

The Bomb, a Life

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Human conception takes place when a sperm from the male penetrates an egg from the female. The fertilized egg, a single cell, splits, forming into two cells, then four, then sixteen. Nine months of exponential growth result in the birth of a baby.

In physics, nuclear fission takes place when a piece of Uranium 235 (the sperm) enters, at bullet speed, another piece (the egg). Atoms are split, releasing neutrons which then split other atoms – first one, then two, then four, then sixteen. The chain reaction goes through about eighty generations until it can no longer be contained. A few milliseconds after conception, an explosion is born and 100,000 people are killed.

The processes are strikingly similar, but frighteningly different. In biology, conception and gestation are complicated and time-consuming processes which lead to the creation of a single human being. In physics, they're relatively simple processes which occur in an instant, and then annihilate thousands. 'How easy it is to kill people when you turn your mind to it', one atomic scientist remarked shortly after Hiroshima.

Nothing that man has created is bigger than the Bomb. It's not just a weapon, but a tool for re-shaping the earth – in a physical, political and philosophical sense. Its importance stretches far beyond its corporal manifestation. It's an entity, a being. It was in the room when John and Robert Kennedy discussed the problem of Soviet

missiles in Cuba, when Ronald Reagan and Mikhail Gorbachev met at Reykjavik, and when George W. Bush and Donald Rumsfeld planned their invasion of Iraq. It was a camper at Greenham Common, and an inmate of the gulag. The ubiquity of the Bomb, in politics, war, philosophy and culture convinced me that it deserved a biography, a life story which would capture the impact which it has had on our lives.

What follows are scenes from the life of the bomb. Most of these are serious, some are tragic, some silly and some strangely funny. These scenes will also bring to life the bomb's dysfunctional family, including its violent big brother, its troubled parents and one or two mad uncles.

The Bomb, by the way, is male. We know that because the scientists said so. They had a lexicon to go with their work. Building the bomb was equated with pregnancy, the first test with giving birth. A successful test would be a boy, a dud a girl. The team desperately wanted, but also dreaded, a son.

The scientists were communal parents. Like most parents, they agonized over whether to have a child. They were driven forward by the miracle of creation, and pulled back by the dread of what they might conceive. Many hoped to fail. They wanted to discover that fission was impossible and the atom bomb a fantasy befitting H G Wells or Marvel Comics. But, among those who hoped to succeed, some thought that if absolute power could be created war itself might be vaporized. The Hungarian émigré Eugene Wigner was one who thought in these terms:

We realized that, should atomic weapons be developed, no two nations would be able to live in peace with each other unless their military forces were controlled by a higher authority. We expected that these controls, if they were effective enough to abolish atomic warfare, would be effective enough to abolish also all other forms of war. This hope was almost as strong a spur to our endeavours as was our fear of becoming the victims of the enemy's atomic bombings.

Working in Germany, Carl von Weizsäcker expressed exactly the same desire, in roughly similar terms. Incidentally, Alfred Nobel had the same idea when he invented dynamite.

The bomb was an immigrant American of Jewish extraction. Its parents came from the US, but also from Great Britain, Italy, Germany, Hungary, Poland, Russia, Czechoslovakia and a host of other countries. Hitler's persecution of the Jews before the war meant that he gifted the United States some of the foremost atomic physicists working at that time.

The bomb could so easily have been German, Russian, British or French. Scientists in those countries understood the basics of nuclear fission and how to make a bomb. But actually building one was an industrial problem of gargantuan proportions. During wartime, only the United States had the capacity to construct, from scratch, a massive nuclear industry. The investment totalled \$2 billion and resulted in an infrastructure bigger than the American auto industry. The Bomb is testimony to the richness of American resources – raw materials *and* labour.

Building the huge electro-magnets required in the isotope separation processes required tons of copper, a precious wartime commodity. Fortunately, the US had lots of silver, which has roughly similar conductivity. Representatives from the Manhattan Project approached the Treasury and announced that they needed between five and ten tons of silver. That drew a supercilious reply: 'silver is never measured in tons; our unit is the Troy ounce'. Eventually they asked for, and got, 395 million troy ounces, what you and I would call 13,500 tons. The wiring in the magnets alone was valued at \$300 million.

