SECRET CITY

January 14, 2008 William R. Burleigh

In peace there's nothing so becomes a man
As modest stillness and humility:
But when the blast of war blows in our ears
Then imitate the action of the tiger;
Stiffen the sinews, summon the blood,
Disguise fair nature with hard-favour'd rage.
- Henry V III, i 3-8

The military man Leslie Groves was surely no scholar of William Shakespeare and he likely had never heard of St. Crispen's Day. But like King Harry before him, his sinews were now stiffened and his blood running as he faced his nation's state of war with hard-favour'd rage.

Among those closest to him, Groves was known as "a tremendous lone wolf," abrasive in manner and inflated with "an ego second to none." Even his chief aide called him "the biggest sonuvabitch I've ever met - but one of the most capable."

That capability he had just demonstrated by directing construction of the Pentagon in Washington. Now he had been handed an even more daunting assignment, the likes of which no officer had ever before faced. Simply put, he was charged with building facilities to produce enough enriched uranium to trigger an atomic bomb - and to do it before the enemy did. He had three years at most.

Only two days into his new job, he made his first fateful decision. The date was September 11, 1942. Fingering a map, he picked from a series of proposed locations his choice of a place to launch the venture that was to be compared with Columbus' voyage of discovery.

That place was a remote 52,000 acre tract resting along the Clinch River in East Tennessee near Knoxville, a land mass bigger than the state of Rhode Island but isolated by the ridges and foothills of the Cumberland Mountains with only five unpaved roads running through it. Labor was cheap, TVA power plentiful.

So secret was this site that for the coming years it would appear on no maps and even though it would grow into the fifth largest city in his state, not even the governor of Tennessee would know what was taking place there. Neither, for that matter, would most

of the 82,000 people eventually employed at the site itself.

Within days the ruthless and relentless Groves had ordered the land cleared of the 1,000 or so families who scratched out marginal livelihoods from the hard-scrabble acres. Within a month their land was condemned and government agents, citing the War Powers Act, were offering them a non-negotiable $56 an acre for it. They were told they had until New Year's Day, only two months away, to vacate or be arrested as trespassers. With crops still in the fields and demolition crews already ripping off their roofs, they wandered away as nomads searching for new homes outside the barbed wire boundaries that quickly stretched for miles and miles. Incensed by what he saw as unfair treatment, one of the homeless was heard to say: "When the Yankees came before, we could shoot them."

The urgency driving Groves was spawned by events that had been steadily unfolding since early in the century in the laboratories of Europe's most prestigious universities. In those places physicists of dazzling abilities worked to strip away the secrets of the atom - Einstein, Max Von Laue, Lise Meitner and her nephew Otto Hahn, Enrico Fermi and Ernest Rutherford among them. They finally were able to conclude from their experiments that when the small, massive nucleus of an atom was bombarded with neutrons, more energy could be released than the neutron itself supplied. This led them to uranium, the heaviest of natural elements found in abundance in the earth's crust. They were tantalized to discover that with an exotic refinement of it, a large scale liberation of atomic energy in a sustained chain reaction could at least theoretically be made to occur. By early 1938 these physicists could see emerging from the energy of such a release the possibility of a bomb of unimagined destructive force. This prompted Fermi to speculate, "A little bomb like that and it would all disappear."

Germany had emerged as the clear leader among countries now hurrying to push back the frontiers of physics. A number of scientists of Jewish heritage were at the forefront of these achievements. With a growing sense of personal and professional unease, they watched the ominous rise of Hitler and began to find ways to escape from the expanding Nazi orbit, some to England, others to America. They feared that a thousand-year German Reich could emerge, made invulnerable with an atomic arsenal. Their arrival in the U.S. and the warnings they brought convinced Franklin Roosevelt in late 1939 that steps must be taken so "the Nazis don’t blow us up."

What those steps would be led in a direct line to the immense challenges now

facing Leslie Groves. For though the scientists on both sides of the war divide had figured out in their laboratories what was theoretically possible, huge imponderables hovered over the practical aspects of building a bomb. What had actually been accomplished in the labs had yielded only microscopic grams of the elusive radioactive material required for a big bang. How to refine tons of ore posed a massive mystery.

In fact, a few highly reputable authorities doubted the very possibility, much less within the desperate deadlines posed by world war. "It can never be done unless you turn the United States into one huge factory," concluded Einstein's colleague, Niels Bohr.

