

CHAPTER 1

NUCLEAR FEAR—THE GODZILLA OF ALL FEARS

‘A man cannot be too careful in the choice of his enemies’

—Oscar Wilde

In the early 1940s, nuclear technology in America was a burgeoning field rife with possibilities for potential weaponry to be put to use in World War II. The year 1942 saw the world’s first nuclear reactor, which was fashioned from a crude pile of uranium and graphite out of which cadmium rods (able to absorb neutrons) protruded. This ambitious experiment—stacked on the floor of a squash court at the University of Chicago and surrounded by concrete walls—was inauspiciously referred to as Chicago Pile-1.

When the cadmium rods were removed from the pile, neutrons were released, which caused fission and the splitting of atoms—hence, the creation of the first *man-made*¹ nuclear reactor. In that same moment, something in the

¹In 1956, P.K. Kuroda speculated that a *natural* assemblage of uranium could form a **natural nuclear reactor**. He went on to point out that if such an assembly did exist, it would have gone critical 1.9 billion years ago. A “*fossilized*” reactor was found by the French in Gabon, Africa, in 1972. Many scientists have studied this reactor site and concluded that it had operated 1.7 billion years ago. This was indeed the world’s first nuclear reactor—and it occurred naturally.

world shifted imperceptibly: Nuclear energy had gone from being hypothetical formula to practical device and thereby a historical fact.

Those humble beginnings in the lower level of an amateur sports arena belied the significance of what had just occurred: The world's first man-made self-sustaining nuclear reactor had been developed, ushering with it the birth of a new, nuclear age.

The public's initial reaction to this achievement was subdued. After all, what kind of impact could splitting a few atoms have on anything?

Within 3 years, the government's wartime efforts with atomic weaponry had sufficiently answered that question. Defense measures based on the principles of nuclear fission had stepped up considerably and were being secretly shrouded under the mysterious workings of the Manhattan Project, which was led by director Robert J. Oppenheimer. The first atomic bomb was tested by the U.S. Army's Manhattan Engineer District in July of 1945 in the Alamogordo Desert, which is a remote region of New Mexico. After witnessing this atomic trial run (called the Trinity test), Oppenheimer famously quoted the Bhagavad Gita, an ancient Sanskrit text: "Now I am become death, the destroyer of worlds." Because of the high degree of secrecy, the American public, however, remained unaware of the potential for destruction that had been unleashed in the desert.

That is, until everything changed forever on August 6, 1945.

1.1 THE BOMBING OF HIROSHIMA AND NAGASAKI

President Truman's decision to drop an atomic bomb (nicknamed "Little Boy") on Hiroshima on August 6, 1945 and then to drop another ("Fat Man") 3 days later on Nagasaki brought World War II (WWII) to a decisive end, with Japan's surrender shortly thereafter on August 15, 1945.

Of course, many Americans rejoiced in the victory. The A-bomb brought to a swift close a battle that had been raging on for 6 years and threatened to continue indefinitely, draining both domestic resources and finances, and claiming the lives of what could have arguably been tens of thousands of additional Allied soldiers.

However, when Japan finally signed the surrender on September 2, 1945, U.S. troops were returning to a homeland dramatically different than the one they had left.

1.2 NUCLEAR FALLOUT IN AMERICA

Although the end of the war was obviously good news, newsreel images of the atomic aftermath and declassified films of mushroom clouds exploding

in the desert had indelibly burned themselves onto the collective American conscious.

Reports came in that within seconds of the atomic blasts, a total of approximately 110,000 Japanese had been killed; within days, the number of dead had doubled to 220,000—most of those were civilians. Thousands more were disfigured or would die in years to come because of radiation exposure.

It was apparent that not only Oppenheimer, but also America itself, had become a destroyer of worlds.

Its knowledge and possession of nuclear weaponry obviously positioned the United States as number one in the global arms race. The deaths of so many civilians and the near-destruction of two developed cities was more than enough to prove the effectiveness of atomic power and to impress or intimidate political opponents around the world—but it was also enough to make the American people question the safety of their government’s domestic nuclear experiments and the attendant radioactivity.