The US also had the advantage of being a big country where a huge atomic infrastructure could easily be hidden. Isolated places were also necessary because of the danger of disaster, explosion or massive radiation release. Los Alamos, Hanford and Oak Ridge, now synonymous with the Bomb, were chosen because

they were a long way from anywhere else. That said, the first atomic pile was built not in the middle of a desert, but in the middle of Chicago. In a squash court under the University of Chicago football stadium to be precise. There was no real danger of the pile exploding but meltdown was possible. Arthur Compton, who assumed overall responsibility for the project, decided not to tell the university president, Robert Maynard Hutchins, exactly what was going on beneath his stadium, on the grounds that people should not be told what they cannot understand. 'The only answer he could have given would have been – no. And that answer would have been wrong.'

The Bomb had a pet cat. Midway through the project, she took ill and in the process reminded the scientists of the danger of their work. One of the Army vets diagnosed bone necrosis caused by radiation poisoning. The cat was transformed from pet to specimen as vets and doctors, unfamiliar with the disease, charted its decline. The poor animal declined according to a process now familiar but mysterious back then: her hair fell out, tongue swelled and ulcers appeared. When scientific curiosity waned, she was destroyed.

The Bomb was born near Alamogordo, New Mexico, on 16 July 1945. Robert Oppenheimer, father-in-chief, called the test site Trinity, in acknowledgement of a John Donne sonnet. Its original Spanish name was Jornada del Muerto, or Journey of Death. The area was Alkali desert, one of the most inhospitable places in America. So inhospitable, in fact, that there was a dire shortage of local women to keep the visiting military personnel happy. The unit assigned to the test site won the US Army's award for the lowest wartime VD rate.

The Bomb's birth was preceded, appropriately, by a huge thunderstorm. Those who observed its coming all acknowledged the arrival of a magnificent calamity. Isidor Rabi, another émigré scientist, remarked:

Suddenly, there was an enormous flash of light, the brightest light I have ever seen or that I think anyone has ever seen. It blasted; it pounced; it bored its

way right through you. It was a vision which was seen with more than the eye. It was seen to last forever. ... It looked menacing. It seemed to come toward one.

A new thing had just been born; a new control; a new understanding of man, which man had acquired over nature.

Quite a few scientists felt inclined to philosophize. Others were brutally pragmatic. 'Some people claim to have wondered at the time about the future of mankind', Norris Bradbury remarked. 'I didn't. We were at war and the damn thing worked.' General Leslie Groves, the military head of the Manhattan Project, commented, very succinctly, 'The War's over.'

The Bomb's first job was to end the war, quickly, by killing lots of Japanese. It was dropped on Hiroshima from the Enola Gay, an American B-29, at 0816.02 on 6 August 1945, exploding directly over Shima Hospital, 550 feet short of its actual target. But targets hardly matter when a bomb is capable of destroying an entire city.

'I just could not understand why our surroundings had changed so greatly in one instant', one Hiroshima resident recalled. 'I thought it might have been something which had nothing to do with the war – the collapse of the earth which it was said would take place at the end of the world, and which I had read about as a child.' In another part of the city, Michihiko Hachiya and his wife watched as their house collapsed around them.

The shortest path to the street lay through the house next door so through the house we went – running, stumbling, falling and then running again until in headlong flight we tripped over something and fell sprawling into the street. Getting to my feet, I discovered I had tripped over a man's head. 'Excuse me! Excuse me, please!' I cried hysterically.

Hiroshima residents could not understand how their city had been destroyed so quickly, especially since there'd been only one bomber in the sky that morning. They came up with all sorts of theories, none of them, in truth, any more preposterous than that of a bomb made from a lump of uranium. When fission was eventually explained to them they remained sceptical. They dubbed the Bomb *Genshi Bakudan*, which means 'original child bomb'. The Americans called it Little Boy.

