounts, it was proving to be a complicated and frustrating legal battle for the government, especially since the Rajneeshees had placed their own members in high-level positions within the nation's tax assessment and collection system. The result: the government was stymied by calculated internal obstacles in its attempt to compel the sect to pay what it owed.

Evidently, it was for such reasons that Rajneesh's chief lieutenant, personal secretary, and confidante Ma Anand Sheela (formerly Sheela Silverman), set out to relocate the operation to the United States, where it would serve as the global headquarters. Not only would this sidestep the immediate tax situation in India, but it would also provide the principal ashram with room to expand. The latter, it seems, had become a problem at the Poona site, which had outgrown its facilities and needed space to grow. And although a team of sannyasins had identified a sizable property elsewhere in India that they sought to purchase and develop, the government's land-use regulations prohibited the parcel from being used for the sect's purposes. By moving to the U.S., then, the Rajneesh operation would be able to acquire a larger property.

As to the cover story for the impending relocation, Rajneesh and Sheela claimed it was because the guru was ill and needed to undergo medical treatment in the United States. It was the same explanation they would offer to officials in the U.S. And taking the guru at his word, American immigration officials would grant Rajneesh a visa, a temporary one, which would permit him to enter the country to receive medical care. It appears, though, that he may have had no intention of returning to his homeland, since efforts to dismantle the six-acre ashram in Poona began shortly after he departed.

As the time arrived for Rajneesh to move to the United States, he took a vow of public silence, explaining that it marked the next phase of his spiritual evolution. That said, he would continue speaking to a handful of trusted insiders, Ma Anand Sheela foremost among them and the woman to whom he would entrust the day-to-day functioning of what had become an extensive, international enterprise. And indeed, the venture truly was far-reaching. As of 1981, the Rajneesh entity operated four hundred meditation centers worldwide for use by 200,000 disciples.[24]

In America

In the same way that Bhagwan Shree Rajneesh left millions of dollars of debt behind in India, so he also left behind ten thousand sannyasins who had forfeited their earthly possessions to live and study with him in Poona. If these devoted men and women wished to remain in his presence, it would be up to them to come up with the funds to trek halfway across the world.

Rajneesh, himself, set out on this journey in late May of 1981, accompanied by a small crew of hand-selected disciples. Arriving in the United States on June 1st, the group settled in a thirty-room, hilltop mansion, an imposing edifice built in the manner of a Rhineland castle and overlooking the city of Montclair, New Jersey. Although the sect applied for the majestic estate to be tax exempt, the ensuing public outcry caused it to withdraw the request. The group also set about publicizing the programs offered by its local meditation center, running five national advertisements focusing on love, laughter, and other pleasurable experiences. "On July 22," reports the *New York Times*, "the Montclair center ran an advertisement in Time magazine headlined 'Sex' and reading, in part: 'Never repress it! Search all the nooks and corners of your sexuality.'"[25]

Predictably, the tantalizing promotional campaign aroused curiosity in some quarters, but it also invited criticism, most of all from the citizens of Montclair. From parents to public officials, local opponents, like those in Poona, condemned what they regarded as a free-love cult, a sham religion, and a moral threat to the community. This is despite the fact that the sannyasins, thus far, had not behaved in a manner that violated the law. Rather, the situation seems to have been that of a fundamental clash of values, with the incoming devotees' beliefs and lifestyles differing markedly from those of the established, larger community and causing the original residents to feel threatened. In all likelihood, the townspeople would have not been so unnerved had they been privy to the plans that were unfolding within the sect itself.

At precisely this moment, Ma Anand Sheela and her second husband were discreetly purchasing a vast amount of ranchland, over 64,000 acres of it, near the Cascade Mountains in Oregon, where Bhagwan Shree Rajneesh would take up residence at the end of August. Known as the Big Muddy Ranch, the property spread across rural Wasco and adjoining Jefferson counties. "This expanse was to become both a fully-functional urban center and a spiritual mecca for followers from around the world," write Chloe Prasinos and Steven Jackson.[26] It is not known to what extent Sheela and her spouse, when buying the $6,000,000 property, inquired into Oregon's land-use regulations that applied to the ranchland, but they surely would have been struck by the similarities to those laws that had vexed the sect in Poona. Just

as India's land-use policies prevented the Rajneesh operation from developing property that was not zoned for the ashram's purposes, so the regulations in Oregon would place firm limits on the organization's new digs in the Pacific Northwest.

Of all the American states in which to settle, the Rajneesh sect, for whatever reason, selected one having among the most restrictive land usage laws on the books. "Oregon's land use planning program has been cited as a pioneer in U.S. land use policy," write Hannah Gosnell and her colleagues, alluding to the state's 1973 Land Conservation and Development Act.[27] "The program was a response to rapid population growth in western Oregon during the 1950s and 1960s, which raised concerns in the state about the loss of forests and farm land to development."[28] Among the law's principal objectives: "the protection of forests and agricultural lands, and the protection and conservation of natural resources."[29] It was this same respect for the environment that had been on display in Wasco County when officials previously decided that the Big Muddy Ranch and surrounding territory—the property that Sheela and her husband were now acquiring for Rajneesh—would be protected from urbanization. To make sure it would not be used for such purposes, officials classified the land as "EFU," meaning "exclusive farm use" only.

Rajneeshpuram, Oregon

Shortly after the forty-nine-year-old guru, along with Sheela and a small team of sannyasins, moved onto the Oregon ranch, an ambitious effort was put forth to develop the site as rapidly and extensively as possible. The purported aim was to transform the existing overgrazed property into a natural paradise, a modern-day Eden boasting fertile farmland and a commune for those who worked it. What was not acknowledged was the sect's plan to construct a town as well, one with buildings and roads and schools, despite the "exclusive farm use" law. Equally misleading, the organization's leadership told local officials that the commune would be home to forty people, when in fact hundreds and eventually thousands of Rajneesh's devotees would take up residence at the site, all of them dressed in the sect's distinctive colors. These sannyasins would become known in the region as the "Orange People," a neutral descriptor that both locals and sannyasins considered inoffensive, although the nickname would later be replaced by such derogatory terms as the "Red Menace," "Red Vermin," and "Red Rats."[30]

In terms of the commune's demographics, the men and women who were devoted to Rajneesh's entrancing message of personal and spiritual liberation were a remarkable lot. "His feel-good philosophy attracted sannyasins who were overwhelmingly well-educated," writes Rachel Graham Cody,

"affluent urbanites with every intention of remaining in the world—on their own terms."[31]

Cody's observations were bolstered by a University of Oregon survey conducted within two years of the commune's founding.[32] Most of the sannyasins, it found, were Caucasians in their early thirties who were married and had relocated to the Oregon ranch from large cities. The genders were more or less evenly divided. In terms of education, 64 percent were college graduates, with 36 percent holding masters' degrees or doctorates, most often in the social sciences, arts, and humanities. Yet many of the locals failed to be impressed by the Rajneeshees' urban roots and prolonged schooling. "It didn't mean they had any horse sense," said Margaret Hill, the former mayor of a nearby town and critic of the sect.[33] Still, the record would show that the sannyasins were a politically astute group and thus well-equipped to take on the local community when matters took an unpleasant turn. This would happen the following year when the commune's leadership put into motion a strategy for land development that was unpalatable to the established populations of the two counties.[34]

The structure and composition of commune's leadership, it should be noted, was unique. Although Bhagwan Shree Rajneesh had taken a vow of public silence, he nevertheless conversed daily with his right-hand woman, Sheela, who, in turn, managed the commune with the backing of a coterie of female sannyasins. Rajneesh believed that women, not men, should run it, although he himself would remain the head of the venture. Even so, Sheela quickly acquired more and more power, including the presidency of the Rajneesh Foundation International, and ultimately rose to the level of de facto chief of the entire international operation. "Sheela controlled the finances and directed the operations of almost all of the organizations created to administer the cult's activities," says Seth Carus of the Center for Counterproliferation Research.[35] Sheela was also fast to force her decisions on the sannyasins, her management style being classically authoritarian. "Because she was accountable only to the Bhagwan, members of the cult had to accept her decisions or risk being expelled," Carus adds.[36] This included those decisions about which many sannyasins had doubts; specifically, doubts that the guru had been involved in the decision-making process, since the outcomes were at odds with his teachings. Significantly, it would be Sheela at the helm when the sect eventually entered into the ominous realm of bioterrorism.

In its formative days, the Oregon operation appeared to function smoothly and efficiently, with amiable relations between the orange and red-clad sannyasins and the residents of Antelope and The Dalles, the latter being a nearby town and the Wasco County seat. Townspeople regarded the Rajneeshees, as the sannyasins now dubbed themselves, as a benign curiosity, not as a threat as was the case in India and New Jersey. But the

locals' perception shifted in response to the Rajneeshees campaign of expansion and land-use conversion.

A few months after its founding, the commune began building houses and other structures on the rural land. As to the homes, EFU zoning laws permitted lodging for only ninety people on the ranch, so the sect found itself at odds with local authorities when it sought to dramatically increase its housing for the disciples who were arriving from around the world. Then, too, zoning laws required that the Rajneeshees conduct any business that was not farm-related at a location off the ranch, the nearest spot being the incorporated town of Antelope eighteen miles away. For the Rajneeshees, this proved to be an annoyance, having to drive to Antelope each time they wished to carry out business.

In an attempt to dispense with the troubling regulations, the Rajneeshees petitioned Wasco County for permission to hold an election, one that would decide whether the Big Muddy Ranch—that is, the commune—could incorporate. If so, it could alter the zoning regulations. As it happened, the county had no choice but to consent to the election, since the law required it if at least a hundred Oregon citizens petitioned for it. And so it was that the Rajneeshees handily prevailed in balloting that was held in May of 1982, and at once set about fulfilling their agenda.

After renaming the property "Rajneeshpuram"—the sannyasins whimsically called the commune "Rancho Rajneesh"—Sheela and her cadre of helpers turned to more commercial matters. "As a municipality," writes Carl Abbott, "the community now controlled land-use decisions and was no longer constrained as rural land, so long as it adopted a comprehensive plan that met Oregon's state planning goals."[37] Because the City of Rajneesh now had the authority to approve building permits, it sanctioned a flurry of them, over three hundred for business enterprises and residences. "That authority was the key to changing cow pastures into card rooms," reports *The Oregonian*.[38] By late 1982, Rajneeshpuram was home to a jewelry shop, numerous pizza parlors, cafés, and restaurants, a shopping mall with clothing stores in which the sect's characteristic orange and red garments were sold, and organizations such as the Rajneesh Foundation International and the Rajneesh Institute for Therapy.[39] During the brief lifespan of Rajneeshpuram, the commune would create "almost a million square feet of buildings, including a large meeting hall, and numerous residences, almost all of which [were] below building codes," reports the Center for Land Use Interpretation.[40] "[The Rajneeshees] hoped to blend spirituality and materialism while building an intentional community that could also serve as a destination resort and luxurious pilgrimage center for sannyasins from all over the world," writes sociologist Marion Goldman.[41]

During this period, the Rajneeshees' presence also increased substantially

in neighboring Antelope, previously a sleepy hamlet comprised of forty-seven people, among them retired ranchers seeking solitude in a settlement long known for it.[42] As could be expected, the sudden influx of Orange People caused the townspeople to feel as if the sect was, in effect, annexing their home. And flare-ups were inevitable. As the townspeople increasingly shunned the Rajneeshees, the latter, in turn, arrived in clusters in Antelope each day, harassing public servants by making excessive demands for needless services while also surveilling and photographing the residents as they went about their daily business. In addition, sect members bought up much of the town's real estate. And while the residents of Antelope, feeling overrun, made a desperate attempt in 1982 to disincorporate the town so as to discourage the Rajneeshees from using it for their business affairs, the sannyasins, whose numbers were now greater in Antelope, retaliated by ensuring that the disincorporation attempt failed at the voting booth.

Later that year, the Rajneeshees took even bolder action. When a second election was held, one for membership on the Antelope city council, the Rajneeshees, now comprising the majority of the town's citizens, won all but one of the seats. Exercising its power, the Rajneesh-controlled council wasted no time raising taxes, a tactic that would burden the elderly retirees subsisting on fixed incomes. The council also changed the town's name from Antelope to Rajneesh, as well as changing Main Street to Maylana Bhagwan Street and the city dump to Adolf Hitler Landfill and Recycling Center.[43] Longstanding residents complained that the identity of the laid-back western town was slipping away—or, more precisely, being hijacked—but their grievance fell upon deaf ears, with the sect, unapologetic, rebuffing the original residents' desire to preserve their way of life. In her memoir, Sheela blamed the victims—that is, the residents of Antelope—for the sect's aggressive annexation of their town, which the Rajneeshees now planned to transform into the entrance to their commune several miles away. "[T]hey forced us to take over the city," Sheela writes.[44] And other Rajneesh leaders insisted, if condescendingly, that the sect knew what was in the best interests of the original residents. "In a funny way I don't have a lot of sympathy for someone who wants to live in a stagnant place," remarked the newly elected mayor, Ma Prem Karuna.[45] Regarded by locals as an exercise in arrogance, the takeover of the town led to further hostility toward the sect. "Antelope, better dead than red," proclaimed a popular anti–Rajneesh bumper-sticker.[46] "[B]ag the Bhagwan," read another.[47]

For the Rajneeshees, there were other positive developments during this period in addition to assimilating the town of Antelope. The sect opened a discotheque, restaurant, and bar in Portland, the objective being to raise capital for the commune. Even more ambitious, it purchased the Martha Washington Hotel in the same city, a stately edifice constructed in 1923 and

designed in Georgian Colonial Revival style. Re-christened the Hotel Rajneesh, it catered to visitors traveling to the city of Rajneeshpuram.

Meanwhile, in Rajneeshpuram itself, construction flourished and included more houses, businesses, and an airstrip, with such ambitious growth proving to be a minor boon to the region's economy. In large measure, this was because the Rajneeshees purchased their equipment and building materials locally. All parties appear to have benefited, then, even if a sizable portion of the original land was no longer used for farming.

As for the land that did remain intact, it enjoyed a stunning rejuvenation. Not only did overgrazed pastures become lush once again, but new species of plant life imported by the sannyasins thrived in their new home. It was a transformation that was both swift and sweeping, and it was due largely to the innovative farming methods the Rajneeshees introduced to the region. Not surprisingly, the sect made a considerable amount of money from agriculture and other dealings during its early years in the Pacific Northwest. Unlike Bhagwan Shree Rajneesh, however, the preponderance of sannyasins did not personally share in the profits.

As had been the case in India, the guru's circumstances were strikingly different from those of his disciples. Whereas the latter lived humbly off the land, Rajneesh immersed himself in earthly possessions, acquiring, for instance, a cache of jewelry valued at over one million dollars.[48] Even more conspicuously, a Rajneesh trust held ninety-nine Rolls-Royces for him, the collection being the largest of its kind in the United States. Each day, Rajneesh would drive one of the luxury automobiles through the commune's streets, greeting his followers with the Namaste hand gesture.[49]

It is also worth noting that the Rajneesh operation in Oregon raked in a substantial amount of money from donations, money that came largely from the sect's hundreds of meditation centers around the world. The headquarters in Rajneeshpuram solicited these donations with claims that it needed financial help to protect itself from religious persecution. Among other allegations, the Oregon group insisted that the local community was impugning its reputation and, more ominously, threatening to harm the sannyasins themselves. And although many observers in the region looked upon these claims as a ploy to make money, it is true that the sect was indeed receiving threats. And not just threats. In July of 1983, a domestic terrorist bombed the Hotel Rajneesh in Portland, a man described at his trial as a member of a "militant, fundamentalist Muslim organization" who kept a bomb-making workroom in his Los Angeles home.[50] But the local population felt physically threatened, too. The Rajneeshees had assembled a security force of their own by this point, with sannyasins trained at the state's police academies and armed with Israeli-made Uzis and Galil assault rifles.[51] The previously sedate region was devolving into a powder keg.

Further ratcheting up the tension was a lawsuit filed at the end of 1983 by Oregon Attorney General David Frohnmayer. Taking the position that the incorporation of Rajneeshpuram, a religious city, breached that cornerstone of American democracy—the separation of church and state—Frohnmayer argued that the city was ineligible to exercise governmental powers or share in the state's revenues. Even more significant, he insisted that Rajneeshpuram, being in violation of federal and state constitutional requirements, disincorporate.

Descent into Bioterrorism

With conditions between the sect and the local community marked by mistrust and animosity bordering on rage, the stage was set for the sinister acts that would transpire in the summer and autumn of 1984. The catalyst: a Wasco County election scheduled for November, one in which three seats for county commissioner would be up for grabs. It was an election of the utmost importance, at least in the Rajneeshees' view, since two of the officials currently occupying the seats had been critical of the sect and were hindering its efforts to continue expanding in the region. Unseating this pair of commissioners was therefore of great consequence to the Rajneeshees' long-term growth project. And to ensure the desired result, Sheela and her accomplices set out to install at least two of their own sannyasins on the commission, thereby handing majority control to the sect. It was a turn of events the Rajneeshees would conspire to bring about through the one-two punch of voter fraud and bioterrorism.

The first scheme, voter fraud, entailed the launch of the sect's Share-A-Home campaign, which it touted as a humanitarian program geared toward helping the nation's homeless by transporting them to Rajneeshpuram to live, work, and grow spiritually. Busing in 4,300 street people, mainly veterans, the sect signed them up to vote as soon as they arrived, while instructing them to cast their ballots for the Rajneeshee candidates or face expulsion from the commune.[52] The illicit maneuver would quickly fail, however. Recognizing the bald attempt at voter fraud, Oregon's Secretary of State temporarily suspended the registration process and, pointing to Oregon's twenty-day residency requirement for voters, assembled a team of legal experts to interview each of the indigents in order to establish their eligibility. Not surprisingly, most of the new arrivals did not meet the state's criteria. The upshot: the Rajneeshees promptly canceled the Share-A-Home program and expelled the majority of the homeless it had bussed to Oregon.

The next stage of the plan was even more disturbing. Whereas the stab at voter fraud was designed to help the pro–Rajneesh candidates by packing

the rolls with sannyasin voters, the bioterrorism scheme was intended to undermine the non–Rajneeshee candidates by incapacitating those citizens who might cast their ballots for them.

Ma Anand Puja, the thirty-eight-year-old nurse who had earlier contaminated the drinking water of two county commissioners—the episode recounted at the outset of this chapter—is the person who prepared the pathogens that would disable the local citizenry. Fascinated with poisons and death and feared by the other sannyasins, she was suspected by some of having been involved in the 1980 death of Sheela's first husband, a man whose last moments were reportedly videotaped.[53] It was further rumored that Puja, whom the Rajneeshees called Dr. Mengele behind her back, had infected at least one sannyasin with HIV in order to observe the results.[54] "There was something about Puja that sent shivers of revulsion up and down my spine," recalls Satya Bharti Franklin, a former sannyasin, who added that the nurse was the "alleged perpetrator of sadistic medical practices."[55]

To sabotage the upcoming Wasco County election, Sheela, Puja, and a team of twelve lower-ranking sannyasins explored the idea of flying a small aircraft laden with bombs into the county courthouse with the pilot parachuting to safety.[56] Less theatrical but more pragmatic, they weighed the benefits of using biological agents to lay low the local population. Among the pathogenic microorganisms they considered was the bacterium that causes typhoid fever and the virus that causes hepatitis. They also discussed the protozoan *Giardia lamblia*.

As to the means of delivery, potential methods included depositing dead beavers into the local water supply, since beavers harbor microbes that are harmful to the human population. It was an approach that was ruled out, however, when the team learned that workers at the regional water plant had installed protective grids over the tanks. Other methods of adulterating the water supply were considered as well, one of which appears to have been attempted but ultimately failed. At the end of the day, it was the idea of contaminating the local food supply that prevailed.

Regarding the pathogen, the decision was made to deploy *Salmonella* enterica Typhimurium, a bacterium the Rajneeshees already had in stock. They had ordered it several months earlier from a commercial supplier, VWR Scientific in Seattle, in a standard transaction that did not raise eyebrows because it was purchased by the Rajneesh Medical Corporation.[57] The underlying reason for the acquisition: Puja wished to experiment with the pathogen at the Rajneeshees' biological research unit, which, in reality, was a secret germ warfare facility. Situated in a gorge far removed from the sannyasins' lodgings, it consisted of two dozen buildings where, in the summer of 1984, she instructed a lab tech to culture the *Salmonella* in substantial quantities. Although the technician initially objected owing to the dangerousness of the

microbe, he carried out the directive in due course. By all accounts, Puja could be very persuasive. Subsequent to this, Sheela, Puja, and their collaborators set about testing the pathogen's effects in a nearby town, the microorganism having been suspended in a liquid medium to make it dispersible.

One strike took place at an Albertson's Market, where Puja entered the grocery store with an eyedropper loaded with *Salmonella* and sprinkled it onto a bin of lettuce.[58] Another sannyasin, meanwhile, entered the Wasco County courthouse and deposited the same substance on doorknobs and urinal handles throughout the building. Still another moistened her hand with the liquid, then shook hands with an elderly gentlemen at a political gathering. And then there was the Rajneeshee who was dispatched to four schools and nursing homes in the area, where she was to slip the adulterated substance into the food supplies. Although the sannyasin did in fact visit the assigned locations, however, she later claimed that she could not bring herself to poison the pupils and elderly nursing-home residents.[59] Then again, she found herself "under close observation" by the staffs of the facilities, which is unsurprising in light of the sect's dubious reputation.[60] Unwilling or unable to complete the crime, the sannyasin wound up pouring the substance onto the street before returning to the commune. "When I got back I lied," she testified before a grand jury. "I said to them that I had done it."[61]

These early experiments, with the exception of the one that was purportedly aborted, were valuable in that they furnished Sheela, Puja, and their accomplices with hands-on experience with *Salmonella* poisoning. Such familiarity would prove advantageous when deploying the bacterium in the upcoming biological offensive.

Another advantage of *Salmonella* is that it would be difficult to detect, and it would most likely incapacitate, but not kill, those being targeted. And this was in line with the sect's objective of alarming and sickening the locals. As noted in Chapter Four, *Salmonella* poisoning is characterized by fever, headache, abdominal cramps, diarrhea, and bloody stools within hours or days of infection, and, while dreadful, usually resolves within a week. Among those in whom the infection may be more dangerous are young children, older adults, and ailing individuals with weakened immune systems. In some cases, hospitalization may become necessary, with *Salmonella* poisoning occasionally proving to be fatal if the infection spreads to the bloodstream or other parts of the body and remains untreated. While death resulting from the bacterial infection is infrequent, the illness itself would be sufficient to deter most people from leaving their homes until it had run its course, thereby making it an ideal agent for the Rajneeshees' purposes.

The poisonings were slated to take place in September. Even though the election was still several weeks away, Sheela and Puja decided to implement a mass contamination at this juncture to ensure that it would work. To this

end, the pair, explaining that they "wished to do an experiment," instructed a half-dozen trusted sannyasins to help spread *Salmonella* throughout The Dalles, according to a witness.[62]

This time, restaurants would be the main focus, with at least ten of them being targeted in The Dalles area, from taco shops and pizza parlors to large, full-service restaurants. All of the eateries were popular establishments, and were patronized not only by the townspeople but Interstate motorists as well.

According to a retrospective account prepared by Oregon Congressman Jim Weaver and preserved in the Congressional Record, the Rajneeshees' bioterror plot entailed two waves of mass poisonings. The first was a small, limited attack initiated on September 10th, with a second being a much larger one implemented on September 23rd. The latter was a Sunday, and therefore a busy day for The Dalles' eateries.[63]

To execute their plot, the Rajneeshees, in both attacks, dispensed with their standard orange and red garb and donned street clothes in order to appear less conspicuous, then dined in the targeted restaurants. During their meals, they discreetly slipped *Salmonella* into food products, even into the coffee creamers, with special attention to the offerings of salad bars.[64] "Using a plastic bag filled with a brown liquid they nicknamed 'salsa,' they poured the salmonella filled slurry directly into salad dressings, splashed it on produce, put it in water, and generally got it everywhere they could," writes journalist Dylan Thuras.[65] Unfortunately for the residents of The Dalles, the attacks were successful. "Within hours, emergency rooms were flooded with sick patients," writes Scott Keyes.[66]

Typical of those arriving at the hospital were the Turners, a married couple and owners of a furniture store who, along with their two-year-old daughter, were poisoned at Sunday brunch.[67] Also representative was the Carlton family, the father being a state trooper who, along with his wife and three-year-old son, ended up in the emergency room after eating the bacteria-laden food.[68] Perhaps most disturbing was a couple, a husband and his pregnant wife, whose baby would be born displaying the effects of *Salmonella* poisoning. And so it went, with a staggering 751 people suffering from gastroenteritis as a result of the attacks, forty-five of whom required hospitalization.[69] Also worth noting, the total number of illnesses, while steep, does not include the Interstate motorists who were not residents of The Dalles but had simply stopped briefly in the town to enjoy a meal before continuing on to their destinations. "The actual number of victims was probably much higher because many out-of-state travelers may have been infected as well," writes Carus.[70] Fortunately, no one is known to have died, but the fact that over seven percent of the population of The Dalles was stricken made the ordeal the largest *Salmonella* outbreak in American history and the largest bioterrorism attack in modern times.