It also begged the question that still resonates today: What would happen if these weapons—or the plans with which to build them—were to fall into the wrong hands?

In the weeks after Japan’s surrender, the post-war sense of euphoria and security with which many U.S. citizens regarded their country’s international dominance and recently exhibited, seemingly impenetrable defense policy were short lived. The atmosphere started to disintegrate into one of shared uneasiness, a sort of American zeitgeist of anxiety, as thoughts of nuclear power gave way to nuclear paranoia.

1.3 WMDs: WITNESSES OF MASS DESTRUCTION

Media images compounded the problem of atomic anxiety. Newsreels and footage of the nuclear explosion tests carried out in the desert of New Mexico were declassified by the U.S. military and shown relentlessly in the U.S. media, partly as pure news reporting and partly as an attempt at patriotic propaganda. However, the effects of overexposure to that kind of previously unseen, man-made mass destruction had an unforeseen negative impact on the American psyche. One can relate it to the more recent images of the World Trade Center buildings collapsing on 9/11; studies have shown that even almost 7 years after the tragedy, viewers who see the familiar footage broadcast in an unexpected context still feel a sense of powerlessness and loss of control at not knowing when or where they will be exposed to these images. In that sense, the anxiety one feels about randomly having to “relive” those moments through the media mirrors the same fear of uncertainty about when and if another terrorist attack will occur.

Witnessing the explosion of atomic weapons on their own soil (albeit by their own government) left a lot of Americans shaken. The issue of exposure to radioactivity became a by-product of exposure to images of nuclear testing.

Although the sudden increase in visibility of the mushroom cloud images contributed to a national nuclear unease, invisibility also played a significant part. The American public, like the Japanese citizenry, had been kept largely in the dark about the advances in nuclear weaponry until it was already too late. The general lack of knowledge about all things nuclear on the part of the American public added to their mistrust: The government had kept the information hidden all too well, not only from the enemy but also from its own people. The questions were as follows: What have we been exposed to and what new era of warfare are we being dragged into? And the underlying worry was as follows: Are we psychologically and physically prepared?

In addition, the fact that atoms themselves are invisible lent a feeling of the supernatural (or supranatural) to nuclear fission. The seemingly arcane knowledge about atomic energy was regarded by most Americans as belonging exclusively to the realm of scientists and secret government agencies (unlike guns and grenades, these new weapons were even out of the hands of the soldiers themselves).

The concentrated amount of death and devastation contained in a single atomic bomb, although based on simple laws of physics, made it seem almost alien. Richard Rhodes, the author of *The Making of the Bomb* commented that Einstein's equation $E = mc^2$ had been demonstrated for the first time to the world, in a horrifying way, by dropping the bombs on Japan. This also had a sobering impact on world politics. As Rhodes points out, if one graphs the number of deaths caused by war, there was in mankind's history an exponential rise in the death toll at the end of WWII (estimated to be 47 million). After which there was a radical drop to perhaps one million per year for the rest of the 20th century. Clearly, the bomb had a dramatic impact on not only going to war but also on policymakers' opinions about the futility of war.

And this is where the entertainment industry enters the nuclear equation.

1.4 FEAR AND THE FILM INDUSTRY

Within weeks of the atomic bombing of Japan, Hollywood filmmakers rushed to edit the declassified footage of mushroom clouds and nuclear testing into their products: from noir spy thrillers and pseudo-documentaries to B-level (and further down the alphabet) science fiction movies. The already terrifying true-life images of A-bombs exploding were capitalized on by the film industry and spliced alongside what were considered, at the time, even more

unimaginably terrifying images of mutant monsters, atomic-powered aliens, and nuclear arms-induced Armageddon.

One of the first films on the scene was Henry Hathaway's *The House on 92nd Street*, which was released a mere month and a half after the bombing of Hiroshima. Logistically, the movie must have already been in post-production at the time, but it is apparent that a few lines of dialog (no footage, however) were added before its release to allude to the new nuclear threat. Although the film is a straightforward spy thriller, the Nazi infiltrators living in New York City were given a more pointed, updated purpose than simply smuggling U.S. military plans out of the country: Their new goal was to find the unspecified "secret ingredient of the atomic bomb."