After a second bomb was dropped on Nagasaki, Japan was defeated. The end of the war meant that the lid was removed from the Manhattan Project. Workers at Hanford and Oak Ridge suddenly discovered what they had been making for the past three years. In New Mexico, residents celebrated the way their two sons had won the war. The *Santa Fe New Mexican* newspaper took enormous delight in officially exposing the great secret. 'Santa Fe learned today of a city of 6,000 in its own front yard', the paper announced on 8 August. 'The Los Alamos bomb ... lifted the secret of the community on the Pajarito Plateau, whose presence Santa Fe ignored, except in whispers, for more than two years.' No mention was made on the front page of the number of deaths in Hiroshima, but a short piece on the removal of tomato juice from the ration list was included.

Shortly after the war, and much more quickly than the Americans expected, the bomb was cloned, in the Soviet Union, Britain and France, and eventually in China, India, Pakistan, and Israel. A big brother came in 1952, with the thermonuclear bomb, a device which had no upper limit as to explosive potential and, in truth, no strategic utility. The biggest H-bomb was Tsar Bomba, a 57 megaton device exploded over the Arctic in 1961, a bomb 3,200 times bigger than Little Boy. It was built and designed in just sixteen weeks by a team led by Andrei Sakharov. The explosion ripped roofs from houses 250 miles away. It was so heavy that the parachute required to slow its descent caused a temporary shortage in the Russian hosiery industry. Or so it is claimed. The size of the bomb can be measured by the magnitude of the lies told on its behalf.

The Bomb's job was to keep the peace between the atomic powers, through deterrence. Since there was no way to un-invent the weapon, safety, it seemed, lay in proliferation. Some scientists took solace in the fact that their original prediction about the Bomb bringing an end to war between superpowers has in fact proved correct. But the jury's still out on that matter.

Many people agonized over what the Bomb seemed to say about man and his capacity to destroy. Philosophers and scientists vented their angst in serious journals. These articles are significant, but not as an indicator of national mood. Most people simply adjusted to the new presence, while others celebrated it. A great deal can be learned about the mood of America by studying the country music charts. During the Korean War, Jackie Doll and his Pickled Peppers sang:

*There'll be fire, dust and metal, flying all around,
And the radioactivity will burn them to the ground
If there's any Commies left they'll be all on the run
If General MacArthur drops the atomic bomb.*

Love it or hate it, Americans enjoyed singing about the bomb. My favourite is Sheldon Allman's Radioactive Mama, which includes the following lines:

*Radioactive mama, hold me tight
Radioactive mama treat me right
Radioactive mama we'll reach critical mass tonight
Well when we get together clear away the crowd
There won't be nothing left except a mushroom shaped cloud
...
Well since I kissed you baby, that evening in the park, I lost my hair and
eyebrows and my teeth shine in the dark.*

America tested her bombs in Nevada, where the holes in the earth are so big they have names. One of the biggest is called Sedan. It was formed on 6 July 1962 when a 104 kiloton thermonuclear device was detonated, leaving a crater 1,280 feet in diameter and 320 feet deep. Twelve million tonnes of earth were displaced. The seismic energy equalled an earthquake of 4.75 on the Richter scale.

The test was part of Operation Plowshare, a biblical reference designed to bathe the blast in moral virtue. Originally part of Eisenhower's 'Atoms for Peace' programme, Plowshare explored peaceful uses for atomic explosions, in particular their applicability to large-scale construction projects.

When I visited, the guide on the tour, a retired Atomic Energy Commission engineer, assumed a fatherly pride when he showed off Sedan. He stood taller, thrust out his chest and came close to saying 'I made this'. The crater is impressive, but mainly as a huge metaphor for gargantuan naiveté. Sedan was an experiment to explore whether a second Panama Canal could be made with nuclear explosions. Atomic devices would be stretched across the isthmus like a string of pearls and, presto, a big explosion would achieve in seconds what previously took decades of digging. When Edward Teller, the Bomb's benevolent uncle, explained the idea to an unenthusiastic President Kennedy, he boasted: 'It will take less time to complete the canal than for you to make up your mind to build it.'

Sometime in the 1950s, a wedding took place. The Bomb was married to that other great technological phenomenon of the twentieth century, the rocket. For Stalin, rockets were an instant answer to the advantage the Americans had in the mass production of nuclear weapons. When it came to rocketry, the Soviets initially had more thrust. For a short but significant period the US was genuinely overwhelmed. But then she caught up and the nuclear arms race became a missile race. The marriage of nuclear weapons and rockets has been highly successful.