Despite the uncertainties, FDR's scientific brain trust became persuaded that the nation nevertheless had to try — and that in General Groves the Army had one formidable factory builder.

At least five potential means of enriching uranium presented themselves, but as the bleak war clouds of 1942 gathered, there was no experimental confirmation of any of them, no formulas, no sets of blueprints, only some informed hunches and spirited debate within the scientific community. Which method should be pursued? James Conant, the young Harvard president turned presidential adviser, decided to push all of them at once. Thus, in mid-March President Roosevelt secretly authorized construction of a series of highly experimental plants in an all-out effort to produce U-235, the key fissionable ingredient for an atomic weapon.

Thus did the Manhattan Project come into being, so named because it was undertaken within the aegis of the Manhattan Engineer District of the U.S. Army Corps of Engineers with General Groves in command. The secret site he chose in East Tennessee for the initial manufacturing facilities would be known simply as Site X. It was further decided that a central laboratory where the material could then be fitted into an actual bomb would be located at another secret, remote location, this one on a 7,200-foot mesa in New Mexico at a place called Los Alamos.

It was Edward Teller's conclusion after the war ended that "without General Groves, the scientists never could have built the bomb." At the time, though, they recoiled at the idea of being under military control and working with industrial contractors. After all, General Groves was an engineer, not a physicist. They registered vigorous objections to his authoritarian approach toward work "democratically begun" in the groves of academe.

For his part, from the very outset Groves exhibited the impatience that would

become his hallmark over the next three years.

Within six weeks after the East Tennessee landowners and squatters were evicted, steps were taken to isolate the entire 92-square-mile area, 17 miles long and 7 miles wide, so that actual construction could begin. High barbed wire fences defined the perimeter. One could attempt to gain entry at only seven heavily guarded checkpoints, where security remained on high alert. Site X would be identified officially as the Clinton Engineer Works after the closest nearby town of Clinton. It would be several years before the area became more familiarly known as Oak Ridge — after the oaks that lined long sections of the valley.

Almost immediately contractors began cutting 55 miles of roadbed for the trains that would haul supplies into the reservation. They moved untold amounts of dirt to build 300 miles of paved roads and streets. Eventually they constructed 163 miles of wooden sidewalks - all of this in a wilderness that would quickly be turned into a muddy quagmire by the heavy equipment stripping away the ground cover. The memories of mud would long linger with those drawn to the site to work and live. As one of them wrote:

In order not to check in late,
I've had to lose a lot of weight,
From swimming through a fair-sized flood
And wading through the goddam mud.

I've lost my rubbers and my shoes
Perpetually I have the blues
My spirits tumble with a thud
Because of all this goddam mud.

It's in my system so that when
I cut my finger now and then
Instead of bleeding just plain blood
Outpours a stream of goddam mud.

Armed with orders from the scientific high command in Washington, General Groves started mapping plans for electromagnetic isotope separation plants and a

gaseous-diffusion plant. He wasn't far into his job before he concluded that a third method under consideration - reactors to produce a new element called plutonium - could create such vast amounts of dangerous radioactivity that it needed a separate reservation, one that would be built at an equally remote location in Hanford, Washington. Even at that, his fears for the Tennessee site prompted him to separate between the protective ridges of the Cumberlands the plants to be built there "so that in case a disaster struck one it would not spread or contaminate the others." The few who were privy to the actual nature of the work were under no illusions about the deadly dangers and uncertainties ahead. They simply had no way of yet knowing whether an accidental radioactive chain reaction might lead to catastrophe. General Groves once told an engineer: "If the reactor blows up, jump in the middle of it and save yourself a lot of trouble."

Influenced by the success of the legendary Ernest 0. Lawrence in the radiation labs at the University of California at Berkeley, General Groves decided that the electromagnetic plants would be started first. The yawning 825-acre complex where the plant's 268 buildings would be constructed was known as Y-12, a designation without meaning other than to confuse spies into thinking it was some sort of code.

Although his peers remained skeptical, Dr. Lawrence was convinced that the use of cyclotrons offered a short cut for extracting highly fissionable U-235 from heavier common uranium ore, U-238. The task, however, could not have been more difficult. U-235 constitutes only 0.7% of natural uranium, although it is chemically identical, a devilish complication. General Groves compared the needed separation to "trying to find a needle in a hay stack wearing boxing gloves."