Regarding the response of public health workers, while some of the residents of The Dalles were certain it was the work of the Rajneeshees, health officials remained open to other possibilities and set about looking into the matter without delay. On September 17, in the wake of the first wave of infections, a member of the Wasco-Sherman Public Health Department began reviewing the incoming reports of *Salmonella* poisoning in The Dalles and, the following week, notified the state health department of the situation. The concern was that the number of infections was mounting, with a significant percentage of the cases necessitating hospitalization. Twenty-four hours later, the state health department reached out to the Centers for Disease Control in Atlanta and requested the federal agency's help in pinning down the cause of the outbreak. And within another forty-eight hours, a pair of CDC medical epidemiologists were on the scene. For the next six weeks, a team drawn from these county, state, and federal agencies worked together to track down the source of the infections.[71] "With an outbreak this large," reads a CDC account of the event, "investigators were initially optimistic that they would be able to find a common pattern or thread that could explain the occurrence of illness in so many people."[72]

Investigative procedures included analyzing the stool samples of those diagnosed with gastroenteritis coupled with one-on-one interviews with the victims about their recent experiences. For the purposes of comparison, the team also interviewed hundreds of people in The Dalles area who had not been ill. The plan was to sift through these personal accounts until a mutual factor was identified; a specific item, practice, or location common to all of those who had become sick but not to those who had remained healthy.

The ensuing laboratory analyses confirmed that *Salmonella* enterica Typhimurium had indeed been the causative agent in the avalanche of illnesses. The results of the interviews were another matter, however. Although the team queried the victims about their food preparation practices as well as the food products they had eaten prior to becoming ill, a common denominator did not emerge. "[T]he investigators could not identify a single food item or contamination of a single food item that could have accounted for the *Salmonella* Typhimurium gastroenteritis outbreak," reads the CDC account.[73] One pattern stood out, though: a disproportionate number of victims had consumed a variety of foods at the salad bars in certain restaurants.

Curiously, when laboratory analyses were conducted on samples of the contaminated foods in these bars, none of the ingredients used in preparing them was found to contain *Salmonella*. An unexpected finding, it could only mean that the bacterium was deposited on the food after it had been prepared and placed on the salad bars.

Inspections of the different types of salad bars implicated in the poisonings also revealed striking incongruities. For instance, one restaurant,

The Portage Inn, had a salad bar in its main dining room that was open to the public, and it operated a second salad bar in its private dining room, which was open only to banquet guests.[74] In both the public and private dining rooms, the same food was served, including the contents of the bars, and for this reason it was expected that the patrons of both salad bars would have been infected. Yet the investigative team discovered that it was only the patrons of the public bar who had contracted *Salmonella*; those who had dished up their food from the private one remained healthy. At least at The Portage Inn, then, this suggested that whatever or whoever had contaminated the food after it had been placed on the buffet-style bars only had admittance to the public one, such as a customer. A restaurant employee would have had access to both the public and private bars and therefore could have contaminated the food in the two of them.

Then there was the nature of the food itself. *Salmonella* was found in foods that were not naturally hospitable to the bacterium, such as lettuce salad, while being absent in many of those in which one would expect to find it—eggs, milk, fish, and chicken. And while several restaurants under investigation were discovered to have tainted lettuce, it had been grown by, and purchased from, different farms and vendors. Conversely, a name-brand product might be contaminated at one restaurant, but an identical product might be pathogen-free at another eatery. To many observers of the investigation, it was obvious that the massive *Salmonella* outbreak, in failing to correspond to any known pattern of food contamination, was anything but a naturally-occurring phenomenon.

In the end, however, the public health team pointed its finger at the restaurants' staffs, claiming that unhygienic practices had fouled the food at the ten establishments. A highly improbable conclusion, it meant that multiple workers at multiple eateries had engaged in unsanitary practices on precisely the same days and with the same pathogen at play. Not only that, the workers had, for the most part, contaminated those foods in which *Salmonella* is seldom found, and only after the food had already been prepared and made available to the public. Of course, it was an explanation that beggared belief. As to why the team did not consider the possibility of a Rajneesh-engineered bioterrorism plot, particularly when witnesses had reported observing Rajneeshee diners behaving oddly in the affected restaurants, the reason is unclear. Some have suggested it was because the evidence of a bioterror attack, while compelling, was circumstantial, while others emphasized the non-forensic nature of the public health team.[75] In any event, most people remained perplexed by the team's pronouncement and could not fathom how the extensive investigation could culminate in such a conclusion.

For the next several months, food handlers would continue being blamed for the historic *Salmonella* outbreak. But helping to absolve them

would be Congressmen Jim Weaver, convinced, as he was, that the restaurant workers were not behind the poisonings. "I received daily printouts from the CDC investigation that made it only too clear that it was virtually impossible for the food handlers to be the source," says Weaver.[76]

His frustration mounting, the congressman, on February 28, 1985, stood before the U.S. House of Representatives and accused the Rajneeshees of having orchestrated a sweeping bioterror attack on the population of The Dalles. After summarizing the case and the public health team's findings, Weaver wrapped up his speech with a formal request. "I conclude my story by calling for an intensive police investigation of the salmonella outbreak in The Dalles," he said.[77]

Despite the fact that the lawmaker had presented a mountain of persuasive circumstantial evidence to support his argument, Weaver's allegations and his call for an formal inquiry were rebuffed. The Rajneeshees, as could be predicted, feigned indignation and vehemently denied his accusations, crying religious persecution. It was the sect's knee-jerk response to criticism. Yet public health officials were antagonistic as well. "Quotes from the health authorities stating I was wrong were printed in the Oregon press, condemning my speech," Weaver wrote in the *New York Times*.[78]

For the time being, then, there would be no investigation into the possibility that the religious sect had perpetrated a bioterror attack on an American city. The final report that was released in 1985, like the preliminary one, persisted in laying blame at the feet of The Dalles' restaurant workers. "The report infuriated locals, who were convinced that the cult was responsible for the outbreak, as well as law-enforcement officials, who now lacked the 'probable cause' needed to open a criminal investigation of the group," writes Judith Miller and her colleagues.[79]

At the commune, meanwhile, Bhagwan Shree Rajneesh maintained his public silence, except when compulsory. He broke it, for instance, when the Immigration and Naturalization Service ordered him to present himself to its local office and answer its agents' questions. Among other misdeeds, the INS suspected the guru of officiating at hundreds of sannyasin marriages in order to enable the foreign partners in the relationships (the couples were not actually romantically involved) to be granted U.S. citizenship.

Also during this period, 1984–1985, the guru continued driving his beloved Rolls-Royces around the grounds of the commune each day, as well as using drugs much of the time. "[H]e was taking large doses of Valium and inhaling nitrous oxide, sometimes twice daily," writes James Gordon, the aforementioned psychiatrist who had become deeply involved with the sect.[80]

Beyond the seemingly contented guru, however, life within the city of Rajneeshpuram had come to be characterized by internal strife and power struggles, with scores of sannyasins harboring immense hostility toward

Sheela. Widely disdained, she was accused of usurping the leader's power for her own ends.

Outside of the gates of the commune during this same period, the sect, having given up trying to rig the county commissioner election, was still battling with local officials over land-use regulations and other legal and political matters. Then, in the latter part of 1985, the dam gates broke and the sect's downward spiral into bioterrorism at The Dalles was thrust into the bright glare of the national media, together with a host of other illegal acts.

Paradise Lost

It was on September 16, 1985, in Rajneeshpuram, that Bhagwan Shree Rajneesh dispensed with his vow of silence and announced in an impromptu press conference that Sheela and nineteen of her cronies, Puja among them, had fled the country. The "gang of fascists," as he called them, were en route to Europe.[81] Explaining that he had just been informed that this renegade group had committed all manner of crimes, he claimed as his sources those loyal sannyasins who had long shunned Sheela and her accomplices and had stayed behind after the apostates bolted.

During the press conference and a follow-up presser the next day, Rajneesh claimed that Sheela and her minions had mismanaged the commune's finances, stolen large sums of money, committed arson and bombings, and tried to poison his dentist, his personal physician, and a district attorney. The gang had targeted him too, he declared, seeking to "kill or incapacitate" him using substances concocted in "a secret tunnel behind Sheela's house."[82] Other allegations: the group had tried to contaminate the local water supply, and had also sought to perfect a mass-casualty biological agent that would be undetectable by standard methods and would eliminate its targets slowly, over the course of time. Lastly, Rajneesh stated that he suspected the gang of having engineered the 1984 *Salmonella* outbreak in The Dalles. Denouncing Sheela and her minions for having created "a Stalinist regime," the religious leader asked officials to visit the site and investigate his allegations.

Reaction to Rajneesh's press conference ranged from shock, disbelief, and in some cases relief among the sannyasins, to the suspicion that the guru had known all along about the gang's illicit deeds and was simply being disingenuous. Now that the "fascist gang" had fled the country, it was suspected, he was desperately seeking to distance himself from it by feigning ignorance and indignation. A high-ranking sannyasin who had participated in the *Salmonella* project, for instance, a man who was later placed in the federal witness protection program after testifying for the prosecution, reported that Sheela, prior to implementing the bioterrorism plot, played a tape-recording

of the guru responding to her plan to poison the people of The Dalles. "If it [is] necessary to do things to preserve [my] vision, then do it," Rajneesh said on the tape, according to the witness who listened to it.[83] Sheela interpreted the guru's response on the barely audible recording, a tape that may or may not have been altered, to mean that he approved of the proposed bio-attack.[84]

As to the investigation, it commenced on October 2nd, with fifty investigators arriving at the commune and establishing a base of operations for what would be an across-the-board inquiry. Among the participating organizations were the U.S. Customs Service, the Federal Bureau of Investigation, the Oregon State Police, and the U.S. Immigration and Naturalization Service, with the National Guard being present as well.[85] The multi-agency team was assembled by David Frohnmayer, the Oregon Attorney General who, as noted earlier, was pursuing a case against the city of Rajneeshpuram on the grounds that its incorporation violated the separation of church and state. (Investigators would soon unearth the sect's hit list, and on it they would find David Frohnmayer's name, along with that of U.S. Attorney Charles Turner and nine others in the fields of politics and journalism.[86])

Scouring the massive Rajneeshee compound, investigators discovered not only the secret tunnel under Sheela's house, the one the guru had described in his press conference, but also the buildings that comprised Puja's germ warfare factory. Here, investigators collected potential evidence of the type that would likely be present in most any laboratory, such as masks and gowns, syringes, and lab equipment, but they also tagged a more telling object: a freeze-dryer Puja had purportedly purchased so she could culture the AIDS virus. Fortunately, it was an attempt that failed. Also in the search, the team found suspicious manuals, including *How to Kill: Volumes 1–4*, *The Anarchist Cookbook*, *The Perfect Crime and How to Commit It*, *Deadly Substances*, and *The Handbook of Poisons*.[87] Most incriminatingly, though, the team discovered a handful of invoices documenting the numerous pathogens Puja had ordered and which bioterrorism experts associate with biowarfare, among them the microorganisms that cause typhoid fever, tularemia, shigellosis, gonorrhea, and certain types of respiratory and urinary tract infections.[88] Dated September 25, 1984, the pathogens had arrived at Puja's laboratory in the midst of the *Salmonella* outbreak in The Dalles. Equally damning, the strain of *Salmonella* enterica Typhimurium that Puja had ordered from the medical supply company matched that which was recovered from the victims' bodies. Officials therefore concluded that the Rajneeshees had in fact planned and executed the biological attacks in The Dalles, and quite possibly carried out poisonings in other Oregon locations as well, among them Portland and the capital city of Salem.

And there was more to be discovered beyond the evidence of bioterrorism. "Investigators uncovered what remains the largest, most sophisticated illegal electronic eavesdropping system in American history," writes Miller

and her co-authors. "[A] Rajneesh security team had bugged entire floors of their [on-site] hotel, many of their disciples' homes, the ranch's public pay phones, the Zorba the Buddha café, and even the Bhagwan's bedroom."[89] And there was evidence of many other criminal acts as well, quite serious ones.

Indictments would swiftly follow on October 23rd, and would charge Bhagwan Shree Rajneesh with violations of federal immigration laws, while also charging others in the sect, Sheela and Puja foremost among them. And although Rajneesh would be hustled aboard a Lear Jet and be flown eastward shortly before the indictments were handed down—presumably, the plan was to sprint him out of the country—police were on the tarmac when he touched down in North Carolina. At the airport in Charlotte, they arrested and charged him with lying to the Immigration and Naturalization Service about his intent to remain in the country temporarily for medical treatment, and for performing four hundred counterfeit marriages so his followers could gain American citizenship. Besides the religious leader and his disciples traveling with him on the jet, authorities also seized over twenty suitcases stuffed with cash in various currencies, designer eyewear, watches, jewels, and a pistol.

As for Sheela, the mastermind of the sect's most audacious deeds, the authorities tracked her down in southern Germany, where she had recently appeared on a television broadcast. Arresting her, they charged the sect's unsanctioned leader with, among other crimes, arson, immigration fraud, and attempted murder, and extradited her to the United States. The latter allegation pertained to the two county commissioners whose water had been spiked while they were inspecting the commune and to the mass poisoning of the residents of The Dalles, which was classified as "product tampering." It was the first major use of the recently-enacted "Tylenol laws," created after an unknown perpetrator laced the popular painkiller with potassium cyanide.

Regarding Puja and the eighteen other sannyasins who also fled to Germany, officials traced them to a luxury hotel and arrested them, too, with the charges against Puja being the most serious. Then there were those disciples who had remained in the United States, but who had nevertheless taken part in the sect's wrongdoing and who would face criminal prosecution as well. All told, thirty-four sannyasins in the U.S. and abroad were charged with crimes ranging from burglary, racketeering, drug trafficking, and arson, to electronic surveillance, conspiring to commit product tampering, immigration violations, and attempted murder.[90] Most would not serve time in prison but would instead cooperate with the prosecution in turning over evidence.

Legal Consequences

The Rajneeshees' days in court would be crushing for the sannyasins who had devoted their lives to the commune and to their leader. And the

collapse of the American incarnation of the Rajneesh operation would be swift and absolute.

On November 14, 1985, Bhagwan Shree Rajneesh entered an Alford plea to two felony charges, meaning that he formally pleaded guilty even though he maintained that he was actually innocent. Paying four hundred thousand dollars in fines, he received a ten-year suspended sentence with the understanding that he would leave the country within five days and not to return for at least five years. Even then, he could return only with the express consent of the American government. Vowing never to step foot in the United States again—the moneyed maharishi now called the U.S. a "wretched country"—the guru returned to India, where he struggled to reestablish his base.[91]

Back in his homeland, Indian officials monitored the discredited spiritual leader, as well as keeping an eye on his disciples. Three weeks after his American and European staff arrived to join him, officials voided their visas, with the guru, in protest, seeking to relocate to another country. After being refused admission by numerous nations, he returned to India, where he would remain.

"Lonely, bankrupt, banished from the United States, humiliated by the immigration authorities of a dozen other countries, the sensual sage is now chasing anonymity in the suburbs of Bombay," journalist Sundeep Waslekar wrote in 1987.[92] Yet Waslekar's assessment, while accurate, was incomplete. Changing his name to Osho, a Japanese title of respect and the word for a highly-evolved Buddhist monk, Rajneesh continued promulgating his doctrine of enlightenment from his site in India until his death in 1990. Regarding the cause of death, the fifty-eight-year-old's demise was the result of a heart attack, according to official records, although it was speculated that it was actually due to AIDS, murder, or other medical conditions or acts.

On November 29, 1985, three of the restaurants that the Rajneeshees targeted with *Salmonella* in The Dalles sued for damages, with their claims climbing well into the millions of dollars. One week later, the State of Oregon filed additional charges against numerous Rajneesh-owned corporations and organizations, declaring that they had engaged in illegal activities. The federal law used to charge the Rajneesh operations was the Racketeer Influenced and Corrupt Organizations Act (RICO). Under the agreement that the various parties signed the following year, the Rajneeshees would pay five million dollars to the state of Oregon, to selected residents of The Dalles, and to the restaurants the sect had been singled out for the bio-attacks.

Meanwhile, on December 10, 1985, the church-state lawsuit against the City of Rajneeshpuram, the one that Attorney General Frohnmayer filed in 1983, went before the court. The decision: the incorporation of Rajneeshpuram had violated the separation of church and state clause, therefore the city was to be disincorporated. As it happened, the decision was overturned in

1986, but by this time it had little impact because the commune had been abandoned.

Also that same year—July 22, 1986, to be exact—Ma Anand Sheela pleaded guilty to federal and state charges, the former consisting of wiretapping, conspiring to tamper with consumer products, and immigration fraud, and the latter involving arson. It seems she had set fire to the Wasco County planning office at one point.[93] Puja also pleaded guilty to wiretapping and conspiring to tamper with consumer products. Each of the women received a prison sentence of four and a half years, with the stipulation, in Sheela's case, that she exit the United States after serving her sentence. And indeed, she moved to Switzerland after her release from prison, where she would be known as Sheela Birnstiel and would buy and operate nursing homes.

As for the town of Antelope, it regained its original name in due course, even as a wealthy Montana rancher purchased the nearby Rancho Rajneesh and converted it to a seasonal camp for Christian youth. Known today as the Washington Family Ranch, it plays host to an estimated one thousand children and adolescents each summer.

Unfortunately, those businesses that the Rajneeshees targeted would not be as lucky. "Most of the contaminated restaurants never recovered from the poisonings," writes Miller and her colleagues. "Dave's Hometown Pizza was the only restaurant to survive long after the attacks at its original location and under its original ownership."[94] In the main, this was because the public psyche had been indelibly stamped with an association between the ten restaurants and the *Salmonella* bacterium. An irrational but predictable fear of contamination, the people of The Dalles and Interstate travelers thereafter avoided even the remote possibility of infection at these eateries despite of the fact that the establishments had been decontaminated and certified as safe. In this way, the Rajneeshees' attack continued harming the city of The Dalles long after the assault itself.

◆ 7 ◆

Tokyo Under Siege

The Aum Shinrikyo Biochemical Attacks

In the shadow of Mount Fuji, Japan's majestic and sacred volcano, once stood the village of Kamikuishiki, a pastoral community renowned for its rolling meadows and breathtaking view of the nation's tallest peak. Long known for its tranquil ambience, the settlement exuded an easygoing attitude that residents found appealing and visitors sought throughout the year. But its serenity would be shattered forever in the spring of 1995. Early one morning, police officers in gas masks arrived in droves, stormed into a religious complex situated at the edge of the hamlet, and launched a week-long search of the premises. Their revelations would shock not only the villagers, but the entire East Asian nation and the global counter-terrorism community as well.

Front and center was the sect's three-story "religious sanctuary." Inside, police noted that its ventilation system was a remarkably sophisticated one, the type normally found in industrial operations and a discovery signaling that the lackluster, concrete edifice was something other than a spiritual refuge. Continuing their search, authorities came upon a cache of explosives and, even more alarming, a series of laboratories stocked with equipment suggesting that the sect had been experimenting with chemical warfare. Confirming this suspicion were the chemical compounds recovered at the scene, among them sodium cyanide, phosphorus trichloride, sodium fluoride, acetonitrile, and isopropyl alcohol, the latter four agents being the components of the lethal nerve gas, sarin. The amounts, moreover, were staggering, a supply so enormous as to require hundreds of large metal drums to store them and a fleet of forklifts to transport them. "Police have found tons of chemicals that newspapers here estimated could make enough sarin to kill millions of people," the *New York Times* reported while the investigation was still underway.[1]

A further search revealed that the sect had been exploring other methods of mass destruction as well. In two more buildings that contained laboratories, authorities came upon a six-foot-tall apparatus known as a germ incubator, and nearby they discovered a storage unit in which 160 casks of peptone were stockpiled. A protein derivative used to grow bacterial cultures, the presence of the latter substance in such immense quantities meant the organization had almost certainly been experimenting with biowarfare. Supporting this notion, a substantial amount of *Clostridium botulinum*, the bacterium that causes botulism, was retrieved from the labs, along with vials containing the Ebola virus and the bacteria that cause anthrax infection and Q fever in humans.

Over the next three years, more disturbing truths would come to light about the sect's forays into bioterrorism. For one, the organization had constructed an eight-story, windowless building near Tokyo devoted exclusively to weaponizing microbes, and it was in the process of erecting a second one intended for advanced bioweaponry near Mount Fuji. For another, the sect, in the early to mid–1990s, had secretly carried out numerous small-scale bioterror attacks across Japan, with pathogenic bacteria being deployed in all of them.

As to the reason for the 1995 raid at the sect's Mount Fuji headquarters, the one exposing its vast WMD operation, it was in response to a monstrous chemical attack in downtown Tokyo. The first large-scale terrorist offensive of its kind in the modern age, it was the product of a cadre of scientists who were members of the Aum Shinrikyo religious sect, a controversial group often described as a doomsday cult. The attack was meant to spark profound social unrest in Japan, with the ultimate aim of setting off a global apocalypse and ushering in a new spiritual era.

The Making of a Sect

From the beginning, the Aum Shinrikyo sect promised to provide a path to enlightenment. Pairing the Buddhist mantra "Om," or Aum, with the phrase "Supreme Truth," or Shinrikyo, the name embodied the group's lofty mission according to its founder Chizuo Matsumoto, who would later become known as Shoko Asahara. A man whose life experiences were at once unusual and painful, they would, in due course, contribute to the anguish of countless others.

Born in Yashushiro, Japan, on March 2, 1955, Asahara (Matsumoto) was diagnosed with infantile glaucoma shortly after delivery, a congenital condition rendering him sightless in his left eye and with only thirty percent vision in his right one. His parents, unfortunately, were impoverished and

thus unable to provide for his special needs—they lived in a dirt-floor hovel with their three other children—and for this reason they sent him to live at a government-run boarding school for the blind when he was six years old. Here, Asahara would remain for the next fourteen years. It would not be a pleasant stretch for him, nor for those who had to live and attend classes with him.

His former teachers and fellow students recall that Asahara appeared to feel rejected by his parents' decision to send him away from home, as well as ashamed of his family's destitution and embittered by his visual impairment.[2] "Asahara," says classmate Ikuo Hayashi, "often talked about his sense of loss, his feelings of betrayal by his parents, and his profound feelings of loneliness and fear at being alone in a strange place."[3] These feelings of dejection and indignation would persist throughout Asahara's lifetime and color his actions over and again.

During his school years, the future guru was also viewed as short-tempered and belligerent, and was quick to bully the other students. Most often, he targeted those who were easy marks, such as younger pupils who, unlike him, were totally blind and therefore at the greatest disadvantage. "He would force them to pick up his noodles and cakes," says a former classmate, with others reporting that Asahara intimidated his classmates into giving him their money and belongings.[4] Yet even as he grew older, Asahara didn't change in this respect except to become more antagonistic and arrogant, alarming his teachers and peers with threats of violence—he once warned that he would torch the school—and declaring matter-of-factly that he planned to become the prime minister of Japan. "A dormitory roommate described living with him as 'hell,'" write David Kaplan and Andrew Marshall.[5]

Shortly after graduating from the residential school at the age of twenty, Asahara was arrested for assault when he became combative during an argument.[6] A year later, he sought entry into college, but failing the admissions exams at Tokyo University and Kumamoto University, he embarked instead upon an informal study of traditional Chinese medicine. During this same period, he also married and used his in-laws' money to set up an acupuncture practice. Although it proved to be a lucrative business, it turned out to be a risky one because it involved the prescription of herbal potions and Asahara was not a registered pharmacist. Even more damning, some of his treatments appeared to be fraudulent. "One tonic, called Almighty Medicine, was simply tangerine peel in alcohol solution," write Kaplan and Marshall. "[Asahara] charged up to $7,000 for a three-month course of treatment."[7] It was products like Almighty Medicine that caused a Japanese court in 1982 to convict Asahara of practicing pharmacy without a license as well as selling unregulated medications. The judge jailed him, fined him nearly two thousand dollars,

and thereby brought to an end his brief excursion into herbal medicine.[8] But Asahara remained unbowed. "Humility was not one of his more striking attributes, for his self-image was suffused with a sense of grandeur and destiny," writes Ian Reader, a professor in the Religious Studies Department at Lancaster University.[9]

For a fresh start, Asahara, determined as ever, turned his attention to the study of astrology and traditional and emergent religions, among them Taoism and New Age systems, and through such explorations became inspired to join the Agon-shu sect. A twelve-year-old Japanese "new religion," most observers were critical of Agon-shu and dismissed it as a cult. Its philosophy was based on a unique interpretation of Buddhism, one that stressed the importance of relinquishing one's ties to society, which was said to possess negative karma that could be transmitted to the individual. It was a view Asahara would come to embrace and henceforth promote. But while he respected the teachings of the Agon-shu sect and would eventually borrow some of its concepts, he exited the group three years later and established a small yoga school in Tokyo, one that he registered as Aum, Inc.

At first, the operation was predominantly secular, with Asahara combining yoga with psychic capacities and claiming to possess the ability to levitate. To prove his talent in defying gravity, he circulated photos, albeit unconvincing ones, purportedly showing him hovering in the lotus position. In due course, he moved beyond such theatrics, although he did remain attracted to mysticism, including the prophecies of the fourteenth-century French physician and astrologer Nostradamus, whose forecasts Asahara would later fuse with his own predictions.

Ian Reader has proposed a reason for Asahara's enduring affinity for mysticism and the supernatural, and it stems from the powerlessness the visually-impaired guru endured as an impoverished, displaced youth. More to the point, Asahara's early circumstances and experiences may have instilled in him the need to transform himself into a commanding presence, even a transcendent one; a need suggested by his childhood fantasy of becoming Japan's prime minister, and later the trailblazer of a new spiritual era of humanity. Supernatural forces, he appears to have believed, could help bring about such a transformation. "This interest in esoteric practices, mystery and psychic powers implied a rejection of and an alternative view to the overarching paradigms of the secularised, scientific, rationalist worldview," says Reader. "It was, in effect, suggesting that the human being, rather than being bound to the world and at the mercy of rationalised events and physical limitations, contained the potential for transcendence on the spiritual and physical levels."[10]

During subsequent treks to the Himalayas and northern Japan which Asahara claims to have made, he persisted in his quest for enlightenment.

