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Atomic John: The Bomb as Fetish

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The Bomb as Fetish

Introduction by Lawrence S. Wittner

"Atomic John," an intriguing article that appeared in the *New Yorker* on December 15, 2008, is particularly remarkable for what it reveals about the inability of some Americans to confront the consequences of the U.S. atomic bombing of Japan.

On the surface, it is the story of John Coster-Mullen, a 61-year-old "truck driver" from Waukesha, Wisconsin, who, through years of painstaking effort, has succeeded better than the ostensible experts have in constructing a precise model of the weapon that annihilated Hiroshima. This is a formidable intellectual achievement, and the author of the article, David Samuels, emphasizes this fact. Moreover, Coster-Mullen has made available his findings about the bomb's technology in a self-published book and on the Internet.

Actually, however, as one plunges into the article, one discovers that Coster-Mullen is not quite the simple trucker mentioned in the article's subtitle. Indeed, he previously had worked as a commercial photographer and in other jobs that provided him with considerable skill in visual measurement, as well as technical knowledge.

And stranger currents swirl below the story line, especially Coster-Mullen's obsession with producing a precise physical model of the atomic bomb. As Samuels shows us, Coster-Mullen has not only devoted many years of his life to studying the details of the weapons used to destroy two Japanese cities, but is absolutely obsessed with them. He maintains extensive atomic bomb memorabilia and is constantly on the lookout for more. In addition, during lengthy travels with Samuels across the country to nuclear-related sites, he talked obsessively, non-stop, about the construction of atomic bombs.

This fanatical concern with what are, after all, no more than material objects characterizes Coster-Mullen's approach and, in time, also overwhelmed Samuels, who admits to finding Coster-Mullen's work "strangely seductive." Writing with admiration of the trucker, Samuels declares that Coster-Mullen's goal "is simply to present readers with accurate information about the past." He is one of "the small and shrinking number of

people who engage in painstaking, firsthand research in order to separate the truth from the body of supposed facts, and who keep the rest of us honest."

Yet what is the most significant "truth" about the atomic bomb? The reality is that Coster-Mullen informs us about minutiae—the technical features of the original atomic bomb—rather than about far larger and more meaningful issues, such as why the Bomb was used, what it did to the people of Japan, and how its development and use triggered the nuclear arms race since 1945.

Nagasaki in ruins following the atomic bombing

Indeed, when it comes to these matters, he is remarkably ignorant, repeating shallow clichés. As the two men gaze at Coster-Mullen's model of the Hiroshima bomb, on display at Wendover Air Force Base, there is a revealing moment. According to Samuels:

> I asked him if there wasn't something obscene about an exhibit that commemorates the incineration of ninety thousand civilians, who were among the last victims of a war that was pretty much over. "Well, there was no indication that they were going to surrender," Coster-Mullen said. He added that most of the fifty million people who died in the Second World War were civilians.

A rough analogy would be someone devoting much of his life to ascertaining the exact construction of the crematoria at the Auschwitz concentration camp who, when asked about the causes and consequences of the Nazi Holocaust, replied: "The Jews caused a lot of trouble in Europe. Also, most of the people who died during World War II weren't Jewish."

Why, then, is Coster-Mullen—having skirted all the big issues posed by the atomic bomb—fascinated by what could be considered nuclear trivia? Perhaps he takes satisfaction in one-upping the supposed experts and defying government attempts to maintain secrecy on the atomic bomb's features, by doing better than anyone else has in unearthing the details of its construction. Certainly this is the dominant theme of the article, which highlights how an allegedly simple worker—one who never graduated from college—has uncovered, single-handedly, the hidden secrets of the atomic bomb.

One explanation that Samuels does not

explore is that Coster-Mullen—like many Americans—is psychologically incapable of facing the horror that his country unleashed on Japan and the potentially fatal nuclear arms race that it unleashed on the world. Although he recognizes the importance of the bomb, he cannot confront the reasons for that importance, for to do so would be painful.

Fire. Hiroshima mural by Maruki Toshi and Maruki Iri

This avoidance of a painful reality is also implicit in the publication of this article. After all, in a very extensive report, it is curious that Samuels only once—as quoted above—raises a larger issue pertaining to the bomb: its mass destruction of civilians in a war that was virtually over. And what should one say of the New Yorker, which in 1946 did so much to expand popular consciousness of nuclear war by publishing John Hersey's powerful "Hiroshima" and today has narrowed the scope of its concern from the victims of the bomb and a world of nuclear weapons to covering the building of a small-scale model of the bomb?

In the midst of this chilling evasion of the broad issues raised by nuclear weapons, it is worth remembering that millions of people—including many Americans—have gone beyond fetishizing the bomb to addressing in word and deed more profound issues. Indeed, recognizing the nuclear catastrophe of the past, they have formed powerful peace and disarmament organizations, educated their societies on nuclear dangers, championed nuclear arms control and disarmament treaties, and fervently opposed any repetition of the nightmare that engulfed the people of Hiroshima and Nagasaki. As a result, they played a major role in curbing the nuclear arms race and preventing nuclear war. In many ways, their story represents the other side of the coin. It is certainly more reassuring than the eerie obsession with atomic bomb technology revealed by this article.

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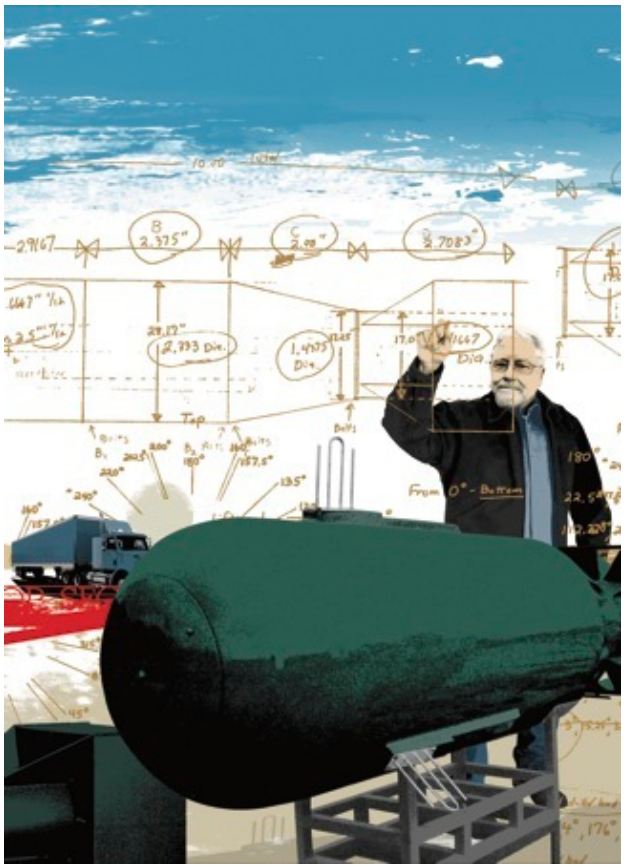
Atomic John: A truck driver uncovers secrets about the first nuclear bombs.

David Samuels



John Coster-Mullen conducted a decade of research to build the first accurate replica of the Hiroshima bomb.