Although it is amazing to think of the speed at which the entertainment industry sought to exploit the cataclysmic turn of events, this is not to say that works of film or fiction about the potential threat of radium and nuclear fission did not exist before the dropping of the first atomic bomb. Some science fiction writers in the late 1930s and 1940s (such as H.G. Wells) had already described accounts of the world coming to an end because of molecular-level mishaps. A few even came so close to the clandestine information involved in the Manhattan Project that they were censored by the U.S. government.

Even 2 years before the advent of the A-bomb, as unlikely a source of political realism as Batman used a plot in which Asian enemies tried to get their hands on secret American stockpiles of radium. The undisclosed use of this radium by evil forces would pave the way for their plans of world domination.

Could it be that Batman had gotten it right all along?

According to Hollywood, yes. Its role as atomic aggressor had ironically turned America into the ultimate target—if only on film, for the time being.

1.5 CELLULOID SPIES

A slew of movies released in 1945 and the years (and decades) following depict the United States as a country crawling with spies intent on finding the "secret" atomic formula.

Perhaps the most iconic of atomic, apocalyptic endings was delivered in Robert Aldrich's famous example of film noir, *Kiss Me Deadly*. In this adaptation of Mickey Spillane's spy novel, the hero/anti-hero Mike Hammer unintentionally unleashes an atomic explosion that causes the end of the world when curiosity gets the better of him, and he opens a briefcase containing the "great whatsit" (radium?).

Throughout the film, enemy agents have been trying to kill him to take possession of the briefcase; yet, once it is safely delivered, Hammer himself (in a reprisal of the archetypical, unaffiliated American detective role seen so many

times in film noir) is the one who unwittingly unleashes the atomic explosion and watches in the movie's final frames as the world is swallowed up in an enormous mushroom cloud. *Kiss Me Deadly* resonated so strongly with post-war American audiences because it captured the sense of both nihilism and naïveté with which most citizens approached the issue of nuclear weapons and nuclear energy.

1.6 ATOMIC NATURE RUN AMOK

Spies, however, are not the only things that celluloid America was crawling with. Science fiction films of the 1950s (reacting to the recent Soviet threat of atomic warfare) show the country being invaded by insects bent on destruction, having gained their enormous size and powers through inadvertent exposure to radiation. From giant ants (*Them!*) and spiders (*Tarantula*) to a human-hybrid fly formed during a laboratory accident (*The Fly*), these mutant creations of popular culture, when studied together, point to a larger, more serious national concern: What effects would atomic radiation have on the environment?

In on-screen representations, America was open to an atomic attack both from below (out of the depths of the ocean in *It Came From Beneath the Sea* and from the Earth's core in *The Beast From 20,000 Fathoms*) and above (from outer space in *The Day The Earth Stood Still*). The giant insects, mutant monsters and, atomically armed aliens were special effects-enhanced stand-ins for Americans' real concerns about what radiation could do (or had already done) to the water supply, soil, and air.

In addition to the Soviets' amped up Cold War weaponry, the reports of disfigurement, deformed babies, and radioactive fallout that had still plagued Japan 10 years after the bombings weighed heavily on our country's conscience, even in the form of our commercial entertainment.

In 1955, perhaps the most notorious example of post-atomic war anxiety was released: *Godzilla, King of the Monsters*. What makes this film and its subsequent series most notable is not only the way it was embraced by the American public but also the fact that it was produced in Japan and was later dubbed with the stand-in reporter Steve Martin played by Raymond Burr. This gave a mechanism through which the Japanese movie could become an "American" movie without the traditional dub-line. Burr reprised this same role almost 30 years later in *Godzilla* 1985.

Watching the mutant, atomically enhanced creature come forth from an ocean tainted by radioactive waste to wreak havoc on unsuspecting Japanese citizens instilled fear (perhaps mixed with remorse) in audiences across the United States.

