View of atom smasher and sign for Westinghouse Research Laboratories.

HHC Detre L&L, Westinghouse records, RSP 484. R&D—Atom Smasher, Box 24, Folder 80, Item 4.
The Westinghouse atom smasher, built by the Westinghouse Electric and Manufacturing Company in 1937, launched the company’s world-changing innovations in nuclear research. The five-story tall, light bulb-shaped structure is the last vestige of the Westinghouse Research Laboratories—though it has admittedly seen better days since being toppled last winter. To the world, the smasher was a pioneering laboratory for one of the first large-scale nuclear physics research programs. To residents of Forest Hills and neighboring Chalfant and East Pittsburgh, it was a vital part of their neighborhoods, connected to the widespread Westinghouse network yet nestled among the small houses of the company-supported Westinghouse Plan.

With the surrounding labs shuttered long ago, the atom smasher is seen as a lone industrial relic, but it is a significant part of the cultural landscapes of the community, of early-twentieth century innovation, and of atomic history. It holds a unique place in atomic history, partly because of its development as a commercial, independent enterprise, whereas many places of early atomic research began as government land takings or isolated university programs, or were enshrouded in Manhattan Project secrecy.

The atom smasher was the first commercially owned Van de Graaff generator in the U.S. when it joined the already well-established Westinghouse Research Laboratories, a spin-off of Westinghouse Electric Company’s large East Pittsburgh manufacturing plant a mile away. Established in 1886, the plant employed thousands by the turn of the century to manufacture turbines, motors, and other electrical generating equipment. A precursor to the Research Laboratories was first established at the East Pittsburgh plant in 1906. In 1916, that research division expanded and moved to the Forest Hills location.
Although splitting functions has become common, at the time, the Westinghouse Research Laboratories was, as one retrospective explained, “the first major research laboratory to be separated physically from a manufacturing location,” seeking to create an environment “especially suited to research endeavors.”

By the late 1920s, 70 engineers were working at the Research Laboratories, organized into sections on metallurgy, magnetics, physics, chemistry, mechanics, and other subjects. While their work was already influential in the technological world, they also made a large impact on the borough of Forest Hills. With many engineers, support staff, and their families, the population of Forest Hills jumped from 1,500 in 1920 to 4,549 in 1930 according to the census. It was estimated that about 90 percent of the residents of Forest Hills worked at Westinghouse in the late 1920s.

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Although the Research Laboratories were notable for being separated physically from the main manufacturing facility, in reality a strong connection was maintained with the plant at East Pittsburgh, with Ardmore Boulevard and Electric Avenue tethering the two facilities and drawing further connections throughout the Westinghouse landscape. Beginning in the early 1900s, the streetcars, sometimes called the East Pittsburgh “trippers” (or later, the “war workers route”), transported thousands of Westinghouse employees.

Managers
and engineers from both locations attended lunches and presentations at each location, being beneficial to all.9 The research personnel were among those on the streetcars; in the early days the Research Laboratories entrance faced Ardmore Boulevard, and the approach was up the steep hillside. Upon arrival they were obliged to climb the "100 steps up to the Lab."10 Such stairs were a common feature throughout the region, as many Pittsburghers know well. But not every lab employee rode the streetcar. Trygve Yensen, Manager of the Magnetic Department, was an avid skier and around 1930 was known to sometimes ski to work using Ardmore Boulevard. Yensen became known for developing Hypernik for transformers, and Hypersil, a major improvement in silicon steel.11

Along with this research productivity, by 1930 new construction was added to the laboratories. The main, original building was doubled (or more) in size. Several new buildings were added to the north of the main building within the property, including a boiler, generator, chemical laboratory, and community building at the corner of Avenue D.12 The Forest Hills library, initially named the Westinghouse Community Library, was housed in the community building from 1925 to 1934.13