And it was during one of these journeys that a Hindu wise man ostensibly told to him that an apocalypse was imminent, one that only gentle mountain hermits ("shinsen") would survive. As the story goes, Asahara, now in possession of this prophetic knowledge, returned to Tokyo convinced that he alone could save the world from annihilation. To this end—and with the wholehearted support of three dozen of his yoga students—he formed an organization and in 1986 bestowed upon it the name Aum Shinsen-no-Kai. The title translates as the "Aum Mountain Hermits' Society."[11] Its short-term objective was to prevent a global cataclysm, while its long-term goal was to usher in a new spiritual age with Asahara himself guiding the masses.

Within a year of establishing the organization, Asahara set about refashioning it to render it more religious in nature, and he placed special importance on asceticism. Offering a customized version of Buddhism infused with elements of Hinduism and Christianity—he declared himself to be the incarnation of Christ—Asahara tightened the sect's organizational structure, separated its members from their loved ones and from society at large, installed within the sect severe controls, and, not coincidentally, acquired a lucrative livelihood in the process. In the fullness of time, his personal fortune, along with that of his organizations, would exceed one billion dollars. "Monks and nuns had to sever all ties to their families and friends and give everything they owned to Aum Shinsen-no-Kai to demonstrate their lack of attachment to the mundane world and their commitment to the community," write Richard Danzig and his associates.[12]

Continuing to evolve, Asahara, in 1987, changed the sect's name to Aum Shinrikyo and officially changed his birth name, Chizuo Matsumoto, to Shoko Asahara. By this point, the organization's orientation had become wholly religious, with the guru reiterating his prediction that human civilization was about to be supplanted by a more spiritual one. New and enlightened, it would initially be populated exclusively by his disciples, whom he maintained were superhuman.

Asahara, at this juncture, also redoubled his demands for self-denial among the sect's membership; this, despite the fact that he himself continued engaging in sexual relations both with his wife and with a number of female disciples, eventually fathering six children with his spouse and an unknown number with the sect members.[13] He sought to extend the reach of Aum Shinrikyo too, establishing a publishing program and, as its inaugural project, producing the journal *Mahayana*. The result of such efforts: a dramatic spike in membership—the number of participants soared into the hundreds and soon, the thousands—coupled with the formation of Aum branches throughout Japan and beyond.

In terms of the sect's membership, it attracted young adults who were dissatisfied with the status quo and in search of a deeper, richer meaning in

life. As well, it enticed a considerable number of older members, and for the same reasons, among their ranks being scientists and other professionals. And as the membership soared, so did the sect's wealth. "Devotees flocked to the Mount Fuji center, where the cult charged over $2,000 for week-long meditation seminars," write Kaplan and Marshall.[14] It was only one of many profitable marketing ventures.

As it happened, within a few months of these seemingly positive developments, matters began to take a more troubling turn. For one thing, Aum Shinrikyo's application for recognition as a religious organization, a legal status that would entitle it to tax breaks and other benefits, was turned down by the Japanese government. Although it would later be approved, this initial rejection enraged Asahara, prompting him to cry religious discrimination. And there was another unsettling development: people began dying.

"In September 1988 the first unnatural death occurred among Aum members when Majima Terayuki died due to excessive ascetic practice," writes Martin Repp, editor of the journal *Japanese Religions*. "In order to avoid police investigation, Aum's leaders ordered his body to be burned and then disposed of, which is illegal."[15] In response to the disciple's death, concerned relatives of Aum members began demanding that the organization allow their loved ones to resume contact with their families, while disillusioned ex-members sought an official investigation into the sect's questionable activities.

Matters became even more alarming as the organization added murder to its repertoire. First, in early 1989, an Aum Shinrikyo hit team strangled one of the group's members, Shuji Taguchi, who was preparing to the reveal wrongdoing by the organization. Asahara ordered the assassination and handpicked the disciples who could carry it out. Then, later that same year, a more notorious trio of killings took place as an indirect result of a series of exposés by the Japanese press.[16] The reports, which were scathing, presented the sect as a counterfeit operation that was raking in enormous sums of money and headed by a man who whose credentials were less than pristine. "Asahara was portrayed as an exploitative and manipulative leader with an overbearing ego," says Reader, a representation that fueled Asahara's paranoia and convinced him that he and his organization were the targets of the government and the media.[17] As things stood, he already believed the sect was a target of the British royal family and Jewish interests. The result is that the guru became even more convinced that he must assume power in Japan before public sentiment turned against him and the entire Aum enterprise.

As to the murders, they would transpire after the illuminating newspaper accounts were published, a time when the loved ones of Aum members joined forces with a band of ex-members to form an organization called the Aum Shinrikyo Victims' Society. For legal representation, the assemblage turned to Sakamoto Tsutsumi, a respected attorney who set about scrutinizing the

background and current status of the sect and, in so doing, came to be perceived by Asahara as a grave threat.

Regarding Tsutsumi's discoveries, one of the first concerned a fundamental myth of the Aum Shinrikyo organization, namely that Asahara's DNA had been analyzed and was found to be uniquely non-human. Tsutsumi determined that the assertion was false, that Asahara's genetic code had never been examined. Moreover, when geneticists at Kyoto University did analyze the guru's DNA at the attorney's request, they found it to be ordinary in all respects. Additional evidence that Tsutsumi gathered, which apparently was voluminous, likewise shed a harsh light on Asahara's spurious claims and the sect's disturbing, even abusive, practices. But most unsettlingly to the guru was the fact that the attorney, who could not be bought off or otherwise "persuaded," planned to place the incriminating materials before the public. Of course, Shoko Asahara knew this would bring about his own downfall and the collapse of his organization.

So it was that Asahara issued an order to eliminate the troublesome Tsutsumi, with one of the men he selected for the job being Tomomitsu Niimi, the same high-level member who had killed Shuji Taguchi earlier that year. And indeed, Niimi and his collaborators proceeded to break into the lawyer's home, where they found Sakamoto Tsutsumi and his wife in a bedroom and strangled the two of them. As she was fighting off her killers, Mrs. Tsutsumi begged that the couple's fourteen-month-old son not be harmed. "Please save the child, at least," she said, according to a *New York Times* report.[18] Unfortunately, the infant began to cry, so the assassins suffocated it with a blanket. A trained assassin, Niimi would eventually injure or murder even more innocents as a member of the terrorist team that would conduct the infamous sarin gas attack on the Tokyo subway system.

Convinced that he was being blocked from his destiny of escorting humanity into a new age, Asahara decided to form his own political faction. With this aim in mind, he and twenty-five members of Aum Shinrikyo announced their candidacies in 1990 in Japan's upcoming parliamentary election. By this point, the sect claimed several thousand members and enjoyed a moderate degree of influence in certain segments of Japanese society, therefore the guru fully expected his party to be victorious. But he miscalculated badly. The sect's numbers were tiny compared to the hundreds of thousands of citizens who would be voting in Asahara's district, and a sizable swath of the population viewed the sect and its campaign as bizarre, even comical. And sure enough, the election delivered a decisive blow to the sect and its unrealistic aspirations. "Every Aum candidate lost heavily, and none more so than Asahara, who received only 1,783 votes out of the half million cast in his constituency."[19] Humiliated by the sweeping public repudiation, Asahara, an unstable man still haunted by his formative experiences of rejection and

disability, now became emboldened to a pathological degree. He vowed to seize power by whatever means necessary.

Bioterror Attacks

Bioterrorism was Asahara's method of choice. Lethal pathogens were obtainable in Japan at the time, and, as noted earlier, their use as weapons is potentially more catastrophic than chemical agents, since certain microorganisms, unlike chemicals, are capable of reproducing and spreading far beyond the original victim pool. So it was that the guru, after his group's spectacular defeat in the parliamentary election, set out to assess the effectiveness of an in-house bioterrorism program, and he began by ordering his scientist-members to carry out small, covert attacks on selected components of Japanese society and on American military interests in Japan. At the time of their occurrence—the experimental assaults transpired between 1990 and 1995—they were not recognized as such; their true nature only came to light a few years later. In part, their exposure was the result of a *New York Times* investigation, one that made use of court testimony, interviews with Japanese and U.S. authorities, and confessions by the sect's members. The ensuing account of the group's bioterrorist activities is based in large measure on these findings, which the newspaper published in May of 1998.[20]

Asahara set into motion his bioterrorism program in 1990, with his first step being to appoint a chief of operations to oversee it. This person was Seiichi Endo, a thirty-year-old man who had joined the sect three year earlier and previously undergone graduate training in virology at Kyoto University. Endo and Asahara, in turn, assembled a cadre of young scientists from within the ranks of Aum Shinrikyo and offered them the opportunity to participate in the aberrant project. Certainly the undertaking would be a challenge, the group's mission being at once complex and consequential, and Endo himself being held accountable for its outcome. As to the objective, it was onerous but clear-cut. "He was to find a few lethal germs, feed them special foods, grow them to astronomical numbers and turn the resulting brew into a widely dispersible material, preferably a fine mist or powder that could easily penetrate human lungs," says science writer William Broad.[21]

1990 Botulism Attacks (Tokyo). Predictably, Endo and his collaborators were initially drawn to the deadliest toxin known to affect the human population, the one produced by *Clostridium botulinum*, which they decided to culture and deploy. The mission would take place a few weeks after the sect's trouncing in the election, when a four-person Aum Shinrikyo team traveled to Hokkaido, Japan's northernmost island and Endo's childhood home. Here, in a section of "rough country," they hoped to find botulinum samples. And

indeed, on this landmass teeming with forests and lakes and volcanoes, they managed to amass an ample supply of the bacterium. The group then returned to the sect's headquarters and set to work growing the microorganism. A month later, their bioweapon was ready—or so they believed.

In April 1990, Asahara sent three customized vans from the sect's compound near Mount Fuji to Tokyo, sixty miles away. Inside the vehicles were large storage tanks loaded with aerosolized botulinum toxin, which the bioterrorists sprayed indiscriminately as the vans glided through the city streets. They next traveled to a pair of American targets, again to discharge the toxin: Yokohama North Dock, which is an important U.S. Navy base, and the Yokosuka Naval Base, a neighboring installation and home of the Seventh Fleet. Wrapping up their offensive, the group released the agent at the New Tokyo International Airport, known today as the Narita International Airport, a sprawling operation that holds the distinction of being the largest commercial air facility in Japan.

Back at the Mount Fuji compound, Endo and his team awaited news of the disaster they believed that they had put into motion. A week passed, however, with no reports of mass illness or death in the areas thought to have been contaminated by the poison. Presumably, the strain that the team had collected in northern Japan, although it did generate a toxin, did not produce one that would noticeably harm humans. Furthermore, because the number of botulinum strains number well into the hundreds, and since the vast majority of them do not make toxins that possess the lethality sought by Endo, the wayward scientist saw before him an unending series of time-consuming, trial-and-error attempts to bring about the wholesale suffering Asahara had ordered. Therefore, to cut his losses, he switched to another pathogen.

1993 Anthrax Attacks (Multiple locations). The findings from the *New York Times* investigation suggest that Seiichi Endo instructed a sect member, one who had held a license to practice medicine and had contacts inside the medical research community, to discreetly acquire samples of *Bacillus anthracis*.[22] Shortly thereafter, this person did manage to obtain the sought-after bacterium. As to the source, the pathogen was supplied by an individual employed by the University of Tsukuba, a renowned research institution situated forty miles northeast of Tokyo.[23] Officials at the university contend that they were unaware of such a transaction.[24]

With the anthrax bacterium in hand, Endo and his team now shifted their work to the organization's aforementioned eight-story, concrete edifice in Tokyo, where their objective was to grow immense amounts of the microbe and prepare it for dissemination. And for the next three years, the team members toiled in their laboratories until they succeeded in multiplying the anthrax into a staggering quantity, enough to eradicate the populations of entire nations. But first, Asahara was determined to attack Japan itself, so

Endo and his associates prepared a domestic offensive with a target date of June 1993.

It was on the 29th of that month, a Tuesday, that the Aum bioterror team began discharging aerosolized anthrax from the roof of its Tokyo edifice. Because anthrax is odorless, Endo and his crew did not expect the surrounding community—that is, the victim pool—to be aware of what was happening to it. But the experiment did not unfold as planned. Soon after the sect released the pathogen, calls from concerned citizens reporting a foul odor began pouring in to the police station in the city's Kameido district. Evidently, it originated from the sulfur and ammonium compounds that had been used when culturing the bacterium.

Next day, as more anthrax was released, forty-one additional complaints of stench were lodged, with still another 118 reports the day after that. Stumped, the police asked Aum Shinrikyo representatives for permission to inspect the sect's building, but the request was rejected. When asked about the persistent odor, an Aum disciple offered the off-the-cuff explanation that fellow members had been boiling beans. Because the unpleasant smell disappeared following the police visit, however, authorities considered the case closed, at no point suspecting the disciples of experimenting with biological weapons.

In terms of harm, no serious illnesses or fatalities were registered, although health workers did receive numerous reports of nausea, vomiting, and loss of appetite during the intermittent four-day offensive, along with accounts of sick birds and house pets. Hearteningly, a retrospective case-detection survey carried out six years after the attack, one that analyzed community health patterns in the region targeted by the assault, likewise found no upticks in anthrax-related conditions during the period in question.[25] And not only was no one seriously afflicted; there is a possibility, albeit a slim one, that the sect may have inadvertently helped protect the intended victims from infection. This is because, unbeknownst to the bioterror team, the anthrax deployed in the offensive was a form used to vaccinate cattle. "While they may have been trying to kill people," says microbiologist Paul Keim, "the most they could have done is actually immunize people from the disease."[26]

As to reason for the attack's failure, experts believe that at least five issues prevented the damage the sect was seeking to generate. "The use of an attenuated *B. anthracis* strain, low spore concentrations, ineffective dispersal, a clogged spray device, and inactivation of the spores by sunlight are all likely contributing factors to the lack of human cases," write Hiroshi Takahashi and his colleagues.[27]

Still determined to wreak biological, social, and political havoc, Asahara had his chauffeur, Shigeo Sugimoto, transfer more of the same anthrax to one of the sect's vans and head to the heart of Tokyo toward the end of July,

where the driver sprayed the pathogen near the nation's legislature. Days later, when no reports of illness or death among Japan's lawmakers were forthcoming, Sugimoto tried again, on this occasion routing the van near the Imperial Palace, the emperor's principal residence. As before, though, no ill effects occurred, with part of the problem, as noted earlier, being that it was a vaccine strain of the pathogen.

1994 Sarin Attack (Matsumoto). Owing to the repeated failures of the team to induce mass illness by biological means, Endo and his collaborators turned to chemical weapons. They were aware that chemical agents, while they might not produce as many casualties as a biological attack, would be easier to devise and successfully deploy. And this did turn out to be the case.

The bioterror squad set out on a dry run on a summer night in June 1994, the target being a three-story apartment building in the picturesque mountain town of Matsumoto. Among others, the building's tenants included a handful of local officials who recently had enraged Asahara by not conceding to his wishes regarding an Aum project proposed for the town. And not only were the trio of legal authorities in the guru's crosshairs, but the townspeople as well, since they too had opposed the scheme. So it was that the terrorists parked a specially-equipped truck near the apartment building together with a companion vehicle that served as a mobile gas chamber. Around midnight, as the building's tenants slept, industrial-sized fans blew sarin gas from the vehicles toward the building. "The group wanted to see how many it could kill," reports the *Japan Times*, "and the citizens of Matsumoto, who had already angered Aum founder Shoko Asahara by vigorously opposing his plan to set up an office and factory at the land in southern Matsumoto, were the guinea pigs."[28]

At once, the building's residents, along with those in the surrounding neighborhood, began experiencing symptoms that ran the gamut from minor aggravations to blindness and seizures. As to the victims, their ages ranged from three years to nearly ninety, with 208 people seeking outpatient treatment and 54 requiring hospitalization.[29] In all, fourteen died, some of them in their apartments within minutes of the attack, while others expired in the hospital in the ensuing days. One perished many years later from her injuries.

The agent, sarin, is a nerve gas the Nazis developed during World War II. Within seconds of exposure, the nervous system short-circuits and an array of symptoms erupt. "The nose runs, the eyes cry, the mouth drools and vomits, and bowels and bladder evacuate themselves," says James Hamblin, physician and senior editor at *The Atlantic*.[30] The victim usually has no idea as to the cause of the symptoms, pure sarin gas being colorless, tasteless, and odorless. Once exposed, the victim may die within as few as ten minutes.

At the time of the attack, the authorities suspected it might be the work of North Korea, Japan's adversary. Within seventy-two hours of the incident,

however, the police were unofficially pinning the blame on a professional photographer who lived nearby; a man who, like his neighbors, required hospitalization for exposure to nerve gas. Certainly the reason for the allegation was a stretch: in his home, police found chemicals used to develop photographs. Under considerable pressure to solve the crime, however, officials were quick to leak the news that they may have collared their man. It would not be until a more expansive sarin gas attack in Tokyo that the Matsumoto assault would be recognized as terrorism perpetrated by the Aum Shinrikyo organization, forcing officials to apologize to the much-maligned photographer.

1995 Botulism Attack (Tokyo). Despite the fact that the chemical attack had been successful, Asahara was still eager to create a biological weapon, and for this reason he ordered Endo and his team to once again orchestrate an attack making using of the botulinum toxin. Accordingly, the team, in short order, selected a particularly vulnerable target: the Tokyo subway system. It would be a circumstance in which scores of unsuspecting commuters would serve as a captive audience for the group's malignant experiment.

The plan itself was ingenious. A clever Aum disciple invented a prototypical briefcase inside of which was an apparatus designed to convert a liquid medium containing the pathogen into vapor for dispersal. On the sides of the case were vents for the toxin's release. "The bacillus was held in solution in vinyl tubes, which were mounted on a small ceramic diaphragm," write Kaplan and Marshall. "Powered by dry batteries, this device turned the solution into steam, which was then blown from the briefcase by a small electric fan."[31] Three such briefcases were to be used in the actual attack, with the apparatuses contained within them being triggered by the vibrations of passing commuters or subways.

In terms of the toxin, it was more than capable of sickening or killing those in its path. "It would take eighteen to thirty-six hours to do its slow and deadly work, giving morning commuters a case of botulism from which they would never recover," write Kaplan and Marshall. "Thousands would probably succumb to bouts of diarrhea and vomiting, swelling eyelids and creeping paralysis, until their heart or lungs ceased to work."[32]

The assault took place on Tuesday, March 15th, at Kasumigaseki Station, a heavily-trafficked spot during the morning rush hour. Arriving at the depot, sect members carefully positioned the briefcases near three ticket booths and walked away, knowing that subway workers, or perhaps commuters, would pick up the cases. Regardless of who did it, the outcome would be the same: jostling them would set off their internal mechanisms and release the toxin, which would waft through the station, stairwells, subway cars, and tunnels, all the while infecting those in its orbit. Yet when the moment arrived, this did not happen. Instead, two of the briefcases failed to work, and the one

that did function discharged a harmless vapor, an exasperating turn of events for the bioterror team. As to the reason for the absence of illnesses and fatalities, it was determined that a sect member who had been involved in the mission's preparations, overcome with guilt about the horror that was about to descend upon the people of Tokyo, decided to replace the botulinum toxin with a more benign agent. "The fate of the disobedient cultist is unknown," write Kaplan and Marshall.[33]

The Tokyo Subway Gas Attack

Asahara's determination to attack the capital city was not diminished, however. With a preoccupation bordering on obsession, he remained consumed with conducting a large-scale assault on the Tokyo subway system and adamant that it take place at once. For him, the mission had assumed a mystical dimension that extended far beyond the realm of rational thought, with his immersion in the prospective calamity causing the guru to place unreasonable demands on the bioterror team. One mandate was that they create, essentially overnight, enough sarin gas to kill thousands of commuters and release it on the capital city's subways as soon as it was ready. To Asahara, time was of the essence. But manufacturing and weaponizing a large quantity of pure sarin would, of course, be virtually impossible within such a narrow time frame, so the team sought to placate the increasingly volatile guru by concocting, over the course of a few days, a less potent, or attenuated, form of the nerve agent. Since Asahara was highly unpredictable and emotionally explosive by this point, the team was loathe to disappoint him or otherwise incur his wrath.

"[P]rior to the Tokyo sarin attack, Asahara's connection to reality was so muddled that we must suspect him to have been, at least some of the time, psychotic," writes psychiatrist Robert Jay Lifton, winner of the National Book Award for his study of Hiroshima survivors.[34] Besides insisting that the bioterror team produce sarin on a wholly unrealistic schedule, Asahara was also convinced that he and his sect were about to be assailed by the authorities. Driving this fear, he supposedly received a tip-off on March 18th from a contact in the Army, a warning that the military might soon raid the sect's Mount Fuji compound. For the erratic Asahara, his paranoia mounting, such a possibility now became an urgent matter of self-defense. He considered it imperative that he annihilate the aggressor, meaning governmental and military authority and even civilization itself, if he was to protect himself and preserve the Aum Shinrikyo operation. "Destroying the world became the only means of staving off a sense of death and extinction," writes Lifton.[35]

In addition, Asahara was counting on the Tokyo mass murder to spark

social upheaval and distract the police and the military, his hope being that the latter would scrap its presumed plan to inspect Aum Shinrikyo headquarters. Then, too, he was planning on the terror attack to help lay the groundwork for a scheme that was already in the works and planned for the coming November: a final, grand offensive in Tokyo in which Aum Shinrikyo would disseminate "sufficiently large amounts of sarin to initiate World War III."[36] The irrational guru was banking on Japan blaming the chemical assault on its number-one ally, the United States. "The great release planned for November 1995 was to be the actual harbinger of Armageddon," says Lifton.[37] As noted earlier, Asahara was convinced that he and his followers would emerge from the global catastrophe unscathed and supremely positioned.

So it was that five high-ranking Aum members were instructed to report to a room at the Mount Fuji compound at three o'clock in the morning on March 20, 1995. These disciples, all of them men, would be the ones to conduct the gas attack in Tokyo a few hour later, and they had had been summoned to this early Monday gathering, a top-secret training session, to practice releasing the poison when the fateful moment arrived. Among other key facts, the team learned that the nerve agent would be liquid sarin, and that each man would carry between thirty and forty-four fluid ounces of it in small, plastic bags swathed in newspaper.

Next, the men rehearsed releasing the ghastly agent. "Using umbrellas sharpened with a file," writes Haruki Murakami, "they pierced plastic bags filled with water rather than sarin."[38] In the actual attack, the liquid sarin would seep from the punctured bags and begin vaporizing, emitting an invisible gas that would quickly sicken or kill everyone in its path. A simple but effective procedure, the disciples later said they had taken pleasure in practicing it.

At the conclusion of the session, self-protection materials were distributed, antidotes foremost among them. "[The] physician [Ikuo] Hayashi handed out hypodermic needles filled with atropine sulphate to the team, instructing them to inject it at the first sign of sarin poisoning," says Murakami.[39] If administered shortly after exposure, atropine sulphate is often effective in preventing death or permanent disability.[40]

The Team

Regarding the bioterror team, Ikuo Hayashi, its oldest and most highly educated member, was a graduate of the Keio University School of Medicine in Tokyo. After receiving his medical degree, he underwent advanced training at Mount Sinai Hospital in Detroit, Michigan, then returned to Keio to serve as a heart and artery specialist at a leading hospital.[41] Subsequent to this, he was appointed chief of the Department of Circulatory Medicine at the

National Sanatorium Hospital in Tokaimura, Japan.[42] It was in the late 1980s, while he was serving in the latter capacity, that the middle-aged physician began to reflect on his life and work and found them lacking. "Somewhere along the line Hayashi seems to have had profound doubts about his career as a doctor and, while searching for answers beyond orthodox science, he became seduced by the charismatic teachings of Shoko Asahara and suddenly converted to Aum," says Murakami. "In 1990 he resigned from his job and left with his family for a religious life."[43]

Once he had settled into the sect, Hayashi was tapped to lead the organization's Ministry of Science and Technology, as well as being named the Minister of Healing. His work in Aum Shinrikyo extended far beyond healing, however. Within a short period of time, Hayashi's duties came to include not only overseeing a nine-bed medical unit in Tokyo, the loftily named Astral Hospital Institute, but also administrating electric shocks to disloyal disciples or injecting them with a homemade truth serum, the purpose being to extract information from them. And the doctor did more besides treat and torture Aum disciples. "[H]is skills were made use of in every form of its medicalized criminality: in abductions and incarcerations, in plastic surgery for disguise, and in drug production and use," writes Lifton.[44] Clearly, Ikuo Hayashi was an impeccable choice for the impending terrorist mission.

During the attack, Hayashi would be assigned to Tokyo metro's Chiyoda Line, where his task would be to discharge the poison. He would have an accomplice whose main task would be to serve as the getaway driver. This person was Tomomitsu Niimi, the previously mentioned assassin who strangled a sect member as well as an attorney and his family.

Elsewhere on the city's subway system, the Hibiya Line to be precise, two more Aum disciples were set to release the poisonous agent at different points along the route. Their names were Toru Toyoda and Yasuo Hayashi (no relation to Ikuo Hayashi), each of whom also had a driver assigned to him for the escape.

At the time of the terrorist mission, Toru Toyoda was a twenty-seven-year-old physicist who had graduated with honors from Tokyo University, completed a master's degree, and was preparing to pursue a doctorate when he decided instead to join Aum Shinrikyo. Not surprisingly given his background, he rose swiftly in the sect's Ministry of Science and Technology, specifically in its Chemical Brigade, where he became known for his dedication to its projects. He also became known for his resolve. "He's the type that never rests once he has set his mind on something—he likes to see things through to the end," writes Murakami. "Or perhaps he is more the type of person willing to martyr himself for a principle."[45] Stoic, with a demeanor suggesting a touch of arrogance, Toyoda would be shocked when informed about the sect's plan to launch the chemical attack in Tokyo and especially about his own

role in it, but he would participate all the same, in part by employing emotional anesthesia to make it through the murderous undertaking.[46]

Ten years older than Toyoda was the other terrorist on the Hibiya Line, Yasuo Hayashi, whose academic background was in the nascent field of artificial intelligence. After graduation, Hayashi traveled extensively in India, where he developed an interest in religion before returning to his homeland and joining Aum Shinrikyo. A senior figure in the Ministry of Science and Technology, younger disciples described him as kind and paternal, a listening ear and a guiding hand. In sharp contrast to this depiction, Shoko Asahara, perhaps because of his escalating paranoia, suspected Hayashi of being an infiltrator, and for this reason increased the amount of sarin the scientist would transport in the subway attack.

