MEMORIES OF SECRET CITY DAYS[1]

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[During the Manhattan Project (from May 25, 1943) a Jr. Chemist, Tennessee Eastman Corp., Y-12 Plant]

A Guest Column for the Newspaper Based on the Memoirs Paper, June, 1999[1]

We need to go back to the early days of 1939 for a little background in telling why Oak Ridge came to be in World War II and to appreciate better the remarkable things that were done here.

PRELUDE

In January of 1939, two brilliant chemists over in Germany proved that if you bombard the heavy element uranium with neutron radiation, some of the uranium atoms split in two and become entirely different elements of about half the weight of uranium, like barium and lanthanum. And when the atom's nucleus splits, a huge amount of energy is released-10 million times the energy released in chemical reactions we are familiar with, like burning coal and gasoline, or exploding dynamite and TNT. The physicists in those days were working with only microscopic amounts of uranium, but could detect the energy released easily. Nuclear energy is the energy of the universe-God's way- the energy of the sun that keeps us warm. On the grand scale, nuclear energy is the most common kind; the chemical energy that we humans know is a rare thing only known on planets such as ours!

Now a significant aspect of this finding was that the world in January 1939 was still at peace, so this exciting development was immediately published in a scientific journal read by scientists in every country all over the world. The news traveled like wildfire. Top scientists in every country soon were talking about the staggering implications for peaceful and for military purposes that might come in 10 or 20 years.

In our country, as elsewhere, scientists rushed to their labs, and in a few months the German results were confirmed at four different universities here in the U.S.A.: Columbia Carnegie Institution of Washington, Johns Hopkins, and the University of California.

In that summer that year of 1939, I graduated from high school in Pennsylvania, got a summer job as Nature Counselor in a Boy Scout camp, and spent two weeks as a Boy Scout Guide and messenger-boy at the great 1939 New York World's Fair. During orientation week that Fall as the greenest 16 year old freshman ever matriculated at Washington & Lee University in Lexington, VA, I learned all kinds of must-know things about W&L's honor system and traditions, but in off hours was jolted by the radio reports of Adolf Hitler unleashing his "Blitzkrieg" against poor Poland on September 1. He had started the most terrible war in history, one that would affect all our lives.

One of the early findings of our U.S. physicists was that one of the forms of the uranium as it is dug out of the ground is much more susceptible to being split than the other; the slightly lighter in weight U-235 is more

[1] This is an expanded version of a talk on the 15th Anniversary of the Oak Ridge Retirement Center, 6/99, written up for the Oak Ridge Historic Preservation Association. Some of the introductory material is taken from the author's "Overview of the History of Y-12."

easily fissioned than the U-238. So we need to separate the two "isotopes." The problem of separating uranium atoms differing only in weight was thought to be so difficult that some respected scientists were quoted by the *New York Times* as saying one would never be able to separate enough U-235 to produce a nuclear weapon - it's too tough a job. Chemists separate one element from another all the time, but they rely on differences in the chemical properties of elements, and isotopes of the elements have to behave identically in chemical processes.

The difficulty with isotope separation was not just that no one had ever done it with a heavy element like uranium, but also a great challenge because U-235 is rare—when you dig uranium ore out of the ground only 7 out of every 1000 uranium atoms are U-235; 99.3% of them are U-238! Worse still for the prospects of making a bomb was the conclusion by some physicists that you might need hundreds of pounds of 80% U-235 to make a bomb!

Our scientists had the greatest respect for German science and technology, and knew that if the Germans found some way to make a weapon, Hitler would not hesitate to use it. If it could possibly be done, we needed to find the way first. This gave our top scientists the motivation to undertake (with a self-imposed secrecy in 1940 and 1941) intense research programs on five different isotope separation ideas that appeared, at least theoretically, to have some chance of working[2].

Research went on actively at several universities during the next two years with one very active program at the University of Virginia under Dr. Jesse Beams on the gas centrifuge method. Beams had a head start having already separated the isotopes of chlorine using his gas centrifuge, but the much heavier U was a more difficult challenge. Dunning and others started work at Columbia University to develop a diffusion barrier material for the gaseous diffusion method that seemed very promising from a theoretical standpoint.

By the middle of the year 1940, discussions among the physicists based on further laboratory research had increased their interest, not cooled it, and discussions with government officials led to the organization of a new group to coordinate all the research going on that might be of interest to our nation in a military sense.

The new top level government oversight group was formed in June called the *National Defense Research Committee (NDRC)* and as chair the President appointed Dr. Vannevar Bush, an eminently well qualified scientist and administrator, formerly President of Harvard and of the Carnegie Institution. The big question they faced was, "Can one separate the isotopes of uranium and produce nearly pure U-235?"