The equipment to be used, Groves once explained, would be "considerably bigger, closer in tolerance and more demanding as to accuracy than any similar equipment ever designed." The structures to house it would constitute some of the largest and costliest industrial plants ever built.

To extract a mere 100 grams of U-235 each day - only four ounces, mind you - would require some 2,000 so-called Calutrons (short for "California cyclotron") set amidst thousands of tons of magnets, stretching over the equivalent of 20 football fields. The idea was to shoot electrically charged uranium atoms into a circle in this intense magnetic field shaped like a racetrack. The lighter the atoms, the tighter the circle they would travel. Eventually the U-235 atoms would traverse a narrower arc than the heavier U-238 atoms and could then be sucked away as flakes of metal through the aid of

enormous pumps containing more cubic feet of vacuum than anywhere else in the world.

This constituted the so-called Alpha stage, but still those few precious grams that the process yielded each day contained only one-tenth of the enrichment required for making a bomb. Thus, a second Beta stage of purification was also needed. As a result, Y-12 had five Alpha buildings of nine racetracks and three Beta buildings of eight racetracks, each containing "a fantastic labyrinth of equipment and piping." Driven by the urgency of the war, racetracks in the front of the buildings went into operation even before the rear sections could be completed.

Such urgency was based on E.O. Lawrence's calculation in the fall of 1942 that it would take his Calutrons 300 days to produce enough uranium to arm a single atomic bomb. They would have to run 24 hours a day, seven days a week. All the while, much of the work force of 4,800 needed for the operation wouldn't really know what they were producing or why. The young women stationed in rows watching the dials on the Calutrons did wonder at times why the bobby pins would go flying out of their hair, not realizing the power of the magnets behind the panels.

Such enormous quantities of conductor material were needed in the structures of the Calutrons that the order simply exceeded the nation's supply of copper. Never daunted, the Army engineers went to the U.S. Treasury Department and asked for a loan from America's reserves in order to use silver as a substitute conductor. In great secrecy, 14,700 tons of silver bullion were withdrawn from the West Point Depository, valued at more than 300 million war-time dollars. The metal was extruded into strips, then rolled into coils the size of a large automobile tire for use in the racetracks as a great conductor of electricity. Outside auditors monitored the top-secret loan every step of the way to the extent that when the war ended, all but infinitesimal slivers of silver — .035 of one per cent — were returned to Uncle Sam.

The frustrations facing the builders seemed endless, causing delay upon delay as the war clock ticked. At first, the vacuum pumps leaked. Once a mouse somehow entered the enclosed system, causing a shutdown. Then the magnets, which were so powerful they moved 14-ton tanks positioned between them, had to be sent back to their manufacturer for cleaning and rebuilding because oil to cool them collected specks of dust and dirt.

Groves said the problems of building and running Y-12 "would have taxed the ingenuity and industry of Hercules." Nonetheless, what was started in February of 1943

was in partial operation by November.

At the same time, an even more sprawling and complex piece of construction started taking shape in another valley separated by the ridges, 17 miles away. It was the gaseous diffusion facility known as K-25 that would cover more than 40 acres of floor space and become one of the world's single largest industrial plants.

The idea this time was to pump a gaseous mixture of uranium and fluorine against a porous material. The lighter molecules containing U-235 passed through the pores more rapidly than the heavier U-238. In order to attain the necessary enrichment, the gas traveled along an air-tight system of tubes, or cascades - 2,892 stages in all - covering a mind-boggling two million square feet, four stories high and a half mile long shaped in a U. That operation covered twice the total ground area ofY-12.

Pristine, surgical conditions had to be maintained. When leaks along the way began cropping up, enterprising scientists discovered a solution in a coating material for the piping that would later become known as Teflon.

To power all of these diffusers, a companion plant with a capacity of generating 238,000 kilowatts of electricity had to be built alongside on the Clinch River. That was just the beginning, for by war's end the overall operations at the Clinton Engineer Works consumed one-seventh of the nation's total electrical output, being drawn from every available resource.

Over the next ridge from K-25, the world's first full-scale graphite nuclear reactor was constructed and loaded with 25 tons of uranium. It was called X-10. In the early dawn hours of Nov. 4, 1943, as Enrico Fermi himself watched, the pile "went critical" and became a model for the plutonium works General Groves was building out West in the Columbia River basin at Hanford. The X-10 site would one day become the sprawling campus of the world famous Oak Ridge National Laboratory.