Oddly, *Godzilla* seemed to underscore a common link that American and Japanese citizens shared: Both had atomic bombs exploded in their countries

by the U.S. government. The “God” in the title, then, refers less to America in general as a superpower and more to the specific scientific and governmental agencies who controlled atomic power—and, thus, the fate of the world. The monster itself is metaphorical as that power having gone out of control and as the mutant (or at least genetically mutated) strains of life that radioactivity could engender.

The spy thrillers, science fiction films, dramas, and monster movies that were made immediately after the atomic bombing of Hiroshima and Nagasaki, that continued throughout the Cold War period, that focused on nuclear accidents throughout the 1970s and 1980s, and that still grip us with apocalyptic anxiety today show that the dread associated with atomic energy and the effects of radiation has never entirely abated. At most, like the mutant life forms featured in many of these films, it lays dormant, ready to resurface at any time.

1.7 POST-WAR NUCLEAR REACTIONS

Within a year of the atomic attack on Japan and its subsequent surrender, the United States’ official stance on nuclear weaponry had shifted significantly.

Robert Oppenheimer, who had been called “the father of the atomic bomb,” quit his work for the U.S. Department of Defense and became chief advisor of the U.S. Atomic Energy Commission, which had been recently established to turn national attention away from nuclear weaponry and toward the application of atomic energy for more peaceful, productive, nonwartime uses. (From that position, Oppenheimer would later speak out against the escalating nuclear arms race between the United States and the Soviet Union.)

In 1946, the U.S. military asked inhabitants of Bikini Atoll in the Marshall Islands (a territory America overtook from Japan during the war) to leave the area so it could be used for additional, nondomestic nuclear testing. Unlike the Trinity trials in New Mexico, which were focused on military defense, these new, overt rounds of testing were ostensibly intended to regulate safety as well as to ensure “the good of mankind and to end all world wars” (according to U.S. Armed Forces spokesman Commodore Ben H. Wyatt).

The Pentagon had already reported on the American military’s urgent need for having bombed Hiroshima and Nagasaki, which indicated in its official documentary, *The Beginning of the End?* (released in 1946 through MGM), that the drastic move was necessary because the Japanese government² had been close to completion of its own nuclear weapon.

²A recent documentary produced by the History Channel titled *Japan’s Atomic Bomb* validates this premise. Documents detailing Japan’s efforts at building a nuclear weapon were smuggled out of the country in 1949 by a young scientist by the name of Paul K. Kuroda. It was the author’s privilege to study under Professor Kuroda, at which time (circa 1984) these documents were revealed to the author.

In the meantime, Japan had already begun working on treaties against nuclear armament, which would culminate in the 1960s with its self-imposed Three Non-Nuclear Principles disavowing possession, production, and introduction of atomic weaponry.

It seemed that, for the time being, the radioactive genie had been shoved back inside its bottle.

1.8 THE SPECTER OF COLD WAR

The relative post-war peace that Americans seemed to have made with their newfound nuclear power eroded in an instant on August 29, 1949—the day the Soviet Union set off its first successful atomic bomb.

A few weeks later, news of the Soviets' atomic achievement reached American shores and sent shockwaves through a country already familiar with firsthand accounts of the effects of atomic radiation. Estimates by scientists and government officials had stated emphatically that it would be more than a decade before it would be possible for the Soviets to have the bomb. This erroneous assumption was based on another erroneous assumption—that nuclear secrets remain secret. This of course led many to believe that spies were to blame, which was true. This incident in history is only magnified today with the news that even small rogue nations have now garnered nuclear secrets. What is old becomes new and fashionable again even in the realm of nuclear secrets.

Although the U.S.S.R. had sided with the Allies during World War II, it was excluded from secret information about atomic weaponry that had been shared between British and American intelligence; thus, the already strained relations among the countries deteriorated almost immediately after the fighting had ended. The Western allies were wary of communism in general—and of Stalin specifically.

A stunned President Truman refused to accept that Russian scientists had, on their own, discovered the “secrets” of atomic fission (which had been hinted at by Einstein in his famous equation $E = mc^2$ almost four decades earlier and later applied by the Germans in late 1938)—especially so soon after the United States had. Instead, he publicly announced the presence of spies who were working in American intelligence.