Also midyear in the United Kingdom, in the same month the German army forced the British out of Europe with the evacuation of Dunkirk, British scientists formed a group of their top physicists who had been independently studying the potential for an atomic bomb. Their work soon concentrated on the gaseous diffusion approach.

After a year's intensive research on five different isotope separation methods, only slight enrichments had been seen and nobody had collected more than microscopic amounts of U-235. Prospects looked glum. The gas centrifuge appeared most promising even to Nobel Laureate Harold Urey at Columbia who was skeptical of the diffusion work going on there under his direction! Out at California, Seaborg and Wahl had finally isolated the element 94 which they would they would later name plutonium. Those atoms could be split almost twice as easily as U-235, so a number of proponents like Eugene Wigner at Princeton began arguing strongly for following the plutonium route to making a bomb rather than trying to separate uranium isotopes.

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[2] **Gaseous Diffusion** at Columbia Univ. with J Dunning; **Photochemical** at Columbia & Johns Hopkins, Dieke (small effort); **Gas Centrifuge** at Univ. VA, Jesse W Beams; **Electromagnetic** (Calutron) at the University of California with EO Lawrence (starting late in 1941); **Thermal Diffusion** at US Navy Yard, Philip Abelson.

In mid-1941, Vannevar Bush turned to our National Academy of Sciences for their expert opinion on the military value of atomic energy. Arthur Holly Compton chaired a blue-ribbon committee of physicists that after two weeks delivered the opinion that three military possibilities could be envisioned: [a] producing violently radioactive materials that could be scattered by bombs; [b] producing a power source for submarines; [c] producing violently explosive bombs.

This was a pretty mild endorsement of a potential U.S. program compared to a draft copy Dr. Bush received of the results of the British physicist's deliberations. They stated boldly:

1. It will be possible to make an atomic bomb with U-235, requiring about 25 lbs.;
2. A plant to produce about 1 kg/day would cost ~ 5 million pounds;
3. Every effort should be made to do it;
4. A bomb could be in hand by the end of 1943.

They added that even if the war should end before the bomb were produced, the effort would not be wasted – no nation would care to risk being caught without such a weapon. Their report surely spurred Vannevar Bush.

He realized now that his NDRC's authority was limited to research; they could not initiate or pursue engineering or development, which was now essential. So in June 1941, he proposed and won approval for the creation of a new wartime agency the *Office of Scientific Research and Development (OSRD).* He was appointed Chairman, and he persuaded James B. Conant to take his old chair running the NDRC.

In October, the British report officially arrived and Bush and Conant, by now fully convinced our program should go forward aggressively, took the British report to President Roosevelt with the recommendation for decisive action. The President immediately appointed a Top Policy group for the government- VP Henry Wallace, Sec. of War Stimson, Chief of Staff George Marshall, Bush, and Conant, and charged them to find out whether or not a bomb could be built. The work took on new focus and intensity.

By December, the National Academy of Sciences had produced another report, this time saying, "A fission bomb of superlative destructive power will result from bringing quickly together a sufficient mass of U-235." They said the critical mass was not known, but would be hardly less than 2 kg, not likely more than 100 kg. (i.e. between 4.4 and 220 lbs). Nothing was said about the plutonium route!

WE DECLARE WAR

On December 7, 1941, the nation was stunned to hear the announcement of the Japanese bombing of Pearl Harbor. Like others who experienced that traumatic moment, I can recall the exact spot in Lexington, VA where I was standing when I heard that overwhelming news!

The same month Professor E. O. Lawrence, and his team of physicists at the University of California ran a cyclotron around the clock that had been modified to perform like a giant mass spectrograph. Over the month it produced 100 millionths of a gram of U-235, a small amount in terms of the many pounds that would be needed, but it at least demonstrated the feasibility of the concept.

It wasn't until the middle of the next year, 1942, that the nation's atomic bomb efforts were radically reorganized, and turned over to the Army so as to have a single executive in charge of a top priority effort – this was the *Manhattan Project.* Put in charge in September was General Leslie Groves, a real pusher who had recently built the Pentagon in Washington who brought in the very able Col. Kenneth. D. Nichols as the person in charge of all operations. The all-out effort to develop the atom bomb was now underway.

BUILDING OUR SECRET CITY

One of Groves' first actions was to visit and then give his Army engineers the go-ahead to acquire the East Tennessee location for the Manhattan Project that had first been looked at in July. The 12.5 mile long, 7.5 mile wide, 59,000 acre site seemed right for many reasons. It was near Knoxville which had good railroads and a large supply of reliable labor, but the site itself was sparsely settled with only some 1,000 families having to be moved out. Further, the Clinch River was a fine source of cooling water, and those long parallel ridges about 1000 feet high provided the opportunity to locate the town and the plants in separate valleys for ease in guarding both the security of the plants and to assure the safety of the city. Oh, and yes one other reason cited–the site was far enough inland from the coast so there need be no worry about submarine attack!

