

Carl Francis Swinehart 1907 - 2004, An Autobiography

Carl Francis Swinehart - Synopsis

Background

- **Parents:** Rev Francis Marion (Mel) Swinehart D.D. from near Rushville, Fairfield County, Ohio and Amanda Ellen Betz from near Baltimore in Liberty Township, Fairfield County, Ohio
- **Born:** August 26, 1907 in Bainbridge, Ross County, Ohio and moved to Athens at 5 weeks old
- **Family:** three sisters, Ruth, Lucille and Gertrude
- **Hometowns:** Athens, Greenfield, Bellefontaine, Findlay, Cincinnati (Madisonville), and Defiance all in Ohio [He attended Western Reserve University in Cleveland for his Graduate training and stayed in Cleveland/University Heights from his graduation in 1933 - 2004].

Education

- **Preschool** – Ohio University Experimental School – Athens, Ohio
- **Public Schools** – Greenfield, Bellefontaine, Findlay
- **College:**
Findlay – 1 year
Ohio Wesleyan Univ, Delaware OH AB - 1929
Western Reserve Univ, Cleveland OH Ph.D. - 1933

Married – Mina [Wilhelmina E.] Daus Ph.D. Nov. 28, 1934; Two Sons, Richard James and Thomas Warren

Employment:

- Summer Jobs:
Miller Auto – Bellefontaine
Cooper Tire – Findlay
Giant Tire – Findlay
Dalton Adding Machine – Cincinnati
U.S. Post Office – Cincinnati
Graduate Assistant, Chemistry, Cleveland College
- Harshaw Chemical Co. 1932 – 1972
- Consultant 1972 – 2001

PART I

The four children in our family were Ruth, Lucille, myself and Gertrude spaced 2,6 and 2 years. In many ways we paired off 2 + 2. In time and schools it was Ruth – Lucille, Carl Gertrude, but in interest and temperament it was Ruth - Carl and Lucille - Gertrude, the latter married brothers upon graduation from Ohio Wesleyan. All the children and father graduated from Ohio Wesleyan. Mother from Ohio Northern. Father, Ruth and mother are buried in Delaware which

was chosen as a family center since father was moved at 2 to 6 year intervals from town to town in the church work.

Father (Rev. Francis Marion Swinehart) started in the old Ohio Methodist Conference that changed back and forth to West Ohio. At some point the conference merged so he ended up in the Ohio Conference.

His ministries included Wesley Chapel, Columbus, Portsmouth Ohio, Broad Street Columbus; Nahant, Massachusetts (while in divinity school in Boston); Bainbridge, Athens, Greenfield, Bellefontaine, Findlay; Madisonville (Cincinnati) and Defiance. After his death in Defiance, Mother lived with my sister Ruth in Columbus for many years and was well known in the King Ave Methodist Church congregation. Ruth taught for many years at Evert Junior High and had many devoted student friends.

My childhood starting in Bainbridge, Ross County, we moved when I was 5 weeks old to Athens where we stayed 6 years (1907-1913). All moves being in the late summer, August or September after the Methodist Conference.

In Athens, I started kindergarten at Ohio University in experimental classes. Because Gertrude was a persistent tag along she also was included in the class though she was two years younger.

Young memories included bobsled coasting with other students down the hills in Athens for I could ride back up the sleds being pulled by a horse. I was fascinated by the tin smith's trash where I was able to retrieve many discarded manuals. A real treasure to a young boy.

The spring flood of 1913 was an awesome sight remembered for the roofs of chicken coops floating by with chickens on the peak. At Athens, Father dedicated a new church and conducted a large men's Sunday school class. His watch was a Christmas gift from the class in 1910 and in later years, he was called back for funerals by close ties made in Athens.

In 1913, we moved to Greenfield and lived there four years until 1917. Here we experienced the start of World War I. Being close to the large Chillicothe encampment we had a soldier billeting in our house for a time.