This “official” presidential proclamation seemed to lend credence to the Red Scare suspicions that had been plaguing the U.S. administration—and the Hollywood film industry—since 1947. Although the House Committee on Un-American Activities (HUAC) had been in place since the 1930s to check on the propagation of subversive materials (particularly, at that time,

anti-American or pro-Nazi messages, whether interpersonal or spread through the media), its focus had shifted after the end of World War II to almost exclusively sniffing out the dissemination of communist propaganda within the country.

Infamously, HUAC held a series of hearings to examine members of the entertainment industry on suspicion of being Soviet sympathizers. Producers, directors, and actors who had been making, either with express government commission or consent, pro-Russian films just a few years earlier, when the U.S.S.R. was siding with the Allied forces, were now coming under scrutiny as “reds” or, worse yet, Russian spies. For refusing to cooperate with Congress, certain workers within the industry were blacklisted and refused work, most notably the Hollywood Ten.

With Truman’s proclamation about Soviet espionage (reaching a crescendo in the 1960s with the trial and execution of the Rosenbergs), the scrutiny under which average American citizens lived amid accusations of the “red menace” and the examples that HUAC was making of a select group of high-profile people—all in addition to the Russians’ new atomic intelligence—another wave of paranoia swept the country.

Fear of a nuclear winter chilled most Americans to the core; thus, the Cold War began in earnest.

1.9 THE FEARFUL FIFTIES

By the early 1950s, the U.S. military had established permanent test sites for nuclear weapons in the Nevada desert and the Marshall Islands. By then, most of the American public was resigned to the fact that the only way to avoid an impending nuclear war with Russia was to accelerate the arms race; thus, newly developed hydrogen bombs were added to America’s arsenal.

Amid government-sanctified anti-Communist propaganda films and individual members of Hollywood attempting to outdo one another in the production of patriotic, pro-democratic movies, America was once again awash in images of mad (Soviet) scientists intent on pushing a single red button to blow up the entire (free) world and undercover agents seeking to steal U.S. military secrets—both in movie theaters and on broadcast news media.

Unlike the spy thrillers of the late 1930s and 1940s, in which unspecified shadowy figures from Axis nations roamed the underground, the current crop of Hollywood offerings identified one single, unified enemy out to destroy us.

The constant threat of a possible Russian atomic missile attack on American soil is perhaps the most prolonged and persistent example of terrorism ever to affect our country.

1.10 DR. STRANGELOVE AND LEARNING TO LOVE THE BOMB

The U.S. government's policy of increased isolationism, as well as some influential politicians' well-publicized searches for Soviet infiltrators, stoked the public's panic about a potential outside attack.

At the same time, Russia's increased atomic strength ignited an almost contradictory belief among Americans that a strong military defense and arsenal were our best chances for avoiding nuclear apocalypse. A 1954 Gallup poll showed that 54% of Americans felt the H-bomb actually decreased the possibility of another world war.

Many historians argue that the change in U.S. administration brought with it a marked change in Americans' attitudes toward Cold War weaponry. Truman left office in 1953 to be succeeded by President Dwight D. Eisenhower; he was a decorated World War II veteran who was introduced to the American public as having played a major role in the defeat and disintegration of the Nazi Party. During the war, Eisenhower had acted as commanding general in the European Theater of Operations, and he was appointed afterward as the supreme commander of Allied Forces in the North African Theater of Operations and, finally, as general of the Army.

Whereas Truman's decision to deploy nuclear weapons on Japan seemed sudden (in that there was barely more than a month between the first nuclear tests and the actual bombing of Hiroshima, with no advance warning of either event given to the American public) and brought about a swift ending to the war, Eisenhower's policy toward the current Cold War crisis was that the country had best be prepared to remain in it for the long haul. The emphasis on nuclear weaponry had shifted from one of deployment to deterrent.

It was a change the American public could learn to live with.