Gen. Groves vetoed the previous idea of locating the production nuclear reactors for making plutonium here, thinking it was too close to Knoxville. In the event of accidental release of radioactivity, it might put at risk that city as well as the town site and the isotope separation plants. Moreover, it would giveaway once and for all time the nature of the secret operations. So he sent his engineers out to find another site and they settled on a 500,000-acre tract in Washington State.

His Manhattan District engineers came in soon after site selection and bought the 59,000 acres for what they called the Kingston Demolition Range at a cost of $2,600,000; an average of $44 bucks an acre! Clearing the land and removal of homes and barns began, and the name was soon changed to the less descriptive Clinton Engineering Works, which it remained till after the war.

Groundbreaking for the first building in Oak Ridge, the Army's Administration Building (we always called it "The Castle on the Hill") began in November 1942, and design of the Townsite for housing the workers got underway full-speed. The effort started, assuming the scientists would soon be able to tell the engineers just what the separation process would require so far as equipment and the size and number of buildings! At the close of 1942, the Top Policy Group decided they had to narrow the field of isotope separation processes to two (the electromagnetic and diffusion), and they stopped all the research and development work on the other three. And since they could not be sure either of these two would work, they decided not to wait any longer for the scientists and would move forward with building plants for each of them at Oak Ridge – the plants that were to be Y-12 and K-25.

The surer bet of these gambles, the one that seemed to offer the best chance of beating the Germans to the bomb was the electromagnetic, also called the Calutron process, being developed at the University of California by Nobel Laureate Ernest O. Lawrence and his staff. This Calutron process (the name derived from California, University, Cyclotron) was to be the fantastic plant built in the Bear Creek Valley, then and now called Y-12

In December of 1942, the Manhattan District allocated a total of $30 million to build the Y-12 Calutron Plant. Because of many later increases in size and complexity, it ended up by the end of 1945 costing $427 million!

The very next month, January 1943, Groves called in the Y-12 architect/engineer Stone and Webster of Boston, MA, as well as the future operating contractor Tennessee Eastman Corp. of Kingsport, TN, and told them that even though the Y-12 valley was still in farms, and the design of the process equipment was not yet worked out, he wanted the first building operating in July -- six months hence! The listeners were appalled, but winning the war was what they wanted to do. Amazingly enough, they almost did the impossible. They had this never-before-conceived-of plant built and started up in 11 months, just six months behind Gen. Groves' absurd demand!

Ground breaking for the first building at Y-12 took place in February and the first building was finished before the end of March. Its only name was a number, 9731, to not give anything away. It was 731 feet above sea level! And, also in February, in the western end of the CEW area over at X-10, Dupont broke ground for

the first buildings of the Clinton Labs, which was to be the site of the world's first nuclear plutonium production reactor. Their first building was also finished in March.

The back-up uranium isotope separation process at Oak Ridge was the gaseous diffusion process (K-25), under development at Columbia University in New York City. This process appeared much less promising because no suitable material had yet been developed for the vital diffusion barrier. But if there was any chance one could be found, it seemed that the rest of that process could be mastered. So it was decided to also begin building the K-25 plant down at the western end of the CEW reservation. It was to be designed by the Kellex Company with operations the responsibility of a division of Union Carbide called Carbide and Carbon Chemicals Division. Ground was broken in September of 1943, and the first building of this huge first-ever of its kind plant came on line in February 1945, 17 months later.

The other Manhattan Project approach to releasing energy from the atom's nucleus was to make a new element not found in nature called plutonium using a nuclear reactor or pile. The first of these piles was built at the University of Chicago by Fermi & team in December 1942, and the decision was made to follow this plutonium route to a bomb in case some some fatal flaw were encountered in the still untested separation of uranium isotopes. Another driving motivation was the suspicion that German scientists were also pursuing this plutonium route.

The huge nuclear reactors and chemical separation buildings needed to make the plutonium from uranium were started on the Hanford site in eastern Washington State. Clinton Engineering Works (Oak Ridge) was chosen to be the site for a small size pilot facility needed to produce enough plutonium so that chemists could determine how to design the production processes to separate the plutonium from uranium. So in November 1943 the Graphite Reactor, the world's first plutonium producer, went critical at what we called X-10 or the Clinton Laboratories over in Bethel Valley; the place we now know as ORNL.