In Greenfield, we lived in two houses. At the first, which was across from a large church, I was standing in the front door when lighting struck the church and a ball of fire sizzled around in the front lawn.

Next to this house in a small commercial building may have been the start of animated movies for though the windows I watched the drawing and operation of what later became the elaborate Disney production. Also near this first house in Greenfield there was a head on collision between two doubleheader freights at the edge of a trestle. One of the refrigerated cars was loaded with eggs and children from five families came out of this car completely covered with egg as they salvaged.

We moved closer to the church in Greenfield and it was here I remember the parsonage turned

into a candy factory one Christmas during World War I. Sugar was hard to get and the congregation contributed an accumulation of ¼ pound sacks which the woman's group turned into candy for a Christmas bazaar.

There were a few cars in Greenfield one of these went to the west coast and back with some Greenfield air still in one or more of its tires, quite a feat for the period 1913 – 1917.

Mother spoke German before English and Father knew a Pennsylvanian Dutch version well. Speaking German at home was discouraged during World War I. Ruth took the subject in High School but it was discontinued at that time also.

In school I watched the construction of the new high school with amazement. The building was of advanced architecture for the time. It was donated to the town by Mr. E.L McClain, founder and owner of the American Pad Co. who made horse pads and had interests in the textile mills supplying the Greenfield factory. My mother became a close friend of Mrs. McClain who followed our family in later years.

Another important industry in Greenfield made office furniture for the U.S. Post office for the classification of mail.

The move from Greenfield to Bellefontaine was made by van rather than by train. We still had the basement full of crates and barrels needed for the move by rail, but they were discarded after reaching Bellefontaine.

In Bellefontaine, we lived at two places with my older sister going off to college and to teach. I carried the Toledo Blade and remember being called out of school by a telegram about a special edition that came too late to sell.

We raised chicken and rabbits and had good sized gardens (my first experience with eye drops to escape the bright sun I crawled into a corn shock and stayed the rest of the day.)

We rented our barn to a man for his Model T Ford. I enjoyed watching him take it all apart and reassemble the transmission with the planetary gear assembly.

We got our first car in 1919, a Buick touring car with side curtains. In Bellefontaine, we had our first encounter with a tree. Father to avoid the trouble of holding his foot on the accelerator had used the hand throttle out in the country but at the first corner in town it was too much speed. Mother went through the windshield, but the car suffered only a dented bumper.

In 1922, I became interested in radio through a group at the high school. We made crystal receivers and cluttered the air with spark coils made from Model T ignition coils. We could hear KDKA and Arlington time stations. Later I got a tube and father started to take the radio seriously in 1924 with the reception of the election returns. He was interested in election and in the temperance movement in particular.

During the winter in Bellefontaine most of the cars were placed on blocks and the people used

buggies or sleighs. Often a buggy would be seen pulling three or four sleds hitched on with a long single rope that the boy would let go if he wanted to drop off. We would hitch rides up the road to the high point in the State and coast most of the 2 ½ miles back to town.

Even though the town is near the highest point in Ohio, its water came from artesian wells that made quite a gusher when uncovered. The water came from subterranean caverns that feed an underground river running from Bellefontaine to the Blue Hole near Sandusky. Findlay and other towns tapped this underground water supply. Its source is said to be at least 250 miles west but of may not be known to everybody.

In Bellefontaine, I worked as a water boy to keep the concrete pours wet down during its setting one summer. Then in the paint shop of Miller's factory. They made wooden hearses and racing cars. Hearse bodies were assembled and painted, then placed on chassis driven down from Detroit. Later in Findlay, we saw many of the chassis being transported to numerous shops through out the state for special purpose vehicles, hearses, trucks, fire engines etc.