In the years since the Cold War began, fears about the potential for nuclear war were subsumed into what soon became normal daily behavior: Students dove under desks during routine atomic air raid drills (this author remembers many such drills very vividly during his youth), and underground bomb shelters sprung up as quickly as aboveground swimming pools in suburban backyards. In a sense, the overall attitude of this time period, which was espoused by Eisenhower, was that the possession of nuclear arms became somewhat synonymous with the protection of the "American way of life." As long as the United States kept up its end of the arms race, the possibility of actual nuclear warfare was banished to a more distant corner of the American consciousness. This sentiment was later reaffirmed in the concept known as mutually assured destruction or "mad."

By 1957, U.S. citizens living in the Southwest had especially become so accustomed to the testing going on in Nevada (and so reassured by the

government's declarations of health and public safety) that a new beauty pageant called Miss Atomic Bomb was created, and crowds from neighboring Las Vegas would set up beach chairs to watch nuclear "sunsets," cocktails in hand (see Fig. 1.1).

For perhaps the first time in history, long-held fears of nuclear annihilation sat squarely alongside an embrace of the benefits afforded by having (as opposed to utilizing) nuclear weaponry. Americans would continue to occupy this position uncomfortably for the next quarter-century.



Figure 1.1. On May 24, 1957, the Las Vegas News Bureau released the last and, arguably, the most famous "Miss Atomic Bomb" photo of all to coincide with Operation Plumbbob at the Nevada Test Site. All Las Vegas Strip hotel showrooms had their own "lines" of showgirls, who performed in between the famous headlines. Don English took the famous Miss Atomic Bomb photo of Copa showgirl Lee Merlin at the Sands Hotel. With a cotton mushroom cloud added to the front of her swim suit, the publicity photo of the last Miss Atomic Bomb has appeared and continues to appear in hundreds of publications worldwide.

1.11 NUCLEAR TERROR REVISITED

Essentially, Americans' relationship to atomic energy has, since the discovery of nuclear fission, depended a great deal on the amount of information—and misinformation—divulged by both the government and the media (sometimes acting in accordance). This is true of almost any issue that, along with health implications, has ties to the country's military, economic, and political considerations.

However, a time comes when the public's fears runs head-on into facts about the safety of nuclear power.

That is what happened with the American public's perception of nuclear energy in the late 1970s and 1980s. Although anxiety over a nuclear holocaust never fully subsided after the initial outbreak of the Cold War, it was partially mollified by the country's economic and industrial booms in the latter half of the 1950s. In the 1960s, the U.S. military's involvement in a "hot" war in Vietnam left little energy and few resources to be wasted on Cold War concerns.

By the 1970s, nuclear power was being considered as a viable alternative to other energy sources, especially amid rising fuel prices, increased tensions in the Middle East, and heightened environmental awareness. In fact, 93 nuclear power plants across the United States all began operating within the same year, 1973, providing 20% of the country's electricity. Oppenheimer's long-held dreams of peaceful application for atomic energy were finally coming to fruition.

Until America suffered a meltdown.

In 1979, the Three Mile Island nuclear power plant in Pennsylvania overheated at its core. Although the meltdown released only a small amount of radioactivity into the surrounding area, no immediate injuries or deaths occurred. According to the U.S. Nuclear Regulatory Commission (NRC), detailed studies of the radiological consequences of the accident were conducted by the NRC, the Environmental Protection Agency, the Department of Health, Education and Welfare, the Department of Energy, and the State of Pennsylvania. Several independent studies were also conducted. Estimates are that the average dose to about 2 million people in the area was only about 1 millirem. To put this into context, exposure from a full set of chest X-rays is about 6 millirem compared with the natural radioactive background dose of about 100–125 millirem per year for this area. The collective dose to the community from the accident was very small. The maximum dose to a person at the nuclear site boundary would have been less than 100 millirems.

The real casualty of Three Mile Island was the "meltdown of public confidence" in the use of nuclear energy. Ironically, *The China Syndrome* (an

acclaimed fictional film depicting the melting of the core of a nuclear reactor and the subsequent cover-up) was released on March 16, 1979—a mere 12 days before the accident at Three Mile Island. Hollywood benefited, and the country's use of nuclear power went into a tailspin (in terms of public confidence and in terms of a sharp rise in anti-nuclear sentiment). According to the U.S. Department of Energy, the last reactor built was the River Bend plant in March 1977. The last plant to begin commercial operations was the Watts Bar 1 plant in Tennessee, which came online in 1996.

