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Mr. Howard's home in Moristown Tenn.

on the date(s) of April 1, 1995

for the oral history collection being compiled by Dr. Marshall.

Manly Howard
Interviewee's signature

Address 725 Mohawk Dr.
MORISTOWN TENN.
Phone 615-581-7453

Date 4-1-95

Chris Smith
Interviewer's signature

Address 70 Aniston Bch. Rd
Lot 22 Aniston 01.36201
Phone 205-435-7367

Date 4-1-95

INTERVIEWEE BACKGROUND INFORMATION

Name: MANLY HOWARD M/F Male

Address: 725 MOHAWK DR. MORISTOWN TENN

Phone number(s): 615-581-7453

Approximate age or date of birth: 76 yr of age March 21 1919

Mother's Name: Constance Long Howard

Father's Name: Mike Lawrence Howard

Places lived and when: ALBERMARLE N.C. 1919-1930 Thomasville NC,

until 1936, Chattanooga Tenn. 1943, Oakridge Tenn. 1947

Education: East Tenn State graduated 1941 BS. Chemistry

Religion: Babstist

Business, political and social memberships (past and present) Amer. Chemist Society

Present occupation: Retired

Former occupations: Chemical Engineer

Special Skills: Speed Reader, Improving ^{Profit Margin} Quality of Production

Major Accomplishments: SAVED 5 MAJOR CHEMICAL

PLANTS FROM CLOSING, 7000 jobs saved

National Events in which interviewee has participated: N/A

Local Events in which interviewee has participated: N/A

National born U.S. citizen? Yes No

Naturalized Citizen: Yes/No Date: N/A

Country from which he/she emigrated: N/A

Documents, photographs, and artifacts which are in the possession of the interviewee:

N/A

Individuals recommended by the interviewee who might be candidates for an oral history interview: N/A

Additional information: N/A

BACK AFTER 1976 UNTIL PRESENT MORISTOWN TENN 1946
BRAZIL ARGENTINA 1966 to 1976
INDIA 1976

South America

AND CHEMICAL PLANTS

CONTENTS

ENV. HIST
CLASS, 1995
(Marshall)

MANLY HOWARD
by Chris Smith

DOB - 3/21/1919

- East Tenn. State U. grad. Chemistry
- worked nuclear ind.
- Oak Ridge, TN
- ENV. ISSUES, POLLUTION
- work for Inka Corp - synthetic fibers
- consultant to chem. ind. S. Am + world

**ORAL HISTORY INTERVIEW WITH MANLY HOWARD
CONDUCTED BY CHRIS SMITH ON APRIL 1, 1995, AT
MR. HOWARD'S HOME IN MORRISTOWN, TN.**

**DR. MARSHALL
ENVIRONMENTAL HISTORY
APRIL 4, 1995**

CHRIS SMITH



**ORAL HISTORY INTERVIEW WITH MANLY HOWARD
CONDUCTED BY CHRIS SMITH ON APRIL 1, 1995, AT MR.
HOWARD'S HOME IN MORRISTOWN, TN.**

Environmental History has led me to perform an oral history interview with Mr. Manly Howard on the first day of April 1995. The interview was conducted at the home of Mr. Manly Howard in Morristown, Tennessee. The topic of the interview is Environmental factors that Mr. Howard has observed and participated in that have influenced the environment around them. Mr. Howard was born on March 21, 1919 in Akron, Ohio. He is the son of Michael Lawrence Howard and Constance Long Howard. He graduated from East Tennessee State University with a Bachelor of Science in the field of Chemistry. Mr. Howard is currently retired and enjoying a relaxed lifestyle with his wife Etta Eloyce Johnson Howard, also known by her loved ones as "Georgia". The couple have been married for fifty two years and have three children, four grandchildren and two great grandsons.

Mr. Howard began his discussion with a description of his earliest recollections of pollution. He remembers when milk and ice were delivered to peoples homes by horse and wagon People placed cards on post beside the road to let the driver know how much milk and ice to leave. The horses

seemed to know where to stop by seeing the cards on the road side. People piled their garbage upon the side of the street. When the piles got too high they were picked up by the horse and wagon and taken to the dump. At the dump the garbage was sorted through and what was useful was salvaged. The rest of the garbage was burned and the unburnable amount was left to decay on its own.