Our second house in Bellefontaine was an elegant palace for a minister's family. Hot water boiler with an automatic damper control system. Hard wood floors, bird's-eye maple wood work, burlap wainscoting and an intricate floor plan. Entrance, front parlor, parlor, dining room, study, kitchen and pantry were on the first floor. It was close to a public park where the tall trees in the fall were an overnight stop for migrating black birds. The neighbors all had boards with ropes which would make a loud bang on their front porches. The clatter at night from their boards was more than the from the birds clatter.

A joint project of all the Protestant churches in town brought Billy Sunday to a specially built tabernacle tent for a revival meeting in Bellefontaine.

I also remember in 8th grade teacher for his interest in Whittier' poem "How strange it seems with so much gone of life and love to still love on". This he said reminded him of a man he knew that had one kidney removed. Actually this teacher himself had one artificial leg.

Both from Bellefontaine to Greenfield each summer the family went back to Fairfield County visiting Aunt Jenny Watson and the Powells [Mom's sisters]. For a number of years we camped a week or so at the Lancaster Camp Ground. Here I can recall hearing William Jennings Brian more than once. He could be heard all over the grounds without the benefit of any speaker system that was unheard of in that day.

The move to Findlay was an easy trip by van and car as were the rest of the moves later on. With high school and one year at Findlay College made Findlay more of a hometown for me than the others. I worked as a grocer delivery boy driving a Model T wagon that never had any excess gas. Sometimes I would have to drive on the left side to get the last drop for returning to the store.

In summer I worked at Cooper Tire and Giant Tire Company at various jobs from driving a test car to building tires. Cooper Tire started making cord tires and balloon tire designs. Also at the two there was a start at rubber reclaiming, a cooking process that interested me in chemistry.

One neighbor had a then antique Star car which he would not drive himself but would hire me to drive for his wife. His name was Cole and his wife a Dukes. Most of the land around Findlay is owned by either a Cole or a Duke. Once someone asked a young lawyer, Rep. Cole, if he was any relation to the senior partner Senator Cole in their law Firm. He replied yes, they were brothers but only slightly related as they had been 21 children between them. Also they were of different political parties.

Another neighbor, Helen Barns, took an interest in our family and would show my sisters her attic of old dresses. She had traveled the world over in YWCA work and had many strange art objects. In her house. I recall best her many layers of oriental rugs. She was an interesting person being active for her age. Once on one trip she appeared in Columbus with her cloths in shreds from battery acid. She had turned over her car in route but came on to the meeting.

Father was a delegate to General Conference in Springfield Mass in 1924. He, mother and Gertrude went there for about a month by car. I came by train when school was out. I stopped in Niagara where I saw the Queenston Power Plant being assembled. Taking the belt line around the rapids I had stopped to inquire about seeing the plant only to be turned away. But while waiting on the next car, an engineer and his daughter came and identified himself well enough to command attention and a special treatment. I was invited to join the group and got a wonderfully detailed view of the plant with generators in various stages of assembly.

From Springfield on July 4th, we went to Boston saw the parades in town afternoon of red coats and minute men. From there we visited the east coast New York, Philadelphia, Washington and Home. From Washington, Ohio (Pa??) to Findlay we had 5 flats to fix. They had all been new for the trip. That was the end of fabric tires for our experience. Cord tires from then on would last 10,000 miles instead of 4,000 to 5,000 for fabric. Philadelphia had one traffic light in a tower downtown, when red all traffic stopped at the nearest intersection to let the cross town traffic go. They could not see it but had to judge from the main street traffic or corner police.

That was a great trip and about the only one outside of Ohio we took as a family. After Lucille was married, we went to Rainelle, West Virginia several times, but this was not the touring for the sake if sight seeing variety.

Our second parsonage at Findlay also on Sandusky St. was the only newly constructed house we lived in. It was of new architecture with virtually no front porch. In the basement there was a walled off cistern for soft water and a special pump. This pumped cistern soft water using the force of the city water mains. (no savings of water but mother liked the soft water.) In each house one of my jobs was to clean out the cistern. Water softeners were almost unknown. We did learn of them in Findlay, but it was too new and expensive for our budget.