The two remaining terrorists, Ken-ichi Hirose and Mosata Yokoyama, were assigned to the city's Marunouchi Line and provided with getaway drivers. The thirty-year-old Hirose, the recipient of a baccalaureate degree in applied physics from Waseda University, graduated at the top of his class. Upon finishing his post-graduate coursework, he joined the Aum sect and spent his days at the Ministry of Science and Technology. When told about the planned gas attack, he reported feeling "instinctual resistance," yet he acquiesced largely due to personal doubts.[47] "I shuddered to think of all the victims this would sacrifice," Hirose said. "On the other hand, I knew I couldn't be well-versed enough in the teachings to be thinking like that."[48]

The last disciple-terrorist, Mosata Yokoyama, was described by his fellow sect members as quiet and reserved, and, like Ken-ichi Hirose, appeared to have certain insecurities. Thirty-one years of age at the time of the attack, Yokoyama graduated from Tokai University with a degree in applied physics, worked for an electronics company for a few years, and thereafter took his Aum Shinrikyo vows. Nondescript in appearance and deportment, he was the undersecretary of the Ministry of Science and Technology.

The Multi-Point Assault

As a mass destruction event, the gas-attack scheme was shrewd. Shortly after 7:30 a.m., each of the five perpetrators was to enter the Tokyo subway system at a different station. As mentioned earlier, one man would board a train on the Chiyoda Line, while two others would board separate trains on the Marunouchi Line. The remaining pair would do likewise on the Hibiya Line. All five subways were inbound and would intersect at Kasumigaseki Station in the heart of Tokyo, near government offices and adjacent to the city's police department. By releasing their poisons simultaneously, the perpetrators would ensure that all five trains carried the noxious vapors to this

crucial destination, perhaps the most congested spot in city, and from here it was expected to spread throughout the entire underground network.

Unfortunately for the commuters of Tokyo on this bright Monday morning, the terrorists' strategy proceeded according to plan. Sporting a surgical mask similar to those sometimes worn by Japanese commuters, each of the terrorists sat in a subway car holding a bag filled with liquid poison and wrapped in newspaper. One of the perpetrators, the physician Ikuo Hayashi, recalls his thoughts: "If I unleash the sarin here and now, the woman opposite me is dead for sure."[49] Like his accomplices on the other four trains, he was acutely aware of the impending horror, but he proceeded all the same.

A few minutes before 8:00 a.m., each man placed his sarin-filled bag, still concealed in a newspaper, on the floor of the subway car. On all five cars at precisely the same moment, the men thrust the tips of their umbrellas into the plastic bags and released the liquid, then arose and exited at the next stop. As the cars continued on their way to Kasumigaseki Station, the liquid began oozing from the bags and emitting fumes.

In Ikuo Hayashi's case, he found it difficult to pierce the bag, and although he finally succeeded, only a tiny amount of poison seeped out. It was sufficient nonetheless. As a result of the doctor's actions, 231 people were injured and another two died.

For the hapless passengers on the other four trains, the consequences were more widespread and intense, since greater quantities of sarin were discharged. Not only that, the poison's grim effects were soon being felt far beyond the cars in which it had originally been released. "The fumes were spread at each stop, either by emanating from the tainted cars themselves or through contact with liquid contaminating peoples' clothing and shoes," writes Kenneth Pletcher.[50] For the morning commuters, life became hell.

Kenji Ohashi, a middle-aged car salesman, had no idea what was happening. Although he noticed an unpleasant odor when he boarded a subway car on the Marunouchi Line—impurities in the sarin caused the smell—he took a seat all the same, and still being a bit sleepy at this early hour, closed his eyes. When he opened them again as his destination was being announced, Ohashi discovered a changed world. He could not have known that he had just been exposed to a potentially lethal poison and that his pupils were dilated.

"The lights on the platform were faint," he recalls. "My throat was parched and I was coughing; a really bad, chesty cough."[51] Pulling himself to his feet and exiting the car, he found his symptoms multiplying.

> My nose was running and my legs were shaky. It was hard to breathe…. I didn't have the foggiest idea what had hit me. Only everything had gone dark before my eyes. My lungs were wheezing like I was running a marathon and the whole lower half of

> my body was cold and trembling…. All through the morning my body was like ice. Even with an electric blanket, I was shivering. My blood pressure was up to 180.[52]

Ohashi spent the next two weeks in the hospital, during which he endured muscle cramps, near-blindness, and labored breathing. Even more distressing, he suffered headaches so excruciating as to render painkillers futile. And his misery continued long after he was discharged. For several months, the headaches and lethargy persisted and sharply reduced his ability to perform his job or even go to work. In due course, his managerial duties were handed over to another salesperson, thereby impacting Ohashi's career prospects. "I almost think I'd be better off dead," he told an interviewer a few years after the incident.[53]

It was the same story on the Hibiya Line when another noxious train came to a stop. "The doors opened, and passengers surged and tumbled from the train, gasping for breath," write Kaplan and Marshall. "Five collapsed on the platform, foaming at the mouth."[54] Within minutes, the disaster was evident at street level as well.

> Above ground it was pandemonium…. The pavements and soon the roads were blanketed with casualties lying where they had fallen, or clutching tissues to staunch blood flowing from their noses and mouths…. The commuters made little noise, since the nerve gas had crippled their lungs and stolen their voices.[55]

As the Aum team had hoped, a similar scenario was playing out on the Chiyoda Line. Aya Kazaguchi, a twenty-three-year-old woman in charge of a line of clothing at a garment company, found herself gasping for air. "It's like, there's this tight pressure in my chest, and as much as I try to inhale, no breath comes in."[56] Kazaguchi also realized that she was not alone. "[T]he people hanging on to the handstraps started coughing," she says, adding that a chorus of coughs soon echoed throughout the train.[57] From there, matters spiraled downward, as was the case on all of the contaminated cars as well as in the terminals.

It would be nearly forty-five minutes before the Japanese news media would pick up the story and, among other efforts to help, offer instructions to those in the vicinity of the attack. "[F]lee in the direction you see fewest bodies," was one such recommendation.[58] Still unsure of the cause, officials at first thought a gas line had ruptured, but a military physician who assessed one of the first casualties announced, at 10:30 a.m., that sarin was the culprit. Of course, this pointed to terrorism, since an agent of this type, widely regarded as a weapon of mass destruction, would not otherwise be found in the Tokyo subway system. And the sarin certainly did produce mass destruction.

Symptoms and crisis management. Thirteen people died and more than 5,500 were injured in the Tokyo offensive, with scores of victims being

transported to nearby Saint Luke's International Hospital, a training and general facility as well as a designated field hospital in the event of a disaster.[59] Two years later, a team of doctors who were among those treating the injured at Saint Luke's published an article in the *Southern Medical Journal*, one in which they recapped the symptoms presented by the afflicted and highlighted the difficulties that arose in the medical management of the disaster.[60]

On the day of the attack, Saint Luke's treated 641 sarin victims, five of whom were in critical condition upon arrival. Diagnosed with respiratory arrest, two of them died. The symptoms of another 106 were judged to be moderately severe, and for this reason they were hospitalized overnight, the majority for observation. Nearly all of these patients, 105 out of 106, were diagnosed with miosis, or constriction of the pupils. "Other ophthalmologic symptoms were ocular pain, blurred vision, and visual darkness," write physician Sadayoshi Ohbu and his colleagues. "Dyspnea, nausea, vomiting, muscle weakness, coughing, agitation, and fasciculation were relatively common."[61] Also among those in the moderately-severe category were four pregnant women, one of whom would opt for an abortion owing to the potential effects of fetal sarin exposure. As for those whose symptoms were considered mild, they too suffered primarily from eye problems and received treatment through Saint Luke's outpatient services. Ohbu notes that the main factor in the severity of all of the patients' symptoms was the amount of the poison they had inhaled, with related factors including their proximity to the sarin package and the amount of time they had remained in the noxious environment.[62]

Unfortunately, some of those taken to Saint Luke's unknowingly carried the contaminant on their clothing, thereby transferring it to hospital personnel. "[N]early 50% of the medical staff working in this hospital site complained of some degree of Sarin gas exposure due to secondary contamination from patients," writes Kenichiro Taneda, another Saint Luke physician. "Approximately 10% of pre-hospital EMTs also experienced acute symptoms of secondary contamination due to vaporized Sarin, probably from the victims' clothes."[63]

And then were the psychological effects of the attack. Of a sample 610 sarin cases treated at Saint Luke's, nearly sixty percent reported symptoms of posttraumatic stress disorder a month after the assault. Dishearteningly, this number remained more or less the same at the six-month mark. In terms of specific symptoms, the Ohbu team writes that "[f]ear was seen in 32% of the victims, some of whom still cannot use the subway."[64] Headaches and malaise were the most common and enduring psychological effects, with other problems including insomnia (29 percent), flashbacks (16 percent), irritability (16 percent), depression (16 percent), and nightmares (10 percent).[65]

Turning to the victims' medical treatment, several issues came to light

in the course of the Tokyo episode. Because the authorities were not immediately aware that sarin was the cause of the unprecedented number of people falling ill in the city's subways, caregivers who were first on the scene—paramedics, police, firemen—unwittingly placed themselves at risk. "No primary decontamination was performed on-site," writes Tomoyo Saito, a research fellow at Keio University, "and, more importantly, first responders and health care workers involved in the initial response were not wearing personal protective equipment."[66] At the receiving hospitals, medical staffs likewise placed themselves at risk during the early hours of the disaster through their contact with incoming sarin victims and contaminated first responders. Then, when it was determined that sarin was the source of the poisonings, further problems became apparent. First and foremost, the city's doctors found themselves at a disadvantage, very few of them having had experience treating patients suffering from exposure to this distinctive chemical weapon.

Contributing to the madness was the issue of "medical surge capacity" and the fact that Tokyo's healthcare resources were quickly overwhelmed. Despite the existence of a municipal emergency plan designed to provide structure and guidance during an urban disaster, the city's medical facilities were hard-pressed to attend to the sheer volume of victims—there were literally thousands seeking treatment on the same morning—meaning limited numbers of hospital beds as well as physicians to diagnose and treat the afflicted. The aforementioned Saint Luke's International Hospital was one of many that found itself filled beyond capacity. "Exhausted physicians who had sarin victims added to their existing caseloads treated patients in hallways," writes Robyn Pangi. "All hospital facilities, including chapels and halls, were used to treat sarin victims."[67] Routine surgeries were canceled and outpatient clinics shuttered if they were not required for victim management.[68] And there was still another challenge: the sarin antidote was in short supply. To be sure, Tokyo's private and public health services were stretched far beyond their limits as they strove to furnish timely medical care to those in need of it.

Aftermath: Assassination Attempts and Arrests

While these events were taking place in more than eighty hospitals and clinics across Tokyo and beyond, the five Aum Shinrikyo terrorists, elsewhere in the capital city, hurried to a designated safe house for refuge. Subsequent to this, they and their drivers returned to the sect's headquarters.

As for the police, they set to work assembling the pieces of the puzzle. Before long, they detected the connection between the Tokyo poisonings and the earlier gas attack on the apartment building in Matsumoto, home to the three judges who were adversaries of the Aum organization and who required

hospitalization for sarin poisoning. The police also reopened three unsolved murders, namely, the strangling deaths of Sakamoto Tsutsumi and his wife and child, Tsutsumi being the attorney who was preparing a case against Aum Shinrikyo at the time of his death. And as the authorities' mounting suspicions reached the public's ears, the Aum organization reacted swiftly and visibly. On March 21st, the day after the nerve-gas offensive, the sect called a press conference during which it leapt into full denial mode replete with faux indignation, accusations of prejudice, and finger-pointing.

"I know what kind of substance sarin is," declared Yoshinogu Aoyama, an attorney speaking on behalf of the sect, "and only such parties as the American military could make and keep and use such a substance."[69] Many of those in attendance contend that Aoyama was not, in fact, blaming the nerve-gas attack on the United States, but rather suggesting that the Japanese government may have acquired the sarin from this Western ally and used it against its own people.[70]

Twenty-four hours later, police raided the Aum Shinrikyo offices in Tokyo and the sect's main compound near Mount Fuji. As Aum disciples decried what they portrayed as religious persecution by the government, law enforcement officials unearthed the sect's secret laboratories and retrieved biological and chemical warfare equipment along with the ingredients used to brew liquid sarin. Confiscated, too, were filmed accounts of the sect's experiments using the bacterium that causes Q fever, videotapes revealing that numerous disciples, evidently including the guru himself, had been accidentally exposed to the pathogen and sickened by it. Because the evidence being gathered appeared so incriminating, police arrested several disciples on the spot. Asahara was not one of them, though. The guru was in hiding.

As could be expected, the Japanese people were now up in arms, enraged that the religious group had carried out such an appalling act of violence against everyday commuters en route to work. And intensifying the anger and apprehension, Asahara's voice came on the radio at this juncture and proclaimed that the nation's citizens should accept their deaths without regret. It seems the guru had managed to purchase radio airtime in Russia, where his taped message was beamed back to his homeland in a broadcast clearly calculated to heighten the panic level of the population. Asahara's insinuation, of course, was that further attacks were imminent. And indeed, more offensives would be carried out, primarily small, individualized ones, although their aim would no longer be to trigger an apocalypse. "[T]he guru ordered that Aum resort to acts of terrorism in order to prevent his capture," writes Lifton.[71]

The first, an assassination attempt, was slated for March 30th, the objective being to murder the chief of the National Policy Agency, or so the authorities suspected.[72] The target, Takaji Kunimatsu, was a fifty-seven-year-old

official who was leading the nation's principal inquiry into the controversial sect. By eliminating this top law enforcement figure, Asahara evidently believed both the manhunt and the investigation would come to a halt. In terms of the assassination attempt, it was to be a one-man job and was set to occur on a morning when Kunimatsu would be traveling without his bodyguards.

"According to TV interviews with Kunimatsu's secretary, who was helping him into his car at 8:25 a.m., a masked man standing behind a utility pole fired four shots, hitting Kunimatsu in the shoulder, the side and twice in the back," reports the *Chicago Tribune*.[73] The assailant, wearing a surgical mask, was not identified or captured. Although he was struck by four bullets, the stouthearted Kunimatsu survived and the investigation proceeded.

In the ensuing weeks, Aum members continued making bomb threats, the purpose being to frighten and intimidate those they regarded as enemies of their religion. In a small number of cases, disciples sent actual bombs, although none of the resultant injuries proved to be fatal.

In mid–April, Shoko Asahara, still in hiding, alarmed and angered the populace once again by declaring that his organization was about to deliver another catastrophic blow to Tokyo. A false alarm, it nevertheless managed to keep the citizenry on edge as well as costing the city financially, the entire metropolis being placed on alert as a precaution.

Even more ominous was an attempted chemical attack on May 5th. The Shinjuku subway station in Tokyo was to be ground-zero, a highly congested terminal at a critical railway hub. Here, an Aum terror squad placed four bombs containing sulfuric acid and sodium cyanide, enough to annihilate ten to twenty thousand people, beneath ventilation shafts in restrooms. Three of the bombs failed to detonate, however, and the remaining one caught fire, with observant subway workers extinguishing the flames before the poisonous mixture could be released. The terror unit, unfazed, set about preparing to conduct more gas attacks and bombings.

It would be on May 16th, for instance, that Aum disciples set out to murder Governor Yukio Aoshima, who was in the process of revoking the organization's status as a tax-exempt religious entity. Mailing a parcel containing an incendiary device to his office, the bomb mutilated the hands of the staff member who was unlucky enough to unwrap the package, although the governor himself escaped injury.

Yet it was also on this day that a pivotal event occurred. Police launched coordinated raids on one hundred thirty Aum Shinrikyo sites across Japan during which they arrested a large number of members, and, even more important, located and apprehended Shoko Asahara himself. "Police said they found Asahara sitting in silent meditation in a hidden room beneath the third floor of Truth Building No. 6 at the [Mount Fuji] compound," writes

Merrill Goozner.[74] Asahara's capture would constitute a turning point for the Aum Shinrikyo sect and its forty thousand members, who could now be found not only in Japan, but in Russia, the United States, and other nations as well.

Postscript

Shoko Asahara was charged with thirty-nine offenses, among them twenty-three counts of murder. Others included kidnapping, violating Japan's Arms Manufacturing Law, ordering and planning murders, and disposing of corpses.[75] His legal team entered pleas of not guilty on all of the charges, insisting that Asahara should not be held responsible for the deeds of his disciples. Although numerous Aum members, including its scientists, would testify against him, the guru himself would not speak at any point during his trial.

In the end, the court could not be swayed by the arguments submitted by Asahara's attorneys. At the conclusion of the guru's lengthy legal proceedings—they lasted from 1996 to 2004—he was found guilty and sentenced to death. According to court documents, he had "committed the crimes in the process of realizing his fantasy of expanding the cult through militarization and to reign as its king in the name of salvation."[76]

Interestingly, two years later Asahara's defense team sought to have his death sentence overturned. Claiming he had deteriorated during his incarceration—"he was often heard shouting obscenities and he masturbated during meetings with lawyers and psychiatrists"—they hoped their humanitarian plea would save his life.[77] To the lawyers' consternation, however, a psychiatrist reevaluated Asahara at the court's request and concluded that the guru was sane, the upshot being that the punishment was upheld.

Another 188 members of the sect were also charged during this period, their purported crimes extending from comparatively small offenses to homicide and experimentation with biological and chemical weapons. Of these defendants, 187 were convicted, with death sentences being handed down in a dozen cases. The latter included six of the men accused of hands-on involvement in the Tokyo subway attack. Seiichi Endo, head of the sect's biological and chemical warfare programs, would also join the ranks of the condemned. At this time, the men are awaiting execution even as the human rights organization Amnesty International seeks to have their sentences commuted.[78]

As for the Aum Shinrikyo sect, the government rescinded its official status as a religious organization in October of 1995, with the sect filing for bankruptcy a few months later. With Shoko Asahara out of the picture, his two pre-teen sons stepped in as co-leaders of the organization, although a former high-ranking disciple would, in due course, agree to take the reins, a

man who had not been involved in the organization's biological or chemical warfare operations.

In 2000, the organization, still trying to purge its terrorist past, changed its name to Aleph, the first letter of the Hebrew alphabet and, to the remaining Aum Shinrikyo holdouts, a word denoting a new beginning. The sect also modified some of its teachings and apologized to the Japanese people for its predecessors' biological and chemical assaults. Yet the organization, still remarkably wealthy, has not lived up to all of its promises of redress. Whereas the court ordered the sect to pay nearly forty millions dollars to the victims of the Tokyo subway assault, its payouts have been partial—less than half the designated amount—prompting the Japanese government to step forward to offer monetary support to the victims. The casualties include those people are no longer able to work due to severely impaired vision or blindness.

Regarding the sect's home base in the village of Kamikuishiki near Mount Fuji, it was soon disassembled. Unfortunately for the peaceful, picturesque village itself, it too suffered a sad fate, being shunned by tourists who were loathe to visit it owing to Aum Shinrikyo's deeds. Then, too, several suicides occurred at the compound during the sect's collapse, so numerous as to bring further notoriety to Kamikuishiki. For these reasons, an imaginative effort was put forth in 1997 to reinvent and revitalize the settlement through the construction of a theme park based on Jonathan Swift's satirical novel, *Gulliver's Travels*. Featuring an enormous statue of the book's protagonist, Gulliver, staked to the ground by his hair—the figure was nearly 150 feet long—the exhibit included a miniature version of the hamlet Lilliput, with the hope being to attract Japanese families to the unusual spectacle and the associated gift shops. But alas, this would not be its fate. "The Fuji Gulliver's Kingdom theme park shut down," reports the *Japan Times*, "after a four-year attempt to dispel the site's negative image as a former Aum Shinrikyo base."[79] Evidently, parents were disinclined to take their children to an amusement area that had recently been the home of a biological and chemical warfare program, colossal statue aside. Today, Kamikuishiki no longer exists, having been rezoned and absorbed into two neighboring towns.

As to the fate of the Aum Shinrikyo sect, the organization still exists, albeit largely underground in various incarnations. In the Balkan nation of Montenegro, the government recently ejected nearly sixty foreign nationals for alleged involvement in the sect.[80] And in Russia, where the government has forbidden Aum Shinrikyo, it is estimated that the organization has up to thirty thousand practicing members. Many of these people have illegally sought donations for the organization, and some are suspected of having carried out threatening or aggressive acts. According to a 2016 report by the BBC, the Russian government is in the midst of an investigation into the sect and its strong-arm tactics. The allegation: "violence against citizens and injury

to their health"[81] It is an ominous echo of the Aum Shinrikyo organization's early days in Japan.

Meanwhile, in Japan where Aum Shinrikyo remains legal—since World War II, the East Asian nation has been averse to interfering with organizations claiming to be religious—there are presently an estimated 1,500 to two thousand members of Aum's spin-off organization, Aleph, and a related group, Hikari no Wa. Since the nerve gas attacks, however, the Japanese government monitors these descendant entities so as to prevent future acts of violence against the people of Japan.

Fortunately, if there were to be another terrorist attack, the nation would be better prepared for it. In concert with a handful of governmental agencies, the Japanese medical community studied its response to the 1995 sarin attack, the result being an expanded and improved ability to contend with future biological and chemical offensives. Among other upgrades, 73 emergency rooms have been outfitted with chemical-substance analyzers, and medical settings across Japan now possess decontamination equipment and protective gear for their personnel.[82] Additionally, Japan has made it illegal to possess sarin gas, the Asian country being a signatory to the Chemical Weapons Convention which prohibits the formidable chemical weapon. By all accounts, the nation has learned from its dreadful experience with unmitigated violence, of which it has had more than its share.

On two mornings in 1945, the United States dropped atomic bombs on two civilian population centers, the cities of Hiroshima and Nagasaki, and in so doing vaporized, maimed, or sickened 130,000 men, women, and children in an unprecedented and unspeakable act of inhumanity. Fifty years later, on a morning in 1995, the Japanese people were again blindsided by unrestrained and unthinkable violence, this time a chemical attack carried out by domestic terrorists intoxicated with religious misconceptions. To be sure, nuclear, chemical, and biological weapons, whether wielded by state or non-state actors, continue to be among the greatest threats to human life, a dismaying reality to which the Japanese people can attest.

◆ 8 ◆

Lethal Letters

September 11th and the Anthrax Enigma

It was on the clear, bright morning of September 11, 2001, that the world watched in horror as a pair of hijacked airliners slammed into the Twin Towers in Manhattan, while a third bore into the west wall of the Pentagon near Washington, D.C., and a fourth plunged into a dewy Pennsylvania meadow. An elaborate terrorist offensive, it succeeded, in only seventy-seven minutes, in scarring indelibly the American psyche and forever changing the course of history.

During the remainder of that ill-fated September, the traumatized nation waited in anguish and in anger for an explanation; a justification, no matter how aberrant, as to why a band of terrorists had murdered thousands of its citizens and mutilated its iconic structures. In private government circles, meanwhile, another concern came to the fore. Counterterrorism officials worried that the other shoe was about to drop, their hypothesis being that the events of September 11th, monstrous as they were, represented only the opening salvo in what would become a series of assaults on the American people. And, sure enough, their fears were realized one week later when a biological offensive was stealthily set into motion against the distraught nation. Its first casualty: a British-born, sixty-three-year-old photo editor at the *Sun* tabloid, Robert Stevens, who lived in Lantana, Florida, a coastal community in Palm Beach County.

Anthrax in America

It was on September 18, 2001, that the sinister string of events commenced. A letter containing anthrax spores was dropped in the mail, one

addressed to the offices of American Media, Inc., in Boca Raton, Florida, publisher of such tabloids as the *National Enquirer*, the *Globe*, the *Star*, and the *Sun*. The letter is not believed to have contained a message. Only the spores, invisible to the naked eye, are thought to have been present in the form of a tainted, powdery substance.

Days later, the missive passed through the American Media mailroom and, in due course, made its way into the hands of photo-editor Stevens, a fact investigators would deduce several days later when they detected traces of anthrax on the computer keyboard in his office. Since Stevens' job involved acquiring images and related materials by mail, he would have opened the envelope without a second thought. Likewise, the mailroom's employees would have handled it unreservedly, since it was part of the job. This appears to be how a seventy-three-year-old mail sorter and courier, Ernesto Blanco, along with a coworker, Stephanie Dailey, also came into contact with the envelope. Evidently, none of the three voiced any suspicions about the envelope or its contents at the time, at least not to law enforcement officials.

So it was that Stevens, his wife Maureen, and their twenty-one-year-old daughter traveled on Thursday, September 27th, from their Florida home to a resort in Lake Lure, North Carolina, where they enjoyed a brief family holiday. Little did they know it would be their last one, with Stevens becoming sick even before they returned home. "He started feeling ill on Sunday, September 30," writes David Wellman, "complaining of numbness and chills."[1] The photo editor did, however, manage to make it back to Lantana, a six hundred mile trip by car.

Prophetically, it was on this same Sunday that the *New York Times* published an article, "Some Experts Say U.S. Is Vulnerable to a Germ Attack."[2] Making the case that a biological assault was a realistic threat to the United States, the piece reasoned that such an offensive, unlike a conventional military strike, would not be immediately apparent. The pathogen would likely be inserted into the population in such a way as to mimic a natural occurrence and thereby avoid, or at least delay, attracting the attention of bioterrorism experts. "[P]eople will get sick and go to their hospitals," predicted one such expert, Asha George, "and the public health system will have to pick up on this."[3] Unfortunately, not all of the components of this system would be so efficient in the Stevens case, at least not initially.