When a society is dependent on upon horses to maintain a lifestyle, manure was spread up and down the street. English sparrows lived off of the undigested grain in the horse manure. It was not uncommon for hundreds of birds to clutter the street.

Some houses had gas tanks which were connected to a gas stove inside their kitchen. To use the stove one had to deposit money in a slot in the rear of the stove.

Sewage was not considered a major problem back then. Raw sewage was dumped directly into a predetermined creek. Every one knew not to drink, bathe, swim, or fish in this creek for ten or twenty miles downstream. The location of the industries was determined by its proximity to a water source. Water was pumped from the river and used in the mills. The waste from production was dumped into the same river a little further down stream. Mr. Howard remembers a discussion in his fifth grade reader that talked of the "ultimate solution". The town of Charleston, South Carolina contained two water ways the Cooper River and the San Hill River. One river was designated as a clean

water source. The second river was condemned to water pollution. There was no limit in the amount of what type of chemical waste was dumped into it.

Chemical, steel, textile, and copper industries ruined air quality for several miles around. The production of copper released copper sulfide oxide into the air. Mr. Howard visited Copperhill, Tennessee in the early forties.

Everything inside the town and for miles around looked like the surface of the moon. It has been rumored that two states, Georgia and Tennessee, argued upon who was to take this town. Smoke stacks were raised hoping to release the toxins into the jet stream to be carried away. Down town began to grow back in only a few years, but a huge baron doughnut began to form where the by-product returned back to earth. After World War Two the sulfuric acid which could be sold for a profit and eliminated the problem.

The production of sodium hydroxide and chlorine a salt molecule to be separated by electrolysis. The electrode used in this separation was mercury. The mercury was dumped into streams where its excessive weight took it to rest on the bottom. A 1987 issue of *National Geographic* picks Cubatone Brazil as one of the most polluted towns in the world. Mr. Howard visited Cubatone while working in Brazil. He said that people walked through the streets holding handkerchiefs over their faces. The people living in the city considered this pollution to be a way of life. Mr.

Howard felt that the government sacrificed a whole generation of inhabitants to emerge into an industrialized nation.

Mr. Howard's experience working with Hercules explosives and being associated with the Dupont Powder Company led him to discuss pollution and safety in the work place. Before World War Two Mr. Howard worked with Hercules explosives making TNT and dynamite. He talked of incidents dating back to the 1800's where entire buildings were blown apart killing countless numbers of workers inside. Dupont, a company that originated in France, developed a way to control safety in the workplace. It became mandatory for the manager and top executives of the plant to move their families inside the parameter of the corporation. This practically eliminated life threatening explosions and the improper handling of chemicals potentially hazardous to the health of people and to the environment. Dupont was so proud of it's accomplishments that each institution had a sign hanging over the exit of the building as you are walking out that read "Be careful, you are entering the most dangerous part of your day".

The potato originated in America and was introduced to the first Spanish and English explorers. Potatoes seemed to grow well in other parts of the world as well. It became the staple food source for the Irish people. A potato blight

swept through the land wiping out the potato plants. Some starved, the rest were forced to relocate.

The cotton plant , which thrives in the Southern states, was once threatened by the Boll weevil, a beetle that lives off of the cotton plant. The bollweivel migrated from Mexico and devastated cotton production in the entire south. Scientist later discovered a method of producing a cotton plant with a Boll strong enough to prevent the beetle from eating through. The Chestnut blight was caused by a moth that came from the Orient. It wiped out and practically eliminated all of the Chestnut trees. The Elm tree blight, that came from Europe, killed thousands of trees throughout the United States.