WORKING IN THE SECRET CITY

While tens of thousands of construction workers swarmed over the whole area building a city to house construction workers, scientists, teachers, storekeepers, doctors and all the rest; elsewhere in the U.S.A. college kids like me were graduating and either looking for jobs, enlisting in the Armed Services, or being drafted. A month before graduation, I went to Detroit to a meeting of the American Chemical Society, posted my resume, and lined up interviews with 18 companies looking for chemists from the class of 1943. Looking back at these companies years later, I realized that going with any one of the majority of the 18 would have gotten me a job with some contractor or subcontractor of the Manhattan Project in some part of the Country!

I decided to take the job offered by the Eastman Kodak recruiter (Tennessee Eastman Co.). I had talked before I went to the interview with the Head of my chemistry department at W&L, and he had said either Kodak or Merck would be a good company for a chemist. The Eastman interviewer was a distinguished looking, bald, older gentleman who said he was interested in my resume and he had a job for a chemist doing secret war work. I asked where I'd be working. He couldn't say – it was secret. I asked what kind of work I'd be doing. He couldn't say – it was secret. I asked, well, would the job last after the war? He couldn't say. Well, I didn't see anything in his answers I could argue with, so I became their 254th hire out of the well over 30,000 eventually hired for Y-12.

Since there were no laboratories for chemists to work at Y-12 in May 1943, they shipped me along with dozens of others they had hired up to Kodak Park Research Labs in Rochester, NY. We loved it there that summer. We college guys were finally out in the world on our own, and the $38 per week with overtime every Saturday made us feel rich. But mostly our long days in the labs were very challenging and engaging. We learned so much in our research on the chemistry of tuballoy and all its compounds during that summer,

none of it yet being in any textbooks! All our talk and writing in our secret notebooks was in code names. From the day we arrived in Rochester, we never again mentioned the word uranium till after Aug 6, 1945!

In October 1943, when we all finally came down to "Dogpatch" from Rochester (including some long timers like Roger Hibbs, Fran Tench, Robt. E. (Bob) MacPherson, Paul Blakely, among others), we found a fenced-in, huge Army camp, Army cafeterias, and dormitories where we were assigned two to a room. Because of the fast-growing population, within a month Paul Blakely and I were asked to take in a third person and were given a bunk bed! That dorm furniture was plain, but good, solid wood and 50 years later I am still using one of those oak five-drawer dressers!

We could, and did, freely and frequently complain about the food and lack of anything alcoholic to drink except 3.2% alcohol (that means really weak) Barbarossa beer. The town's location straddled two "bone-dry" Tennessee counties, Roane and Anderson. But I never heard anyone complain about our dorm rent – $10/month for a person in a double room.

The bus ride to Y-12 cost a dime, but only 6 cents if you bought 5 bus tokens at a time. You could ride from anywhere in town to the Central Terminal and then transfer to a work bus for free. Practically no one living in town drove cars to the three facilities. For one reason, very few people owned cars, and for another, the stringent gasoline and tire rationing.

The chemical separation buildings we went to work in at Y-12 in October 1943 (9202 and 9203) were a thrill to work in. Everything was brand new. For the first few weeks we spent our days ordering all the lab supplies, chemicals, and glassware we would need from scientific supplier catalogs, and we got it posthaste thanks to our Manhattan Project top priority ranking. We chemists did not know what a "purchase requisition" looked like until after the war. You just made a list and gave it to the clerk down the hall and the boxes soon arrived. We had to change shoes coming in to work in order to keep the building free from the everlasting dust or mud, which was all over our galoshes every day.

We each knew what our particular task and job was month by month, and knew all we needed to know to get it done in our particular six lab rooms. What the folks down the hall were doing was something we had no *need-to-know* about, and we didn't ask after working hours even though they were our friends, nor did they ask us. What went on in all those big buildings we could see while walking to our building we may have been curious about, but that was something else we did not *need-to-know* and didn't ask.

Over the next year we gradually learned a little more and more as our work required, but most of us had no idea about the wide scope of the Manhattan Project's efforts (even like what was going on at K-25 and X-10) until the famous Smyth Report was published in September of 1945 after Japan surrendered.

Overriding any other interest, even more important than girls and food for this 20 year old and my friends, was doing everything we could to win the war. We worked 10 or more hours every day, including Saturdays. All of us who read the war news in the Knoxville newspapers understood and wholeheartedly agreed with the need for the very tight secrecy for our work. Those who didn't were not allowed to stay around long.

We bachelors, of both genders, spent many evenings at one of the fine recreation halls (we called them "rec halls) in Jackson Square, Grove Center, and Jefferson, dancing to Bill Pollock's Big Band records and playing cards. And like chimneys, too many of us smoked Chesterfields or whatever was available at the end of those long, long cigarette lines at drug or grocery stores. We drank that watery Barbarossa until the wee hours, then wandered to the Central Cafeteria, open 24 hours, for a cheese sandwich. That was real living for our dates and us.