Over the next forty-eight hours, the photo editor's condition plummeted, prompting his wife to rush him to the emergency room at nearby JFK Medical Center in Atlantis, Florida. At the time of his intake evaluation—it was 2:00 a.m. on October 2nd—he had a fever of 102.5, as well as confusion, swollen lymph nodes, and nausea.[4] Suspecting meningitis, doctors obtained samples of his cerebrospinal fluid and ordered a chest X-ray and CT scans. But even as these and other procedures were being performed, Stevens' symptoms

compounded, and soon came to include seizures, unconsciousness, and the early stages of organ failure.

In terms of the diagnostic work-up, the findings pointed to inhalation anthrax, much to the staff's surprise. Also known as pulmonary anthrax, it is a rare form of the poisoning brought about by breathing in the bacterium's spores and, unlike other types of the infection, had not been diagnosed in the United States in a quarter of a century.[5] The prognosis, moreover, was grim, as revealed by government statistics. "Mortality has been essentially 100% despite appropriate treatment," reads a document from that period, one released by the Office of the Surgeon General.[6]

A repeat analysis of Stevens' cerebrospinal fluid performed at the Centers for Disease Control in Atlanta, Georgia, on Thursday, October 4th, confirmed the presence of *Bacillus anthracis*. At more or less the same time, Florida's state-operated laboratory in Jacksonville provided yet another verification. Then, on October 5th, Stevens, tranquilized and on a ventilator, expired. It was now that federal officials decided to go public with the news.

"An isolated case of anthrax infection was confirmed on Thursday in a Florida hospital," announced Tommy Thompson, Secretary of Health and Human Services, at a press conference. When asked whether the patient had contracted it naturally or was the victim of an extremist act, Thompson was unequivocal. "There is no evidence of terrorism," he stated matter-of-factly.[7] He next attempted to explain how Stevens might have come into contact with the bacterium. "The man could have picked up the infection from his clothes," the official said, "and [he] was known to have drunk water from a creek recently," alluding to the family's trip to North Carolina.[8] Such assertions, however, were met with scorn by those in the scientific community who were familiar with the pathogen and its modes of transmission. "Inhalation anthrax—from a stream?" asked Robert Kadlec, a physician at the Pentagon with considerable research experience with the microbe. "You gotta be shittin' me."[9]

As it stood, a handful of scientists already knew Secretary Thompson's remarks were, in effect, off the mark, even as he was making them. This is because the Centers for Disease Control and Prevention (CDC), the previous afternoon, had flown a sample of the bacterium to a laboratory in Arizona, with the latter team wrapping up its analysis before the federal official called his press conference. The lab was headed by microbiologist and evolutionary biologist Paul Keim, who, seven years earlier, had taken part in a classified, CIA-sponsored project at Los Alamos National Laboratory designed to differentiate among the numerous varieties of anthrax bacteria.

Keim's team, which specialized in microbial genetics, worked nonstop to nail down the type that had invaded Stevens' body, and within a matter of hours determined that it was the highly virulent Ames strain. It was a

discovery that came as a bolt from the blue, since this was the same laboratory variant that scientists at Fort Detrick had long used in their vaccine studies aimed at protecting American troops from anthrax infection. They had selected it because it was one of the hardiest strains, being able to circumvent existing vaccines and resist nearly all antibiotics. "A vaccine that could protect against Ames," reports the *Washington Post*, "would offer the highest protection for troops exposed to deadly germs on the battlefield."[10] In terms of the number of U.S. labs having access to this distinctive pathogen, it was quite small at the time, no more than a dozen, five of them housed at Fort Detrick itself.[11] And Keim, of course, knew what this meant. "The implications were that this was a bioterrorism event," he said.[12]

Straightaway, the Federal Bureau of Investigation (FBI), together with several other government bodies, formed an investigative unit and set about scrutinizing all aspects of the "Amerithrax" case, as the government now designated it. Because the offices of American Media constituted ground zero, they provided the logical starting point. And, as expected, investigators detected traces of the microorganism in the building, as well as learning about Ernesto Blanco and Stephanie Dailey, the two other employees who suspected they had been exposed to it. A few days later, investigators discovered more anthrax spores in Blanco's van, as well as at a post office where he picked up the mail each day for American Media. Yet this news was withheld from the public. In fact, Florida Governor Jeb Bush, in the coming days, would clamp down on all media coverage of the crisis in his purported determination to protect the state's reputation as a tourist destination and agricultural center. But there was a downside in that the ensuing absence of information would fan Floridians' fears.

"Local media complained—the FBI wasn't talking and neither was the governor's office, and the CDC wasn't returning calls from journalists," says Guillemin.[13] It is doubtful, of course, that the abrupt inaccessibility of information helped tourism and agriculture; rather, it may have raised new questions as to the true extent of the danger in the Sunshine State.

As to the additional pair of American Media employees who tested positive for anthrax exposure, one of them, Stephanie Dailey, remained healthy. Ernesto Blanco, on the other hand, became quite ill and checked into Cedars Medical Center in Miami, where he was diagnosed with pneumonia secondary to inhalation anthrax. What followed would be a protracted, touch-and-go ordeal, although he would ultimately prevail. "Blanco's treatment," writes journalist Adrian Sainz, "was a venture into uncharted waters."[14] In part, this was because the elderly mailroom courier, who had suffered a mild stroke several weeks earlier, displayed symptoms not typically associated with anthrax poisoning, thus making his case unpredictable and its course, irregular.

Regarding the American Media building itself, the publishing company shuttered it once investigators verified the presence of the deadly bacterium. How the pathogen had gotten into the building remained a mystery at this juncture, although those who were knowledgeable about anthrax knew it almost certainly didn't happen by accident. Bolstering their suspicion was the incident's timing; that is, in the wake of the World Trade Center and Pentagon attacks, a moment of profound vulnerability for the American people. Even so, federal officials did not come forward with an acknowledgment that the pathogen's presence in the American Media building was quite likely a terrorist act. They also did not reveal that federally-funded scientists were using the same rare strain of the bacterium for the studies they were carrying out in highly restricted biocontainment laboratories. The only concession was a statement informing the public about the creation of the Amerithrax fact-finding team.

"While officials stress there is no indication the discovery of anthrax in South Florida is linked to any terrorist activity," reads an ABC News report dated October 8, 2001, "the FBI has assumed the lead in the investigation, with the cooperation of law enforcement, local and state health workers, and Centers for Disease Control and Prevention officials."[15] The news report added that Attorney General John Ashcroft continued to insist that the government's investigation was not a criminal inquiry.[16] Thus far, it had been painted either as an epidemiological or an environmental investigation.

Whereas the FBI and other government organizations, presumably to prevent panic, persisted in denying that a bioterror attack was strongly suspected, the CDC adopted a different tack. It, too, strove to discourage undue alarm, but it also furnished a dose of public education in anticipation of additional cases of the infection.

"Anthrax is not contagious," reads the agency's October 4th press release. "The illness is not transmitted person to person."[17] The statement continues,

> Although anthrax starts out with flu-like symptoms, it rapidly progresses to severe illnesses, including pneumonia and meningitis. If anyone has been exposed, antibiotics are the appropriate preventive treatment. CDC has an emergency supply of antibiotics ready for distribution.[18]

To its credit, the CDC issued further press releases in the succeeding days, fact sheets providing information about the bacterium's incubation period and further descriptions of symptoms that might emerge in the infected. To reassure those assumed to be at greatest risk—the workforce of American Media, together with the communities surrounding the publisher's Florida headquarters—the agency announced that the National Pharmaceutical Stockpile had enough antibiotics "to treat several thousand people in Palm Beach County, if needed."[19]

As things stood, thousands of people living in the region, although not experiencing symptoms, were already in a panic. "It's Cipro, Cipro, Cipro," said the manager of a local drugstore, referring to residents' determination to get their hands on the preferred antibiotic, ciprofloxacin, that was used to treat anthrax poisoning at the time.[20] Sales skyrocketed at the pharmacy, essentially tripling in the days after the American Media incident.

Unbeknownst to anyone in Palm Beach County—or to the specialists at the Centers for Disease Control, for that matter—a thirty-eight-year-old woman in New York City had also begun receiving Cipro. Unlike the rattled residents of South Florida, however, she was actually experiencing symptoms of the cutaneous form of anthrax. The most common type of the infection, the one in which the pathogen enters the body through the skin, it comprises over 95 percent of all cases and is less lethal than the inhalation variety.[21] It had been on October 1, 2001, upon developing a dark lesion near her shoulder, that she started taking the antibiotic.

The Manhattan Attacks

Erin O'Connor was her name and she worked in the New York City offices of NBC News, where she was an assistant to newscaster Tom Brokaw. In late September, the studio's incoming correspondence included an envelope addressed to the newsman, one that had been mailed on September 25th from St. Petersburg, Florida, and carried no return address. Removing the letter from the envelope, O'Connor read the inconsistently punctuated, misspelled message:

THE UNTHINKABEL.
SEE WHAT HAPPENS NEXT[22]

For O'Connor, what happened next occurred while she was attaching the letter to its envelope for filing. "As she shot a staple into the porous paper," says Robert Graysmith, "a 'relatively crude' substance spilled onto her."[23] A white powder similar to talc, O'Connor quite naturally was concerned about it, especially in light of the letter's menacing message.

Later that day, she noticed a rash on her neck, with more symptoms soon to emerge. "Over the next several days she developed a softball-size wound on her shoulder," writes David Willman, "along with a low-grade fever."[24] Although her doctor thought he might be looking at an infected spider bite, he didn't rule out the more troubling possibility of cutaneous anthrax, particularly since O'Connor had recently made contact with the mysterious powder.[25] It was during this office visit, then, that he prescribed Cipro and reported the potential exposure to city health officials. But then came a curious turn of events. Because the authorities were aware that previous mailed-in threats had amounted to

naught, they were skeptical of the doctor's report. "All these events had been hoaxes," says epidemiologist Joel Ackelsberg, Director of the Emergency Readiness and Response Unit of the New York City Department of Health. "[M]y approach was that they were going to continue to be hoaxes."[26]

Be that as it may, city officials relayed the physician's concerns to the FBI, with the federal agency, in turn, liaising with NBC's security division. At the Bureau's request, the latter scoured the company's mail until the letter was located, after which tests were performed on it. And what came next was precisely what city health officials had expected: negative results. No trace of anthrax spores were detected on the document, meaning it could not have been the source of infection. Rather, it was merely a warning of forthcoming events. For this reason, officials shelved the case. "According to the health department's protocol for suspicious powders, no follow-up of O'Conner's [sic] case was required," says Jeanne Guillemin of MIT's Security Studies Program.[27]

In the ensuing days, Erin O'Connor's lesion progressed in a manner characteristic of cutaneous anthrax—it blackened and hardened—but tests performed on it were inconclusive. Meanwhile, a second opinion backed up that of her doctor, who had concluded by now that the bacterium was indeed the cause of her condition. The second physician went so far as to note that the lesion was "as classic-looking as you can get."[28]

Finally, dermatologist Marc Grossman obtained tissue samples from the patient on October 9th and sent them to the CDC, where infectious disease specialists performed a biopsy. Perhaps because O'Connor had been receiving antibiotics, the results were negative, but further analyses using what the agency's pathologists described as "two novel immunohistochemical assays" did confirm that signs of anthrax infection were present in the samples.[29] "They also did serology, or blood tests," says Grossman, "that showed that she was developing anthrax antibodies."[30] So the question remained: given that the cryptic letter to Tom Brokaw had been a hoax, how did O'Connor contract the infection? And this raised the possibility of a second letter to NBC studios.

It was not a far-fetched notion. After O'Connor was diagnosed with anthrax poisoning, Casey Chamberlain, an NBC intern, reminded her that another letter had arrived around the same time as the first one. This second letter also contained an ominous message, along with a powder—it was a gray, grainy type resembling brown sugar—which the intern dumped into a wastebasket before routing the document on to O'Connor.[31] Chamberlain added that she had also become ill, developed a sore on her leg, and received antibiotics from her doctor. At the time, her condition was thought to be an allergic reaction to a skin medication she had recently been prescribed. Now, however, it appeared otherwise.

Chamberlain would share this crucial information with the FBI on October 12th, soon after the CDC determined that the O'Connor biopsy was

positive. Following this confirmation, New York City officials and the FBI sped into action, with the latter interviewing NBC employees for any information that might prove useful in what had advanced to a criminal inquiry. And it was during this process that Chamberlain told investigators about the second letter to NBC, a disclosure that constituted a seminal moment in the investigation. Within hours, health workers began testing the entire NBC workforce for anthrax poisoning, while the company's offices, which occupied the third floor of 30 Rockefeller Center in midtown Manhattan, were shut down and a systematic search of the crime scene initiated. When investigators, after combing through more of the company's discarded documents, succeeded in retrieving the second letter, they found it was postmarked September 18th from Hamilton, New Jersey, where a processing center handles the incoming mail from nearby Princeton. As expected, it tested positive for anthrax. "O'Connor did not remember seeing this letter before," says Leonard Cole, "but she must have come in contact with it between September 19 and 25."[32] At last, the source of her infection had been identified.

Terse, handwritten, and misspelled, the message itself was unnerving. It read,

09–11–01

THIS IS NEXT
TAKE PENACILIN NOW

DEATH TO AMERICA
DEATH TO ISRAEL

ALLAH IS GREAT[33]

It was evident that the letter, which was a photocopy, had either been penned by an anti–American, anti–Semitic Muslim or crafted to appear as such. Also intriguing, the paper had been hand-cut to a precise square, then creased to create a classic pharmaceutical fold so as to hold the spores without spillage. These measures, exacting as they were, betrayed an expertise in such matters. As to the message, it was printed in uppercase, or capital, letters—a peculiar but prevalent practice among those who compose anonymous threats. "Every maniac from Zodiac to the Unabomber favored uppercase printing," says Graysmith. "It was harder to match to an individual and gave a more terrifying aspect to messages, as did purposeful misspellings."[34] Obviously, whoever was behind the document was at the top of their game, be it a lone individual or multiple collaborators masquerading as one.

Proliferation and Panic

On this same Friday, October 12th, Judith Miller, a reporter at the *New York Times*, opened a letter that contained a handwritten threat. Like the

letter to NBC, it contained a white powder, one that smelled sweet, and it spilled onto her. Of all the *Times*' staff, the fact that only one such communiqué had arrived and was addressed to Miller seemed significant. What made it especially disconcerting was that Simon & Schuster, just ten days earlier, had published her book, *Germs: Biological Weapons and America's Secret War*, the subject being the U.S. government's classified biowarfare projects and strategies.[35] And there was more. The *Times*, a month before that, had printed Miller's article, *U.S. Germ Warfare Research Pushes Treaty Limits*, which called into question the American biodefense community's compliance with the 1972 global pact banning the development of bioweapons.[36] It was an article that contained a troubling revelation. "Earlier this year," Miller wrote, "the Pentagon drew up plans to engineer genetically a potentially more potent variant of the bacterium that causes anthrax, a deadly disease ideal for germ warfare."[37] Whether or not such publications were the reason Miller became a target would never be established for certain, but the possibility of such a link was undeniable. At the moment, however, the priority was to determine if the letter itself was contaminated, since lives might be at stake and the newspaper's staff was in a collective state of shock. "Whoever did this," Miller said, "had spread panic with only a few anthrax spores, or perhaps only baby powder, and the price of a few stamps."[38]

Securing the *New York Times* building, authorities searched the premises while health officials analyzed the fine, aromatic particles. It was a race against the clock to ascertain if the world's most prominent newspaper had become the target of bioterrorists. And the reassuring news arrived two days later: the building proved to be anthrax-free, and the powder, negative for the pathogen. It had been another deception.

As these nerve-wracking events were unfolding, investigators elsewhere in the city were checking the homes of NBC employees who had been exposed to the anthrax-laced Brokaw letter in case they may have carried the microorganism back to their residences with them. In this way, their family, friends, and neighbors could become infected as well, thus expanding the sphere of damage. And the outcome of the inspections was daunting. "[T]he homes of Erin O'Conner [sic] and Casey Chamberlain," writes Guillemin, "both proved significantly contaminated."[39]

By now, of course, it was neither possible to keep a lid on the story nor advisable to do so, representing, as it did, a public health threat. With the *New York Times* and NBC offices in lockdown and nearly four hundred NBC employees being tested for anthrax poisoning, some of whom were already being administered Cipro as a precaution, it was obviously time for city leaders to address the bio-attack in a public forum.

To this end, Mayor Rudolph (Rudy) Giuliani, on Friday, October 12th, spoke to reporters at a noon press conference in the course of which he

acknowledged that a letter sent to NBC News had tested positive for anthrax. Recognizing the panic that might ensue, he then sought to calm the public's fears, just as he would the next day at a similar media appearance. "We had a lot of people go to emergency rooms," Giuliani said. "[T]he fact is that the surveillance system that we have does not yet indicate any [additional] incidents of Anthrax."[40] Rather pointedly, he was inferring that such emergency room visits were probably unnecessary, while imploring the city's residents to remain clear-headed and composed.

It was a message the mayor would reiterate two days later when he and his team, in an afternoon press conference, again addressed the city's unremitting anxiety. "I was informed that since 7:00 a.m. until 1:50 we had 82 calls," he said, referring to the number of potential anthrax exposures that had been reported thus far that day, none of which had been confirmed.[41] Pointing out that disreputable individuals were exploiting the situation, Giuliani added that city officials had examined twenty-four suspicious packages during the same seven-hour period, some of them smelling suspiciously like baby powder and none appearing to be carrying the bacterium. It was, to be sure, a frustrating, fluid situation the mayor and his team were struggling to contain.

Certainly it is true that New York City was in the midst of an emotional storm what with the anthrax-tainted letter and the continuing hoaxes. And worsening matters was the fact that the bio-attack had come on the heels of the World Trade Center tragedy from which the city was still reeling. Bodies were still being dragged from the rubble and thousands more people remained missing as the menacing letters began to arrive. Bioterrorism, then, was achieving its goal. A single confirmed anthrax letter in the city had ballooned into a full-blown crisis, with the citizenry, vulnerable and sensitized owing to the Twin Tower attacks, overestimating the degree of danger.

Reminding New Yorkers that the letter to NBC News dated back to September 25th, Giuliani sought to ease anxieties by making the case that, in the city's favor, over two weeks had passed with no additional infections being verified. "[I]f anyone else was going to be infected, it would have happened by now," he said.[42] His well-intentioned argument, however, contained a flaw in that it was based on the assumption of impeccable diagnostics. As Jeanne Guillemin notes, no new anthrax infections were known to have emerged recently "but it didn't mean they had been correctly diagnosed or reported."[43] The fact is, more cases were indeed occurring but they were not being recognized as such, thereby placing both young and old at grave risk.

On September 28th, for instance, the mother of a seven-month-old boy took him to her office with her. A producer of *World News Tonight*, the woman

worked at ABC News in Manhattan. During the visit, her co-workers made substantial contact with the infant, hugging and nestling him, before a babysitter took him back to the family's home.

By the next morning, the boy was symptomatic. "[A] red sore the size of a half-dollar appeared on the back of the infant's left arm," writes Cole.[44] Believing it to be a spider bite, the family's physician placed him on the antihistamine Benadryl and sent him home. When the boy's condition deteriorated, he was admitted to New York University Medical Center, where he was started on antibiotics. But even as the treatment appeared to be producing a visible improvement in the lesion, his red blood cell count went into decline and soon he began exhibiting the early signs of kidney failure.[45] In the ensuing days, the staff performed blood transfusions and continued to administer antibiotics, with the fortunate outcome being that the infant did manage to survive the ordeal. Subsequent to this, his physician, after watching the news coverage of the NBC case, realized the culprit was probably the anthrax bacterium, which the Centers for Disease Control verified. On October 13th, the boy's name was added to the list of anthrax victims, making his infection the second confirmed case in the city and the fifth in the nation.

Next up was Claire Fletcher, a twenty-seven-year-old assistant to CBS news anchor Dan Rather. After a lesion appeared on her face on October 1st, she was placed on an antibiotic regimen that effectively combatted the infection. Only later, as the facts emerged about the NBC incident, would her condition be understood for what it was, cutaneous anthrax. But officials were on top of the situation by this point. Even as Fletcher was alerting the authorities to her apparent exposure, an inspection of CBS News headquarters was underway and turning up spores on various surfaces, among them Dan Rather's desk. No one at the network could recall opening an ominous, powder-laced letter, however, with the dispiriting conclusion being that Fletcher must have become contaminated in another fashion. Soon, a series of infections at the *New York Post* would bear out this concern.

It was an occurrence that began with thirty-one-year-old Joanna Huden, an entertainment writer at the newspaper, who noticed an unusual blister on her finger, assumed it was a type of bite, and obtained treatment for it.[46] However, Huden, upon learning more about the anthrax-laced letter sent to NBC News, realized the lesion may have been caused by the pathogen and notified the authorities. In short order, investigators descended on the *Post*'s headquarters, where potentially contaminated materials had already been collected and were awaiting analysis. It seems the newspaper's management, soon after the mayor revealed the NBC case, had taken measures to collect such materials.

"A *Post* memo a week earlier had asked employees to hunt through their work areas for any suspicious mail and place it in a bin for later testing," says

Graysmith.[47] A seemingly responsible course of action, it was not a wise move in actual practice. Rather than making the office environment safer, the procedure may have placed more employees in contact with the pathogen as they rummaged through their files and wastebaskets. As well, the searches may have spread the microorganism to other pieces of mail, with this further increasing the chances of infection. Tellingly, three additional cases of cutaneous anthrax would soon be diagnosed at the *Post*, one of which almost certainly occurred during this misguided retrieval process.[48]

From the thorough-going investigation carried out at the newspaper's headquarters, officials learned that a powder-filled envelope had previously been found and destroyed. More unsettling, they discovered on the premises another envelope, which, like the NBC missive, had been mailed in Princeton, New Jersey, and processed by the Hamilton Processing Center, in nearby Hamilton, New Jersey. Yet there was an important difference: this second envelope, which was damp, had not been opened; rather, the powder it contained appeared to have leaked from it. If so, it could have infected anyone who had come into contact with it, from its place of origin in New Jersey to the offices of the *New York Post*. For that matter, any parcels, correspondence, or mailbags the tainted envelope touched may have become infectious as well. As for the contents of the envelope, when investigators removed the letter they found it contained the same photocopied message as the one mailed to Tom Brokaw at NBC News.

Partly as a result of the *Post* cockup, businesses in the metropolitan area now instructed their employees not to handle suspicious letters or packages, while government investigators looked more closely at the risks faced by employees of the U.S. Postal Service. By the end of the month, well over six thousand postal workers in New York and New Jersey would either be tested for anthrax exposure or placed directly on Cipro as a precaution.[49] And although a handful would be diagnosed with the cutaneous form of the infection, they would all survive.

Unfortunately, it would be a different outcome for two others in the region, both of whom died after inhaling the spores. One was Kathy Nguyen, a Vietnamese immigrant who worked at the Manhattan Eye, Ear, and Throat Hospital, and lived alone in the Bronx. Despite exhaustive efforts, health officials were unable to determine how or where she had encountered the pathogen. The other casualty was ninety-four-year-old Ottilie Lundgren, who lived in the adjacent state of Connecticut and whose local post office tested positive for the bacterium. Not surprisingly, when this news became public, reaction was swift and sweeping. "Uncertain about the risks," says Guillemin, "people all over the country and especially in the Northeast refused to touch their mail."[50] To be sure, bioterrorism was succeeding spectacularly in spreading fear across the nation and restricting the behavior of untold numbers of

citizens. It was also inspiring hoaxers far beyond the boundaries of New York City, this simple, cost-effective means of traumatizing others and creating social disruption.

Imitation and Intimidation

"Anthrax hoaxes have gripped America and the rest of the world," wrote Paul Harris in *The Guardian* at this juncture, "causing far more chaos than any of the genuinely poisoned letters."[51] Highlighting the scope of the problem, Harris provided numerous examples of how ersatz anthrax letters were wreaking havoc from Europe to South America. In Paris, for instance, thirty-four people were hospitalized for observation in mid–October as a result of four separate hoaxes in the French capital. Meanwhile, employees at a telecommunications firm in Lima, Peru, were forced to vacate after the company received a hostile letter carrying an odd substance.[52] It was in the United States, however, that the menace was most pervasive.

Erupting after the announcement of the death in Palm Beach County and accelerating after Giuliani's press conference about the first New York City case, a plethora of anthrax threats beset the nation. The targets ranged from public schools and courts of law to the Internal Revenue Service, the Social Security Administration, even the Federal Bureau of Investigation. As for non-institutional targets, they ran the gamut from the *RMS Queen Mary*—the luxury liner permanently moored in Long Beach, California—to a pair of Home Depot stores in Pennsylvania, both of which received packets of powder from a resentful former employee. In the latter episode, the stunt cost the home improvement chain over a million dollars in lost revenue, since the two stores, among other consequences, were forced to close for several days.[53] And some threats hit even closer to home, such as the FedEx worker in Louisiana who slipped a granular substance into a package and delivered it to a woman on his route, and the man who secretly opened his neighbor's mail and placed a dusty carpet deodorizer in it.[54] According to an FBI report, one man went so far as to scribble the word "anthrax" on a powder-filled envelope that contained "a birthday card for his mother."[55] For sheer number, however, the warnings sent to family planning and abortion clinics were by far the most copious.

"During the second week of October," reports *CNN*, "more than 280 threatening letters were mailed to women's reproductive health clinics on the East Coast."[56] More would follow, nearly three hundred of them. Some, but evidently not all, were the work of one man, a prison escapee whom the authorities subsequently captured and in whose possession they found a sheath of pro-life leaflets, a rifle, and a pipe bomb.[57] Obviously, urgent action was needed to control the frenzy of bio-threats.