Mr. Howard remembers traveling through a town in North Carolina during the "Dust Bowl Days". Cattle was shipped there from the western plains by train. He saw cows so malnourished that you could count their ribs. This was because the soil was blowing away because of poor agricultural practices. He experienced the red glow in the air. Strip farming and contour plowing became necessary to maintain fertile soils due to erosion. Mr. Howard thinks that erosion is a major problem in the world today. He says that all the dams built by TVA are filling up with silt. He predicts that one day the water will be replaced by silt. Mr. Howard's degree in chemical engineering exposed him to many dangerous and toxic chemicals. One plant, where Mr. Howard formerly worked, each year the toxic chemicals

were piled by the river banks with the intentions of properly disposing of them. Procrastination seemed to take its toll on the plant each year. In the spring the river would flood and wash their troubles away.

The job Mr. Howard enjoyed the most in his life was the development of the atomic bomb. He was drafted into the military during the war while working at the Hercules Company making various explosives for the cause of the war. He was given an option to go in as a GI and make fifty nine dollars a month or enlisting as a civilian and making four hundred dollars a month. He was told that he would be working in Oak ridge, Tennessee and to report there in three days. He was hired in on a Saturday in 1943. The town was nothing but mud. The United States Government had moved people out of the area and completely cleared it off. People were living in tents. Mr. Howard and his wife slept in their car for several days before deciding to send Georgia, his wife back to her home in Summerville, Georgia. While at the bus station Mr. Howard ran into an old girlfriend who invited the couple to stay with her until their apartment was completed. They informed him that he would be working on the atomic bomb and that his work would be top secret. Mr. Howard remembered reading, while in college, about two German scientist named Hahnz and Stasman who developed a way to create energy by bombarding Uranium with slow moving Neutrons. It was estimated that one pound of Uranium could produce the

scattering the radioactivity in a wider area. He also made it clear that he felt that the bombs were necessary.

Teddy Roosevelt order that the bomb was to begin production with the intent of it never being used. When he died Truman took over office and he ordered that the bomb be dropped. It was rumored that during a meeting with his cabinet the majority voted not to drop the bomb saying that it was too cruel. Truman overruled their decision and the bomb was dropped.

While in college Mr. Howard received free training to become a pilot. The United States had been pushing for disarmament. We had few planes, ships were in mothballs. There were only two explosive plants in operation before the opening of the plant in Chattanooga, Tennessee. One week before Chattanooga was scheduled for start up one of the two original plants exploded.

Mr. Howard was in charge of starting up the Chattanooga branch. He was on call twenty four hours a day and was given a new 1941 Chevrolet. This was a luxury during a time when cars were not being made. The best plane that America had at the beginning of the war was called the Buffalo. It's heavy protective armor around the cock pit made it slow and awkward. It was no match for the speedy Japanese Zero fighter plane. The Zeroran a circle around the slower Buffalo, shooting at it's engines and propellers bringing down the plane and killing the pilot. The pilot never had a chance against the enemy. Mr.

amount of energy produced by 2.5 million pounds of coal. The major problem with creating atomic energy was the separation of Uranium. There were three processes developed to separate Uranium 235 from Uranium 238. The first process is the Thermal process, the lighter Uranium 238 would rise due to the heat. The second process was the barrier filtration process. This process required plants to be built as large as a square mile. The gas was forced through filters where only the smaller Uranium 235 could fit through. The third process was the electrode magnetic process used to create the atomic bomb which was dropped on Japan. this process enclosed a huge magnet the size of two city blocks. When building the Magnet they ran out of copper wire and used silver from Fort Knox to complete it. There were three bombs created. The first was tested in the Los Alamos desert. The second two were dropped on the cities of Hiroshima and Nagasaki Japan. Destination of the bomb was tricky. It was necessary to compact enough Uranium 235 in a small enough space that it would reach it's critical mass, the result of Uranium isotopes being bombarded with free moving neutrons. Once the critical mass was reached the bomb would explode . The most important part of the bombs success required getting the plane out of harms way before the destination. Mr. Howard adds that the bombs dropped on Japan were " dirty bombs" , they exploded in the air

Howard believes that arming up for World War Two was the first and last time America worked together as a United Nation with a mutual goal. All car manufacturers and industries were converted over to producing war time needs such as; ammunition, planes, and ships. There were plans for a third explosive plant to be opened after the start of the Chattanooga plant. A train stopped in Chattanooga twice daily to pick up the explosives that were completed. Mr. Howard was responsible for cutting down the production cycle time from 1.5 hours to a mere 40 minutes this doubled production. This production increase in production made it possible for the plans to build a third facility be canceled.