Today nuclear power is making a “Nuclear Renaissance.” According to the NRC, currently 23 applications are pending for 34 new nuclear power plants to be built within the next decade. This resurgence of confidence in nuclear has been brought about by high oil prices, lower cost of operation (nuclear is now the lowest cost per kilowatt-hour among the major energy production methods), no production of greenhouse gases, and an urgency for the United States to wean from the use of foreign oil.

After clashes between administrative policy and public opinion over the unpopular Vietnam War, many Americans' trust in the government had already begun to erode. The incident at Three Mile Island invoked further confusion, anger, and anxiety (especially coming less than two weeks after the release of *The China Syndrome*).

Old fears resurfaced: Even though nuclear power was now being put toward peaceful means, that did not mean it still could not harm us.

1.12 CHERNOBYL'S IMPACT ON CONTEMPORARY VIEWS OF NUCLEAR ENERGY

Seven years after the near-miss at Three Mile Island, an event occurred that would turn worldwide public opinion against nuclear power well into the next millennium: the explosion at the Chernobyl nuclear reactor in the northern Ukraine.

In April 1986, this accident released tons of radioactive material—400 times more than what was released by the combined atomic bombing of Hiroshima—into the atmosphere over three countries: more than 12 trillion international units of radioactivity in Becquerels (Bq) or disintegrations per second, most of which was released in the first 10 days. Close to five million people living in the surrounding vicinities were exposed to dangerous levels of radiation. In comparison, all the aboveground testing performed in the 1950s and 1960s is estimated to put some 100 to 1000 times more radioactive material into the atmosphere than the Chernobyl accident.

Less than 50 immediate deaths were attributed to the explosion; the effects were felt for years. A total of 237 occupationally exposed people were admitted

to hospitals, and 134 were diagnosed with “acute radiation syndrome.” Of these, 28 died within the first 3 months, whereas at least 14 additional patients died over the next 10 years; however, perhaps some deaths cannot be attributed entirely to radiation exposure. Two other people died in the explosion, and one more presumably died of heart failure. Additionally, some 200,000 people involved in the initial clean-up of the plant received average total body radiation doses of the order of 100 mSv (millisieverts). Ten mSv is equivalent to the dose of one general chest X-ray. Twenty mSv is also the dose limit currently permitted for workers in nuclear facilities. The average worldwide natural “background” radiation is about 2.4 mSv.

Within the group of 116,000 evacuated from the “exclusion zone,” fewer than 10% received doses greater than 50 mSv; fewer than 5% received more than 100 mSv.

A sharp increase in thyroid cancer among children from the affected areas is the only major public health impact from radiation exposure documented to date. By the end of 1995, approximately 800 cases in children under 15 years of age had been diagnosed, mainly in the northern part of Ukraine and in Belarus. Three children died as a result of this cancer, which can be treated medically.

The only documented and attributed cancers are from thyroid cancer. This is because of the high levels of radioactive iodine that were released to the general population. No increases have been detected in either leukemia or malignancies other than thyroid carcinomas. However, a note of caution should be made that some effects may take years to show statistically significant levels of other types of cancers or other attributable radiation exposures.

Perhaps the greatest toll Chernobyl has had on human health has nothing to do with radioactivity. From this incident, numerous psychological health disorders, such as anxiety, depression, fatalistic attitudes, and other psychosomatic disorders, have been caused by mental distress. It is difficult, however, to separate these effects from those brought about by the collapse of the USSR.

Another important point to stress is that exact numbers related to the Chernobyl nuclear fallout are difficult to come by because the Soviet government stopped allowing radiation to be cited as the official cause on death certificates.

With the closing of the Chernobyl nuclear plant, the case for safe nuclear energy was indelibly damaged. Images of Chernobyl victims recalled the equally unsettling and terrifying photos taken of the atomic aftermath in Japan. The two separate incidents, although very different in nature, became inextricably linked in a lineage of nuclear terror that spanned decades and continents.