Alternating with the recreation halls for our attention was the Center Theater, now the Playhouse. Movies sadly only changed every other day so we were limited to seeing just 4 new movies a week! And the amount of romance and lack of sex and violence in them would quickly put today's young people to sleep.

In the rest of the U.S., Saturday night was the special night of the week. But in wartime Oak Ridge, *the* night was Monday night! Each Monday night, loads of us piled into vehicles that the military called "busses." We called them "cattle cars." These tractor-trailer look-a-likes were formerly parking-lot shuttle busses left over from the Chicago World's Fair in 1933! We rode in the long trailers without many windows, with wooden benches along the walls that would seat perhaps a couple dozen real friendly people! Despite the ordeal of the long hauling into Knoxville, the young bus mob was invariably good humored, buoyed by the thought of visiting real civilization for a few hours—the attraction being that those fine Gay Street stores all stayed open late Monday nights for shopping till 9 PM (my favorites were Miller's for its book department and the S&W, a grand cafeteria). Every Monday night was a treat if only to walk around on real sidewalks instead of boardwalks. But for me, one special Monday night came in November 1943 when I was introduced to Jeanie Holder, the Redhead, in the coffee shop of the Andrew Johnson Hotel, one of the places we fled to occasionally in our continual quest for real food!

Christmas that first year in the Secret City was tough duty for us dorm guys. Most of the single gals we dated were from Tennessee and disappeared to their homes. We bachelors were much too far from home and couldn't go. No long weekends, that was a 24/7 war. Bob MacPherson, bless him, had squirreled away a bottle of champagne when he came down from Rochester with the '43 gang, and moved by the spirit of the season generously decided to open it on Christmas Eve to assuage our depression. With the first small offering, we learned that champagne instantly dissolved the glue in those little white conical paper cups in the dispenser next to the Dorm water coolers, so we formed a tight little group around the cooler, took a new cup for each carefully poured ration, and then had to down it in one gulp before the precious stuff leaked out!

Out at X-10, the graphite reactor (unbeknownst to us Y-12ers) was already finished and went critical November 4, 1943, the first of the Oak Ridge facilities to begin operations.

At Y-12, the first building started operation in Dec. 1943, less than a year after ground breaking! But almost immediately they ran into very serious design and operating problems because of electrical shorts in the magnets that required a crisis effort and over a month to shut down and fix. Right along with operations starting up, many other processing and support buildings were being built all over Y-12. General Groves and his science advisors decided to expand Y-12 even more and to go full speed ahead with K-25 as a back-up in order to speed up U-235 delivery dates.

A small amount of low enriched U-235 went to Los Alamos in March. The wartime mission of Los Alamos, near Santa Fe, NM was to develop the weapon designs for using either the uranium 235 separated in Oak Ridge and for the plutonium being generated at Hanford. Neither atomic bombs nor parts of them were built here in our Secret City during the Manhattan Project.

Down at K-25, some 15,000 construction workers were living in a separate town of their own along the south side of Highway 58, just east of that largest pretty pond across from the front of the plant. The town was called Happy Valley by the residents and they had thousands of trailers, hutments and barracks as well as a theater, groceries, recreation halls, and the Wheat school for the kids. Their job was building the huge K-25 plant, its infrastructure, and the now-gone powerhouse on the river which, when built in 1944, was the largest in the world. In the 1950s the whole Happy Valley site was stripped clean; green-fielding we now call it. Should you drive by there slowly in the winter when the leaves are gone from the trees and shrubs that have inundated the site, you can see remains of levelled graveled areas and you may be able to spot some fireplugs still standing as mute monuments to mark that ghost town.

In the spring of 1944, construction workers at Clinton Engineering Works peaked at 47,000; [3] almost double our present city's population!

The war in Europe was going badly that 1944 spring, but in June came D-Day, the heroic Allied invasion of France from Britain. I kept a copy of the Knoxville News Sentinel of that day. They were so excited the banner masthead of their Red Paper Special Edition reads "KnoxSentinelville New!"

Come fall, another facility, the S-50 Plant, was suddenly added to the two existing Oak Ridge U235 isotope separation plants. Oppenheimer of Los Alamos had convinced Groves that it would be possible to speed up the date at which a bomb could be ready if the previously dropped thermal diffusion process developed by the US Navy were used to provide some low-enriched uranium feed material for Y-12. Even in wartime fast construction terms, S-50 was a wonder. Built along side the huge new steam/power plant at K-25, Groves asked that this extraordinarily complex plant (that both the Germans and the Japanese tried to develop and failed) be built in an impossible ninety days! Wartime motivation and intense and brilliant engineering got the impossible done in 69 days! S-50 did start producing 0.89% product and shipped it to Y-12 starting the following March. And that did speed up production of U-235 for Los Alamos as predicted. After the war, S-50 was shut down, and the site completely cleaned up in the 1950s.