Mr. Howard remembers being in New York on December 7 in 1941 when Pearl Harbor was bombed. He was attending a Chemical Exhibition held at Time Square. Mr. Howard was sitting in a cafe when the announcement came across in lights on Time Square. He told himself that the world would never be the same. The US. began to black out coastal cities in fear of providing easy nighttime targets for enemy naval vessels.

While in New York The French passenger liner " The Normandy" was being transferred into a military personnel vessel. Either by misfortune or German sabotage the ship burned and capsizes in the harbor.

When asked about the recent reports of radioactive pollution effecting Oakridge, Tennessee. Mr. Howard had

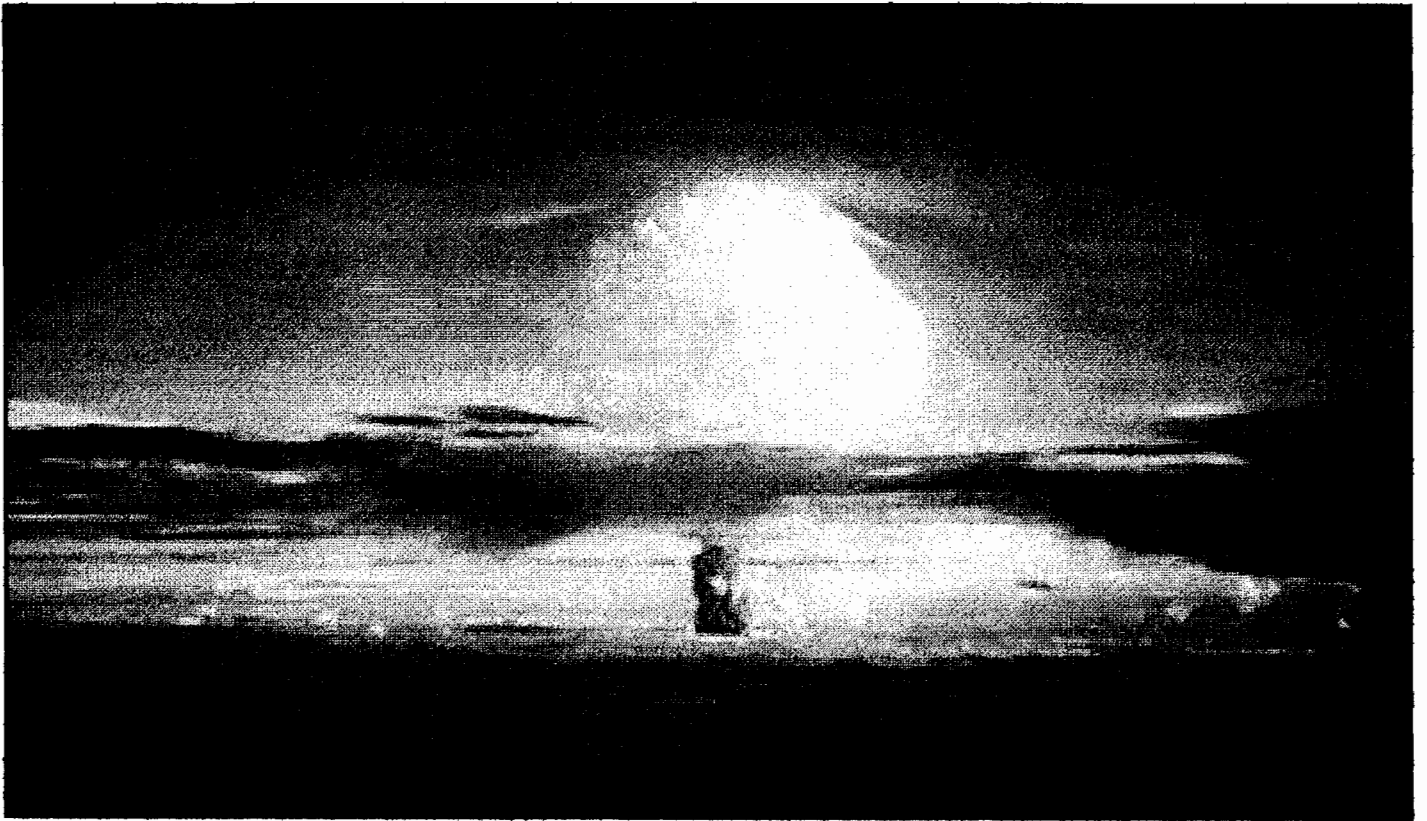
this to say "We thought we were being careful but now I know that we were very careless." They wore badges containing photographic film. Each week the badges were collected and developed. Any employee that had invalid film was dismissed from work for a predetermined length of time. He talked of the improper handling of hazardous chemicals. Some materials were dumped on to the ground and some into the Clinch River. Reports of radioactivity are still present in the silt located at the bottom of the river. Mr. Howard then remarked " Where is a safe place to put it, the United States had a fear of anyone else possessing atomic power, this brings the pollution to the US."