The rest of the Bomb's life we know quite well, because it is also our lives. During the 1960s and 1970s, most of us learned to stop worrying and love the bomb. There were a few protesters, but none of them could answer the crucial question of how to un-invent the bomb. Most of us took solace in deterrence, because it was all we had. For some reason, deterrence, which might have been achieved with a few hundred bombs, eventually required 50,000. At the height of the Cold War, the two superpowers were spending \$50 million per day on their nuclear arsenals.

We know this story, but there's much we don't know. We don't know about the bit characters in this drama, the 'downwinders' in Utah where cancer rates rose alarmingly after the period of atmospheric testing. Or the people of Muslyomova, near the Russian nuclear industry, where the life expectancy is around forty-five years and half the children are born deformed. Or the thousands of gulag prisoners who died while building the Soviet bomb. Or the people of Bikini who were told that God wanted them to move from their island so that the world could be saved.

The Bomb, I suppose, is retired now. Arsenals are at their lowest level since the early 1950s, and the prospect of two nuclear powers actually going to war seems far-fetched. Deterrence nevertheless still works its magic, or at least that is how its proponents interpret the latest crisis between India and Pakistan. But the bomb still causes concern, in a way that scientists never quite imagined. Deterrence depended on nuclear powers acting rationally, and is Osama bin Laden a rational man? We cling desperately to the fact that, while bombs are easy to build, fissile materials are difficult to obtain. But tons of plutonium are currently stored in very insecure places.

In 1992 the Russian nuclear technician Yuri Smirnov was arrested for stealing 1,538 grams of enriched uranium from his laboratory. During his trial, he explained that he had been driven to desperation because of poverty. He hoped to sell the stuff for \$500. 'That was my salary for two years', he explained. 'I needed a new refrigerator, and a new gas stove. That's all. I didn't need to make a big profit.'

The most frightening aspect of Smirnov's story is how easy it was for him to steal the uranium. He simply went home every few days with a small vial containing sixty grams of uranium-235 in his pocket. At his lab, procedures allowed for an 'irretrievable loss' of around 3 per cent. Through careful handling of the material, he siphoned off small amounts, which no one missed. As it turned out, Smirnov was arrested before he could figure out how to sell the material. His arrest was, however, entirely accidental; he was picked up while in the company of some friends who had been stealing car batteries.

In September 1998, a US team visiting the Kurchatov Institute was shown a building containing 100 kilos of highly enriched uranium. The facility was unguarded because the Institute could not afford to pay a guard. Elsewhere, guards had left their posts to forage for mushrooms and berries or because they did not have winter uniforms to keep them warm on patrol. Surveillance equipment was shut down because electricity bills had not been paid. Wage payments were three months in arrears, and some officers had received potatoes in lieu of pay.

When poverty mixes with nuclear technology, the result can be explosive. If the Russians are having difficulty keeping track of their plutonium, just think how much more serious the problem is in Pakistan, where the desire to make some extra cash might be reinforced by genuine sympathy for the groups keen to buy the plutonium.

The Bomb is a weapon which reflects the flawed nature of human beings – their distrust of each other, their craving for power and their obsession with things big. It was developed by scientists whose quest for discovery caused them to ignore the implications of their work. It was seized upon by politicians and soldiers who confused power with security and lacked the imagination to understand that the atom bomb was something new. It has, because of its bigness, perhaps forced men to act more rationally in the application of force. But it is just a bomb – a power, not a personality. The extent to which it seems to have a character lies merely in the fact

that it acts like a mirror, reflecting our own inadequacies. Some time ago, the physicist Victor Weisskopf remarked how science had unlocked so many of the secrets of the world. But, he insisted,

The important parts of the human experience cannot be reasonably evaluated within the scientific system. There cannot be an all encompassing definition of good and evil, of compassion, of rapture, of tragedy or humour, of hate, love, or faith, of dignity and humiliation, or of concepts like the quality of life and happiness. Because science has not provided an answer to those mysteries, a final verdict on the Bomb remains impossible.