From 1930 to 1940 the Research Laboratories—and with it, Forest Hills—enjoyed growth and development, despite Westinghouse employee furloughs resulting from the Great Depression and the developing difficulties of World War II.14 With the pace of research in the nascent field of nuclear physics quickening around the world, the Westinghouse Electric Corporation decided in 1936 to invest in fundamental nuclear research and built an atom smasher, a particle accelerator of the Van de Graaff type. As one of the first private companies to create a division dedicated to nuclear physics research, Westinghouse, according to a 1936 feature article, "set out to do a job that has baffled scientists for nearly a century—the job of disintegrating the atom in hope of solving much of the mystery surrounding the structure of matter."15

Homes were sold to Westinghouse employees at, or near, cost, with a reduction of 10 percent made in the cost after five continuous years of employment.
Westinghouse embarked on this bold research plan two years before the discovery in 1938 of nuclear fission by Dr. Otto Hahn, Dr. Lise Meitner, and Dr. Fritz Strassman after their groundbreaking experiments at the Kaiser Wilhelm Institute for Chemistry in Berlin. At that time there was no known commercial purpose for this cutting-edge technology. Yet the Westinghouse company and its scientists had lofty reasons for investing in the field. Dr. L.W. Chubb, director of the laboratories, described to reporters:

Physicists today are still learning about processes, energies and sequences of operations, which will give nuclear reactions and transmutations of one element into another. By constant experimenting they will learn how to duplicate Nature’s work, how to change elements and how to create new products and processes. Though we do not know where our present work will lead, or exactly what results we shall gain, we know that in this new field are hidden golden nuggets of scientific opportunity.16

The Westinghouse decision to pursue nuclear physics research was a product of an era in which large companies such as Westinghouse, the DuPont Research Laboratory in Delaware, and AT&T Bell Laboratories in New Jersey had the money and facilities to invest in pure research. They did so “to obtain patents that would allow them to stay on the forefront of innovation in new technologies”17 with a view to commercial applications and, of course, profits.

In a 1937 New York Times article, Dr. E.U. Condon, then associate director of research at Westinghouse, explained the new research program: Westinghouse “feels that all research leading to a better understanding of the nature of matter and energy will
ultimately prove of value to the engineering profession, even though its immediate field of application is not apparent.” To advance the research, Dr. Condon started a program of Westinghouse research scholarships in physics. William Shoupp in particular “became a major factor in the early lead of Westinghouse in the atomic field.”

The atom smasher, an engineering challenge in itself, was a five million volt Van de Graaff electrostatic generator operating in a compressed air chamber, within an external tank of welded steel segments, 30 feet in diameter. Scientists used the machine as a source of high voltage for accelerating subatomic particles to high speeds. It operated by transferring electric charge from a moving belt to a terminal, and was capable of accelerating the particles down a vacuum tube at speeds of more than 50 million miles-per-hour to a target 47 feet below. Nuclear reactions were created by this bombardment of target atoms with a beam of high-energy particles. This type of generator produced a very steady voltage as compared to other types of accelerators, allowing for precise measurements necessary for gaining basic knowledge of nuclear physics.

At the beginning of the atom smasher’s research program, some of the results anticipated were the “development of radio active bodies by transmutation of matter; and practical developments in the field of electricity through increased knowledge of the structure of the atom.” The atom smasher scientists began bombarding atoms of lithium, beryllium, and carbon with neutrons and other particles. From this work “the most accurate and complete information to date was collected on the behavior of light-weight nuclear transformations.”

In an era on the brink of the atomic bomb, yet still innocent of it, and before the “NIMBY” (Not In My Backyard) attitude had entered our collective mindset, there was a palpable sense of excitement and optimism surrounding the atom smasher’s construction and its scientific experiments. Following an exhibition for professors and reporters in January 1940, the Pittsburgh Post-Gazette reported, “No super-civilized giants were there, clad in synthe-silk zippersuits…. Ordinary men were there, Wilkinsburgers in business suits—but they performed feats of modern science as amazing as the pseudo-scientific feats of Wellsian fantasy.” Another newspaper reported, “The huge apparatus … will be used for an inconceivable, possibly epic-making venture into the infinities of pure research…. The unique story, as thrilling as H.G. Wells’ most vivid imaginings, is being written daily at the Westinghouse Electric and Manufacturing Company research laboratories.”