Our two years in Cincinnati [Madisonville] came while I was at Ohio Wesleyan. I worked in the post office and at Dalton Adding Machine getting valuable experience with screw machines that has helped me in later years. At Madisonville, father finished construction of a fine large church building.

From helping traveling artisans with work on churches I learned something of:

Organ construction at Bellefontaine
Book binding at Bellefontaine and Findlay
Redecoration at Bellefontaine and Findlay
Construction at Madisonville.

At OWU [Ohio Wesleyan University] I roomed in several homes and boarded with a group of 20 – 30 men at Mrs. Blair's. Her house was almost over to the woman's campus and for two of the three years I roomed at the north turnaround switch of the Dinky street car which operated through town on the interurban line. This made for a lot of walking. I walked rather than wait for the car. This was good conditioning for the winter work as a mail carrier in Cincinnati. We traveled by bumming rides also called thumbing from motorists to shows in Columbus to out of town games and home for weekends. My roommates and I each logged 10,000 miles one winter term.

We moved to Defiance the same fall I started graduate work at Western Reserve University , 1929.

Gertrude finished at OWU in 1930 and was married that June in Defiance to Lucille husband's brother Ed. Lucille and Dick had been married in Findlay. She had become acquainted with Dick Raine through her roommate at OWU, Pegg Raine. Now Gertrude became interested in flying advances in commercial airlines administration, but he also flew a friends plane and came to Gertrude's wedding. This was quite an event for the Defiance airstrip to have a visitor's plane land.

To reach Defiance from Cleveland I generally took the fast mail train to Toledo to make the connection on the Wabash. The New York Central 20th Century Limited left about the same time, but the mail train was faster and made the connection. It only stopped at Lindale (for change form electric to steam) Toledo, Elkhart, South Bend then Chicago. 8 a.m. EST – 2p.m. CST. On one occasion it started late with the holiday rush mail and made up 20 minutes in the 2 hour run to Toledo.

In December 1930 or 1931, we had a big snow storm when getting off the train in Defiance things looked normal until I stumbled over the top of a fire hydrant in the beaten path while walking home from the station. That winter a fleet of Cord autos came out from Detroit to demonstrate in the Defiance snows how well the front wheel drive would function. They really got around where other cars had trouble. No snow plows were available anywhere. The Model Ts with high wheels did quite well and were easy to move with a hand shovel if necessary, but the Cords were of advanced design and a wondrous car.

Traveling in town was like running a streetcar system. If you choose the right set of ruts you went ok, but you could not get a second choice. On New Years Day that winter I drove further to a funeral near Athens and experienced the change in climates across the state. From water filled ruts in the snow at home to shirt sleeve audience in the small country church near Athens in one day.

PART II

Skills and Experience

Vacation jobs involves painting hearse bodies, building tires, running screw machines etc helping in laboratory work and the application of chemicals in industry.

A continuing interest in electronics helped in every work project I can remember. This started at age 14 making radio with galena crystal receiver and source transmitter then advances to a one tube regenerative set which made neighbors sets squeal. My father considered radio a kid's toy until in 1924 he listened most of the night for election returns with head phones changing stations across the country to California.

As a student in astronomy at Ohio Wesleyan Univ. and while the first large telescope after World War I was being constructed and at Western Reserve Univ. close to Case where the old Michelson-Morley interferometer was still being operated, I learned a number of details about optics, grinding lenses and large instruments. Years later (1972 – 80) this experience helped me with large windows of forged sodium chloride for lasers. We use a very large interferometer to test these windows, 18" in diameter, for flatness and optical uniformity. This is set up on a table top that weighs over 1,000 pounds. To avoid vibration this floats on four air cylinders. Morley's floated on mercury.