The turn of the year 1945 saw the newly discovered science and technologies both in the U-235 and in the plutonium side of the Manhattan Project working well. Y-12 began shipping highly enriched U-235 to Los Alamos in the spring of 1945. It was carried out to New Mexico by special couriers in coffee-cup sized nickel cans heavily plated on the inside with gold. Two of these containers were carried in a leather briefcase chained to a courier's wrist. That courier was usually a 1st Lieutenant in Military Security stationed in Oak Ridge, and he took it out by train via Chicago. The precious U-235 product in the cans was in the form of a green powder, uranium tetrafluoride, not as uranium metal weapon parts; all those were then being made at Los Alamos.

During those days, one of the favorite subjects for conversation by folks who didn't actually work at the plants and hear the frequent security briefings was: "What in the world are you guys making out there at Clinton Engineer Works?" Even the people who lived and worked out here saw trucks and railroad cars day-by-day bringing in tons of materials and supplies, and they could see nothing going out! The Louisville & Nashville railroad line delivered about 3,000 boxcars a month of materiel and picked up 3,000 empty boxcars a month. The railroad folks I'll bet couldn't help but wonder, too. Stories were the grist of the rumor and, as you can imagine, the humor mill.

One offering was: "Well we're building a town for our military officers to come back and move into when the war is over." Another was: "They're manufacturing luggage for that globe-trotting Eleanor Roosevelt!" Another: "We're making campaign buttons and banners for Franklin Roosevelt when he runs for his fourth term." And another was: "Heck, I don't mind telling you just what I'm making out there - it's $1.24 an hour." But my prize goes to the answer by one native East Tennessean who worked as a maintenance man at Y-12. He said in all seriousness: "I'll be derned if I know what they'se making out yonder, but I do know one thing for dern sure, and that is that the Gov'ment could sure buy it cheaper some'ers else!"

In April 1945, we here in the Ridge, like the whole nation, were shocked by the death of our long term leader President Roosevelt. At Y-12 we had seen special wooden ramps built to provide access into several of the buildings and we were all expecting him to come to see this wonder that very month. Only in recent years have I learned these ramps were never intended for FDR, but for a proposed visit by Secretary of War Stimson.

[3] Robinson, p. 45.

And then in June of 1945, a month later, Hitler was dead and his Third Reich finally surrendered and the terrible war now focused on Japan. Many of us breathed a huge sigh of relief that the Germans had not been able to build the atom bomb, though their rocket program had been a frightening success. The war in the Pacific was taking a terrible toll of American lives and those remote home islands of the Japanese Empire over 7,000 miles away seemed impregnable.

Here in our secret city, war-work was at fever pitch, too, setting new records everywhere. Employment levels at all facilities were at their wartime peak as was the population of the City! Today our little city of 27,000 is a sleepy little town compared to the 75,000 people [4] then living in 9,600 cemestos (officially called "semi-permanent" homes) and flattops, in 5,000 trailers and 16,000 hutments and barracks spaces all over the area south of the Turnpike especially in Midtown where our Downtown Mall now is. The huge number of singles like me filled up an unbelievable 90 dormitories both of the H-type (like our late Charlotte Hall) and of the S-Type, all long gone. And these were located all over the Jackson Square area and the Jefferson end of the town. A vestige of one, Cambridge Hall, still remains at the corner of Tyler and East Tyrone, one of the four different dorms I lived in a while.

Employment at the plants reached a wartime peak in May 1945. Y-12–the largest by far– reached 22,482; K-25 peaked at 11,000; X-10 peaked at 1,234. Our bus system serving the whole city and all the plants and some off area communities involved a huge number– 840 buses that summer of 1945 and was the ninth largest bus system in the whole United States!

The extraordinarily difficult problem of making a workable, stable diffusion barrier for the K-25 diffusion plant had finally been mastered well enough to start charging uranium hexafluoride into the first stages early in 1945, and with the S-50 thermal diffusion plant feeding its slightly enriched product to a now very productive Y-12, the military security couriers were kept on the road carrying their precious briefcases to Los Alamos all that Spring and eventful summer.

The bomb-designing physicists at LASL had decided early on that they could be confident a U-235 bomb would work so they would not have to use any of the precious Oak Ridge product for an experimental test. But the plutonium bomb was really iffy because of the much greater technical complexity of its implosion system, so a full-scale plutonium bomb was tested in July on the desert at Alamogordo, New Mexico, called the Trinity Test. It was the first man-made uncontrolled release of nuclear energy. I say man-made because, interestingly enough, it has been found that there were naturally occurring nuclear reactors here on earth (Africa) in our distant past (billions of years ago) because the U-235 concentrations in uranium ores used to be much higher than they are today; the isotopes decaying at slightly different rates.