During the 1940 exhibition, Dr. Condon reported that research with the atom smasher had so far resulted in “new yardsticks for measuring high voltages in atom smashing, in new information concerning the neutrino, or little atom, and in new insight into the nature of various elements, particularly lithium, beryllium and carbon”; the exhibitions that day also included the Klystron, a machine for “producing and studying ultra-short waves.”

By August 1940, Westinghouse physicists R.O. Haxby, W.E. Shoupp, W.E. Stephens, and W.H. Wells had discovered a new way of releasing the energy of the uranium atom, known as photo-fission. Instead of bombarding atoms with particles like...
Left:
HHC, Detre L&A Westinghouse files. Research - R+D, Box 24, Folder 82.

Right (Above):
Cross section of the inside the atom smasher.
HHC Detre L&A, Westinghouse records, MSP 484, R&D—Atom Smasher, Box 24,
Folder 82, Item 3.

Right (Below):
Novelty atom smasher pen holder.
Family of Harold D. “Whitey” Whitehurst.
neutrons, this process used gamma rays, energy similar to light or x-rays but with much greater penetrating power, to split the uranium atom.\textsuperscript{26} The discovery of photo-fission, as a concrete demonstration of an early theory in the field, was an important example of the kinds of pure research for which Westinghouse’s nuclear laboratory was intended. L.W. Chubb, then director of the Research Laboratories, explained in \textit{Popular Mechanics}: “The discovery does not mean we are any nearer the day when a ship can travel around the world on the energy from a handful of uranium. But it is another fragment of evidence about atoms that may lead some day to atomic power machines or to some other benefit we are not capable of visualizing.”\textsuperscript{27}

The 1940s, a pivotal decade for the world, was likewise for the Westinghouse Research Laboratories. The publication of the photo-fission discovery was one of the last such articles to appear before censorship went into effect when the U.S. entered World War II in 1941. The openness and excitement heard in the first years of atom smashing were abruptly halted. A wartime curtain came down on private nuclear research activities like those at Forest Hills as the U.S. government and military mobilized for the Manhattan Project.

Other areas of the Research Laboratories flourished as engineers and scientists were called upon to give the U.S. military any technological advantages possible.\textsuperscript{28} In 1941 and 1942, buildings were added to house a microwave tube shop and electronics shop, built to aid in the war effort. These were on the Avenue D side of the site, opposite the cafeteria building. The small structure to the west side of the atom smasher, which housed a combustion lab and the mechanics department, was expanded, and an “underground structure” was added at the rear of the original main building. Already present at this time were facilities for a variety of research, many of which contributed important improvements in wartime technology: electro-mechanics, electro-physics, mechanical engineering, metallurgy, chemistry, magnetics, a high-voltage lab, drafting and patent offices, as well as several other offices and labs, and grassy areas throughout the site with horseshoe courts located behind the combustion lab.\textsuperscript{29}

Dr. Stewart Way of the mechanics department made a major contribution to the war effort with his design of a gas turbine jet engine for aircraft based on an axial-flow design. The atom smasher was used during this time as a compressed air tank for some experiments in the jet engine design process.\textsuperscript{30} Way’s design achieved the lightness and efficiency being sought by the Navy for use in very high-speed planes, and ultimately had “far-reaching influence upon future engineering.” (Notably, building the turbine for the engine would not have been possible without the Research Labs’ metallurgists’ 1939 development of high temperature alloys capable of withstanding high temperature and vibration.)\textsuperscript{31}
In this same period, land acquisition and massive construction began at Oak Ridge, Tennessee, in preparation for the Manhattan Project’s work of uranium enrichment for atomic bomb development. It is often said that the Westinghouse atom smasher was not built for the purposes of bomb-making; instead, it was built for research, especially toward practical power-generation outcomes. This is true, but ultimately, it and the scientists who worked there were not entirely without some connections to atomic bomb development. The Manhattan Project called upon some Forest Hills personnel to assist in the work. In 1942 and 1943, Joseph Slepian and E.U. Condon from the Research Laboratories joined a group of scientists, led by E.O. Lawrence of the Radiation Laboratory of the University of California Berkeley, to explore different methods of electromagnetic separation. Several people from the atom smasher group in Forest Hills were sent to join in the uranium separation evaluations in Oak Ridge. Slepian returned to the Westinghouse Laboratories in 1944–1945, where he continued work on evaluating the ionic centrifuge method of uranium isotope separation on a small scale.