Finally, because the Manhattan Project now faced ever more urgent demands, still another facility - this one known as S-50 - was built along the Clinch River to test a thermal diffusion method for obtaining fissionable material. That costly operation, though, was late to the party and became a forgotten step-child in the headlong rush to win the atomic race against the Germans.

These gigantic undertakings created a ravenous appetite for both dollars and workers. Whatever the commodity, demand seemed always to outstrip supply. The all-in cost would reach $1.1 billion, excluding the value of of the silver - or roughly $128

billion in today's purchasing power. In human terms, it required 67 million man hours to build the plants. When Y-12 started. General Groves thought 2,500 laborers would be needed; the actual construction employed 24,000. Over at K-25, the budget called for 500 by the fall of 1943; by year's end, 6,000 were swarming over the site.

Thus, from the very outset, the secret city of Oak Ridge was overrun with hundreds and then thousands of workers — from hod carriers to Ivy League scientists — all in critical need of food and a roof over their heads. Many of them worked 10 hours a day, seven days a week, for the premium wages that attracted them. Women eventually outnumbered men, three to one. About two-thirds of the labor force came from the Tennessee Valley — from Alabama, Georgia and surrounding Tennessee towns. In stark contrast, young professional talent was drawn from such institutions as Berkeley, Columbia, Princeton and the University of Chicago to this place they called "Dogpatch."

The demand for housing was so urgent that the earliest workers lived in trailers and prefabricated Army-issued plywood structures called hutments. Some pitched tents and others slept on the ground, in cars or in abandoned barns and outbuildings. Attics, basements and even chicken coops in nearby Clinton were rented out in the frantic hunt for a place to sleep.

In its blueprint for the reservation, the Army envisioned a town site on the slope of Black Oak Ridge, a half dozen miles down Highway 61 from Clinton, well removed from the dangerous factories but within the secured precincts. The site was satisfactory but the original plans showed little originality. The Army didn't want a military camp. It needed a livable village if it was to attract the scientific brainpower for the complex work ahead. So the military planners turned for help to the young Boston architectural firm of Skidmore, Owings and Merrill. John Merrill himself led the project team, although security was so tight they weren't told where they were going until they were handed sealed envelopes with their tickets as they boarded a train in New York's Perm Station.

The Merrill plan laid out 13 neighborhoods in an attractive grid of landscaped roadways, shopping and recreational facilities and - mostly - a variety of inexpensive yet durable pre-fabricated housing. The houses were called cemestos, named for the cement-asbestos fiber board used to build them. The material was cheap enough so that such amenities as fireplaces and porches could be incorporated into the houses' design. They became status symbols and were assigned according to a person's importance in the Oak Ridge hierarchy. At its peak, the feverish construction schedule was turning out a new

home every 30 minutes and still there weren't enough to meet the mushrooming demand.

The original town plan called for 3,000 of these cemestos houses, plus 14 dormitories, three apartment buildings, 980 hutments and room for more than 1,000 trailers. This quickly proved woefully inadequate. The civilian-owned Roane-Anderson Company, which was hired by the Army to manage every aspect of the town site, tried but couldn't keep up. The symmetry of the planned community was lost. In desperation, prefabricated plywood "Victory Cottages' were thrown up, as were more apartments, dormitories and military barracks.

Yet as time sped on, some semblance of normal life did take hold, at least as normal as the imperatives of wartime permitted. Coal was delivered free. Water and electricity were free. So was trash pickup and bus service. The need for public transportation around the expansive, mud-ridden reservation was so great, in fact, that the bus system quickly grew into the seventh largest in the nation as it hauled scores of workers back and forth around the clock.

Several shopping centers were built to provide the basic necessities but shoppers typically faced long lines and interminable delays to get into the supermarkets, the drug stores, and other shops. Once there, they found supplies limited and frequently sold out. The longest lines at Jackson Square often signaled the arrival of fresh supplies of rationed cigarettes. The town was surrounded by dry counties, yet residents somehow found ingenious ways to hide liquor as they passed through security checkpoints, especially a bootleg favorite called "Splo."

The wear and tear of daily life produced its share of grumbling and frustration, whether the residents were angry about housing assignments, malfunctioning plumbing, or bad food at the 11 big cafeterias which served 26,000 meals a day. When an acquaintance tried to call an official at the Roane Anderson headquarters and explained she was a friend, the switchboard operator tartly replied: "Madame, for your information Roane Anderson has no friends."