The Manhattan Project's many pieces were finally coming together in the late spring of 1945. Here in Oak Ridge we were finally producing highly enriched uranium 235 (called Oralloy = Oak Ridge alloy) at full capacity. Out in New Mexico, Los Alamos was building the parts for the two very different bombs; one employing U-235, the other employing plutonium. Out in Utah at an airbase called Wendover Field, specially selected B-29 crews were practicing dropping full-scale, full weight atom bomb dummies called "Pumpkins" to workout free-fall ballistics, and all the firing and fusing problems. Six thousand miles west of California on Tinian Island, near Guam in the Mariannas 1400 miles from Japan, special airfields and the bomb assembly building were being finished.

In July, President Truman was meeting in Potsdam, East Germany, with Churchill and Stalin when he got the word that two atomic bombs, one of each type, were on Tinian Island, assembled and ready to drop. He told Churchill who knew about our program, and gave Stalin a broad hint, and the three issued a final ultimatum to Japan to surrender or else. After Japan's refusal to heed the Potsdam Declaration, history was made with the dropping of "Little Boy," the U-235 weapon, on August 6 and the "Fat Man" plutonium bomb

[4] FYI, p. 8 and Groves, p. 425.

three days later. Japan surrendered five days later. Press releases ended the great secrecy and Oak Ridgers along with all other Americans were thrilled to learn that the most terrible war in history was finally over, one in which an incredible 55 million humans were killed by other human beings, finally ended by two airplanes carrying two bombs.

To reassure some nervous townspeople, the top MED official in Oak Ridge Col. K. D. Nichols wrote on the front page of the Oak Ridge Journal that week that there never had been, nor ever would be, any danger of an atomic explosion with mushroom clouds occurring in the Oak Ridge plants even though the U-235 had been "made" here.

The urgent wartime mission of the Manhattan Project was accomplished. Almost two billion dollars had been spent by the end of 1945: by far the largest–$1,128M (million) on Oak Ridge ($478M for Y-12, $512M for K-25, $27M for X-10, $16M for S-50, and $96M for the town), $390M for Hanford, $74M for Los Alamos, $103M for special materials like U mining, refining, etc.), $70M for University and other R&D, and $124M for other costs. The total through 1945 was $1,890M, and the total for the Manhattan Project when it ended the end of 1946 was $2,171M.

AFTER THE WAR

In 1946, K-25 continued to put more and more of their eventual 3,000 diffusion stages on-stream, and nuclear research went forward full blast at the Clinton Labs (X-10). But at Y-12 where Tennessee Eastman had been the major employer, it was a time of cutting back. Y-12 employment had been cut severely starting in September of 1945, not because of the end of the war, but because K-25 had surprisingly few start up and operational problems as more and more gaseous diffusion stages were put on-stream each month and the quantity of product and its enrichment level climbed month by month.

A major personal good news event of that year for me occurred on August 17th, when Jeanie married me after three years of waltzing around the proposition, or I should say jitterbugging around it.

But the end of 1946 was a dismal one for our town. K-25 finally had enough stages on-line to produce all by itself the needed highly enriched U-235. The much more costly Y-12 process that had produced the U-235 so urgently needed had done its job. So on the day after Christmas, termination notices (giving one week's notice) were issued to 5,600 of the remaining 8,000 employees. January 1947 saw Y-12 down from its 22,000 peak 2 years before to 2,400, on its way to its bottom of 1500. A stirring chapter in the history of the wartime Manhattan Project drew to a close.

The impact on the town was tremendous. At church each Sunday you missed many families and good friends. Top officials and scientists borrowed just for the war from the Eastman organizations in Rochester and Kingsport left, as did thousands of operating employees.

The city population dropped from the 75,000 in August 1945 to 43,000 in September of 1946 and then to 30,000 a few years later, a drop of 45,000 people in five years!! Lots of us college boys had no better place to go. We loved it here, were experts in this unique business, so here we stayed.

The spring of 1947 saw Congress put a formal end to the Army's Manhattan Project and turn the continuing national defense production and the so promising peaceful uses of nuclear power and radioisotopes over to a civilian agency, the Atomic Energy Commission.

K-25 was running full blast and even building more capacity. Y-12 was shut down and in a holding pattern while decisions were being made about their new mission of making weapon parts. The Clinton Laboratories at X-10 were given new life with a new name. With new support for their thriving radioisotope

program, and with expanded support for their well-rounded nuclear research programs, they became the Oak Ridge National Laboratory. The gates of the Secret City were beginning to crack open, but the formal opening of the city was not to come for another two years on March 19, 1949.