General Leslie Groves, director of the Manhattan Project, is said to have visited the Forest Hills facility and met with the scientists there on one or more occasions. Groves was among the delegation for the acceptance test of an ionic centrifuge that had been developed at the Research Laboratories. Although it operated as predicted, the gaseous diffusion method became the chosen method for isotope separation, while the ionic centrifuge method was later eliminated from the U.S. Uranium Enrichment Development program. Nonetheless, this work was an important step along the way in atomic research and development.

In 1947, the atom smasher returned to service as a particle accelerator. Westinghouse physicists launched a new research program to examine the “mysterious force [that] keeps the core of matter from exploding like an atomic bomb,” using the atom smasher to analyze and measure the binding force that holds atoms together and the force required to break them apart.

Three years later, the research complex employed 192 scientists out of a workforce of about 450. Likewise, the population of Forest Hills continued its upward trend, from 5,248 in 1940 to 6,301 in 1950. But the decade that followed brought a different, and in many ways final, era to the Westinghouse Research Labs and the atom smasher. As Westinghouse advanced its work from fundamental research to large-scale commercial applications, activity began to move away from the Research Laboratories in Forest Hills. Westinghouse’s first atomic power application project began in 1948 when the Atomic Energy Commission (AEC), led by U.S. Navy Admiral Hyman
Rickover, awarded a contract to Westinghouse to design and construct a pressurized water reactor to be used as a submarine propulsion system for the U.S.S. Nautilus. Dr. Shoupp, one of the original research fellows on the atom smasher project, was the technical leader for the Nautilus project. To support this work and other nuclear projects for the Navy, Westinghouse constructed the Bettis Atomic Power Laboratory in West Mifflin, less than 10 miles from the Forest Hills labs.

Meanwhile, following President Eisenhower’s “Atoms for Peace” speech to the United Nations in 1953, Admiral Rickover, Westinghouse, the Duquesne Light Company Pittsburgh, and the Bettis Atomic Power Laboratory collaborated to develop the Shippingport Atomic Power Station. Ground was broken in 1954, and the plant began producing power in December 1957, making it the nation’s first full-scale atomic power plant used exclusively for peacetime purposes.37 Westinghouse also created a new atomic power department specifically for commercial applications. In August 1955, Commercial Atomic Power Activities (CAPA) was commissioned and housed at the Westinghouse Research Labs, again with Dr. Shoup serving as its technical director. The U.S.S. Nautilus launched on January 17, 1955, later becoming “the first craft to traverse the underside of the north pole,” completing that voyage at Pittsburgh, Pa. The Westinghouse vision of pure fundamental research leading to practical uses had indeed materialized.

By the late 1950s, the Pittsburgh region was home to six Westinghouse nuclear power facilities, including the Forest Hills research site — now CAPA. As Westinghouse engineers advanced the peaceful use of nuclear power with the Shippingport reactor, this built upon the theoretical research program that had been started at the atom smasher in Forest Hills.

Although Paul Rand’s famous Westinghouse “W” logo was added to the atom smasher after it was designed in 1960, and several new buildings were built around this same time, the decline of the Westinghouse Research Laboratories was fully in motion. In 1955, Westinghouse moved its research activities into a million-square-foot Research and Development Center in nearby Churchill, and the atom smasher was permanently shut down in 1958. The Forest Hills site remained in use for a while, with CAPA, and later, the Atomic Power Divisions, then in 1967 the Transportation Systems Sales, Engineering, and Control Departments moved in.