When asked how he feels about recycling Mr. Howard recalls when people first started to recycle. People would bring Coca - Cola bottles in for a deposit. Zinc tubes were used for storing toothpaste and other products. The government asked people to return these tubes when they came to buy more.

After the war Mr. Howard went to work for the Inka Corporation Making synthetic fibers. One afternoon he received a call from Francisco Methisoriaso who was in London England at the time. He wanted to set up a meeting between himself and Mr. Howard. He offered to pay for Mr. Howard's plane ticket to New York for a meeting. Mr. Howard had to decline the meeting because of previous arrangements. A few weeks later, Mr. Methisoriaso called back to set up a meeting in Memphis, Tennessee. They

met in Memphis and spoke with the help of an interpreter. He explained to Mr. Howard that he owned a rayon industry in Brazil that was facing closure if the profit margin did not increase in six months. He said that Mr. Howard had been highly recommended and asked for his help. Mr. Howard refused to work for him full time but agreed to take a look at his company and see if it could be saved. Mr. Howard flew to Brazil during Thanksgiving and found the problem. The two reached an agreement that Mr. Howard would take his vacation and return to Brazil for two weeks and try to get things on track. He returned to Brazil on January 3 which was a Friday. By the following Tuesday he had the plant production almost doubled. He then went to Argentina to take a look at another plant and corrected it as well. He returned to the United States without receiving any payment. After not hearing from the guy for a few weeks, he chalked the whole ordeal up as an experience. Within two more weeks he received a payment that was doubled the agreed amount. Mr. Methisoriaso continued to pay Mr. Howard to not work for his competition. The amount that he received not to work was more than he received to work at his current job. *a deal*

After his youngest daughter graduated from college Mr. Howard and his wife moved to Brazil to work full time. Within then years he made enough money to retire. At this present date he is still retired and living in Morristown, Tennessee.



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I will outline the development of the Atomic Bomb as I remember it.

This information is 56 years old and from memory.

After graduating from collegeⁱⁿ fall of 1941, I was working in Chattanooga on various explosives. One day I was called into office and told that I would work at Oak Ridge. They would not tell me what I would be doing or what we would make. I was selected because of courses in theoretical ^{physical} chemistry I took in college.

I remembered a brief note in college that atomic energy could be produced from U_{235}^{92} an isotope of U_{238}^{92}

In 1939, 2 Germans, Hahn and Strassman reported that when they bombarded Uranium with slow moving neutrons each U_{235}^{92} atom would split into 2 parts of approximately same size and several neutrons. These neutrons could then split other U_{235}^{92} atoms causing a chain reaction. A pound of U_{235}^{92} could produce as much energy as 2.5 million lbs of coal.

The problem to this cheap and plentiful supply of energy is that

$U \frac{92}{238}$ stops the reaction by absorbing the neutrons.