A decisive step in this direction occurred on October 21st, when the United Kingdom, which was also experiencing a staggering number of bogus claims, updated its existing laws pertaining to terrorist threats. Until now, its legislation had addressed explosive devices only, so the revision expanded it to include biological, chemical, and nuclear threats. The penalty: a maximum of seven years in prison. "It sends the clearest possible signal that we will not tolerate these hoaxes and [the] fear and widespread disruption they cause," declared Prime Minister Tony Blair, referring to the hastily prepared legislation.[58]

The United States government, by comparison, would not be nearly so timely. Within a few weeks, the House of Representatives passed the Anti-Hoax Terrorism Act of 2001 and sent it to the Senate, but it was not enacted. It would not be until three years later that such a measure, the Stop Terrorist and Military Hoaxes Act of 2004, was signed into law, thereby making bio-threats a federal offense. It is surprising, of course, that the federal government straggled in so important a matter, not least because two leading members of Congress were among those targeted by the anthrax operation. But unlike the bacteria-laced letters sent to NBC News and the *New York Post*, those dispatched to the congressmen carried an even more dangerous form of the pathogenic agent, one heretofore unseen by scientists.

A Capitol Offense

The person or persons behind the Amerithrax attacks placed Congress in their sights in early October 2001, mailing anthrax-spiked letters to Senate Majority Leader Tom Daschle of South Dakota and Senator Patrick Leahy of Vermont, Chairman of the Senate Judiciary Committee. Arguably the most influential Democrats in the nation at the time, the two lawmakers were among those working on the USA Patriot Act, an acronym for *Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism*. Identical in most respects to the New York City attacks, those targeting Washington, D.C., were set in motion in Princeton, New Jersey.

It was in this city that the Daschle and Leahy letters were mailed, then transferred to Hamilton, New Jersey, where they were sorted by automated, high-speed equipment at the Hamilton Processing Center. It is now believed that the machinery, which postmarks and routes incoming mail, may have crushed the powdery substance in the Leahy letter and caused it to seep through the envelope, become attached to the barcode scanner, and spread to other pieces of mail. Among the consequences, over four hundred postal facilities in New Jersey became cross-contaminated with the pathogen. Not only that, the microbes traveled to other states as well. In the picturesque

New England town of Wallingford, Connecticut, for instance, three million anthrax spores were detected in the local post office; such was the expanse of the dispersal pattern.[59] It is also instructive to note that this development was almost certainly unanticipated and illustrates a major disadvantage of bioterrorism discussed earlier in this book, namely the difficulty its perpetrators face in controlling the microorganisms they unleash.

From New Jersey, the two anthrax-tainted letters traveled to the Brentwood Postal Facility in the nation's capital. Employing thousands of workers and sorting several million letters and parcels each day, the Brentwood center handles the entirety of U.S. mail bound for the twelve government buildings that comprise the Capitol Complex on Capitol Hill. In addition to numerous government agencies, this cluster of buildings also holds the offices of the nation's senators and state representatives.

As it turned out, one of these edifices, the Russell Senate Office Building which housed Patrick Leahy's offices, would be spared from exposure because the letter addressed to the lawmaker was misrouted. And while the Daschle letter would be misrouted as well—the hand-printed envelope is thought to have been the reason—it was still delivered, albeit behind schedule. In fact, it would not be until a week later, on Monday, October 15th, that it arrived at Daschle's suite in the Hart Senate Office Building.

In one respect, the delay was fortunate, since Washington, D.C., was now aware that it was at risk of a biological attack. Only three days earlier, Rudy Giuliani had publicly revealed the existence of the first anthrax-tainted letter in New York City, the upshot being that the capital had been placed on alert, its intervention strategy primed. Tom Daschle was fortunate, too, in that he was attending a meeting in the Capitol Building on this inauspicious morning, a distance away from his offices in the Hart building. Forty members of his staff would not be so lucky, however, being in his suite and on the job when the poisonous missive arrived.

It was a young female intern who examined the envelope, which was sealed with tape and carried the return address of an elementary school in a small town in New Jersey. In itself, this was unremarkable, since lawmakers often receive messages from students as a part of classroom projects. Only later would investigators discover that this particular school did not exist. Believing the letter to be benign, then, the intern proceeded to open it.

"She felt a small bulge at one end, but slit open the flap anyway," writes Graysmith. "A puff of choking gray powder disgorged itself onto the desktop."[60] Like the messages to NBC and the *New York Post*, the letter was a photocopy, as well as being moist and hand-printed on a pharmaceutically-folded sheet of paper. "YOU CAN NOT STOP US," it said.[61] Once again, the English was less than standard. And then came the thrust:

WE HAVE THIS ANTHRAX.
YOU DIE NOW.
ARE YOU AFRAID?

DEATH TO AMERICA.
DEATH TO ISRAEL.
ALLAH IS GREAT.[62]

The intern pitched the letter into the wastebasket and phoned the police, who, in turn, alerted health authorities. Within minutes, officials activated the capital's biohazard protocol, with John Eisold, the chief physician at the Capitol Complex's clinic, dispatching a five-member team to the Daschle suite.[63]

"I grabbed a big bottle of Cipro," says Norman Lee, the doctor who headed up the team. "We also brought doxycycline and enough culturettes for the swabs."[64] While law enforcement, using portable immunoassay devices, screened Daschle's offices and the adjoining suite of Senator Russ Feingold for signs of the bacterium, the medical team set about testing the two lawmakers' staffs. Since the results would not be available for at least forty-eight hours, the team, as a preventive measure, offered Cipro to the seventy workers who were present in the Daschle and Feingold suites and instructed them to report to the Capitol clinic the next day for follow-up care. As it turned out, far more people would require medical attention because the first responders, in the pandemonium of the moment, did not turn off the air conditioning, the result being that it continued circulating air, possibly contaminated with anthrax, throughout the Hart building for another thirty minutes.

Ultimately, the number of people checked for anthrax poisoning would exceed six thousand, twenty-eight of whom would test positive for exposure to the pathogen, meaning its presence could be detected on nasal swabs. None of the exposures would progress to infection, however, due presumably to the prompt cleansing of the victims' nasal cavities and rapid administration of Cipro. Certainly the timely intervention by the Capitol's medical team, together with law enforcement, appears to have effectively contained the incident. Nevertheless, it was imperative that the Hart building be sealed off and decontaminated, a three-month process during which it was necessary to relocate thousands of government workers. Then, too, the damp, leaky anthrax letters—the one mailed to Leahy was subsequently located elsewhere in the city—caused significant cross-contamination to other pieces of mail. Investigators detected traces of anthrax at the White House, Pentagon, Supreme Court, Central Intelligence Agency, State Department, Justice Department, and the Bureau of Alcohol, Tobacco, and Firearms.

Most endangered, though, were the postal facilities in the metropolitan area. At the Brentwood center, for instance, an employee attempted to clean

an apparatus on which anthrax spores had accumulated. Not realizing he was dealing with the highly virulent pathogen, the man used a compressed-air device to dislodge the microbes, which caused them to rain down on him. And symptoms soon erupted. "His face and body became swollen, the membrane around his lungs become inflamed, and he grew unsteady on his feet," writes Graysmith. "Within days he could only speak haltingly and had lost his short-term memory."[65] Not surprisingly, more postal workers would become ill before the situation stabilized. And the situation would indeed stabilize, and fairly soon, with a fragile sense of normalcy returning to the battered nation.

It would be on October 26, 2001, that President George W. Bush signed into law the Patriot Act, a radical piece of legislation ostensibly designed to help prevent terrorist attacks on American soil in the future. By this point, the preponderance of damage caused by the Amerithrax offensive had been done. Shell-shocked, the nation had endured the first major bioterror assault in its history and was preparing to grapple with the aftermath, which would include exorbitant costs. Case in point: the decontamination of the Capitol Complex. It would cost the American taxpayer nearly thirty million dollars to make safe the buildings on its campus.[66] Decontamination expenses in Florida and New York City would likewise be considerable. And there was a substantial human cost, with five people perishing in three regions of the country, all due to inhalation anthrax. Seventeen others suffered from anthrax poisoning but survived, the majority of the cases being cutaneous in nature. And still another twelve thousand people were thought to have been exposed to the pathogen and offered antibiotic therapy as a precaution. All told, the Amerithrax attacks proved to be the most widespread, expensive, and successful biological assault in U.S. history. Yet the question remained: who committed this unprecedented crime?

Pursuit of the Bioterrorists

Among the earliest answers to be proposed were those pointing to foreign sources, namely, the Islamic terrorist elements accused of planning and executing the 9/11 attacks in New York City and Washington, D.C. White House officials wasted no time fingering al-Qaeda as the suspect, with President Bush publicly linking the attacks to the organization during an October 23rd photo-op when asked about the perpetrators' identities. "[T]here's no question that anybody who would mail anthrax with the attempt to harm American citizens is a terrorist," Bush said. "And there's no question that al Qaeda is a terrorist organization."[67] Acknowledging he had no evidence to support this hypothesized link between al-Qaeda and the biological offensive,

the president's words nevertheless made it clear the White House was pointing toward the extremist organization as the guilty party.

But although the Bush-Cheney administration would continue to promote this narrative for the next two years, the FBI, within weeks, would shift its focus to the possibility of a domestic, lone-wolf terrorist, the type who functions independently of organizations and states. In fact, the prospect of such a solitary figure would eventually become the FBI's only hypothesis, and the agency would pursue it relentlessly for years.

But perhaps the most provocative thesis to emerge was the one detailed in the recent book, *The 2001 Anthrax Deception*, written by Harvard-educated scholar Graeme MacQueen, Founder and Director of the Centre for Peace Studies at Canada's McMaster University.[68] A theory that has existed for many years, one that has been constructed and advanced in large measure by journalists, it claims a surprising number of adherents, among them a handful of prominent political figures. It is both intriguing and audacious, even rather jarring, since it suggests the complicity of the Bush-Cheney White House in the Amerithrax attacks.

False Flag Theory

As its foundational proposition, the thesis holds that elements connected to the executive branch of the U.S. government—specifically, neoconservative collaborators linked to high-level figures in the White House—played a central role in the attack. The objective: to justify the U.S.-led invasion of Iraq.

In terms of particulars, the theory asserts that the architects of the Amerithrax attacks sought to rally support for the incursion into the Middle Eastern nation by creating the illusion that al-Qaeda, based in Afghanistan, was targeting the United States with letters contaminated with pathogens provided by Saddam Hussein's biowarfare program in Iraq. It was purportedly for this reason that the letters were designed to appear as if they were the product of a radical Islamic organization like al-Qaeda.

In reality, the "Muslim" letters, with their conspicuous misspellings and Western-style misstatements—"Allah is Great" rather than *Allahu Akbar* or its English equivalent, "God is Greatest," for example—proved to be rather unconvincing, at least to investigators. "It was as if someone had tried to frame Native Americans for the crime by inserting a note in the letters announcing, 'White man in heap big trouble,'" says MacQueen.[69] But no matter; the documents were allegedly crafted to convince the American public that Islamic terrorists were behind the attacks, a public that had just been traumatized by the horrors of 9/11, was presumably gullible, and could easily be misled by talk of Allah, America, and Death.

The false flag theory further asserts that the United Nations Security

Council was also meant to be duped, if not by the letters' text then by the anthrax contained within them. On February 5, 2003, at a time when the White House was pressing other nations to join its impending war in the Middle East, Secretary of State Colin Powell appeared before the UN and delivered a speech containing false allegations about Iraqi weapons of mass destruction, both biological and nuclear. "The attempt to link Saddam [Hussein] to the anthrax attacks was just as fraudulent—and just as significant—as the attempt to link Saddam to 9/11, Al Qaeda and nuclear weapons," writes journalist Glenn Greenwald.[70] In subsequent years, Powell would concede that his presentation to the august body, which proved to be the nadir of his career, was not based on accurate information and had tarnished his reputation.

In regard to the speech itself, the Secretary of State began his discussion of bioweapons, and anthrax in particular, by underscoring the lethality of the bacterium and its potential to decimate the American population.[71] "Less than a teaspoon of dry anthrax in an envelope shut down the United States Senate in the fall of 2001," declared Powell, brandishing a small vile of faux anthrax in front of the television cameras. "This forced several hundred people to undergo emergency medical treatment and killed two postal workers just from an amount … about this quantity that was inside of an envelope."[72] He then proceeded to describe the profound threat that Iraq, with its alleged stockpiles of the pathogen, continued to pose to the United States. "Saddam Hussein [may] have produced 25,000 liters … enough to fill tens upon tens upon tens of thousands of teaspoons."[73] Although the Secretary of State did not declare, categorically, that Iraq had furnished the microbes contained in the Amerithrax letters, his words were exquisitely hewn to insinuate it had done so. "[H]e made sure Iraq, anthrax and the Senate were all mentioned together," says MacQueen.[74] And Powell's verbal gymnastics proved to be persuasive, above all to the public viewing the televised speech. "[H]e had singlehandedly convinced many skeptical Americans that the threat posed by Iraqi dictator Saddam Hussein was real," reports the *Washington Post*.[75]

And there is more. While the false flag theory holds that the paramount objective of the bacteria-laced letters was to help build a case for the invasion of Iraq, MacQueen proposes a second, more immediate purpose for the lethal letters as well. It concerned the perpetrators' reason for selecting as their victims the nation's two leading Democratic senators, Tom Daschle and Patrick Leahy. MacQueen contends that it was an exceptionally vicious episode of political strong-arming.

In late September and early October of 2001, Daschle and Leahy, by virtue of their roles in Congress, were deeply involved in the creation of the controversial Patriot Act, both of whom had strong reservations about its constitutionality and its reach. Of even greater consequence for the bill's fate,

the two lawmakers were in a position to slow or stall the legislation. As Senate Majority Leader, Daschle could, and did, delay the bill on the grounds that it would hand too much power to President Bush. The congressman insisted that it be amended to reduce the president's authority to wage future wars. Likewise, Senator Leahy, as Chairman of the Senate Judiciary Committee, slowed passage of the Patriot Act, since his committee's job was to assess the impact it might have on civil liberties. He was worried the bill would lead to the erosion of citizens' rights.

So it was that the Bush/Cheney White House, frustrated by such resistance, demanded that Congress put aside its misgivings and approve the Patriot Act by October 5, 2001. Yet the demand from the Oval Office was not heeded, with the deadline passing without the bill being approved. In large part, the delay was the result of objections registered by Daschle and Leahy. Accordingly, between October 6th and October 9th, anthrax-laced letters were mailed to Daschle and Leahy, with the potency of the pathogen, as noted earlier, being far greater than that contained in the letters dispatched to media figures.[76] "[G]iven Democratic control of the Senate and the importance of quickly getting these two senators on board, it is obvious why Daschle and Leahy would be key targets of intimidation for anyone wanting the bill passed," writes MacQueen.[77] In the end, this act of coercion, as the false flag theory depicts it, was effective, since shortly after the bacteria-laden Daschle document arrived on Capitol Hill, Congress, in a state of panic, overwhelmingly approved the Patriot Act in spite of numerous concerns on both sides of the aisle.

Along the same lines, the theory hold that the perpetrators' choice of media figures was significant as well. Case in point: Judith Miller, the *New York Times* reporter who received a letter containing simulated anthrax. Although it did not harbor the actual bacterium, the document itself appears to have been prepared by the same perpetrators who sent the poisoned letters to others. Subsequent to this, Miller joined the ranks of those who zealously supported the Bush administration's campaign to invade Iraq. So intense was her advocacy for the incursion that numerous commentators dismissed her as a shill for the White House, and, on more than one occasion, questioned the precision of her reporting. "[W]ildly inaccurate," is how the *Columbia Journalism Review* described some of her articles about Iraq's alleged weapons of mass destruction.[78] They were charges Miller would address in *The Story: A Reporter's Journey*, her 2015 memoir.[79]

Lastly, the false flag theory offers an explanation as to why the first anthrax victim was Robert Stevens, an employee of American Media, Inc., in Lantana, Florida. As it happens, Lantana was also the temporary home of four of the Middle Eastern men who would subsequently be alleged to have taken part in the ghastly attacks on the World Trade Center and the Pentagon.

Not only did they live in Lantana prior to 9/11, the four men also shared, and were on friendly terms with, the same real estate agent as Robert Stevens, Gloria Irish. And Gloria's husband, Mike Irish, was an editor-in-chief at American Media, Inc., where Stevens was an employee. The false flag theory, then, holds that the true perpetrators of the Amerithrax attacks selected Stevens and American Media to be the first victims in order to associate the Florida bio-attack with the four alleged 9/11 hijackers, and to do it by means of proximity and mutual friendships. As it stands, all other theories, including those put forth by the FBI, dismiss as a coincidence the fact that the initial anthrax victims and the four of the alleged hijackers all happened to reside in the same small, Southern town—its population was only 9,400 at the time—and, moreover, that they also shared the same real estate agent.

As for the Bush administration's story, the false flag theory, as previously outlined, argues that the White House narrative about the anthrax attacks was erroneous from the start; that there was no evidence, direct or circumstantial, of foreign involvement in the Amerithrax offensive. Instead, the attacks were, part and parcel, a domestic undertaking and seemingly with government complicity, if not government provenance. As it happens, this certainty of a home-grown entity masterminding the biological assault marks the principal point of agreement between adherents of the false flag theory and investigators for the FBI, the latter also being were convinced that the attacks were executed by a domestic entity. The difference is that the Bureau believed there was only one perpetrator and no government connivance. In the years that followed the attacks, three suspects would come into the agency's crosshairs.

Case 1: Ayaad Assaad

It was approximately three weeks after the 9/11 attacks on the World Trade Center and the Pentagon that the Federal Bureau of Investigation began exploring its single-actor theory. The event that sparked the inquiry began when an anonymous tipster sent a typewritten letter to military police at the Marine Corps Base—Quantico, thirty-five miles south of Washington, D.C.

The letter was postmarked September 26, 2001, meaning it was mailed one day after the two anthrax-tainted letters were sent to the *New York Post* and Tom Brokaw at NBC News. At this point, no anthrax infections, most notably that of Robert Stevens in Lantana, Florida, had been made public.

Received on October 2nd at the Quantico base, the letter warned that a scientist who hailed from the Middle East, Ayaad Assaad, was a religious fanatic and a potential terrorist, that he had the means to carry out a biological strike on American soil, and that he had expressed the will to do so. The document thereafter furnished details about Assaad's family life, and, even

more startling, the particulars of the classified biodefense research he had conducted in the past. Accordingly, the source of the message appeared to be a person, or persons, who had worked in close proximity to the fifty-three-year-old scientist and knew him well.

In reality, Assaad was neither an Islamic zealot nor a terrorist. He was an Egyptian American microbiologist who had worked for ten years in USAMRIID's biodefense program, situated at Ford Detrick, until budget cuts in 1997 forced the institute to terminate a third of its staff. Subsequent to this, he secured a senior-level position in toxicology at the Environmental Protection Agency.

What *is* significant is that Assaad had been among a handful of scientists who had been scorned and harassed by a clique of coworkers while at Fort Detrick, a group that christened itself the "Camel Club."[80] Congregating during the Gulf War years, the group's participants were openly hostile to their Middle Eastern colleagues at the facility. Plausibly, one or more members of this blinkered crew may have sent the poison-pen letter in an attempt to frame Assaad for the actual anthrax-laden letters that were now in the mail, even though the accused was no longer associated with Fort Detrick.

So it was that FBI investigators decided to pursue the allegations, and to this end interrogated the scientist on October 3rd for several hours. To Assaad's relief, they determined he was not a religious zealot or political extremist and absolved him of the accusations. Even so, he remained incensed by the malicious letter, and he did not hesitate to make his feelings known to the press. "My theory is whoever this person is knew in advance what was going to happen [and set me up as the] scapegoat."[81] And the FBI concurred. The fact that someone sent a warning to authorities about a bio-attack merely twenty-four hours after such an attack had been set in motion hardly seemed coincidental, and it prompted the Bureau to turn its attention to those inside the biodefense establishment. But this was not the agency's only reason; two additional issues caused it to look into this community as well. The first involved the strain of the anthrax bacterium and the second, the technology and expertise required to refine it.

Within forty-eight hours of receiving and refuting the accusations against Assaad, the FBI received the results of the initial anthrax analysis from Paul Keim's laboratory in Arizona. The Bureau was notified, on October 5th, that Floridian Robert Stevens had been exposed to the Ames strain, with the same variant being confirmed a few hours later in another South Florida case, that of mail courier Ernesto Blanco. Then, on October 14th, Keim informed federal officials that the letter dispatched to Tom Brokaw in Manhattan contained the Ames variant as well. And forty-eight hours after that, he relayed the same findings to the authorities, except in this case they concerned the variant that had been sent to Senator Daschle at the Capitol

Complex. "Keim's strain identification," writes Guillemin, "forged an undeniable link to the U.S. defense establishment," since this particular variant, as we have noted, was maintained in high-security laboratories under the auspices of the Department of Defense.[82] Keim's findings also linked the government's Ames strain to the attacks in Florida, New York, and Washington, D.C., meaning they were not unrelated incidents or copycat crimes but a coordinated sequence of assaults.

Further bolstering the FBI's suspicions about a biodefense insider or band of accomplices, the Ames strain contained in the Daschle letter had been milled to an extraordinary degree, a degree previously assumed to be unattainable. So advanced was the technological process that refined the microbe, so minuscule were the spores, that they were nearly vaporous when dispersed. By modifying the pathogen to render it so infinitesimally small, its engineers ensured not only that it would float in the air to the point of near-suspension, but also that it would be exceedingly lethal when inhaled due to its ability to lodge deeply in the lungs. At the time, the consensus was that civilian research centers in the United States lacked the technical sophistication to craft an agent of this type, as did most of the military's biodefense labs. As to the very few that might possess the requisite equipment coupled with the know-how, investigators named as possibilities the Battelle Memorial Institute in Ohio and the Dugway Proving Ground in the Utah desert, where biological and chemical weapons are tested ostensibly for defensive purposes.

To be sure, the nation would be in grave danger if the source of the Amerithrax attacks proved to be embedded somewhere among the scores of scientists and technicians holding security clearances. But this is what Paul Keim's findings seemed to suggest. They also appeared to indicate that a profound security breach had not only taken place, but that the brilliant, if devious, creators of the enhanced pathogen possessed "the scientific capacity to launch more attacks," in the words of Jeanne Guillemin.[83] Accordingly, the FBI, gripped by the prospect of further germ warfare assaults, redoubled its efforts to track down the killers—or, as the Bureau would insist until it closed the case, "the killer." And it would be ten months after the Amerithrax attacks that the agency would visibly zero in on a "person of interest."

Case 2: Steven Hatfill

It was the summer of 2002 and the White House was still fostering the notion that al-Qaeda had committed the anthrax attacks using Iraqi-supplied pathogens. In a sharp departure from the Bush-Cheney position, however, the FBI set off in pursuit of an American scientist, Steven Hatfill, an accomplished virologist having a background in biodefense research. An intelligent, creative, and ambitious man, Hatfill was remarkably successful even if he was

not always in favor with his colleagues. Partly, this was because he was not one to hold his tongue, although he was certainly no terrorist according to those who knew him well.[84]

Born in 1953 in St. Louis, Missouri, the FBI's "person of interest" grew up in the central Illinois town of Mattoon. In 1978, after graduating from college and completing a stint in the army, he moved to Africa—specifically, Rhodesia (later renamed Zimbabwe) and South Africa—where he may or may not have been associated with those nation's militaries. Suffice it to say, more than a little mystery remains attached to this period of his life, with there existing wildly divergent accounts of his deeds. As to the reports of his foreign military involvement, author and editor Leonard Cole writes that Hatfill professed to having participated in covert activities while in Africa. "An intelligence analyst who knows Hatfill," says Cole, "confirmed to me that Hatfill had been involved with special operations there of an unspecified nature."[85]

What is known with certainty is that Hatfill was awarded a medical degree in 1984 from the University of Zimbabwe (Godfrey Huggins School of Medicine), after which he completed a residency in hematological pathology, acquired two masters degrees, and pursued doctoral studies in molecular biology at Rhodes University in South Africa. Along the way, he also led a scientific expedition to Antarctica.

In 1994, the United Kingdom became his home for a stretch, with Hatfill relocating to England for a year to carry out biomedical research at an Oxford-affiliated site. Next up was a fellowship at the National Institutes of Health in Bethesda, Maryland, followed by a National Research Council fellowship at Fort Detrick (USAMRIID). While at the latter post, the Department of Defense granted Hatfill a basic security clearance, one that would allow him access to the USAMRIID biosafety labs which housed the Ebola and Marburg viruses. This was necessary because his research centered on viral biowarfare agents, his objective being to help protect the population from such pathogens.

After completing his fellowship at USAMRIID, Hatfill continued his research, this time in the private sector, by accepting a position at the Science Applications International Corporation (SAIC) in Maclean, Virginia. A company that performs biodefense work for the U.S. government, he apparently had no complications at the firm until August 2001, when he was required to undergo a routine, CIA-conducted polygraph test. Because the results turned out to be inconclusive, the Department of Defense, while it reviewed the matter, suspended his existing security clearance as well as withholding a top-secret authorization that was necessary for certain SAIC projects. It was a turn of events that was likely the reason SAIC felt it necessary to terminate him in March 2002, even though it retained him as a consultant; this,

in conjunction with a reporter's phone call to the company that same month informing it that Hatfill was among those scientists considered a "person of interest" in the Amerithrax attacks. So it was that he left SAIC at this juncture, although he landed another position without difficulty, his suspended security clearance notwithstanding.