About 15 miles to the south in Large, on Route 51, another Westinghouse nuclear group, the Westinghouse Astronuclear Laboratory (WANL) was established in July 1959 following the success of the Shippingport power plant. WANL participated in testing during the 1960s at the Nevada National Security Site (NNSS, formerly known as the Nevada Test Site), a major U.S. location focused on nuclear research and testing. This location was established in 1950 at the Army Air Corps training area known as the Las Vegas-Tonopah Bombing and Gunnery Range to collect scientific and military data regarding nuclear weaponry and other uses of detonations.43

From 1951 through 1992, more than 900 nuclear tests of several types were conducted at NNSS. In addition to detonations of nuclear devices, mainly conducted at the locations of Frenchman Flat, Yucca Flat, and the Pahute and Rainier mesas, other research focused on radiation experiments and the application of nuclear energy for space exploration. Westinghouse’s nuclear physicists participated in the nuclear rocket experiments conducted here. The WANL, in collaboration with Aerojet General, developed the “NRX-A series of rocket test engines based on an 1120 mega-watt Westinghouse reactor” for NASA under the Nuclear Energy for Rocket Vehicle Applications (NERVA) program between 1959 and 1971. The nuclear rocket engines were successfully ground tested in the Jackass Flats area in the southwest corner of the Nevada Test Site.

The NNSS’s better-known, vivid evidence of nuclear testing, which looms large in the popular imagination, includes scenes like a motel reduced to concrete and twisted steel reinforcement from an above-ground blast. Other remains include a bank vault with its steel reinforcement exposed and the remains of a replica Japanese village, reduced to mere frames from radiation from an unshielded reactor. Artifacts of testing and analyzing equipment are found in some areas. The Sedan Crater, which was created during
tests for peaceful uses of nuclear blasting, was the first feature of the NNSS to be listed on the National Register of Historic Places.45

“Nuclear landscapes are landscapes of fear,” wrote P. Goin in his landmark photographic study, *Nuclear Landscapes*. The environmental dangers and the potential for “mutually assured destruction” are vivid and terrifying. But unlike the charred desolation of the NNSS, or the former industrial expanses of Shippingport or the Clinton Engineer Works in Oak Ridge, Tennessee—images of which dominate the popular perceptions and histories of the atomic era in the United States—the Westinghouse atom smasher and its landscape is strikingly different. The small research facility grew as a part of its community with origins and goals unlike most atomic facilities. In its own era, it symbolized the promise of technological innovation, inspiring awe and wonder rather than fear. Its very location, built within a residential neighborhood (with which it had a positive relationship), is an artifact of that optimism—and perhaps naiveté—of the years just prior to the wartime detonation of the atomic bomb. In the recent past, the atom smasher garnered pride, admiration, and even affection: a writer for the 1969 *Forest Hills Golden Jubilee* commemorative booklet proclaimed, “At this historic location [the Westinghouse Research site] passed a parade of so many great scientists, inventions and significant ‘happenings’ that a separate history book would be needed to cover the subject…. Our ‘World’s First’ … the atom smasher (1937–38) must top the list!”46

A view of the property of the former Westinghouse Research Laboratories from North Avenue in Chalfant during demolition, December 2014.

Bowman sisters on Avenue A (in the Westinghouse Plan area) in the early 1950s, about one-tenth of a mile up the street from the atom smasher. Their father, Pierre D. Bowman, was a Westinghouse engineer who worked, for a time, at the Forest Hills site.

Collection of Pat Bowman Katsilas.
Despite the former successes of the place, Westinghouse made its final layoffs from Forest Hills in the mid-1980s and in 2004 several of the older research buildings were demolished. It has received official recognition of its historical significance several times. The atom smasher was dedicated as an Institute of Electrical and Electronics Engineers’ (IEEE) Electrical Engineering Milestone in 1985. In 1987 the American Society of Metals International (ASM) designated the Research Laboratories as an ASM Historical Landmark. A Pennsylvania State Historical marker was installed in 2010, helping to promote its significance in both Pennsylvania and engineering history.