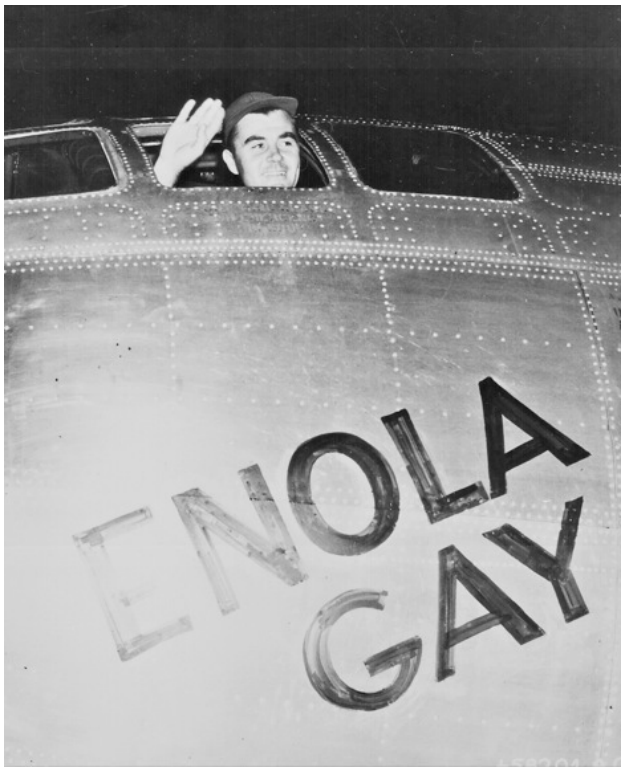
The single, blinding release of pure energy over Hiroshima, Japan, on August 6, 1945, marked a startling and permanent break with our prior understandings of the visible world. Yet for more than sixty years the technology behind the explosion has remained a state secret. The United States government has never divulged the engineering specifications of the first atomic bombs, not even after other countries have produced generations of ever more powerful nuclear weapons. In the decades since the Second World War, dozens of historians have attempted to divine the precise mechanics of the Hiroshima bomb, nicknamed Little Boy, and of the bomb that fell three days later on Nagasaki, known as Fat Man. The most prominent is Richard Rhodes, who won a Pulitzer Prize, in 1988, for his dazzling and meticulous book "The Making of the Atomic Bomb." But the most accurate account of the bomb's inner workings—an unnervingly detailed reconstruction, based on old photographs and documents—has been written by a sixty-one-year-old truck driver from Waukesha, Wisconsin, named John Coster-Mullen, who was once a commercial photographer, and has never received a college degree.

I first came across Coster-Mullen's name in January of 2004, after I attended an exhibit by the artist Jim Sanborn, at the Corcoran Gallery of Art, in Washington, D.C. The show, called "Critical Assembly," included what appeared to be spookily exact replicas of the interior mechanism of the first atomic bomb, which Sanborn had manufactured according to Coster-Mullen's specifications. A year later, I read an article in the Bulletin of the Atomic Scientists that mentioned a six-hundred-mile trip Coster-Mullen had taken across the Midwest with a full-scale model of the Hiroshima bomb in the back of a Penske rental truck. He had built the replica with the help of his son, Jason, in his garage, basing it, in part, on his analysis of sixty-year-old screws, bolts, and fragments of machined steel that had been stored in rural basements and attics.

The mention of Coster-Mullen's journey led me back to the November/December, 2004, issue of the Bulletin, which included a review of a book by Coster-Mullen titled "Atom Bombs: The Top Secret Inside Story of Little Boy and Fat Man." The review, written by the eminent atomic historian Robert S. Norris, began, "For many years, Coster-Mullen has been printing his manuscript at Kinko's (adding to and revising it along the way) and selling spiral-bound copies at conferences or over the Internet." Norris clearly considered Coster-Mullen's understanding of the bomb superior to his own. It was known that Little Boy and Fat Man brought together two masses of fissile material inside a bomb casing, forming a critical mass that set off a nuclear explosion.

Little Boy shot one mass of highly enriched uranium into the other with a gunlike mechanism; Fat Man used explosives to squeeze together two hemispheres of plutonium. But the exact details of how these devices worked were unknown. Norris said of Coster-Mullen's work, "Nothing else in the Manhattan Project literature comes close to his exacting breakdown of the bomb's parts. Coster-Mullen describes the size, weight, and composition of many of Little Boy's components, including the nose section and its target case; the uranium-235 target rings and tamper; the arming and fuzing system; the forged steel 6.5-inch-in-diameter gun barrel through which the uranium-235 projectile was fired at the target rings; and the tail section—to cite just a few."

My own copy of "Atom Bombs" soon arrived in the mail, along with a sheet of testimonials from Harold Agnew, the former director of the Los Alamos National Laboratory, who was aboard the Enola Gay when it annihilated Hiroshima (a "most amazing document"); Philip Morrison, one of the physicists who helped invent the bomb ("You have done a remarkable job"); and Paul Tibbets, the commander and pilot of the Enola Gay ("I was very much impressed"). "Atom Bombs" consists of densely interlocking sentences, nearly all of which contain dimensional information that contradicts the assertions of previous authorities. "A circular steel plate was positioned inside the 17.0"-diameter tail cylinder at the front of the tail tube and another towards the rear of the tube," Coster-Mullen writes. "These allowed the tail to be slid over the 10.5"-diameter gun tube during assembly. The forward plate was positioned 26.5" in front of the aft plate and was welded to the front of the tail tube."

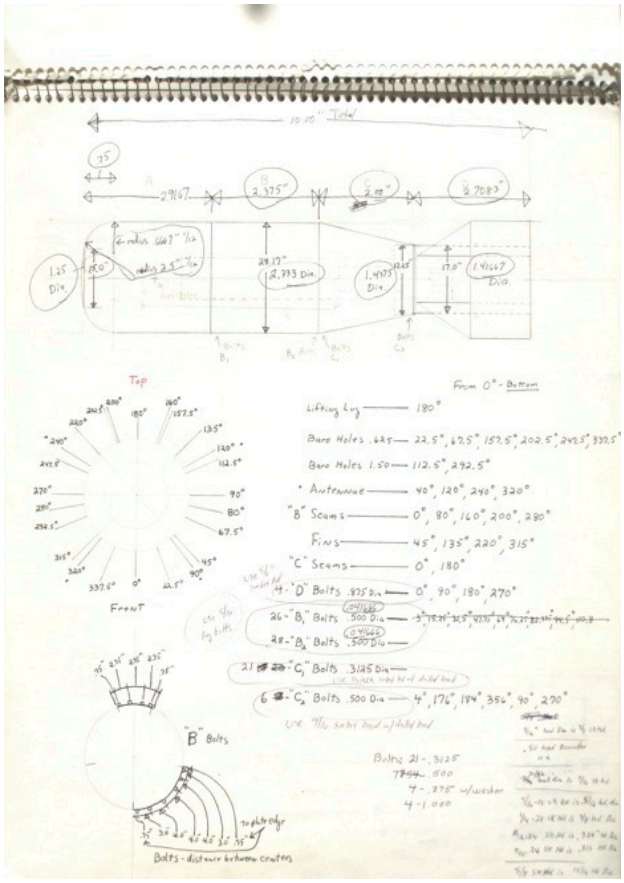


Col. Paul W. Tibbets, the commander and pilot of the Enola Gay

Though the book's specificity about dimensions, shapes, and materials was mind-numbing, the accumulation of detail was strangely seductive. As Coster-Mullen described how the different parts of the Hiroshima and Nagasaki bombs fit together, I felt that I could practically assemble an atomic weapon myself.

The text was followed by more than a hundred pages of declassified photographs extracted from half a dozen government archives, which showed the weapons at various stages of completion—surrounded by scientists in New Mexico or by tanned, shirtless crew members on Tinian Island, in the Western Pacific, just before the bombs were dropped. Coster-Mullen's book concluded with thirty-five pages of end notes, including a hilariously involved discussion of the textural differences in the gold foil used to separate the plutonium hemispheres for the first atomic bomb, Trinity

(dimpled), and the Nagasaki bomb (flat).



A page from Coster-Mullen's sketchbook

Coster-Mullen sees his project as a diverting mental challenge—not unlike a crossword puzzle—whose goal is simply to present readers with accurate information about the past. "This is nuclear archeology," he told me, in a late-night phone call. "It's like any other kind of archeology." Though the government does not make a practice of providing Coster-Mullen with timely responses to his technical inquiries, no official has actively discouraged him from pursuing his research. After a period of mild equivocation, he decided to publish all the details he had uncovered about the mechanics and production of the bomb, even though the subject remains classified. "I was acting like a classification officer," he recalls. "'I can have the truth and you can't.' Who am I to say that?"