I produced and studied gases containing silicon chloride and fluorine for my Ph.D. thesis. This work carried over to Harshaw making for sale ten new gases in cylinders, tank trucks and tank cars as containers. We worked on a method for producing these safe handling and containers conforming with ICC regulations. After calculating safety disk size and thickness for a tank truck I asked to rise a test run to feel the surge of liquid allowed for equations. The test was with water but the driver knew he would be carrying acid. I remember the ride, he made sharp turns and quick stops hitting holes in a large cinder lot. Liquid runs forward then back then forward hitting the ends hard several times five seconds apart at each stop. The disks held then and in service since but I was so confident with that first bump but knew it was ok by then of the ride.

In recent years an acquired skill in reading infrared spectra for inorganic salts and minerals has helped on many problems like identifying the grade of brick for a speck the size of a pin head in a big salt crystal. Most solids give an infrared spectrum that is as unique as finger prints are for individuals.

Experience from graduate school in explaining the strange results students found in qualitative analysis laboratory was a start for the kind of questions that came up every day.

Work at Harshaw and Patents

This was like two separate jobs then a third.

1932 to 1960 in research and development for fluorides and inorganic products with special problems for plating, ceramics, catalysts and the Manhattan Project for the atomic bomb feed stock

1960 to 1972 research and development for crystals and electronic products. First at three

locations E. 97th St and Prospect Ave, Cleveland and Elyria then in 1969 –70 moved into a new plant on Cochran Rd. in Solon, Ohio
1972 – 2004 consulting for Harshaw and its owners in succession, Kewanee Oil, Gulf Oil, Harshaw/Filtrol partnership.

Attached is a list of U.S. Patents for which I am the inventor or co-inventor

Most of these were taken out as a defense against our infringing on another patents and any chances of claims in the future. The 17 year period for exclusive use or royalty generally was all passed before the product developed a real place in the market. As a defense the value of a patent containers.

“Frosting Mixtures” from my first patent after 50 years are still used by glass plants to frost bottles, bulbs, tumblers, plates etc. This invention developed out of a series of visits to glass plants in Lancaster , Newark, Niles, Mt. Pleasant, Corning etc to learn what problems they were having in using Harshaw hydrofluoric acid. Old recipes for satin frosting made solutions using some ammonium carbonate plus acid etc. Carbonate from this ammonium carbonate seems to be the agent giving the satin finish but it soon decomposes in acid. The finish would become coarse long before the solution could be consumed. I made frosting mixtures from materials that do not change in acid. The finish looked the same as it was used and the solution could stand a long time if there were no parts to frost. Glass from different plants can react at different rates especially when it is colored. From each prospective customer for frosting mixture we asked for a number of samples of their glassware. These we tried in different solutions to get the finish needed. Also testing life of the solution by skipping pieces over and over in a small volume. From this laboratory work we had frosted ware left over after sending back examples to the customer. Some of these plates or tumblers could still turn up at home but after 50 years most of them have been broken or discarded.

Failure Turned Success

In 1957, I made over 100 small crystals of lithium fluoride adding various amounts of 52 other elements. We hoped to find a scintillator that gives a quick flash of light when hit by an x-ray or gamma rays from radioactivity. Some of the lithium atoms, Li-6, have a good cross-section for stopping neutrons which was also a reason for so many trials but the search failed.

Fortunately I still had many of these in 1962, when Dr. John Cameron and Prof. Farrington Daniels from the Univ. of Wisconsin asked why one old sample of lithium fluoride crystal was thermoluminescent and others were not. From tests both in Cleveland and Madison Wis. on the retained crystals and new ones with better proportions of activators we soon duplicated the desired crystal. See my patent 3,320,180.

Thermoluminescent materials (TL) give a glow of light when warmed after being exposed to UV, X-rays, gammas or neutrons. Energy making this light can be trapped in the material for thousands of years as electrons that were knocked out of place. On warming these jump back to their old orbit of lower energy giving light.