Preservation efforts for major sites of the Manhattan Project are under way as our nation attempts to address the many issues surrounding nuclear weapons development. In December 2014, President Obama signed into law the 2015 National Defense Authorization Act, thus authorizing the creation of the Manhattan Project National Historical Park. The National Park Service unit will include properties at Los Alamos, New Mexico; Oak Ridge, Tennessee; and Hanford, Washington.

At first glance, this small atomic research facility in Forest Hills seems to have little in common with those elements of our atomic heritage in terms of scale, complexity, and secrecy—but they all share a heritage of connected research and discoveries. The major atomic heritage sites are central to the development of the atomic bomb and to our historical understanding of those events. But there is a much more varied story to be told outside of the Manhattan Project. The Westinghouse atom smasher and Research Labs wrote a part of that story, in which scientists sought to unlock knowledge for productive use in industry, for sustainable forms of energy generation, and for scientific discovery leading to unforeseen technological innovations.

For nearly 80 years the giant light bulb-shaped atom smasher stood on the edge of Forest Hills as the area’s charismatic symbol of early atomic-era progress. But as this Westinghouse site changed and evolved over the last century, change has come again. P&L Investments purchased the 11-acre property of the former Westinghouse Research Laboratories in 2013. By January 2015 all the remaining buildings were demolished and the atom smasher was knocked to the ground and left in an extremely vulnerable situation.

Prior to its demolition, the Westinghouse atom smasher was the most visible artifact of Westinghouse’s early, prescient commitment to nuclear research toward practical industrial uses. It is in the direct lineage of Westinghouse’s pioneering work in naval and rocket nuclear propulsion and commercial nuclear power applications. Today, nearly half of all the commercial nuclear power plants in operation were either built or designed by Westinghouse engineers, and Westinghouse is now engaged in constructing a fleet of new AP1000 reactors. These accomplishments stand alongside those of the other departments at the Westinghouse Research Laboratories, which also provided the world with numerous important inventions. In the Pittsburgh region, it helped Forest Hills to build houses, community facilities, and even the swimming pool that has been a highlight of summers for decades. It had equally as much impact on the residents of
Chalfant next door. The atom smasher, as an iconic symbol of the Westinghouse legacy, is significant to local people as a part of their families’ mid-twentieth century experience, creating a distinctive community history while fostering Pittsburgh’s reputation for industrial innovation.

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“Atom-Smashing ‘Cannon’ Near Completion at Plant Here.” Pittsburgh Sun-Telegram, Wednesday, July 7, 1937. Thanks to Ed Reis, Heinz History Center Westinghouse Historian, for providing a copy of this document.


Willis L. Shirk, Jr., personal communication, 18 February 2013. The author thanks Mr. Shirk for useful discussions and sharing his expertise on the Westinghouse nuclear topics.


By 1939, researchers attained a steady potential of 4,000,000 volts, the largest steady voltage ever applied to a vacuum tube up to that time (Phares 1941: 79).


From “Westinghouse in Atomic Power” pamphlet. Thanks to Ed Reis, Heinz History Center Westinghouse Historian, for providing a copy of this document.


From “Westinghouse in Atomic Power” pamphlet.


Meanwhile, the borough’s population had grown steadily until the 1970s. From 1970 to 1980, the population of Forest Hills declined by 14.3%, and it has continued to decline ever since, with a population (according to the 2010 census) of 6,518.


Kintner, quoted in R. E. Peterson, “Recollections of the Research Laboratories on Ardmore Boulevard.” 1980, p. 8. Box 164, folder 17. Thanks to Ed Reis, Westinghouse Historian, for providing a copy of this document to me.


Sanborn map, 1930.

HHC Detre L&A, Records of Forest Hills Public Library, MSS #214.

After its large increase in population during the 1920s, the population of Forest Hills increased again, to 5,248 in 1940.