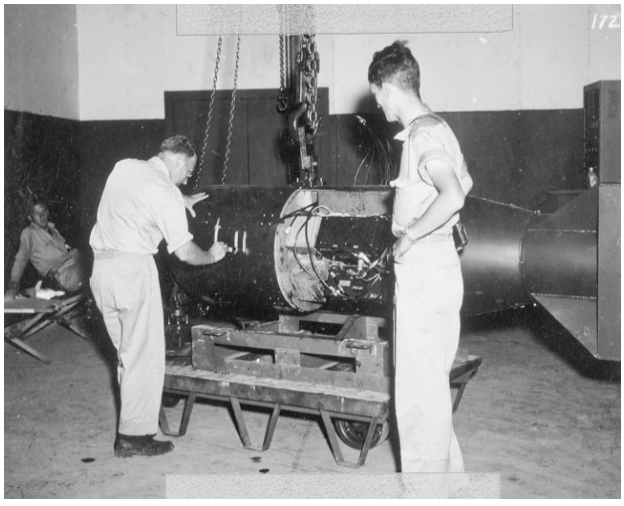
Mushroom cloud over Nagasaki

Among other things, Coster-Mullen's book makes clear that our belief in the secrecy of the bomb is a theological construct, adopted in no small part to shield ourselves from the idea that someone might use an atomic bomb against us. Surely, hostile powers could easily obtain the kind of information that Coster-Mullen has acquired, however painstakingly, in his spare time. Any nation that can master the challenges of the atomic-fuel cycle and produce a critical mass of uranium or plutonium, as Iran is reported to be on the verge of doing, would have little difficulty in producing a workable bomb. Given a sufficient quantity of highly enriched uranium, a small number of engineers working for a terrorist group like Al Qaeda or Hezbollah could easily assemble a homemade nuclear device.

I recently wrote to Coster-Mullen and suggested that we take a trip across the country to visit his Little Boy replica, which is currently housed at Wendover, a

decommissioned Air Force base in Utah. After some negotiation, we agreed to ride together on his late-night delivery route between Waukesha and Chicago. We would then drive to Wendover. Along the way, he would explain the inner workings of the first atomic bombs, and I would learn how he got it right and the experts got it wrong.

Coster-Mullen and I met in the darkened parking lot of a regional distribution center for a big-box retailer, some ten miles outside Waukesha. Dressed in Lee jeans and a tan shirt with the J. B. Hunt logo, he had titanium-frame glasses, blue-gray eyes, and a full head of silvery hair. The distribution center was the size of seven or eight football fields; fans roaring overhead and an enormous conveyor belt drowned out the beeps of cabs backing up to trailers. Coster-Mullen picked up his sheet for the night, which involved stops at Store 1950, in Streamwood, Illinois, and Store 1889, in downtown Chicago. He was to drop off a container filled with lawn furniture in Streamwood, and haul back "sweep" merchandise—cardboard boxes, defective items, coat hangers—from Chicago. We walked outside and hooked up Coster-Mullen's truck to trailer No. 537427, with a solid click. It was seven o'clock on a Sunday night. He calmly recited a safety checklist ("My lights are on, my flashers are on") and we set off.



The Hiroshima combat unit in one of the Tinian assembly buildings.

Over the years, Coster-Mullen told me, he had held nearly a dozen jobs, including working at camera stores in and around Milwaukee; doing inventory control for the Beloit Corporation, which manufactured paper-making equipment; taking photographs of industrial equipment for Trane, the heating and air-conditioning company, and then for Mercury Marine, which makes high-quality engines for boats; working as a studio photographer for Pohlman Studios, in Milwaukee; and running his own photography business. These jobs had provided him with the skills, he says, that helped him solve the puzzle of the bomb. I asked him how he wound up driving a truck. "They are always hiring," he said. "I figured if people with the brains of a squirrel could drive a truck, maybe I could drive a truck."

The highway cut through scrubland, and by nightfall Coster-Mullen was driving past Old World Wisconsin, a tourist attraction that features restorations of prairie homesteads. Making long cross-country drives, Coster-Mullen said, had given him plenty of time to reëxamine the three-dimensional diagram of the bomb that he keeps in his head, like a Buddhist monk contemplating the Karmic wheel. His truck routes also made it easy for him to maintain connections with sources. Twelve years ago, Coster-Mullen pulled into a Wal-Mart parking lot in North Carolina and got into the car of a retired machinist in his late seventies, who showed him photographs of metal pieces that he had fashioned for the Trinity bomb, which was set off in the desert outside Alamogordo, New Mexico, in July, 1945. Coster-Mullen said that machinists often hid the fragments in their shoes and pants cuffs, in order to have something to show their grandchildren. Two years after meeting the machinist, in 1998, Coster-Mullen, while driving through Nebraska with three cars in front of him, figured out the exact shape and weight of the pieces of uranium inside Little

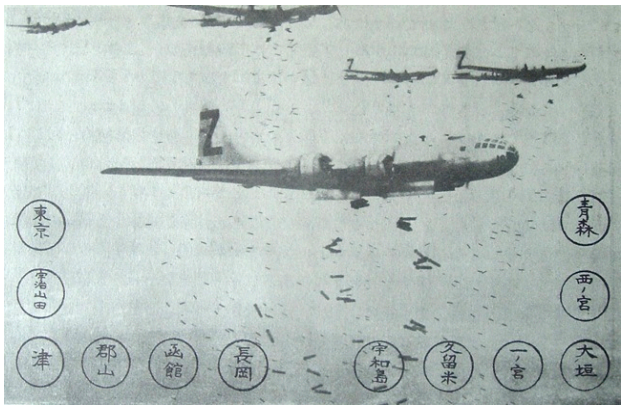
Boy. “I’m sitting there with my pocket calculator, going, ‘If the core had this diameter, and the length is this, what’s the volume?’ ” he recalled. “I went, ‘That’s it!’ And then I got on the horn—urh-urh.”

Arriving at the drop-off point in Streamwood, we unhooked the truck’s electric and air lines, then turned the crank on the landing gear forty times. We picked up another container, got back in the truck, and headed south, toward Chicago. At four in the morning, we passed the Sears Tower. Coster-Mullen gingerly navigated the pillars inside an indoor parking garage and pulled up to the loading dock.

The trailer, which contained thirty-one thousand pounds of FAK—“freight of all kinds”—wasn’t ready yet, so we checked out the bales of sweep merchandise: crushed boxes of cookies, dented cans, ripped jeans. Finally, we hooked up the trailer and hit the road. As we headed north, Coster-Mullen explained to me the likely blast effects of a Hiroshima-size nuclear device exploding in a container truck in downtown Chicago. He said, “All you need to do is take two subcritical masses of uranium and smash them into each other to form a critical mass. Neutrons strike the heavy uranium nucleus, which splits, releasing a tremendous jolt of energy along with two or more neutrons, which split more nuclei, setting off a chain reaction that grows and grows and finally manifests itself as a huge fireball over a populated area, blinding, asphyxiating, incinerating, or crushing every living being within a five-mile radius.” As he elaborated on the scenario, the sun began to rise, and I fell asleep with my face against the window.

We arrived at Coster-Mullen’s home, in Waukesha, around eight o’clock that morning. He lives in a ranch house on a cul-de-sac in a pleasant subdivision. His wife, Mary, is a retired social worker who spends most of her time reading and knitting. They have two children together, and Coster-Mullen has a third from a previous marriage. Asters, black-eyed Susans, and coral bells blossomed beneath the trees in the back yard. Coster-Mullen, in anticipation of my visit, had arrayed his kitchen with some of his atom-bomb memorabilia, including a roof tile from the hypocenter of the Hiroshima blast, which he purchased for eighty-nine dollars from a former member of the U.S. radiation-survey team. He also owns a brick of graphite from Enrico Fermi’s lab at the University of Chicago—the site of the first reactor pile—which he was given by two physicists who were fans of his book; a small marine fossil that was underneath the Trinity bomb when it exploded in the New Mexico desert, which Coster-Mullen dug out of the ground himself during a visit to the site; silicone molds of the detonator for the Trinity bomb; a chunk of uranium; and a sphere of beryllium, a component of modern atomic bombs.

He handed me a leaflet that had been dropped over Japan by B-29 bombers in late July, 1945. “Attention Japanese People,” the leaflet says. “In the next few days, four (or more) of the cities named on the reverse side will be destroyed by American bombs. These cities contain military installations and workshops or factories that produce military goods. We are determined to destroy all of the tools of the military clique.”