Since Oak Ridge was attracting more PhDs per capita than any place in America, recruiting them from the finest universities, General Groves insisted that it must offer superior schooling for the young families who would come. A highly respected education system evolved with credentialed teachers being brought to Oak Ridge from 40 states to staff 10 elementary schools and a high school.

Residents had access to first-rate medical treatment and it didn't cost much. The

Army provided a constantly expanding hospital. Well-trained doctors and dentists were available, even for house calls. Pre-paid health insurance could not be offered because the emerging Blue Cross system was not allowed to tap personnel records for security reasons. So a local non-profit membership was founded, offering broad coverage for $2 a month for individuals and $4 for families.

Surprisingly, only eight accidental deaths were recorded during the entire hectic wartime operation - five caused by electrocution, one in a fall, one by burns and one by toxic gas. Their death certificates became classified documents and were not delivered to their families until after the war.

There was another side to life at Oak Ridge. The Army was too preoccupied to attempt changes in the social mores. As a result, conditions within the reservation were as racially segregated as they were outside the gates. Black workers drew only the lowest jobs, rode to work in the back of the buses and lived in enclaves of ugly hutments. Four or five were crammed into 16-square-foot plywood living quarters consisting of only beds and a footlocker, a pot-bellied stove, no plumbing or electricity and no glass in the windows, only wooden shutters. They had to slog through the mud to toilets and showers. In the words of a one-time resident, looking back, it was "no fittin' place to stay."

Despite all the negatives, the hardships actually seemed to engender a strong sense of community among Oak Ridgers. They sensed they were engaged in some big undertaking to win the war — even though they weren't quite sure what it was.

Their uncertainty was born of the massive security that turned Oak Ridge into something bordering a police state**.** Movement was tightly restricted. ID badges were checked everywhere. It was joked that getting through the Siegfried Line in Germany was easier than making it through Elza Gate. Mail was censored, as were the columns of the local newspaper. Not even church bulletins could be mailed to relatives for fear of an inadvertent leak of information that could be of use to spies.

In certain ways, Oak Ridge became a town of codes, aliases and lies -all in the name of security. When new workers were trained, General Groves later admitted, the "announced aims of their operations were completely distorted" to avoid disclosing the real nature of the work. An internal monitoring network evolved. Plainclothes agents were in abundance. Residents watched each other. It has been estimated that one in four was an informant. Civilian contractors were commissioned by the Army to call in project employees at random for interviews. Reminded of the critical importance of the war

effort and how tight lips were an absolute must, they were asked to be alert to suspicious actions or breaches or any other information that might interest the security forces. They were given envelopes pre-addressed to "Acme Credit Corporation, Knoxville" for use in sending their reports. Apparently thousands did.

To hide his own whereabouts, when on the reservation General Groves stayed in the maternity wing of the hospital.

It seems unfathomable in the context of today's world that the atomic secret could actually have been kept so well in this secret city. Nonetheless, those who have given the matter careful study believe the number who knew the real purpose of Oak Ridge was relatively small. Even within the scientific group**,** though a larger number glimpsed part of the puzzle, not many had the whole picture. Everything was on a need-to-know basis. One knew better than to ask questions. To be sure, there were clues. At the Oak Ridge library, pages of dictionaries and encyclopedias with the word "uranium" became worn thin by curious fingers.

From the outside, authorities focused on possible espionage threats from the Germans, nearly to the point of paranoia. What they didn't realize, until years later, was that the Soviets were the ones busy penetrating the secrets of Oak Ridge. Soviet agents learned much about its purpose via their intelligence successes at the radiation labs at Berkeley. The notorious Klaus Fuchs passed on detailed information about the super-secret barriers developed for the gaseous diffusion plant. And despite the security curtain, the spies David Greenglass, Al Slack and perhaps others actually worked for a time as contract employees within Oak Ridge.

As 1944 dawned, the kinks in the intricate network of pipes and barriers, magnets and pumps were getting worked out. In a remote part of the reservation nicknamed Katie's Kitchen, General Groves ordered built into a hillside a concrete bunker containing a bank-size vault to store the grams of fissionable material as it was produced. The site was disguised as an abandoned bam and silo, complete with grazing cattle. But the silo actually housed a machine gun emplacement in its tower, and armed patrols hid out in the sylvan surroundings below. Groves was not a man to take chances.