Louisiana State University, in short order, tapped the virologist to serve as Associate Director of its National Center of Biomedical Research and Training. "Hatfill had been highly recommended to Louisiana State University by two very highly placed friends" from the National Institutes of Health, writes Graysmith, an auspicious development both for LSU and for Hatfill himself in view of his circumstances.[86] Unfortunately, the job would not last long due to the FBI's ever more invasive presence in his life.

As the Bureau had done with other scientists known to have had access to biodefense labs prior to the Amerithrax attacks, it approached Hatfill in January 2002, and questioned him about his activities. It also administered a polygraph test, which he passed.[87] Yet he was not off the hook. Six months later, the FBI contacted him again with further questions, with the virologist meeting with investigators once more and offering them the opportunity to inspect his home, car, and off-site storage unit without a search warrant, which they did. And like the initial interview and polygraph test, neither this second interview nor the ensuing searches unearthed any incriminating material. Then, without warning in August, the FBI turned up yet again on his doorstep, this time with a court order in hand and surrounded by television crews. As news helicopters circled overhead, investigators swarmed the premises and made off with his computer and other items. It was a spectacle that seemed staged for maximum publicity, even though the Bureau denied it had tipped off the media in this high-profile case that had yet to yield a meaningful lead in eight months.

"[T]he FBI had been under pressure to solve the case, both from Congress and the general public," writes Marilyn Thompson, the former Assistant Managing Editor of Investigations at the *Washington Post*. "Already under fire for its failure to detect and thwart the plans of the 9/11 hijackers, the bureau badly wanted to prove its competence by making an anthrax arrest."[88]

As it stood, the agency had kept Hatfill under constant surveillance throughout the summer, which had not been the case for the twenty-nine other "persons of interest" it was said to be monitoring. And Hatfill knew the FBI was singling him out. Between the heightened surveillance and the highly publicized raid on his home, he suspected that he was being set up as the fall guy in the Amerithrax case.

Among the reasons the FBI claimed the virologist had come to its attention: he had spent ten days in England in November 2001, a trip that coincided with a hoaxed anthrax threat being mailed to the United States from London.

In reality, Hatfill, shortly after the attacks, had traveled to the town of Swindon, England, to undergo training by Hans Blix, chief of the United Nations' WMD inspection program. The UN had selected Hatfill to join its cadre of bioweapons inspectors, the plan being to dispatch him to Iraq to search for any biowarfare agents that Hussein's military might still possess. Fortunately, a fellow scientist who escorted Hatfill vouched for the fact that the virologist had not traveled into the city of London during the trip and therefore could not have mailed the threat.

Investigators also pointed to an entry on Hatfill's résumé, one from the late 1990s when he was serving as a biodefense consultant to the Metropolitan Medical Strike Force of Washington, D.C. Among his areas of knowledge, he listed the following:

> [F]ormer U.S. and foreign BW programs, wet and dry BW agents, large-scale production of bacterial, rickettsial and viral BW pathogens and toxins, stabilizers and other additives, with former BG [*Bacillus globigii*] simulant production methods, open air testing and vulnerability trials, single and 2 fluid nozzle dissemination, bomblet design, munitions programs, and former Soviet BW programs.[89]

Because Hatfill's description demonstrated an interest and knowledge of biowarfare, and because he had developed training programs designed to prepare emergency responders for bio-attacks, investigators found him suspicious. It was a contorted logic that Hatfill would later liken to Kafka's absurdist novel, *The Trial*.[90] Of particular significance to the FBI, Hatfill had long argued, correctly as it happens, that the United States was ill-equipped to handle a large-scale bioterror assault, with investigators hypothesizing that he may have launched the Amerithrax attacks in order to trigger widespread panic and thereby stimulate the federal government into increasing its funding of the biodefense industry. It was a stretch, without a doubt.

A third source of suspicion centered on another entry on Hatfill's résumé, an entry claiming he had obtained a Ph.D. in molecular biology from Rhodes University. In actuality, he had finished his dissertation and progressed to doctoral candidacy status, but, for whatever reason, did not receive the degree itself. And this was taken as support for the position that he might be a bioterrorist, suggesting, as it did, an impairment in his integrity.

Then there was the draft of a novel investigators retrieved from the computer confiscated from his home. An aspiring writer, Hatfill had penned a thriller in which the bubonic plague is set loose upon a population. It was a tale that had been born years earlier at a dinner party during which the guests—military officials, journalists, and Hatfill himself—spontaneously invented a narrative about a bioterror assault within the United States. Reflecting on the story sometime later, Hatfill decided to weave it into a novel. Upon finishing the text, he registered it with the U.S. Copyright Office and shared

it with a friend, a former CNN correspondent, whose help Hatfill solicited in securing a literary agent. While the manuscript, then, was not a secret, and although anthrax did not make an appearance in the story and the U.S. Postal Service was not the route of the fictitious plague's spread, the FBI nevertheless considered the novel a red flag. Shortly after the Bureau downloaded the draft from Hatfill's computer, it appeared in the news media and quickly caused the virologist to appear as something of a madman.

Lastly, *Newsweek* magazine reported that an FBI bloodhound, one that had been exposed to the scent of the Amerithrax letters, identified the same scent at a Denny's restaurant in Louisiana, one the virologist supposedly patronized. It was a curious assertion, since the pristine letters—forensics specialists had been unable to detect fingerprints or DNA evidence on them—had subsequently been decontaminated by irradiation, causing independent experts to express serious doubts about the validity of the FBI's claim.[91] And equally disconcerting was a follow-up to the story itself. "[T]he *Baltimore Sun*," writes journalist David Tell, "phoned the managers of all 12 Denny's restaurants in the state of Louisiana, each of whom insists that no such bloodhound search as is recounted by *Newsweek* has ever been performed on his premises."[92] If the *Baltimore Sun*'s findings are accurate and no tracking dogs were actually used, it raises questions as to who fed the specious information to *Newsweek* and for what purpose.

In the end, the Bureau did not have a strong case against Hatfill. In fact, it had no case at all, with the agency itself conceding a lack of evidence linking the virologist to the Amerithrax attacks. All the same, its agents continued tailing their quarry around the clock, and, by Hatfill's own account, they did so quite conspicuously. But he would have none of it. On August 25, 2002, he called a press conference, one in which he blasted the FBI and its tactics. Complaining of repeated leaks of information calculated to impugn his reputation and railing against the agency's attempts, as he perceived the situation, to stress him to the breaking point, he called into question the motives behind the events.

"This assassination of my character appears to be part of a government-run effort to show the American people that it is proceeding vigorously and successfully with the anthrax investigation," Hatfill declared in the nationally televised appearance on the steps of his attorney's office. "The FBI can be seen to be on the job, the press is hot on the trail and the public is satisfied … that progress in the anthrax letter attacks is being made."[93] He added, "I want to look my fellow Americans directly in the eye and declare to them, 'I am not the anthrax killer.'"[94] At the conclusion of his comments, Hatfill, clearly distraught, tearfully embraced a friend.

Besides proclaiming his innocence before the same media that had been castigating him—a piece in the *New York Times* excoriated the FBI for not

pursuing even more aggressively a certain "person of interest" who fit the virologist's description—Hatfill asked that he be permitted to furnish handwriting samples to the Bureau for comparison with the writing in the Amerithrax letters.[95] During the press conference, he wondered openly why he, who was under suspicion, had to suggest this standard procedure to the FBI rather than the Bureau initiating it of its own accord. Additionally, Hatfill volunteered publicly to take a blood test. This is because the press was reporting that he was known to have taken Cipro in the past, which was true, but the news accounts neglected to mention that he had been prescribed the antibiotic by his physician when he was about to undergo sinus surgery. A blood test, Hatfill knew, would confirm that he had not been vaccinated against anthrax in the previous three years and had no antibodies to the pathogen in his system.

Hatfill also produced and distributed to the news media his SAIC timesheets which established that he had been on the job in Maclean, Virginia, on those days and times when the anthrax letters were mailed in New Jersey. Further verifying his presence on those days was the entirety of his former SAIC crew of coworkers. As Hatfill made clear in the press conference, he could not have undertaken the eight-hour roundtrip drive to New Jersey to post the letters while he was at work in another state.

And finally, Hatfill, throughout the investigation itself, made the case over and again that he was a virologist with a specialty in the Ebola virus. He was not a bacteriologist with an expertise in anthrax. Still, the FBI continued to pursue him as the likely terrorist, even to the point of draining a pond near his home the following year at a cost to taxpayers of a quarter of a million dollars.[96] Meanwhile, LSU, which remained highly supportive of him, was forced to suspend him because his government funds were cut off, with the virologist, by 2003, being nearly insolvent.[97] And so he made his last stand.

Determined to clear his name while penalizing those he believed had wronged him, Hatfill, commencing in August of this same year, filed a series of lawsuits against the Federal Bureau of Investigation, the Department of Justice, Attorney General John Ashcroft, the *New York Times*, and *Vanity Fair* magazine, among other parties. His complaints ranged from libel and defamation of character to violations of privacy stemming from the FBI's illegal leaks to media outlets. He then spent the next five years in court, until, at long last, he was vindicated.

Ultimately, the court dismissed his suit against the *New York Times* on the grounds that he was now a public figure and could not prove malicious intent on the part of the newspaper. By comparison, his complaint against *Vanity Fair* was resolved in his favor, with Hatfill settling out of court for an undisclosed sum. Even more significant, the Department of Justice, having

within its jurisdiction his principal nemesis, the FBI, was ordered to furnish him with an annuity worth 5.8 million dollars for its having leaked information about the investigation. It was a victorious moment for the exhausted Hatfill. After the judgment was handed down, his attorneys released a statement underscoring the importance of the nation's courts in ensuring that citizens' rights are respected by the government and the media, while also expressing their optimism that the legal and financial ramifications of the case would discourage similar conduct by federal investigators and journalists in the future. "We can only hope that the individuals and institutions involved are sufficiently chastened by this episode to deter similar destruction of private citizens in the future—and that we will all read anonymously sourced news reports with a great deal more skepticism," they said.[98]

Two months later, on August 8, 2008, the FBI issued a statement exonerating Steven Hatfill. It declared there was nothing to tie him to the Amerithrax attacks, nothing to connect him to the flask of spores that had taken the lives of five people. It was the admission Hatfill's attorneys had insisted upon, and it irritated Iowa Senator Charles Grassley who was serving on the Judiciary Committee. "We've had a seven-year investigation and $15 million spent on it and one of the 'people of interest' bought off for $5.8 million over what was obviously an F.B.I. screw-up," he charged.[99]

The senator would be similarly dissatisfied with the next "lone wolf" the Bureau would point to as the terrorist. It was a suspect who would emerge from a renewed search that started in 2006 as the Hatfill case was winding its way through the courts in what was shaping up to be a defeat for the Bureau. At a crossroads, FBI director Robert Mueller replaced the head of the Amerithrax investigation, Richard Lambert, with Vincent Lisi and Edward Montooth. In turn, this pair ordered investigators to re-examine the case in order to discover any clues or suspicious individuals that may have been overlooked. Shortly thereafter, the Bureau had a new prime suspect.

Case 3: Bruce Ivins

As is often the case, the FBI's strategy involved the practice of psychological profiling, a process whereby an expert in human behavior formulates a theoretical portrait of the perpetrator's personality traits. In some cases, the profile turns out to be fairly accurate, while in other instances it proves to be wide of the mark. All the same, the Bureau places considerable stock in the procedure, and its presumed value in the Amerithrax case was no exception.

So it was that an FBI behavioral consultant put together a psychological portrait of the Amerithrax killer, which the Bureau then shared with numerous collaborators, among them Abigail Salyers, President of the American

Society of Microbiology. Investigators hoped Salyers, being well-integrated into the scientific community, might be of help in compiling a list of potential suspects from among her professional acquaintances. To this end, they explained to her that the agency had concluded that the Amerithrax culprit was likely "a loner and a loser, and probably a nerd."[100] Even though this was a narrow characterization, Salyers nevertheless found it too broad to apply to those in her organization. "That describes at least half of our members!" she exclaimed.[101] But one person it did not describe, oddly enough, was the man whom the Bureau would eventually tag as the probable killer.

This new target was neither a recluse nor a flop, but rather an extroverted, witty, and generous man who was considered a "team player" by his colleagues.[102] A highly successful scientist who had toiled at Fort Detrick for twenty-seven years, he also was the 2003 recipient of the Pentagon's highest non-military honor, the "Decoration for Exceptional Civilian Service," which paid tribute to his work in anthrax vaccinology. That said, he was not without his share of emotional difficulties, being prescribed antidepressants and anxiolytics since 1999 and undergoing various forms of therapy. Bruce Ivins was his name, and he was a forty-seven-year-old senior microbiologist at USAMRIID when the Bureau latched onto him as a suspect.

Born in Lebanon, Ohio, in 1946, Ivins earned undergraduate and graduate degrees in microbiology from the University of Cincinnati, following which he was awarded a post-doctoral fellowship in the Department of Bacteriology and Immunology at the University of North Carolina—Chapel Hill. In 1980, he accepted a position at USAMRIID and thereafter devoted himself to helping develop an anthrax vaccine that would protect against multiple strains of the bacterium, as well as those that had been altered by enemy biowarfare scientists. The existing serum, it seems, was ineffective against artificially-manipulated anthrax in which various strains had been combined in order to render it more deadly. And by all accounts, Ivins' efforts, which advanced the field of vaccinology in important respects, were hailed by his peers far and wide. "In the eyes of his colleagues he was one of the world's anthrax experts," writes Guillemin.[103] An FBI report likewise acknowledged Ivins' proficiency, particularly in research making use of the Ames strain of the bacterium. "[C]onsidered an expert in the growth, sporulation, and purification of *Bacillus anthracis*," reads a Bureau summary, "[h]e has personally conducted and supervised Ames anthrax spore productions for over two decades."[104] It was because of this background that he would be among the handful of scientists selected to analyze the pathogens contained in the Amerithrax letters.

Whereas Steven Hatfill, as previously noted, came under the FBI's watchful eye fairly early in the Amerithrax investigation—the accusations against him commenced in mid–2002—Bruce Ivins, by comparison, was regarded

as a trusted scientist during this same period. Like most Americans, he, too, had been stunned by the destruction of the World Trade Center and the Pentagon and the staggering loss of life that ensued, with these events triggering in him a mix of intense emotions.

"I am incredibly sad and angry at what happened, now that it has sunk in," Ivins wrote to a friend in mid–September 2001. "Sad for all of the victims, their families, their friends."[105] He added that he was also "angry at those who did this, who support them, who coddle them, and who excuse them."[106] His emotional state was transformed on October 4th, however, when he learned that a Florida man had been diagnosed with inhalation anthrax, a surprising development that ignited the microbiologist's curiosity.[107] Spending the better part of the day at his computer emailing his colleagues, Ivins suggested that the incident may have been a rare instance of natural anthrax poisoning.[108] Unaware that Paul Keim in Arizona was already on the case, he also touched base with the CDC and asked if its specialists had thought to establish the bacterium's strain—and, if so, whether it was one known to South Florida.[109] Obviously, he yearned to be involved in the study of the pathogen, and the following week he would come a step closer when the NBC/Brokaw letter arrived at Rockefeller Center in Manhattan.

On October 12th, shortly after investigators located the tainted Brokaw document at NBC headquarters, the letter and its lethal contents were rushed to the New York City Department of Health laboratories. A few hours later, a sample of the spores was flown to the CDC in Atlanta and another to Keim's microbial genetics lab in Arizona, with the letter itself, along with its envelope and the bulk of the spores, being sent to the Special Pathogens Laboratory (SPL) at USAMRIID. Here, the contaminated materials were hand-delivered to John Ezzell, chief of the SPL and the senior microbiologist who would be in charge of their analysis. It was a fitting facility given that its role was to examine biological and environmental materials for the presence of biothreats. Not surprisingly, the SPL was about to become a hive of activity.

Three days later, to be precise, a postman delivered the next letter on the terrorists' hit list, this one to Senator Daschle's suite in Washington, D.C. Wasting no time, first responders placed it inside of two Ziploc bags and handed it over to officials, who hurried it to the Special Pathogens Laboratory like the Brokaw letter before it. Upon arrival, Ezzell took custody of the document, securing it in a third Ziploc bag and storing it in a refrigerator pending his analysis which was slated to begin later that evening. By this point, the SPL had been designated the principal facility for the study of the Amerithrax agent, with this opening the possibility of additional USAMRIID scientists being assigned to assist with the project. For obvious reasons, they would need to be experienced with the anthrax bacterium, preferably the Ames strain, with this prospect galvanizing Bruce Ivins because it meant he might

be ascribed a hands-on role in the historic biomedical event that was unfolding within walking distance of his office.

As things stood, the microbiologist had been feeling exasperated at being kept at arm's length up to this point in the investigation, with one of his colleagues describing him as "an absolute manic basket case" during this period.[110] Certainly Ivins' reaction was understandable in view of his extensive experience with the Ames strain of bacterium, probably more than anyone else at Fort Detrick. But the tide would turn on October 17th, with his mood shifting to exhilaration as he was at last brought into the fold. Because it was necessary to assess the spores' concentration, or density, the task was assigned to him owing to his substantial knowledge of the procedure.

What Ivins lacked knowledge of, or so he claimed, was the type of highly-refined spores he saw under the microscope when he undertook the assessment later that day. It was a sight that rattled him. "[H]e wouldn't, couldn't, stop talking about it," said Gerry Andrews, the head of USAMRIID's Bacteriology Division, referring to the extraordinary milling of the anthrax. "It was like smoke. That's what he said it looked like…. He said it was just hovering in the air."[111] When discussing the experience with another colleague, Ivins described a second emotion he also felt upon observing the microorganism. "It scared the shit out of me," he said. "I've never seen anything with such quality, high grade in all my life…. It's the first time I've ever been scared [at USAMRIID]."[112] In due course, Ivins would become alarmed as well by the FBI's decision to focus on him as the perpetrator of the Amerithrax murders.

To nail down the killer, the Bureau set up shop in the Fort Detrick region, an undertaking that included the participation of the nearby Naval Medical Research Center in what would essentially serve as a temporary forensics lab devoted to the case. And for the next six years, this FBI operation liaised with that of Paul Keim in Arizona. More specifically, the Bureau, beginning in 2002 and continuing for the next few years, required all U.S. institutions that possessed the Ames strain of the bacterium to submit samples of its holdings to this local lab, with identical samples being sent to Keim's microbial genetics outfit in Arizona. The submissions would constitute a national repository, one that would be anonymized for security purposes, meaning the people overseeing the storage operation would not be privy to the samples' places of origin or the identities of the scientists who had submitted them. Once the repository received all of the country's samples, they would be compared to the anthrax extracted from the Daschle letter in the hope of securing a match. Only then would the origin of the submission be revealed.

Of course, the sampling procedure itself was flawed: the person or persons who perpetrated the Amerithrax assault, if they were the ones submitting holdings from their labs, could simply send cultures of anthrax that had not

been used in the crime. Nevertheless, the FBI decided it was necessary to proceed in this manner due to the large number of specimens to be collected, over a thousand of them, since a single research institution could conceivably contain several labs in which numerous studies were being conducted using different batches of the Ames variant.

Bruce Ivins, strangely enough, had recommended such a project—a storehouse of anthrax samples to be used for comparison purposes—long before the FBI actually launched it, and he even volunteered to help get it off the ground. Not only that, he offered to contribute specimens from his own laboratory, one of which, ironically, would eventually become central to the investigation and incriminating to Ivins himself. As the microbiologist would explain to the Bureau, it was a sample with a most unusual provenance.

"He mentioned several cultures by name, including a batch made mostly of Ames anthrax that had been grown for him at an Army base in Dugway, Utah," reads a joint investigative report by the *ProPublica* organization, *PBS Frontline*, and the *McClatchy Company*."[113] The Dugway Proving Ground, as noted earlier, conducts experiments with biological and chemical biowarfare agents in what is arguably the most sophisticated biodefense program in the nation. As such, it has the ability to process pathogens and chemical substances in ways far beyond the capacities of other sites, USAMRIID included.

In 2002, Ivins submitted several of his holdings to the FBI and Keim labs, among them a sample of his Dugway batch. Comprised mainly of spores from the Utah facility, he had previously combined them with a reserve of non–Dugway spores he also kept in his lab, the result being a one-of-a-kind mixture. In the anonymization process, RMR-1029 would be its designation. At this juncture, Ivins, unlike Steven Hatfill, was not yet a "person of interest" in the crime.

Once all of the nation's samples had been collected and catalogued in the repository, the next step was to compare them to the anthrax extracted from the Daschle letter. Despite the fact that the researchers were meticulous in measuring the samples' genetic similarities and differences, however, the existent DNA fingerprinting method was unable to draw distinctions among them. At this level of analysis, the cultures were still too homogeneous. A more advanced technique was needed, one that could examine the morphology—the form and structure—of the spores in each submission. If the researchers could detect minor differences in the spores' appearances, and if they could then trace these differences back to the DNA itself, it might provide them with a means of distinguishing among the numerous specimens of Ames-strain anthrax. More to the point, it would permit them to match, at the genetic level, the Amerithrax pathogen to the sample containing the same microbe.

With this aim in mind, a team at The Institute for Genomic Research

(TIGR) in Rockville, Maryland, one consisting of corporate president Claire Fraser and researchers Tim Reid and Jacques Revel, entered the picture. Determined to find the needle in the haystack, these scientists, between 2002 and 2003, devised a technique that enabled them to separate the numerous Ames-strain specimens based on morphology, and to then link the specimens' unique features to their genetic codes. As a result, they were able to isolate a submission that was essentially identical to the anthrax used in the attacks. Labeled RMR-1029, it was the one sent to the repository by Bruce Ivins.

At this point, it is important to note that Ivins was not the only person who had access to the spores in his RMR-1029 sample; scores of USAMRIID researchers made use of anthrax originating from the same lot. "[T]here are dozens, if not hundreds, of scientists, contractors, students, professors, who used that same anthrax, the very anthrax that would have the same genetic components as RMR-1029," writes lawyer Paul Kemp.[114] Unfortunately, USAMRIID did not keep a detailed record of the researchers who extracted shares for their own experiments, therefore investigators could not interview them or inspect their labs.[115] Furthermore, the Fort Detrick facility was not the only research center to possess RMR-1029. "Sixteen domestic government, commercial, and university laboratories … had virulent RMR-1029 Ames strain *Bacillus anthracis* material in their inventory prior to the attacks," reads an FBI search warrant affidavit.[116] Curiously, the Bureau, although it was in possession of this information, did not release it publicly. Instead, the agency singled out Ivins as the sole custodian of the RMR-1029 spores. "We have a flask that's effectively the murder weapon from which those spores were taken that was controlled by Dr. Ivins," said a lawyer representing the District of Columbia in a 2008 press conference.[117] Once the FBI identified what it considered this telltale link to Ivins' flask, it stopped searching for other matches to the anthrax that was used in the attacks.

It is possible, of course, that the unique spores that comprised RMR-1029 originated from those grown for Ivins at the Dugway Proving Ground, the ones with which he subsequently mixed his own supply of non–Dugway spores. On this point, a subsequent analysis revealed that the former accounted for eighty-five percent of the content in Ivins' RMR-1029 sample, with the latter, the non–Dugway spores, making up the remaining fifteen percent.[118]

The FBI also called attention to a problem that occurred in the microbiologist's collection of the spores prior to their submission. It seems the Bureau rejected Ivins' original RMR-1029 offering from February 2002, because he used a different type of test tube than that stipulated by the agency. Certainly it was not the only submission to be discarded; numerous labs initially provided specimens the Bureau refused to accept. Yet in a procedural oversight, the FBI forwarded a copy of Ivins' excluded sample to Keim's lab,

where it was stored, and, in due course, would prove damaging to the microbiologist.

In April 2002, the FBI ordered Ivins to send it another specimen and he obliged, although the willful scientist once again did so in his own fashion rather than comply with the procedures set forth by the Bureau. This is because the sampling method specified by the FBI in the Amerithrax case was different from that which was standard practice in the field of microbiology, with Ivins adhering to his profession's own customs. As it turned out, this would affect the composition of his sample and cast a shadow of suspicion over him.

So now there existed two submissions of Ivins' RMR-1029 spores in Keim's lab in Arizona, with the pair purportedly being drawn from the same flask. Upon examination by researchers, however, it was discovered that Ivins' first sample was different from his second one. Whereas the original submission, the one the Bureau rejected due to the type of test tube used, proved to be morphologically identical to that in the Amerithrax attacks, the subsequent submission was different from the pathogen used in the attacks. Seizing on this discrepancy, the FBI concluded that Ivins had knowingly tampered with the latter sample, the hypothesis being that the microbiologist, between his first and second submissions, found out that the TIGR team had devised a technique that would allow it to more precisely analyze the morphology of anthrax and thus trace the incriminating spores back to him. The Bureau discounted other reasons for the disparities between the two cultures, such as inconsistencies or irregularities in Ivins' collection methods.

Interestingly, a few years later investigative reporters learned that Ivins had, in fact, furnished the FBI with several anthrax specimens from his lab, some of which contained spores that were virtually indistinguishable from those in the Amerithrax attacks. Furthermore, he had done so even after he learned that investigators suspected him of the crime. The Bureau did not make this fact public, however, nor did it share the information with Ivins' attorneys, which could have helped exonerate him.[119] It was a disturbing omission on the part of the investigation's leadership.

The fact is, the Bureau, having decided in 2006 that the microbiologist might be guilty, set about amassing evidence, if only circumstantial, to support its contention while simultaneously downplaying or, it would appear, withholding information that contradicted the case it was attempting to construct. Although it had not yet let Steven Hatfill off the hook, the agency seemed to be aware it would soon be in need of a new prime suspect. Accordingly, it looked to other features of the crime for evidence against Bruce Ivins.