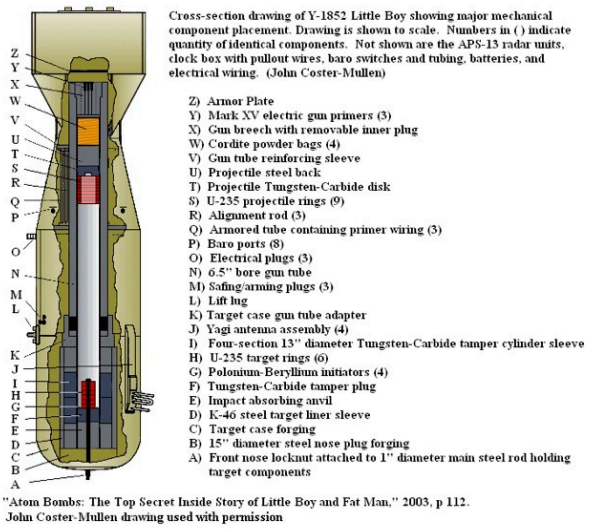
A leaflet dropped over Japan

On the kitchen counter sat something seemingly unconnected to atomic weapons: a hobbyist's model of the Joan of Arc chapel, on the campus of Marquette University, in Milwaukee. In fact, Coster-Mullen told me, the model, which he completed in 1993, had helped spark his obsession with building his own bomb. He had built the model in the hope of launching a business. Marquette alumni and other visitors, he had figured, would eagerly buy replicas of the chapel and display them in their homes. Constructing the model was difficult, he recalled: "I was using dental picks and surgical 3-D glasses and I learned how to carve little eyes in the wood benches." Like most of his business ideas, before and since, the project showed both a fanatical devotion to detail and a hazy grasp of what ordinary consumers might pay for. He placed the chapel models in local gift shops on consignment, but few sold. After this failure, Coster-Mullen decided to make replicas of something with wider commercial appeal.

In December, 1993, he persuaded his son, Jason, who was then seventeen, to accompany him on a road trip to the National Atomic Museum, in Albuquerque, where Coster-Mullen could examine the empty ballistic casing of an atomic bomb at first hand and make sketches that he could use to build an accurate scale model. After driving two thousand miles to the museum, he was distressed to find that the atomic-weapons area was closed for renovation. He protested until his contact at the museum finally appeared and let them in. He and Jason spent hours measuring the bomb casings on display. (In the early nineties, after the fall of the Soviet Union, no one was particularly disturbed by the sight of a father and son poking measuring tape inside the casings of fifty-year-old bombs.) The Coster-Mullens were soon measuring weapons casings around the country, including at the Wright-Patterson base, in Ohio; the West Point Museum, in the Hudson Valley; and the Smithsonian, in Washington, D.C. They also saw the Fat Man display at the Bradbury Science Museum, in Los Alamos.

During these and other excursions, Coster-Mullen discovered that much of the dimensional information about the bombs in history books was wrong. "Rhodes and others said that Little Boy is twenty-nine inches in diameter—but it's not, it's twenty-eight," he said, in the friendly, matter-of-fact tone he uses to soften the force of his obsession. Wondering what other errors the historians had made, he began to attend reunions of the 509th Composite Group, the military unit that dropped the bombs. He went to his first reunion in 1994, in Chicago. Before the gathering, he wrote a draft of a pamphlet about the bomb and sent it to Frederick Ashworth, a naval commander who was in charge of the Fat Man weapon. "The Monday of the reunion week, I get this letter back from Admiral Ashworth, who, justifiably, took me to task," Coster-Mullen recalls. "He said, 'Either treat this subject with the seriousness it deserves or drop it.' So I chose the former."

Coster-Mullen spent the next ten years of his life mastering a body of recondite technical data. He extracted photographs from government archives and scrutinized them with a magnifying glass; he interviewed one retired machinist after another, as well as scientists and engineers. Researching the bomb provided Coster-Mullen with an outlet for a sensibility that might have been equally at home collecting tropical butterflies or double-print stamps. To suggest that Coster-Mullen is a garden-variety classification freak, however, is like comparing a high-school trumpet player to Miles Davis. Driven by his desire to solve a great puzzle, he is personally affronted by recycled information and secondary sourcing, which often leads him to express contempt for people who are lazier than he is—a category that includes virtually everyone.



An early version of Coster-Mullen's rendering of Little Boy's internal components

The first edition of "Atom Bombs" was completed in 2003. With the publication of the book, which has since undergone several hundred revisions, Coster-Mullen became a leading member of the loosely organized scholarly fraternity dedicated to challenging the ethic of secrecy behind the atomic security state. Its dozen or so members included Richard Rhodes; Chuck Hansen, a computer programmer whose Freedom of Information Act requests helped him assemble "The Swords of Armageddon," a twenty-nine-hundred-page, seven-volume archive of documentary information about the U.S. nuclear arsenal; Howard Morland, who published the first detailed sketch of a thermonuclear weapon, in The Progressive, in 1979; and Carey Sublette, a programmer in California, who has posted a wealth of data about atomic weapons on the Internet.

Coster-Mullen fulfills orders for "Atomic Bombs" himself, by running off copies and then mailing them. (The book is available through Amazon, and costs $49.95.) According to a recent log of purchase information, "Atomic Bombs" is sought after mainly by people whose e-mail addresses identify them as members of the nation's secret nuclear archipelago: LANL, LLNL, SNL, ORNL, ANL, Pantex, Fermilab, the Hanford and Savannah River nuclear plants, the F.B.I.

"Thanks again for the great book," a nuclear worker named Lee recently wrote to Coster-Mullen. "As soon as I finish it, my son, who's on the 61 program"—maintaining the stockpile of variants of the original B-61 nuclear bombs—"will be reading it, probably in one of the assembly bays."

Many customers seem to enjoy thumbing their noses at U.S. security officials, who remain determined to keep the bomb's precise technical specifications a mystery. Harold Agnew, the former director of Los Alamos, recently wrote to Coster-Mullen, "The real problem with the security people is that they are basically ignorant and maybe just plain stupid. I guess if they just say no to everything they believe they have job security and won't get into trouble with their equally stupid bosses." Agnew added that he had suggested to security officials at Los Alamos that they invite Coster-Mullen to give a talk on how he did his research—"so in the future if there really is something they want to keep close, they might have a clearer idea as to how to do it."

In March, 2007, after an extended debate within the community of civilian nuclear obsessives, Coster-Mullen's revisionist diagrams of Little Boy and the core of the Fat Man bomb were posted on Wikipedia. Accurate information about how a simple nuclear bomb is made, and how it works, is now available to anyone with Internet access. "Before 9/11, I found our government's emphasis on secrecy abhorrent," Richard Rhodes told me. "I find it even more so now." Rhodes considers absurd the idea that a foreign government or terrorist might build a bomb based on Coster-Mullen's diagrams. "Everyone who is sufficiently sophisticated in these matters hardly needs the help of us poor souls, who aren't even

scientists," he said. Rhodes said of the U.S. government's classification efforts, "The point is to keep the bombs out of sight, to make us feel that the bombs aren't real, and that is John's real contribution. The notion that we are safer because we have all these bombs tucked away is a huge fraud."

Coster-Mullen is a man of rigid preferences. He loves Diet Coke, but under no circumstances will he drink Diet Pepsi, which he describes as having a sugary, chemical aftertaste that makes him feel nauseated. Even a teasing mention of Diet Pepsi can set off a rant that will momentarily eclipse talk of the bomb. Other subjects capable of replacing the bomb in his mind for short periods of time are his wife and children; the stupidity of Christian beliefs; the stupidity of religion in general; the prevailing etiquette at truck stops; and stories about rescued cats. The longest he has ever gone in my company without mentioning the atomic bomb is thirty-seven minutes, a record he achieved on a particularly beautiful stretch of road running through the sun-baked canyons east of Salt Lake City. To say that Coster-Mullen actually went that long without speaking about the atomic bomb is an exaggeration, as he referred to nuclear weapons twice in passing, and because he was aware that I was timing him with a stopwatch.

Coster-Mullen had agreed to drive us from Waukesha to Wendover, while I sat in the passenger seat of my rental car and asked questions. (I'm a lousy driver.) Research materials shared the back seat with a small cooler that plugged into the dashboard cigarette lighter and contained cheese, salami, and four twenty-ounce bottles of Diet Coke, which Coster-Mullen consumes at the rate of one per hour. When he finished a bottle, he tossed it onto the back seat. After two or three empties accumulated, he refilled them with soda from a two-litre mother-ship bottle that he kept in a shopping bag on the floor.