REFLECTIONS

A few months ago, on separate visits to distant daughters, I told some of these stories and was pleased to find they were fascinated with the wartime history of our town, even graciously complained about the fact that as kids I had never told them a thing about where I worked and what I did. And they said Our Town had paid a price in that so many of our Boomer kids fled the town after college – wanting to go somewhere to work other than in secret plants they knew nothing about. But they think it's nice that we still live in the old F-house where they grew up, built so long ago in the heat of WWII.

Although we enjoy our old Cemestos home, as many others still do, what is so remarkable is how so very much of our Secret City no longer exists! Think of all that meant so much to our lives and to our wartime success that now is gone.

Gone are the seven, two-story wings of the Army's Castle on the Hill which oversaw not only the operation of the four major facilities and city here during the war, but those at Los Alamos, Hanford, and all the other Manhattan Project programs at industrial firms and universities from New York to California.

Gone too is our fine Oak Ridge High School on the hill above Jackson Square with its auditorium used for community concerts and lectures, and its gym used on Sundays for the worship of at least two churches I know of, Presbyterian and Episcopal. Gone too is our wonderful 300-bed Army hospital and the two story Doctor's building and the Dental Building right off the Turnpike at Tennyson with its peak of 29 dentists in 1945.

Also gone is the much used and abused (and burned down) Central Cafeteria, our much loved Ridge Rec Hall, and those at Grove Center and Jefferson, and all those – can you believe – ninety dormitories, the women's numbered W-1 up and men's M-1 up. I lived in M-3 (where Ridgeview stands) when I first came, and I remember W-2 fondly because that's where Jeanie lived. It stood near where Jackson Plaza stands now.

Gone too are the over 150 miles of boardwalks that served as much needed sidewalks and also wound gracefully through many wooded areas of the town. These were thoughtfully generated from the pine trees that had to be cut during city construction, the Knoxville Journal reported in a 1945 edition.

Also vanished are the vast trailer camps and the Army's Special Engineer Detachment camp where the Mall now is. Gone also is the remarkable S-50 thermal diffusion plant, gone the huge K-25 power plant that generated twice the capacity of Norris Dam, and vanished as well is the whole independent construction town of Happy Valley that sprawled over across the highway from the entrances to K-25 with its peak population of 15,000!

And some nice things in our culture have gone too along with those buildings of our secret city: first and foremost, all those so young, so smart, so cosmopolitan, friendly people who came here from all over the land and were united in a single purpose – to help win the war and stop those terrible reports of battles and bombings we had to read in every day's newspapers. Because there were virtually no natives in Oak Ridge, we were all newcomers, all in the same boat. We got to be real friendly playing "And where are you from?" standing in those long lines everywhere, meeting in rec halls and riding those buses to Knoxville and to the plant. You learned quickly not to say "Now what do you do?"

Also everyone here in the reservation had a job so there were no homeless, no salesmen, no relatives dropping in to see you unannounced. The few old folks in town were maybe 50 years old. There were no obitu-

aries to read in the paper, no funeral home. To get a telephone in your house, your employer had to certify your need for business reasons. Wow, that meant very few of us had phones, and no calls from all those charities or people wanting you to change your telephone service.

True, lots of what you would like to eat or wanted to buy was not available in the stores because of the war, but what you could get had reasonable prices. Here are a few prices listed in the Army's "Guide to Oak Ridge" pamphlet published in September 1946. The coal to heat your house was free, as was pick-up of your furnace's soft coal ashes and your garbage. A room at the city's hotel, the Guest House (later the Alexander), for your parents cost you $3 bucks a night with a connecting bath, $2 if you could sell them on using the "community bath."

Our-even-then-fine Hospital charged $10/day for a private room, but more reasonable was a semi-private for $6.50 or a ward bed for $5 a night! And when your baby came, mom often stayed seven or more days. Gone too is the helpful Maid Service you could arrange for just by phoning a central Roane-Anderson Co. liaison office. They kept a listing of available home workers. You had to agree to hire them for at least four hours work and to pay them fifty-eight cents per hour salary plus bus fare to and from the Maid Service Office.

Buildings, culture, people. All of one purpose, and that purpose fulfilled in an almost unbelievably short period of time. Scientists and engineers, construction workers and operators, inventing and then building equipment and technology to do things no one else in the whole world had ever done before.

So many of their buildings, and so many of them, now nameless heroes who contributed so much to our nation and the world by their secret wartime work here, now all gone with the wind, ghosts in the memory of a vanishing few. Let us remember the thousands who labored in our Secret City and honor their remarkable achievements.

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