In America, President Reagan had already spoken out against the madness (the “mutually assured destruction”) of maintaining nuclear armaments. Now,

the explosion at Chernobyl was recognized as evidence of exposing the fallacy of “safe” nuclear energy.

As a result, Chernobyl and at its core, nuclear energy, has been framed by hundreds of Hollywood movies as a mutant monster that created mutated, deformed victims in its wake and that, in the minds of some, seems to elude human control.

1.13 THE MYTH OF THE LONE MADMAN

From the Axis forces that operated in World War II to the Soviet superpower during the Cold War, even to potentially sinister nuclear power plants that operated among us, Americans could always trace the sources of possible atomic threat, attack, or espionage.

That sense of certainty ended when our world fell apart on September 11, 2001. After 9/11, terrorism took on a whole new meaning. Our military began searching for terrorist activities in all corners of the globe. The fear of a nuclear bomb falling into the hands of an unhinged dictator or terrorist cell bent on destroying the Western world was the underlying basis for the American public’s support of invading Iraq.

President Bush raised concerns by announcing that any extremist radical “able to produce, buy, or steal an amount of highly enriched uranium a little larger than a single softball” could produce a nuclear weapon within a year.

The myth of the lone madman is nothing new. Even before the first atomic bomb was dropped, films featured the iconic image of the mad scientist experimenting with radiation to one day realize his plans for world domination.

However, even regime leaders sympathetic to terrorist cells do not give away nuclear weapons or the materials with which to build them. For one thing, it costs too much. For another, it can be used against the very regime that provided it. After all, the first step toward world domination begins within a nation state.

Despite this logic, the terror caused by the possible possession of nuclear weapons by extremist factions or rogue nations has already taken hold of the American imagination and has held it hostage. Because the definition of a true terrorist lies in his ability to evoke and sustain fear, even the hint of a nuclear weapon has already done half the work for would-be terrorists.

1.14 FEAR OF AN UNKNOWN ATOM

Perhaps part of the strategy to relieve Americans’ anxieties and negative reactions about all things nuclear should center around lifting the veil of secrecy

that has enshrouded nuclear power for so long. Public acceptance is usually based on an increase in knowledge and information; in this case, that information includes how exactly nuclear fission functions, both the harmful and beneficial effects of radiation, what countermeasures are in place against atomic and radiological warfare, and the roles of medical personnel, the military, and first responders in radioactive scenarios. (All of these topics will be covered in the following chapters of this book.)

Since the Soviet Union has splintered and the Cold War arms race has ceased to exist, the perception of nuclear power as associated only with weaponry has also faded, taking with it much of the stigma surrounding its production.

As America looks to alternative fuel sources, nuclear energy is again at the forefront, for its “clean-burning” properties and low costs. In addition, the industry as a whole has one of the strongest safety records—with built-in security mechanisms as well as precise and exhaustive standards of regulation. Not one person in the United States has ever died as a result of a nuclear-related accident in the commercial nuclear realm. (Accidents are the anomaly, although of course they receive the most press coverage and therefore occupy a prominent place in the public consciousness.) With advancing designs for nuclear power plants, such as light water reactors, and an increasing reliance on computerization, the probability of accidents and human error has been greatly reduced.

Even though the potential for nuclear destruction is indeed real and has certainly been realized, it has also been exaggerated through decades of popular culture and public fear. Although more deaths over time have been attributed to auto accidents than to nuclear accidents or warfare, cars do not evoke nearly the same level of anxiety as nuclear reactors because we have accepted them as part of everyday life and find that their benefits outweigh the risks.

For nuclear energy to be viewed in the same light, it is important that the public be informed of its positive aspects. For example, nuclear energy reduces carbon dioxide emissions, which some believe contribute to global warming. The nuclear power produced in the United States today cuts the carbon dioxide being released into the atmosphere by an amount equivalent to taking 94 million cars out of commission. What this means is that nuclear power is perhaps more likely to save the Earth than to destroy it.

The key to nuclear safety has always been in the understanding of it, the harnessing of its use, and the implementation of maintenance and regulations. After all, nuclear energy is based on physical laws of nature; fear of atomic energy is a creation of mankind.