Soon after we had begun the car trip, we passed the industrial city of Beloit, Wisconsin. As a young photographer on the Beloit Daily News, in 1973, he was responsible for one front-page picture and five inside photos per day. He spent hours in the darkroom each week, and the knowledge that he gained about the technical side of photography proved indispensable when he began researching his book, and subjecting declassified photographs from government archives to detailed analysis.

Coster-Mullen's techniques for assessing the size and nature of objects depicted in photographs are familiar to photo editors, intelligence analysts, and others whose job is to glean detailed information from images, but they were new to the community of civilian atomic researchers. His first such intimate examination was of a famous photograph from July 15, 1945, of the scientists Herb Lehr and Harry Daghlian lugging a wooden crate containing a portion of the Trinity device's "physics package"—the plutonium part—to a car parked outside the McDonald Ranch House, a test site in New Mexico. A retired master machinist at Los Alamos, whom Coster-Mullen interviewed, had once measured the plug of Fat Man's physics package, and recalled that it was eleven or twelve inches long, and had been inserted into an aluminum sphere that was at least two feet in diameter. If Coster-Mullen could figure out the size of the box in the picture, he reasoned, he could determine the maximum size of the object inside. "They're backing around the corner of that open door," he noted, gesturing at a copy of the photograph that I held on my lap as we drove through Dixon, Illinois—Ronald Reagan's home town. "The height of the box is in line with the front edge of the door."

There were distinctive-looking suicide doors on the vehicle, which made him think that he could identify the model, so he took the photograph to an antique-car dealer south of Milwaukee. Together, they examined the

dealer's collection of Clymer manuals, which contain mechanical specifications for major American cars. American manufacturers stopped building cars for civilians after the 1942 model year and didn't resume making them until the 1946 model year, which made it easy to identify the car in the McDonald Ranch House photo as a 1942 Plymouth.

A few weeks later, Coster-Mullen was driving with his wife past an antique-auto show, where he found two 1942 Plymouths. "I showed the photograph and I said, 'I'd like to measure the height of that door,' " he recalled. "The photographer's taking that with a normal camera lens, and he's back about twenty feet from the car, so you wouldn't get any foreshortening. So I measure the height and applied proportional measuring. A is to B as C is to D. And it turned out that that box was only about ten and a half inches long. So, obviously, something eleven or twelve inches long couldn't even fit in that box."

Later, when we took a break at a truck stop in Iowa, he told me about another early discovery: a declassified report about the death of Harry Daghlian, who died of radiation poisoning at Los Alamos after he dropped a block of tungsten carbide onto a bomb assembly containing a plutonium sphere, on August 21, 1945. The report contained a photograph in which another physicist recreated Daghlian's accident. A ruler was helpfully positioned on a tungsten block, which allowed Coster-Mullen to determine that the plutonium sphere, which was identical to those used in the first atomic bomb, was 3.62 inches in diameter. All it took, he said, was a set of digital calipers and a little high-school geometry.

A few hours after leaving the truck stop, we passed by a town in Iowa called Stuart—a deduction I made upon seeing a huge white windmill with the word "STUART" painted vertically on its base. A road sign informed us that Omaha was ninety-three miles to the west.

"That beryllium sphere that you showed me yesterday," I said. "Where did that come from?"

"eBay!" Coster-Mullen replied. "It cost about thirty bucks. I bought it because it was roughly the same size as one of those polonium-beryllium initiators they used in Fat Man." Polonium is also readily available on the Internet, he said. He said that it was possible, though not easy, for a rogue figure to acquire material for an atomic weapon. "They proved in a test that you can use reactor-grade plutonium in a bomb," he said. "I believe it took place in the seventies or eighties, at a Nevada test site. Supposedly, thorium can be used to make uranium. Well, thorium was in camper gas lanterns. Oh, you'd have to have quite a few. Americium, which is the key element in smoke detectors, is supposedly a fissile material. But it would probably be suspicious, because you'd need to order about a million smoke detectors to extract enough material."

At midmorning, we reached the outskirts of Omaha, where we visited the Strategic Air and Space Museum, whose grounds are marked by a towering Atlas D ballistic missile. Energized by forty ounces of Diet Coke, Coster-Mullen ignored the SR-71 Blackbird spy plane hanging over the entrance to the museum and headed straight to the front desk, where he corralled a retired armed-services veteran who was volunteering his time. Smooth jazz played in the background.

"Do you have any casings of Little Boy or Fat Man?" he asked.

No, the veteran said.

By the time we left the museum, the sky had gone dark and storm clouds were on the horizon. As Coster-Mullen drove, I examined a scale drawing of Little Boy that he had begun drafting in 1995. When he had visited the Bradbury Science Museum earlier that year, he noticed that a diagram of the exterior of the bomb had been mislabelled; it placed a contact

fuse on the nose of Little Boy. An archivist agreed to send Coster-Mullen a copy of the flawed diagram in the mail. Also included in the package was a partial diagram of the bomb's interior, a document that Los Alamos had never before released. The diagram revealed that a long gun barrrel had been screwed directly into an adapter attached to the target case. This was the first piece of hard information that researchers had about how the mechanism inside Little Boy was actually assembled.

Not long afterward, Coster-Mullen told me, he read a coffee-table book about the Enola Gay. The text described Little Boy's gun barrel as having been made of wood, a suggestion that was clearly preposterous, and could have passed muster only with a publisher of art books. The book also said that the gun barrel was fifty-two inches long; the statement caught Coster-Mullen's eye, as it was virtually the only piece of specific dimensional information in the book. "I figured that number might be a clue," he recalled. "It probably came from somewhere else, since the author clearly didn't understand what he was writing about."

That year, the Smithsonian commemorated the bomb's fiftieth anniversary with an exhibition about the Enola Gay that featured the casing of a Little Boy. (Perhaps a dozen Little Boys were produced.) The bomb had originally been intact, save for its uranium, but in 1986 agents of the Department of Energy arrived at the museum and took the weapon away. Government officials were worried that a terrorist group with access to sufficient quantities of highly enriched uranium might commandeer the bomb, load it with fissile material, and set it off. The bomb was taken to an underground facility—supposedly situated in Los Alamos, beneath a McDonald's—where its insides were removed. The gutted artifact was returned to the museum in 1993.

A small number of visitors to the Smithsonian exhibit may have noticed that the bomb had been modified in a peculiar way. Whereas the exterior casing of the bomb had previously been covered in a uniform coat of dark-green paint, the surface now had a series of cryptic markings and numbers, including a "36" and a "52." The nose of the bomb was marked with what looked like a "12." Pictures of the altered bomb casing began circulating among atomic researchers.

When Coster-Mullen saw the "52" on the bomb casing, he immediately thought of the fifty-two-inch gun barrel that was mentioned in the Enola Gay book. The "12," in turn, made him think about a book called "Project W-47," by James Rowe, who was in charge of the bomb-assembly teams at Wendover, where the crew of the Enola Gay had trained before shipping out to the Pacific.

"At one point, Rowe gave a description where he looked inside the target case from the back end of the bomb, and he said it was bored out to two-thirds the length of the target case," Coster-Mullen recalled. "Well, the target case is thirty-six inches long, so two-thirds is twenty-four inches." The "12" on the nose of the bomb, he guessed, might correspond to the remaining twelve inches, which is where the front end of the physics package began. It was a typical Coster-Mullen moment: he treats the world's most destructive invention as an ordinary clocklike mechanism, made of simple parts that must fit together according to readily discernible laws.

He knew from other archival investigations that Little Boy's projectile was sixteen inches long. He realized that, by adding thirty-six and sixteen, he ended up with fifty-two—a number that almost certainly corresponded to the placement of the front of the projectile that would be shot down the gun barrel at the uranium target situated twenty-six inches away. He had figured out the essential geometry of the bomb.

Coster-Mullen surmised that the numbers on

the casing had been written by whoever had been given the job of disassembling the bomb and removing its interior mechanisms. During the process of gutting the bomb and shipping it back to the Smithsonian, no one had bothered to wipe the bomb clean.

We were making our way toward Wyoming, through an empty stretch of Nebraska farmland. A hummingbird perched on a wire fence outside my window. A yellow school bus with no wheels was marooned by the edge of the highway. In the middle of a field, some inventive local person had used aluminum tubing to fashion what looked like a dinosaur skeleton. We drove by a herd of cows. "A feed lot," Coster-Mullen said, looking off to his left. A biotic stench soon vied against the pleasant fresh-leather scent that the car-rental place had sprayed on our seats.