The labs at Los Alamos were anxious to get their hands on the material so they could begin experimenting with how to construct the bomb itself. So in March 1944 - barely a year after construction of the first plant was begun - an initial shipment was made. It was a small collection in the form of green salt, driven to Knoxville by military

couriers dressed as traveling salesmen. They had the rare cargo handcuffed to them in a special briefcase lined in gold as they boarded an ordinary overnight train to Chicago. There they handed over the shipment to a relay team for a 26-hour journey aboard the Santa Fe Chief to the desert way station of Lamy, New Mexico. From there it was driven to nearby Los Alamos, where the contents were reduced to metal. Thus was taken the first halting step into the nuclear era.

J. Robert Oppenheimer and his colleagues at Los Alamos were initially unable to tell General Groves with any accuracy how much U-235 they would need for a single bomb. There were wild swings in their estimates from 10 to 100 pounds. They finally concluded that a single gun bomb would require 92.6 pounds.

By early 1945, Oak Ridge was able to ship in earnest the weapons-grade material now consistently emerging from the complexities of manufacture. The cross-continent train trips grew more routine. General Groves was emboldened to tell his Washington brain trust that he was "reasonably certain" the first bomb could be operational by August 1st. There was little room for error. "If our gadget proves to be a dud," Groves told a colleague, "I and all the principal Army officers of the project. . . will spend the rest of our lives so far back in a Ft. Leavenworth dungeon that they'll have to pipe sunlight in to us."

The "gadget" was called "Little Boy" by its Los Alamos designers. It would measure 101/2 feet long and 29 inches in diameter, weighing 9,700 pounds. In its core would reside the enriched uranium so painfully processed back in Tennessee. As summer arrived, General Groves huddled with Oppenheimer and set July 25th as the deadline for the final shipment from Oak Ridge of just enough bomb grade U-235 to complete Little Boy's preparation.

A fortnight later these efforts reached their climax in a blinding moment that is now seared into mankind's memory, never to be forgotten.

On August 6th, a Monday, Little Boy dropped free from a B-29 Superfortress, the Enola Gay, at 8:15 in the morning and 43 seconds later exploded over the Japanese city of Hiroshima in a nuclear inferno that left an estimated 71,000 human beings dead or dying and another 68,000 injured, many of them grossly disfigured.

The residents of Oak Ridge were just sitting down for lunch when over the radio came a bulletin from the White House with President Truman's announcement to the world that 16 hours earlier the United States had employed a weapon with a force greater

than 20,000 tons of TNT, using those strange words "atomic bomb."

Suddenly the secret was out. Those who were there recall that the reaction within Oak Ridge seemed surprisingly muted at first. It took a while for the workers, who had been sworn to secrecy for so long, to absorb what they were hearing and to make the connection with the work that had been taking place around them. In one house, a then-young Jay Searcy remembers his father listening to the radio and shouting "It's a bomb! We've been making an atom bomb!" By mid-afternoon, the import of their role grew more apparent. Celebrating began. Connie Boiling, one of the workers at Y-12, remembers that "everybody just quit work. . . . They didn't even clock out. They just left the machines running when they found out. Everybody went over to Jackson Square." There the gathering crowd blew whistles and horns and started dancing in the street. Soon extra editions of the Knoxville newspapers arrived, one bearing the headline "Power of Oak Ridge Atomic Bomb Hits Japan." They sold for a dollar and were quickly grabbed up. Townspeople swelled with pride as the eyes of the world suddenly were cast on the role played by their little secret city. They saw their work shortening the war and saving GI lives. The euphoria lasted for days. Not even the subsequent news of a second bomb falling on Nagasaki, this one using plutonium from the Hanford works, and then the official end of the war could match the initial elation.

Here and there, though, there was more sober reflection. A story was told of a grief-stricken wife rushing to the hospital where her scientist-husband was a patient and demanding to know how he could involve his family in a project that brought death to so many people.

Eventually, of course, such feelings came to shape the agonizing national debate over whether the United States was justified in using the first nuclear weapon in history, a debate that is sure to continue so long as man's conscience weighs the choices imposed on him by his technological creations.