Lab Spill. A few months after the Amerithrax attacks, for instance, a technician assigned to Ivins' lab accidentally splattered a small amount of

anthrax. Although Ivins cleaned the spill himself and was prompt in doing so, he did not report the incident to his superiors as prescribed by protocol. In due course, his misdeed came to light, at which point he owned up to it and apologized for having neglected to follow proper procedure even as he assured those in charge that he had made certain the area was free of the pathogen before proceeding with his work. All the same, it was a serious lapse for a scientist conducting germ warfare research in a biocontainment lab, and the FBI pointed to the deed, which had occurred five years earlier, as a demonstration of his lack of professional integrity.

Return Address. Another issue concerned a possible link between the return address on the Daschle and Leahy letters and a past event in the microbiologist's personal life. Pillars of their community in Frederick, Maryland, Bruce Ivins and his wife Diane were highly regarded by their friends and neighbors. Bruce played the keyboards in a Celtic band and at the Catholic church the couple attended, performed juggling acts for local children at Mullinix Park, and volunteered with the Red Cross. Diane, for her part, headed an anti-abortion group, the Frederick Right to Life organization. The pair was also supportive of the Mississippi-based American Family Association (AFA), a Christian fundamentalist outfit having as its mission the return of an errant American society, as the group perceived it, to Biblical tenets. The AFA was vehemently anti-abortion, with this position being to the couple's liking.

In 1999, the AFA filed a lawsuit centering on an incident that had taken place in Wisconsin the previous year, one in which a student at a Christian school was disciplined in such a way as to provoke a state investigation. The legal dispute stemmed from the fact that a pair of government social workers, responding to a tip-off, arrived at the school and interviewed the child without the consent of the school's administration. The AFA lawsuit, then, addressed what the group considered to be a case of state intrusion into a private religious institution.

As it happened, Bruce and Diane Ivins resumed their donations to the AFA, which they had allowed to lapse, a month after the organization filed the lawsuit. This was, part and parcel, the extent of their involvement, with the FBI assuming the couple's renewed contributions were intended to help cover the AFA's legal costs. As to the way in which this incident was related to the Amerithrax case, it had to do with the name of the school. The child in the lawsuit was a fourth grade student at Greendale Baptist Academy near Milwaukee. On the anthrax-tainted letters sent to Senators Daschle and Leahy, the return address, which turned out to be spurious, was listed as, "Fourth Grade, Greendale School, Franklin Park, NJ." Predictably perhaps, the fact that both the litigation and the lethal letters referred to the "fourth grade" at a school called "Glendale" set off alarms at FBI headquarters. It also

was not lost on investigators that the American Family Association had long been antagonistic toward Senators Daschle and Leahy, both of whom were pro-choice on the subject of pregnancy termination. The Bureau's hypothesis, then, was that Ivins had addressed the letters in such a way as to slyly reference the AFA lawsuit and his own anti-abortion sentiments.

Work Schedule. Further evidence, again circumstantial, on which the agency placed considerable stock were the USAMRIID time sheets, which revealed that Ivins had returned to his laboratory each night between September 14th and September 16, 2001, despite the fact that his research projects did not necessitate it. Although he arrived and departed at different times on those nights, he remained in his lab for exactly two hours and fifteen minutes on each occasion. It was as if he had allotted himself a precise amount of time per stay. The FBI also noted that he returned to his lab for such visits during the first five nights of October 2001, although on these occasions he remained for periods ranging from twenty minutes to nearly four hours. As to the significance of this pattern, the Bureau pointed out that his two clusters of nightly visits occurred shortly before the first and second sets of Amerithrax letters were mailed to Florida, New York, and Washington, D.C., the suspicion being that he was preparing the anthrax-laced documents for posting on these occasions.[120]

When questioned about such comings-and-goings, the microbiologist explained that "home was not good" during this period and he needed to "escape" to his workplace.[121] Surely it is true that he was enduring a considerable amount of turbulence at this juncture, with the FBI confirming that "Dr. Ivins was undergoing significant stress in both his home and work life."[122] The Bureau did not accept his explanation that he was seeking respite in his laboratory, however, dismissing it as unconvincing.

Yet there was more to the picture. Investigative reporters, upon subsequently inspecting the USAMRIID time sheets, found that Ivins' evening visits to his lab actually began in August 2001, weeks before the 9/11 attacks and the ensuing bioterror incidents designed to appear as a feature of the same radical Islamic plot. And since his "escapes" to his lab, as he described them, pre-dated the 9/11 offensive by a month, it raised the question as to whether his visits in September and October, like those in August are presumed to have been, were for reasons other than refining anthrax and mailing it to media and political figures.

Mental Instability. Lastly, the FBI underscored the fact that Ivins was in individual and group therapy for anxiety and depression at the time of the Amerithrax attacks, had developed a drinking problem as well, and was prescribed psychotropic medication for his symptoms. Investigators argued that these facts, based in part on the agency's examination of a cache of emails he sent to his friends, attested to his emotional instability and behavioral

unpredictability during the period in which the bioterror offensive was planned and executed.

It is true, of course, that Ivins was enduring emotional distress before, during, and after the 9/11 and Amerithrax attacks. What the Bureau neglected to mention is that his symptoms did not appear to have affected his outward behavior or his job performance. Other than his pronounced interest in the anthrax attacks, which could be expected of a top anthrax researcher who had devoted his career to the pathogen, Ivins' demeanor was apparently unremarkable. This is not to say his mental state could not have led him to secretly engage in mass murder, but simply to draw attention to the fact that those who had known and worked with him for several years did not consider his mood inappropriate or his behavior to be bizarre, erratic, or otherwise noteworthy. He also was stable enough to retain his security clearance and proceed without interruption in his sensitive position at the biodefense facility.

As to motive, the Bureau hypothesized that Ivins was worried that his vaccine research was about to lose its financial support—a reasonable concern at the time—and that a limited bioterror attack would demonstrate the need for the serum. Thus, the Amerithrax attacks, in this scenario, were part of a scheme to ensure continued funding. Alternatively, the FBI suggested that he may have thought a bio-attack would increase sales of the genetically-engineered anthrax vaccine on which he held two associated patents. The latter premise was a bit shaky, however, since government-employed scientists normally do not collect royalties for their work. Earnings customarily return to the government itself.

So it was that the Bureau, having gathered what it considered to be sufficient circumstantial evidence against Ivins coupled with possible motives, classified him as a "person of interest" in 2006, stepped up its scrutiny in 2007, then pulled out all of the stops in 2008 in much the same way it had done in the Steven Hatfill case. Agents combed through Ivins' personal belongings in his home, as well as confiscated work-related materials such as his research files and equipment.[123] They also conducted conspicuous surveillance. On a twenty-four-hour basis for approximately a year, agents sat in parked cars in front of his house presumably to intimidate the scientist and alienate him from his neighbors. If nothing else, the tactic implied, not so subtly, that he was a treacherous and perhaps dangerous individual. Yet during this same period, Ivins retained his high-level security clearance at Fort Detrick and his access to the lethal microorganisms housed in its biosafety labs. Because of such incongruities in the federal authorities' treatment of him, it was unclear what they truly believed about their new suspect.

On other occasions, investigators confronted the Ivins family in public. One incident occurred at a retail mall, where they waylaid the microbiologist

and accused him of mass murder. They assailed his wife, too, who had accompanied him on the shopping trip, asking her point-blank if she was aware that her husband was a killer.[124] Bearing in mind that Ivins was already enduring marital turmoil and undergoing treatment for depression, public condemnations of this sort may have further stressed his marriage and accelerated his emotional decline.

In a similar vein, federal agents paid a visit to the couple's adult daughter, telling her that her father was the bioterrorist behind the Amerithrax murders. "The agents also offered her twin brother the $2.5 million reward for solving the anthrax case—and the sports car of his choice," reports the *Washington Post*.[125] Then, too, they spoke at length with Ivins estranged brother, whose opinion of the microbiologist was what one would expect given that the two had refused to talk to each other for sixteen years. As a result, the FBI, by encroaching on past and present family relationships, may have ramped up the anxiety Ivins' was experiencing.

It therefore did not come as a shock when he was found unconscious in his home on March 19, 2008. Hospitalized briefly at the time, the following month Ivins checked himself into a rehabilitation center where he completed a four-week treatment regimen presumably for alcohol abuse. Unfortunately, his mental condition remained in decline, his inpatient stay notwithstanding, such that it was by now fairly obvious to most everyone who knew him that he was deeply depressed. And while some of his coworkers were unaware that the Federal Bureau of Investigation was pursuing him, and quite aggressively, the observations of those who were aware of this fact were astute. "It would be overstating it to say he looked like a guy who was being led to his execution, but it's not far off," says W. Russell Bryne, an infectious disease specialist and Ivins' former supervisor at USAMRIID.[126] Whereas some thought Ivins was distraught because he was convinced the Bureau was determined to seek an indictment, others emphasized the stress he was enduring due to the ordeal's drain on his financial resources, the microbiologist having hired an attorney to defend himself. "He didn't have any more money to spend on legal fees," recalls a friend.[127] Certainly the onset of financial problems could be expected to contribute to the emotional deterioration of a man who is already despondent.

Then, on June 27, 2008, Ivins' downward spiral reached a new low when the FBI announced its settlement with Steven Hatfill, meaning that Hatfill was no longer a "person of interest." Ivins seemed to have believed, quite rightly as it turned out, that he was the next suspect in line, with the settlement clearing the way for the agency to press for his indictment. Shortly thereafter, on July 10th, he was abruptly hospitalized in a mental health facility, although it remains unclear whether institutionalization was imperative at this point.

It seems that Ivins' group therapist, an entry-level counselor at a clinic in his neighborhood, contacted authorities and claimed he was homicidal. She also took out a restraining order ostensibly to prevent him from attacking her. These were, of course, sensational assertions by any standard, and Ivins' friends and colleagues found them at odds with their own observations of him. Curious, too, was the counselor herself. As the *Washington Post* subsequently reported, the woman, under a different name, had been a member of a motorcycle gang, had a history of heroin, cocaine, and PCP abuse, and had just completed three months of home detention—house arrest—as a punishment for a drunk-driving arrest.[128] On the application for the restraining order, it was also noted that she misspelled her job title, a possible point of relevance in that it suggests she may have lacked the educational or intellectual qualifications for her work as a counselor. When the newspaper published her striking claims about Ivins four weeks later, the counselor no longer worked at the clinic. According to a colleague, Ivins had already suspected she was cooperating with the FBI.[129]

Whatever the case, the microbiologist, on July 10, 2008, was on the job at USAMRIID, where he participated in a top-level conference centering on a vaccine that was in development for the bubonic plague. Although his colleagues at the conference, including the vaccine's developer, did not consider Ivins' behavior to be aberrant at the meeting, authorities arrived and ushered him to an inpatient psychiatric facility based on the counselor's claims about his potential homicidal behavior. The upshot: Ivins' security clearance was revoked, his access to his lab rescinded, and his employment at USAMRIID terminated as of September.

Two weeks later, the fraught scientist discharged himself from the mental health facility and returned home. Telling his daughter a few days later that he was suffering from tension headaches, he asked her to purchase a large bottle of Tylenol for him—not an unusual request in light of his circumstances. But Ivins had other plans for the painkiller. On Sunday, July 27th, police were called to his home, where they found the microbiologist sprawled unconscious of the bathroom floor in what appeared to be an acetaminophen overdose. Rushed to the hospital, he died two days later. Although there was no suicide note at the scene, and while the FBI did not order an autopsy of its prime suspect's body, the death was classified a suicide due to the profound stress Ivins had been enduring, including his impending job loss. In short order, the Bureau announced it had been about to indict him for the anthrax murders and planned to seek the death penalty. Not everyone, however, bought the FBI's story.

"There's nobody easier to convict than a dead man," said Keith Olbermann, an MSNBC political commentator who was quick to challenge the FBI's handling of the investigation.[130] The fact is, the Bureau had nothing but

circumstantial evidence to support its allegations, meaning it had a thin case that might not have won a conviction, let alone the death penalty. In fact, some were skeptical the agency was about to charge Ivins at all; rather, doubters suggested that his death had conveniently handed the FBI an opportunity to make this claim and, in so doing, report that it had succeeded in getting its man. "If he was about to be charged," says Byrne, "no one who knew him well was aware of that, and I don't believe it."[131]

Yet this was not the only aspect of the case that met with suspicion. In the months and years after Ivins' demise, as damaging information about him was methodically leaked to the press, a chorus of critics insisted that the Bureau was deliberately painting a distorted picture of the dead man so as to foster an aura of guilt. Among these critics was Richard Lambert, the FBI inspector who, from 2002 to 2006, served as head of the Amerithrax investigation itself. Nine years later, in the spring of 2015, Lambert filed a lawsuit against the Federal Bureau of Investigation to address what he claimed were the agency's retaliatory actions against him, actions that stemmed from concerns he had voiced to his superiors about the investigation while it was still underway and afterwards. In his legal complaint, the former FBI inspector described what he perceived as the Bureau's "efforts to railroad the prosecution of Ivins in the face of daunting exculpatory evidence." The document continues,

> Following the announcement of its circumstantial case against Ivins, Defendants DOJ and FBI crafted an elaborate perception management campaign to bolster their assertion of Ivins' guilt. These efforts included press conferences and highly selective evidentiary presentations which were replete with material omissions.[132]

While the former FBI insider was careful not to state that Ivins was wholly blameless in the Amerithrax attacks, he did assert that there was "a wealth of exculpatory evidence to the contrary which the FBI continues to conceal from Congress and the American people."[133]

Yet putting aside for a moment the exculpatory evidence the agency purportedly withheld, many of the facts that *were* available to Congress and the American people still failed to support Ivins' guilt. First and foremost, the microbiologist passed the FBI's polygraph tests, a finding that was glossed over throughout the course of the investigation. Then, too, his handwriting samples did not match those of the person or persons who addressed the anthrax envelopes and printed the messages in the letters. The Bureau also could not place Ivins in key spots at critical times, most notably in St. Petersburg, Florida, and Princeton, New Jersey, when the letters were known to have been mailed from these locations. Furthermore, investigators found no traces of Ames-strain anthrax in his home or car, nor were they able to detect microscopic fibers from the letters, the envelopes, or the tape used to seal

them in his home or office. Even the amount of anthrax deployed in the attacks, as measured by weight, was not missing from the supply of the pathogen the microbiologist kept in his laboratory. To be sure, there were gaping holes in the FBI's case.

It is also worth noting that Ivins' colleagues at USAMRIID, a group that was among his most ardent defenders, pointed out that he worked exclusively with wet anthrax, whereas dry anthrax was used in the Amerithrax offensive, the latter being an altogether different entity and one that none of the researchers at Fort Detrick employed in their research; it was the scientists at the U.S. Army facility in Dugway, Utah, and the Battelle Memorial Institute in Ohio who worked with wet anthrax. Experts also explained that no one person could have pulled off the Amerithrax attacks, from obtaining and processing the spores in such an exceptional fashion to mailing the pathogen-laced letters without leaving any traces of DNA, fingerprints, or other identifying material on the envelopes and mailboxes. A lone-wolf terrorist simply could not have managed the multifaceted operation in its entirety. Rather, the attacks, insisted the FBI's critics in the scientific community, required a plurality of specialists contributing to discrete stages of the process.

Supporting these voices was that of Senator Patrick Leahy, who, as one of the targets of the attacks, had a personal investment in the matter. Although he did not rule out the possibility that Ivins may have been the perpetrator, he put no stock in the lone-wolf theory. "If he is the one who sent the letter," said the congressman, "I do not believe in any way, shape or manner that he is the only person involved in this attack on Congress and the American People."[134]

Senator Leahy made these comments in a packed assembly on September 17, 2008. A tense and at times adversarial meeting, it included not only FBI Director Robert Mueller and members of Congress, but also such interested parties as Robert Hatfill, the Bureau's previous target. Because it was an oversight hearing held by the Senate Judiciary Committee, it was presided over by the committee's chairman, Iowa senator Chuck Grassley, who was himself skeptical of the Amerithrax inquiry's findings. As the congressman was aware, it had been the most expensive investigation in the history of the FBI, and one that, in the end, cost the American taxpayer an estimated one hundred million dollars.

"Congress and the American people deserve a complete accounting of the FBI's evidence, not just a selective release of a few documents and a briefing or two," Grassley said in the hearing. "There are many unanswered questions the FBI must address before the public can have confidence in the outcome of the case."[135]

Grassley then proposed that an independent review of the Bureau's detective work be undertaken, one that would re-examine the nine thousand

witness interviews the agency had conducted, along with the eighty searches its agents had performed and the six thousand items they had collected. The FBI, however, opposed the recommendation. Its position was that such an evaluation would interfere with its ongoing Amerithrax investigation, which had not been officially terminated despite the fact that the agency had publicly named the late Bruce Ivins as the likely perpetrator. What was eventually agreed upon, then, was a different sort of review, albeit one that would still be of value. Led by a team of experts from the National Research Council (NRC) under the auspices of the National Academy of Sciences, it would be an appraisal of the scientific quality of the investigation.

So it was that the NRC group, in a 1.1 million dollar study conducted over a two-year period, revisited the science behind the Amerithrax inquiry, and on February 15, 2011, released its findings. A blow to the FBI's reputation, the NRC report was, in effect, a compilation of areas in which the Bureau's research lacked scientific rigor. For instance, the National Research Council revealed that the genetic analyses the FBI used to implicate Ivins and his flask of RMR-1029 were not nearly as convincing as the Bureau had professed. "The scientific data alone do not support the strength of the government's repeated assertions … as in 'the scientific analysis coordinated by the FBI Laboratory determined that RMR-1029, a spore-batch created and maintained at USAMRIID by Dr. Ivins, was the parent material for the anthrax used in the mailings,'" the report stated.[136]

The NRC team also noted that the FBI failed to consider a process known to biologists as "parallel evolution," in which identical or nearly identical genetic mutations occur independently in two or more batches of spores. In such a case, the distinctive anthrax in Ivins' flask at USAMRIID may have had an unknown twin at another location, namely, in the research lab from which the Amerithrax attacks were perhaps launched. Here, the spores' unique mutations would have arisen randomly or under conditions similar to those in Ivins' laboratory.

Most significantly, though, scientists at the Lawrence Livermore National Laboratory, who also contributed to the NRC study, discovered that the anthrax used in the Amerithrax attacks contained inordinately high levels of silicon, an additive which had been used to ensure that the pathogen floated in the air. What was most telling about this unexpected finding is that the process of aerosolizing, or weaponizing, the microorganism by affixing sizable amounts of silicon requires both highly specialized skills and, even more implicative, an outsized fermenter. And this ruled out USAMRIID. It did not, however, exclude other sites that also conducted biodefense work for the federal government—again, the U.S. Army's Dugway Proving Ground and the Battelle Memorial Institute. A startling revelation by the Livermore scientists, the *Wall Street Journal* published a report on the findings and concluded that

they exonerated the troubled microbiologist, at least as a lone-wolf terrorist. "[N]o matter how weird he may have been, [Ivins] had neither the set of skills nor the means to attach silicon to anthrax spores."[137] When questioned by the news media about the critical Livermore discovery, the FBI declined to respond.[138]

Ultimately, the National Research Council's study implicitly reinforced the view held by certain members of Congress and numerous scientists, namely, that the Bureau's all-consuming campaign to assign responsibility to a single bioterrorist may have allowed the real perpetrators to go free. A flawless analysis of a defective federal investigation, the NRC report caused the FBI's leadership to bristle, although the Bureau continued to insist that the Amerithrax investigation had been top-notch and its findings, solid.

In 2010, the FBI formally closed the case. The agency's conclusion was, and remains today, that Bruce Ivins was in all probability the sole perpetrator of the anthrax attacks. Despite repeated requests, the Bureau has not shared the inquiry's case materials with members of Congress or the public.

After the Storm

While questions remain as to the true identity of the person or persons responsible for the Amerithrax assault, what *is* indisputable is that the attacks themselves triggered a jaw-dropping surge in federal funding for biodefense research and preparedness, and they did so with lightning speed. "Since 2001," reports a piece in the *New York Times Magazine*, "senior members of both the Obama and Bush administrations … have consistently placed biodefense at or near the top of the national-security agenda," with nearly eighty billion dollars having been invested in research and readiness since the ordeal.[139]

The FBI's controversial, eight-year investigation likewise generated substantial change, mainly in the form of scientific progress. Its debatable conclusions notwithstanding, the inquiry brought together such branches of knowledge as genomics, molecular epidemiology, and microbiology, thereby validating and advancing the nascent field of microbial forensics. "[T]he Amerithrax investigation was groundbreaking," writes Paul Keim and his colleagues, in that it "pioneered new approaches to the investigation of microbial-based crimes."[140]

Regarding medical countermeasures, while a newer, safer anthrax vaccine has not yet emerged despite the U.S. government having poured hundreds of millions of dollars into the effort, another post–9/11 program, Project BioShield, substantially increased the nation's stockpile of the existing vaccine. In addition, researchers are making headway in experimental measures aimed at treating anthrax illness in children. A pediatric antibiotic is in development,

for instance, that is administered orally and designed to combat anthrax infection, tularemia, and community-acquired bacterial pneumonia. Although *solithromycin*, as it known generically, is also effective in adults, its primary value lies in its comparative safety for a pediatric population.[141]

Noteworthy as well, the Food and Drug Administration, in May of 2015, announced the approval of an infusible drug for the treatment of inhalation anthrax. The medication, under the trade name *Anthrasil*, is made from the plasma of individuals who have been vaccinated against the bacterium and whose serum, as a result, contains antibodies to it.

Still another approach makes use of nanotechnology. Perhaps the most innovative project of this type centers on a microscopic device that, when inserted into the human body, detects lethal bacteria and releases an arsenal of antibiotics in response. The antibiotics, moreover, are programmed to target those parts of the body most affected by the particular pathogens. If successful, the Pentagon hopes to make the device available to military personnel for protection on the battlefield.

And demonstrating considerable merit in the fight against anthrax infection are certain naturally-occurring entities, among them a novel form of marine life recently discovered off the coast of Santa Barbara, California. Itself a form of bacteria known as an actinobacterium, the entity produces *anthracimycin*, an antibiotic that has been found to incapacitate anthrax and may therefore be of value in eliminating the infection in humans. It may also be effective against the difficult-to-treat MRSA, or methicillin-resistant Staphylococcus aureus.[142]

And yet, while these and other advances in the inhibition and eradication of anthrax infection are heartening, it must be kept in mind that they are designed to respond to an exposure, not to prevent one. And this is a serious concern since the chances of a bio-attack may actually be greater today than at the time of the Amerithrax assault owing to the proliferation of biodefense facilities across the United States.

Within the scientific community are researchers like Keith Rhodes, the former Chief Technology Officer of the Government Accountability Office, who warn that the United States now has within its borders far more biosafety level-3 and level-4 laboratories than is necessary or prudent.[143] It is an assertion backed up by data: whereas only a handful of U.S. sites, prior to the Amerithrax offensive, were licensed to experiment with the type of virulent microorganisms used in bio-assaults, this number soared to over four hundred laboratories after the 9/11 attacks, with more than fifteen thousand scientists and technicians having access to the pathogens.[144] This state of affairs, experts argue, sharply increases the chances of an accident or, alternatively, a deliberate strike on the population. “Scientists, security experts and legislators are now pondering various ideas to prevent lab-based terrorism,” says

John Dudley Miller in a *Scientific American* report on the proliferation of U.S. biosafety labs.[145]

And there are additional areas of concern. Alongside the heightened risks posed by the steep rise in new biodefense operations are the threats that continue to exist in the nation's long-established facilities. Among such hazards are those stemming from equipment malfunctions, staff negligence, insufficient training, and infiltration by extremists and those who abet them.

An incident at the Dugway Proving Ground illustrates the problem. In May 2015, the germ warfare operation disclosed that it had shipped live anthrax bacteria to other research centers via the commercial carrier Federal Express, anthrax that should have been rendered harmless by irradiation prior to mailing. "[A]nthrax bacteria were shipped out at least 74 times to dozens of labs in the U.S. and at least five foreign countries from January 2005 to May 2015," writes journalist Alison Young, citing the findings of an investigation conducted by the Centers for Disease Control and Prevention.[146] Because of the debacle, it was necessary to treat thirty-one people with antibiotic therapy.

As to the reason for the potentially fatal foul-up, it turns out that the method used by the Dugway facility to sterilize the bacterium was inconsistent in killing the microorganism. Then, too, Dugway technicians, the investigation found, claimed to have performed verification tests to ensure the spores were dead, yet proceeded to disregard the test results and ship live spores anyway.[147] Providentially, Bruce Ivins, before his death, repeatedly alerted his colleagues to the unreliability of certain irradiation practices in incapacitating the anthrax bacterium and called for stricter measures, among them a standardized sterilization protocol for all U.S. laboratories coupled with improved verification procedures.[148]

In terms of bioterrorism as a means of mass exposure, while no further strikes have occurred on U.S. soil since the autumn of 2001, the possibility of a bio-attack will no doubt persist well into the future. Furthermore, of those pathogens likely to be deployed, there are several reasons to assume anthrax will remain the microorganism of choice. Certainly it is known that al-Qaeda, an organization that continues to evolve, was experimenting with the bacterium before and after the events of September 11th, and that it not only formed a committee devoted to biological, chemical, and nuclear attacks but was also constructing a laboratory in Afghanistan specifically to weaponize anthrax.

Al-Qaeda, however, is not the only organization that is a cause for concern; others exist as well. In addition, new extremist groups will no doubt emerge in the coming years, some of which can be expected to explore the use of biological agents against civilian targets. It is imperative, then, that society identify those terrorist organizations that appear to be intent upon

doing harm through biological means and thwart their efforts to acquire lethal agents. And this means enhanced vigilance. "Better intelligence and biosecurity measures are essential," write René Pita and Rohan Gunaratna, a common-sense conclusion as well as a challenging one in that it must be accomplished in such a way as to protect the population even as it respects the freedom and privacy of the individual citizen.[149]

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