As we drove, I paged through declassified memos from the machine shops at Los Alamos; these documents had provided Coster-Mullen with several crucial details about the bomb. I read aloud from a checklist used by Captain William Parsons, who loaded the gunpowder into the bomb. The various items—"Insert breech wrench," "Unscrew breech plug (about 16 turns, remove, place on pad)"—were meaningless to me.

"Sixteen turns is important," Coster-Mullen said. Learning the number of turns had helped him to gauge the length of the breech plug—which Captain Parsons removed in order to slip in the four silk bags filled with cordite that fired the gun that sent the uranium projectile smashing into its target. Coster-Mullen made his estimation by looking up the standard Acme thread sizes from 1945 in a machinists' book at the Milwaukee Public Library, where he got his first library card.

The subdivision outside Milwaukee where Coster-Mullen grew up was constructed for returning veterans. Everyone got a narrow lot with a nice back yard and a smaller front yard. His parents' house, built after the war, had a fireplace, a basement, three bedrooms, an upstairs bath. Coster-Mullen, who was adopted, told me that his parents' surname was Mullen. When I asked him where "Coster" came from, he gave me a sheepish look, then explained that he had added his wife's last name to his own. Hyphenated names are not exactly common among truck drivers, he said.

When Coster-Mullen was a child, he and his friends often spent Saturday afternoons at the Fox Bay theatre, a movie house with curved plaster walls, where popcorn was fifteen cents. Coster-Mullen loved the newsreels that came first, describing wars and new weapons and the conquest of space. He also enjoyed visiting his great-aunt's house, in northern Wisconsin. There was a little town square with a gazebo and a Civil War cannon. Attached to the side of the cannon was a metal box, and inside it was a brush with sharp steel bristles, which park workers used to clean out the cannon. It thrilled Coster-Mullen to reach inside the dark box and feel the brush pricking his finger.

The Milwaukee Public Museum was a twenty-five-cent bus ride from Coster-Mullen's home, and it was one of the best places in America for an inquisitive child to spend an afternoon. A generation of German artists had immigrated to the city and introduced the art of creating full-sized dioramas filled with cunningly imagined and finely worked details that took full advantage of the laws of perspective and the taxidermic craft. In a scene set in the Grand Canyon, a stuffed mountain lion was depicted in midair, ready to pounce on two mule deer. In a Pacific Northwest diorama, you could see a salmon drying on a rock, with giant trees and ice-capped mountains in the background. At the nearby Milwaukee County Historical Society, there was an intricate scale model that allowed viewers to gaze upon, in every direction, the chaos of the Battle of Gettysburg.

In grade school, John Mullen woke up every

morning at six o'clock to watch a fifteen-minute educational television program in which scientists like Ernest Lawrence, who invented the cyclotron, stood in front of a blackboard and lectured on the basic principles of physics. His favorite teacher in high school, Darwin Kaestner, had worked at the University of Chicago during the Second World War, in a metallurgical lab that was part of the Manhattan Project. The lab was run by Glenn Seaborg, who discovered plutonium. Kaestner said tantalizingly little about his experiences. Coster-Mullen and Kaestner made a bubble chamber out of glass, in which they detected the movement of subatomic particles. Working as Kaestner's lab assistant, Coster-Mullen became an apprentice to a man who, two decades earlier, had helped to produce the initial quantities of plutonium that were used in the first atom bomb.

Coster-Mullen's next big breakthrough on Little Boy came in 1995, when he obtained a curved fragment of the tungsten-carbide tamper from one of the dozens of test units built by the Manhattan Project. An engineer had saved the fragment from the Anchor Ranch test site, in Los Alamos. The purpose of the cylindrical tamper was to reflect neutrons back into the critical assembly, thus containing the chain reaction for a fraction of a second, until enough matter was converted into energy to destroy Hiroshima. The tamper fragment was half an inch wide, an inch long, and two inches deep. It bore a notable resemblance to the State of Illinois.

"It occurred to me that perhaps I could get some dimensional information by analyzing the fragment's curvature," Coster-Mullen recalled. He took the piece to a friend's brother, who worked in the quality-control department of a large manufacturing facility in Milwaukee. "They have huge granite-block tables for making precise measurements of finished machine pieces," he said. A spring-loaded probe touched the curved surface at twenty different points. Thirty seconds later, a number popped up on a screen indicating that the original diameter of the tungsten-carbide cylinder was 13.1513 inches. "That was a big clue," Coster-Mullen explained. The diameter of the cylinder gave him a maximum distance of one inch between the cylinder and the outer casing. He was getting closer and closer to a full understanding of the inner workings of the atomic bomb.

We had driven more than nine hundred miles and been on the road for about sixteen hours. As we approached Scott's Bluff, Nebraska, the clouds, set against a cornflower-blue sky, seemed to glow from inside with a pale, marvellous light. A tanker truck was on the road ahead of us, passing a field of wind turbines. Behind the turbines was a freight train loaded with containers.

"You see how they are stacked two high, one on top of the other?" Coster-Mullen asked, pointing at two containers. "They put one on top of the other in the same clamp holes that would hold it to a chassis." The landscape rolled by his window, like an engineer's blueprint.

The initial years of Coster-Mullen's research were marked by dozens of small revelations about the bomb's mechanics. But, starting in 1998, he began to uncover the most tantalizing of Little Boy's secrets—a finding that completely revised the received understanding of how the Hiroshima bomb worked. Coster-Mullen's discovery revolved around what might be called the "sex" of the bomb.

In the standard historical accounts, the way that the bomb's gun mechanism worked was by shooting a cylindrical "male" uranium projectile into a concave, stationary uranium target. This act of atomic coitus created a mass sufficient to produce a critical reaction. The mass of the projectile was said to be 38.5 kilograms, and the mass of the target was said to be 25.6 kilograms. But no matter how many

times Coster-Mullen did the math the numbers never quite worked out in a way that allowed the projectile and the target to fit inside the gun barrel while remaining subcritical.

The source of the error, Coster-Mullen recognized, was an assumption that every (male) researcher who studied the subject had made about the relation between projectile and target. These scholars had apparently been unable to conceive of an arrangement other than a "missionary position" bomb, in which a solid male projectile penetrated a vessel-like female target. But Coster-Mullen realized that a female-superior arrangement—in which a hollow projectile slammed down on top of a stationary cylinder of highly enriched uranium—yielded the correct size and mass.

The atomic-research community was initially dubious about Coster-Mullen's argument. But even Richard Rhodes, after examining the evidence, admitted that Coster-Mullen was right. Little Boy was female. (Rhodes told me that the drawings in his own book are "seriously deficient," and said of Coster-Muller, "He came out of left field and really did something that I think is pretty dazzling. He worked out a way to see through the ballistic casing of the weapons to see what's inside.")

Coster-Mullen said that his insight into the sex of the bomb was connected to a discussion that he had, in 1994, with an engineer named Harlow Russ, who had worked on Project Alberta—the code name for the bomb-delivery portion of the Manhattan Project. Russ was old and sounded shaky when Coster-Mullen interviewed him over the phone, and he refused to answer basic questions about the size of the project's nuclear stockpile, or to say how many nuclear weapons he had manufactured. But there was one point that he needed to make sure was on the record. As Coster-Mullen recalls it, "In the middle of the interview, he just blurts out, 'You know the projectile was hollow, didn't you?' I said, 'What do you mean, hollow?' " Russ's description of a hollow projectile was at odds with the diagrams in every history book and every museum display about the bomb. At the time, Coster-Mullen had suspected that Russ was senile. But he stored the incident in his memory, along with an injunction from a Los Alamos archivist to "trust Harlow."

Little Boy sitting on its wheeled transport carriage

A year later, Coster-Mullen received in the mail copies of four file cards from the National Archives, which contained a detailed synopsis of an eighty-two-page paper that had once been in the archives but was withdrawn. The paper summarized on the cards may or may not have been, in turn, a summary of a longer and more detailed secret history of the Little Boy program. The file cards were also withdrawn, but not before they were copied by a civilian researcher who distributed copies to people he judged to have the capacity to do meaningful work on the history of the bomb (and who weren't likely to report him to the government).