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Today Oak Ridge appears a conventional small town of 28,000 facing the usual problems posed by Wal-Mart and sprawl. It is similar to so many other mid-American communities and yet so distinctive at its core. From the main turnpike into town one can still glimpse reminders of a half century ago -the cemestos houses, the place where Elza Gate stood, and the shops in Jackson Square. They look a little worse for the wear.

The Y-12 plant continues to operate as a "bomb factory" with 4,500 workers and

remains home to the nation's largest supply of weapons-usable uranium. It's our Fort Knox of the atomic era, housing the gold of nuclear warfare. Over at the Oak Ridge National Laboratory in Building 3019-A is a repository for uranium-233, another fissionable element also prized for its bomb-making capability.

Since these stark realities would presumably rank Oak Ridge high on any terrorist's hit list, the area fairly bristles with potent protection. Among the newest security tools are Gatling guns mounted on fast armored vehicles, capable of spitting out 7.62 millimeter bullets at a blinding rate of 3,000 rounds per minute. The weapon can drill through 18 inches of reinforced concrete.

The plants are nonetheless officially classified as vulnerable to terrorist attack, such as one that could be launched by a hand-held missile lofting a nuclear warhead into these inner sanctums.

To counter such threats, the National Nuclear Security Administration recently renewed a contract for a private paramilitary security force of 900, including some of the toughest cops in the business. As one drives toward the formidable entry portals protecting the Y-12 and K-25 sites from unauthorized visitors, passing on the way the abandoned concrete block guard towers of yesteryear, security vehicles can be spotted at the ready as side road sentinels.

Meanwhile, the seemingly endless task of demolishing the old buildings and cleaning up the toxic and radioactive residue from another age continues apace. It is officially termed the "remediation of past practices." To that end, the government has carved out a 120-acre multi-layered landfill near the Y-12 plant and has hauled 570,000 tons of toxic waste there in the past four years, mainly from K-25 demolition, en route to burying 1.7 million cubic yards expected by 2016. Whether that's enough capacity nobody seems to know because some 200 old buildings from the Y-12 and X-10 sites are still to be razed over the next 15 years at a cost that could reach $8 billion.

Around town one hears anecdotes about the difficulties of the cleanup. For example, one worker entering a site where some of those "past practices" took place reportedly filled a full year's worth of permissible radioactive exposure in a mere 20 minutes. Such stories are routinely dismissed as overblown while residents are reassured that Oak Ridge is as safe and healthy as it is attractive and livable.

The real engine of economic growth in the town remains government-financed research, as it has been from the beginning. Townspeople are proud of the fact that Oak

Ridge is home to the nation's premier scientific laboratory and arguably the world's fastest scientific computer. Moon launch equipment was made there. Nuclear medicine got its start in the labs. Pioneer research took place in kidney and bone marrow transplants.

A century ago in the physics laboratories of Berlin and Cambridge, Berkeley and Princeton, scientists probed the secrets of the subatomic world in order to advance mankind's understanding of matter and energy. It's fair to say they had no clear vision of where their scientific adventures would lead. Today's scientists in the labs of Oak Ridge are engaged in more advanced neutron-scattering research. They are studying the arrangement, motion and interaction of atoms in materials. The operative term is spallation. The fruits of their research, they say, could yield even faster electronic devices, more efficient engines, more muscular computers and designer drugs to revolutionize health care. Yet they acknowledge that the self-same research is being conducted into questions relating to "national security" issues, leaving the specifics to one's imagination. What is known is that one facet involves RRW's - government speak for Reliable Replacement Warheads. A lab leader once wryly explained that nuclear warheads were like children's toys - not made to be taken apart.

Can one then dare to ask - and not risk being labeled a Luddite for doing so — what moral compass directs these technological imperatives, aside from the knowledge gained for knowledge's sake? The question is especially poignant for a place with such a unique legacy.

After all, it was Albert Einstein himself who once remarked that entrusting human beings with modem technology was akin to putting a meat ax in the hands of a psychopath.

Harvey Mansfield was more delicate in his 2007 Thomas Jefferson Lecture in the Humanities. "Science wants the fruits of science," he worried, "and it does not tolerate much doubt about the goodness of those fruits." He went on, "Scientists had a bad conscience about making the atom bomb, it's fair to say, but their doubts were not prompted, still less endorsed, by their science."

To all of this General Leslie Groves gets the final word. As he looked **back** on his career he asked: "Is atomic energy a force for good or for evil?

And he answered: "I can only say, 'As mankind wills it.'"

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