The $U \frac{92}{235}$ (0.7%) would need to be separated from $U \frac{92}{238}$ (99.3%). Each was ^{exactly the} same except $U \frac{92}{235}$ is slightly smaller and lighter than $U \frac{92}{238}$.

Einstein, Fermi, and Lawrence and others that I have forgotten developed 3 processes that might be used.

Two were relatively simple but production was slow. The other was faster but more complicated.

All three processes depended on making a gaseous compound from the Uranium. They found that $U Br_6$ and $U Cl_6$ would sublime - change from solid to gas at operating temperature.

1 Thermal method

Pass $U Br_6$ gas through a series of tall ^{horizontal} towers. The $U \frac{92}{235}$ being lighter would rise faster and enhance at top. This process was not developed.

2 Barrier Filtration.

Force $U Br_6$ gas through porous diffusions barriers of large areas.

The U_{235}^{92} being lighter and smaller would go through quicker and be enhanced. The buildings were almost a mile long. This process was slow but less expensive. This process proved to be more practicable after the first bombs were made.

3 Electro magnetic separation

In this process the Uranium gas was ionized ^{bombarded with electrons} and projected at high rate of speed by electrical charge through a very strong magnet. This reaction was carried out in very high vacuum. The ionized Uranium would be put into a circle by the strong magnet. The U_{238}^{92} being heavier would make a bigger circle and therefore the U_{235}^{92} could be collected in a separate box in the smaller circle.

This process required two steps to gain a pure enough product for the bomb.

After the U_{235} was separated and purified, it was still necessary to make the bomb.

As previously stated, if a slow moving neutron hits an atom of U_{235}^{92} it splits the atom into 2 equal atoms and several neutrons. If any of these neutrons hit other U_{235}^{92} atoms this starts a chain reaction. If the mass was small and not compact, then neutrons would escape and the chain reaction would stop.

How ever, if the surface area decreases as the mass increases, also, if the mass becomes more compact; then the reaction gets out of control - a nuclear explosion - as in Russia.

Compare this to ^{the surface of} a block of ice. If a block of ice is broken into small pieces there is much more surface.
melts quicker.

This brings us to the important point of critical Mass

Critical Mass is the point where the surface area is too small to allow the escape of excess neutrons. This is the point of explosion, when the escaping neutrons are reduced to a point that Auto-Catalytic-Fusion occurs almost completely

The atomic bomb was designed so that more than the critical mass was contained in a bomb shell, but separated so that no where was the critical mass exceeded.

To detonate the bomb, it was necessary to compact the U_{235}^{92} atoms into a small enough space that exceeded the critical mass quickly, so that the nuclear explosion would be complete.

This operation was called implosion opposite to explosion. This was a difficult and delicate part of making the bomb.

As history tells us every part of the making of bomb was successful

There was another process to make the atomic bomb that I was not connected with - the Plutonium bomb.

In this process $U \frac{92}{238}$ is bombarded by high velocity deuterons. This produces a new element Neptunium $Np \frac{93}{239}$

$Np \frac{93}{239}$ has a short half life of only 2.3 days, and converts to a new element plutonium $Pu \frac{94}{239}$

$Pu \frac{94}{239}$ can be handled the same as $U \frac{92}{235}$ to make the bomb.

I understand that Breeder Reactors use this process to make electricity. In this process more fuel is made than used. Theoretically an inexhaustible supply of fuel.

U = Uranium

U $\frac{92}{238}$ atomic number
atomic weight

U $\frac{92}{235}$ isotope of U $\frac{92}{238}$

Np Neptunium - man made element

Np $\frac{93}{239}$ atomic number
atomic weight

Pu Plutonium - product of decay of
Neptunium

Pu $\frac{94}{239}$ atomic number
atomic weight

Half life - Time for half of atoms
in a mass to decay to
half of the weight
Radioactivity.

Critical Mass - Mass weight at which
auto catalytic fission
will occur
For U $\frac{92}{235}$ only 0.01% of
the weight of atom is
used to explode the bomb.

implosion - Opposite to explosion
The mass of atom is
compact.