The four-by-six-inch cards contained vital statistics about the Little Boy combat unit, including when each of the bomb's major components was tested and the product numbers of those components. They gave the exact length of the bomb's projectile: sixteen and a quarter inches. The cards also indicated that the uranium-tipped projectile contained nine stacked rings of active material, with a total mass of 38,531.12 grams; and that the uranium target contained six stacked disks of active material, with a total mass of 25,616.44 grams.

"It didn't work out to my satisfaction, no matter how many times I tried," Coster-Mullen told me. "By now, I'm driving trucks, and I was all alone on the interstate with very few cars, and I've got my pocket calculator in one hand and a little sketchbook on my lap, and I'm writing down numbers and calculating the numbers, and finally I determined that Harlow Russ was right."

It was the end of the second day of our journey. We were now in Wyoming, driving in deep-purple darkness; high mountains were distantly visible, looking as if they had been spray-painted on velvet. "If you could see this in daylight, you would be even more impressed," Coster-Mullen said. His bladder was about to burst, he confessed. Over the past three hours, he had consumed three twenty-ounce bottles of Diet Coke.

There is an absurdity as well as a grandeur to Coster-Mullen's investigations. After all, a man like Harlow Russ, the bomb engineer, could have spared him thousands of hours of trouble simply by explaining how the device worked. But the men who built the bomb weren't talkers. They were proud of keeping secrets, just as they were proud of what they had done to defeat Japan. When the war was won, the country turned in on itself, in order to safeguard the deadly knowledge that the gadget-builders had acquired. We remain fascinated by the story of the bomb, in part, because it shows us who we were at the exact moment that we became the people we are now.

I asked Coster-Mullen what he thought about the fact that so many eminent historians got the story of the bomb wrong. "I now read everything with a jaundiced eye," he said. "People use my book as a source, they rewrite it, rehash it, and their work still comes out wrong. And, actually, I read their books and go, 'This is really good!' If I didn't know anything about the subject, I'd be raving that this is a really terrific book. It's easy to read, it's exciting. Absolutely! Sure! But it's wrong."

The next morning, we were in Wendover, the base where Coster-Mullen's replica of Little Boy was housed. We had arrived late the previous night, and checked into the Montego Bay Casino Resort. Coster-Mullen had woken up at five o'clock. "I don't sleep much," he told me. We got in the car and headed to Wendover Air Field, where the crew of the Enola Gay trained for six months. I shaded my eyes from the glare bouncing off the Utah salt flats. The sharp sunlight led me to notice a crack in the left lens of Coster-Mullen's glasses. When light hit the crack, it appeared as a tiny bright star floating in front of his eyeball.

The Enola Gay crew arrived at Wendover on December 17, 1944, on the forty-first anniversary of the day that the Wright brothers proved that men could fly. The bombing and gunnery range at the base eventually came to encompass three and a half million acres of desert, salt flats, and mountains, making it the world's largest military reserve. B-29 crews dropped hundreds of weighted bomb casings, in order to develop ballistics tables for the elephantine munitions that ended the war. By February, 1945, Wendover had more than six hundred buildings, and nearly twenty thousand residents.

Now the only sign of habitation in this atomic

ghost town was a handwritten sign that said "Laundromat." Here and there, inside the sun-bleached barracks with shattered windows, I detected the sound of fluttering wings. The eeriness of the place was heightened by the unnaturally flat, bright sunlight, which resembled the light used on television shows to illustrate near-death experiences.

Two F-16 fighter jets disrupted the quiet. Coster-Mullen, who was slathered in sunscreen, drove us to the secure areas of the old base, near where the Enola Gay practiced its maneuvers. We parked next to two coffin-like pits in the desert floor. The wind sounded like the hiss on old-fashioned tape recorders.

Coster-Mullen climbed down into one of the pits, which were each six feet deep, twenty feet long, and twelve feet wide; they had once been used as loading bays for the test units. In preparation for bombing Hiroshima and Nagasaki, the pilots of the 393rd Bombardment Squadron dropped a hundred and fifty-five Little Boy and Fat Man test units in the desert, honing the sharp turns that they would need to escape the blast. We returned to the car and drove to two barely discernible concrete patches on the desert floor, where the bombs had been assembled, inside huts whose floors had been covered in copper and attached to grounding wires, in order to eliminate any static that might accidentally set off a bomb. When the war was over, the huts were disassembled and sent to Sandia National Laboratories, in Albuquerque, where they became the world's first nuclear-bomb-assembly factories. "There was also a circus tent that they used for a while," Coster-Mullen added, scanning the floor for stray bits of copper to stick in his pockets.

We walked over to a nearby enclosure surrounded by barbed wire. In the middle of it was a four-by-eight-foot concrete block that looked like an ideal place to sacrifice a sheep. In fact, machinists and engineers had used the block as an operating table for Little Boy. I walked across the concrete to examine the altarpiece of the atomic age. A large crack ran through it.

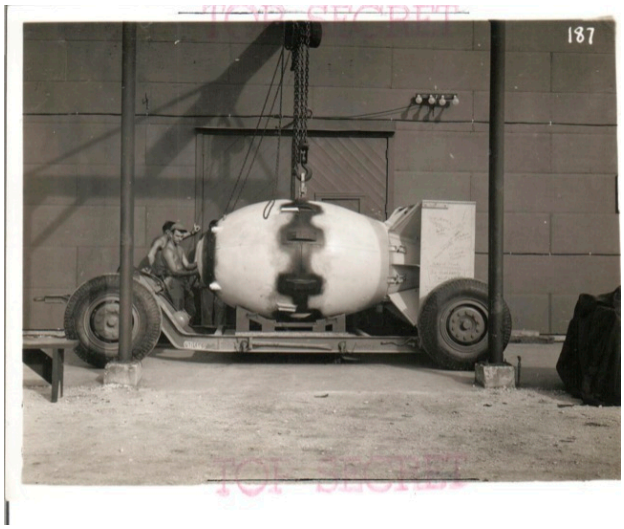
Our last stop at Wendover Air Field was the departure lounge of the small airport that serves charter flights from Salt Lake City. Past the security-screening area was a coffeemaker; next to it, cream and sugar were laid out in old Army helmets. Coster-Mullen's bomb was in a Lucite case across from the coffeemaker, next to a soda machine.

"This is a replica of the Uranium bomb that was dropped on Hiroshima on August 6, 1945," a placard read. "It was dropped from an altitude of 30,000 feet and exploded 1,500 feet above the ground." The actual height of the explosion, Coster-Mullen explained, was closer to nineteen hundred feet.

Up close, Little Boy is a comfortingly handmade submarine-shaped object, painted hunter green and covered with plugs and wires. Inscribed on the surface of Coster-Mullen's replica are the names of the Enola Gay flight-crew members, who signed it, in 2004, at a ceremony in Wichita, Kansas. When Little Boy was deployed, Coster-Mullen said, wires on top of the device were attached to a solenoid unit on the roof of the bomb bay. When the bomb dropped out, the wires came loose from switches inside the clock-box—the brain that told the bomb to drop for forty-five seconds before detonating. On top of the bomb were three green "safing" plugs, arranged in an L shape; as the crew got ready to drop the bomb, they replaced the green plugs with red arming plugs. Beneath were six barometric switches made in Delavan, Wisconsin, which is on one of Coster-Mullen's delivery routes.

I told Coster-Mullen that the bomb looked like something that he had put together in his garage. He agreed: "In today's terminology, this would be a garage bomb." I asked him if there wasn't something obscene about an

exhibit that commemorates the incineration of ninety thousand civilians, who were among the last victims of a war that was pretty much over. "Well, there was no indication that they were going to surrender," Coster-Mullen said. He added that most of the fifty million people who died in the Second World War were civilians.



Fat Man outside of an assembly building

I asked Coster-Mullen why the government insists on classifying even the least significant details about this decades-old device. He shrugged. Actually, he said, nothing about the bomb is secret. He smiled and added, "The secret of the atomic bomb is how easy they are to make."

Coster-Mullen began driving home to Wisconsin through the verdant plains and mountain passes of the American West. It was late afternoon, when color contrasts heighten and objects take on an unusually warm glow; photographers, he noted, call this time the golden hour. He pointed to a clump of trees on a nearby ridge: "Look at the stand of trees by itself, illuminated."

Coster-Mullen seemed to know the history behind everything that could be seen from the highway. "You see those three crosses there, up on the bluff?" he said, pointing out the window. "There's some millionaire who pays homeless people to put them up." Still, there were things about Little Boy that continued to elude him. "Even the placement of where the uranium core is centered, front to back—that's still up for grabs," he told me. Nor has he accounted for the entire weight of the weapon; government documents have offered figures ranging from eighty-nine hundred to ninety-seven hundred pounds.

Tired and hungry, we drove for hundreds of miles and talked some more about the bomb. At one point, though, he changed the subject and told me about the person he admires the most: Gene Smith. "He was a photographer who used to work for Life," he said. "I wouldn't say he was exactly temperamental, but he had a specific vision."

One of the pioneers of American photojournalism, Smith is probably most famous for his photo essay "Country Doctor," which chronicled the practice of Dr. Ernest Ceriani, of Kremmling, Colorado. In the series printed in Life, Ceriani was pictured in a hospital emergency room stitching up a two-year-old girl who had been kicked in the head by a horse. "Gene Smith told what life was really like in America," Coster-Mullen said, when I asked why he admires Smith so much. "You would just sit with a collection of his photographs and wonder how could you have reached that exact point in three-dimensional space to make that image of somewhere so ambiguous and beautiful." Smith was famous for his fights with editors; everyone who ever worked with Gene Smith described him as a pain in the ass. But his photographs helped redefine the way that Americans see.

"One in particular, I remember, was a black-and-white photograph that he took in Japan," Coster-Mullen said, as we drove through the darkness. "On the left side of the photo was the sweep of a passenger train with the engine off in the distance, and the cars running out of the

frame. The remainder of the photograph was a rural scene with two Japanese farmers talking to each other in the middle of a very white roadway."

What bothered and fascinated Coster-Mullen was the question of where, exactly, the photographer had been standing in order to capture two utterly separate moments in a single frame. Coster-Mullen said that he used to wonder: "Was he standing on a bridge, or up on a berm or an embankment? Was he photographing just the train, and then he happened to notice the two farmers? Or was he concentrating on the perfect composition of these two people communicating with each other, and the train just happened to go by at that exact moment?" He was in his early twenties at the time, and just starting his career as a photographer. The question of where Gene Smith stood nagged at him.

In the late sixties, Coster-Mullen got to spend a day with Smith, when he visited the University of Wisconsin. "I asked him respectfully about how he had created that particular photograph. He told me, 'It was simple. I was on the train.' "

Coster-Mullen recently had a chance to put his research to the test. In May, he flew to London to examine the Imperial War Museum's version of Little Boy—which he believed to be the only version of the bomb that had not been gutted by the Department of Energy. During a long correspondence with the museum staff, Coster-Mullen had portrayed himself as a kindly, unaffiliated researcher who wanted to take a few measurements for an independent history of the atom bomb. He was careful not to tell them that the Department of Energy had disemboweled the four Little Boys available for public display in the U.S.

Accompanied by his son, Jason, who works on secure-communications equipment for the Iraqi government, in Baghdad, Coster-Mullen and I turned up at 7:30 A.M. at the museum, which once housed Bedlam, the old lunatic asylum. We waited outside, next to a section of the Berlin Wall, for the museum staff to arrive. (The museum opens to the public at ten.) In Coster-Mullen's hand was a soft-sided briefcase that contained a folder with black-and-white photographs of bomb parts from his book, along with five photocopies of a cross-section diagram of the bomb ("in case I fuck one up") and a device that Coster-Mullen called the Gizmo—a modified version of a SeeSnake digital camera, which resembles the flexible metal probe used by plumbers to clear blocked drains. Coster-Mullen had modified the business end of the SeeSnake with a tiny homemade ruler; he had also outfitted it with a foam mount that would let him shoot video with a Canon pocket camera. It was easy to see why his work is addictive. With each new bit of information, Coster-Mullen was edging closer to cracking the code—"like a safecracker listening to those little clicks," as he put it.

Coster-Mullen kept up an easy patter with the museum curator as we walked past the old rockets, guns, and tanks on display. He casually extracted a pen that a museum staffer had stuffed into the open bolt hole in the nose of the bomb case, in order to block visitors from peeking inside. Then he began quoting facts and figures about the weapon, with the dual aim of authenticating his status as a bomb expert and convincing the museum director that he was a harmless bore. The curator, a stolid Northerner, gamely stayed with Coster-Mullen for an hour. I sidled up to Jason and asked him how he deals with his father's fire-hose-like intensity. "I try to curb it, but that usually doesn't work," he said, with good humor. Coster-Mullen's wife and children appear to have little interest in the mechanics of the first atom bombs; it is easy to come away with the impression that they see John's profound engagement with his favorite subject as a waste of time, a pose that on later examination seems like a Midwestern way of showing pride in his accomplishments while guarding against the possibility of a swelled

head.

Coster-Mullen ran his tape measure in and out of the bolt hole and across the bomb's surface, for comparison with the mysterious numbers on the gutted bomb that had been returned to the Smithsonian. "What the hell are these slots? That's a new wrinkle!" Coster-Mullen said, peering through the SeeSnake into the bomb's innards. "Hey, Jason, put a piece of white tape right at that point," he instructed his son. The museum director politely stifled a yawn, then left.

Coster-Mullen relaxed, and started rubbing his hands together and mumbling with fervor. "Aha, look at that, here are the vents," he said, pointing to four of them. "Now watch me rotate it," he went on, moving the SeeSnake around, and letting me peer inside the bomb. "So that's how they did that!" he said more than once. The bomb gives up its secrets reluctantly. What Coster-Mullen had found was not the holy grail of an intact target block that he had been hoping for. But it was a significant discovery nonetheless: the gun barrel had been configured to vent the air displaced by the hollow uranium projectile when it was fired toward its target. "I suspected there were vents, but I didn't know how they were configured," he said. "This is totally off the wall! This will shake them."

The Imperial War Museum's bomb was now covered in numbered tape, and surrounded by black-and-white photographs, sectional diagrams, and homemade tools. With visitors already trickling in, Coster-Mullen took out a clean cross-section diagram and began to inscribe his new discoveries. "Nobody knows about the position of the vents," he told me. The four vents beyond the gun tube were "the last big thing I've been dying to see. I can't tell you how many times I've disassembled the bomb in my dreams."

Human beings are proud of what they create—no matter how controversial or deadly. Edward Teller revealed the essential secrets of the hydrogen bomb in a popular encyclopedia article. In 1995, Robert Henderson, the chief engineer for the Manhattan Project, sent back to Coster-Mullen an early version of the "Atom Bombs" manuscript, with comments such as "shit" and "pure shit," and then went on to explain the exact (and still classified) process by which engineers made the lens molds that cast the explosives that squeezed the core of Fat Man until it achieved critical mass. Reading through President Truman's diaries, at the Truman Library, in Independence, Missouri, Coster-Mullen found an entry dated July 25, 1945, in which the President marveled that "13 pounds of the explosive" had made the shot tower at Alamogordo, New Mexico, disappear—a pretty accurate estimate of the amount of nuclear material contained in Fat Man.

Coster-Mullen's research project can be construed as a danger to mankind or as a useless antiquarian endeavor. Given that a functional atomic weapon can be constructed in myriad ways, why does it matter precisely how the first bomb worked? Yet Coster-Mullen is proud to have helped establish "a public, permanent record of the facts" about the Manhattan Project. As maddening as his personality can be, it is hard to imagine what America would look like without the small and shrinking number of people who engage in painstaking, firsthand research in order to separate the truth from the body of supposed facts, and who keep the rest of us honest. A corollary of this insight, of course, is that much of what we think we know is wrong.

Coster-Mullen is still trying to figure out more about the bomb, and the U.S. government has little interest in helping him. The knowledge that his bomb will always be a partial and imaginative construction—that it can only asymptotically approach the actual bomb dropped on Hiroshima—is, at times, difficult for him to accept. "Nobody is ever going to take

me over to Los Alamos and say, 'O.K., you can play with it,' " he said, wistfully. "I want to know. But it will never happen." ♦

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Slide show of original article's pictures.