Daniels, US pat 2,616,051 in 1952 used TL in several ways to measure exposure to radiation dosimetry. Cameron had the job of certain x-ray machines used on people in Wisconsin by

measuring the dose the patient would get for each picture. He made a reader for the TL material but could not get a response from new crystals of lithium fluoride in 1962. The reader worked very well when Daniels found the old crystal from before 1952.

Cameron then demonstrated that the TL active lithium fluoride was an especially good dosimeter for measuring how much the human body would absorb.

Harshaw produces a number of TL materials but lithium fluoride is still the best for personnel badges and is now used the world over as TLD-100, TLD-600 or TLD-700.

Some others are TLD-200, $\text{CaF}_2(\text{Mn})$, $\text{CaSO}_4(\text{Dy})$ and lithium borate glass.

Harshaw also makes readers both manual and automated and a number of different card holders for clipping to the clothing. Enclosed literature describes these readers and a sample card is included.

The cards have two crystals chips in a heat resistant transparent plastic. One chip is TLD-600 to measure neutrons plus gamma and the other TLD-700 gammas only. Holes in the are for identification. After heating the chips in the reader, the card can be used again many times.

TLD badges, cards in a plastic holder are worn by workers who expect to get some radiation and need to know the total amount per month or year. They may be x-ray machine operators, metal weld inspectors, sailors in nuclear ships, operators off nuclear power stations etc.

In 1979, after the emergency shut down of the nuclear power plant at Three Mile Island, Pa. Harshaw quickly sent extra readers, three technicians for several months and 5000 cards just to handle the mob of reporters, inspectors and VIP visitors. This was in addition to their already established TLD system for plant workers.

Some automatic systems have been in service a long time but after the trouble in 1979 they have become common and are connected to computer storage to save time and to have a complete record for each individual

Looking back the TLD development started from a strange series of errors and failures that turned into success. It was helped along by many individuals and needs were not at first evident.

As an interesting side line for TLD readers that draw glow curves (light vs. temperature) they are used to date small pieces of ancient pottery back to the time when the clay was fired.

Manhattan Project (atom bomb) and AEC (Atomic Energy Commission)

On Dec 5, 1941, two days before Pearl Harbor day, Dr H.C. Kramers and I took an order for 50 pounds of uranium hexafluoride from the Bureau of Standards in Washington DC.

This work was soon combined into the Manhattan Project by the Army Corps of Engineers. Then after the war AEC took over and Harshaw operated Area "C" in the Cleveland plant for AEC

until 1954, 13 years later.

Both research and production were involved. Security was tight. We were not told anything about the atomic bombs or power but were given all the help possible on our problem. I and others visited laboratories in Washington, Johns Hopkins, Columbia etc. and monthly meetings in New York on specific subjects.

Some of this is described in an article in the company paper, attached, but one experience was quite a surprise. My trip to Oak Ridge July 1 – 19, 1945.

Instructions were to take the night train from Cincinnati to Knoxville Tn. On arrival walk away from the station to the end of the platform for a ride. Once in the gate and after trip to various places the large population and size slowly became evident. The higher hills screened it all from the outside.

I had an apartment near the Holiday Inn and there were tent cities, trailer towns and barracks. A bus system carried 50,000 passengers a day going out to plants 10 to 20 miles.

Streets were paved but the mud during construction must have been something else. I was at Oak Ridge when the first bomb was tested in New Mexico on July 16, 1945. I knew the men quite well but heard nothing of the test or progress until after Japan was bombed in August.

Harshaw's work with uranium compounds went back many years producing ceramic colors. Popular orange Fiesta ware plates used a uranium color. Uses for uranium and thorium were restricted during the War and one of Harshaw's projects was to look up former customers for these ceramic colors. Getting any of them back by exchange or as a health measure but not the real reason.

PART III - Editor's Notes on Carl's Later Years

In all Carl F. Swinehart was named as the sole or co-inventor on 34 U.S. patents with 4 received while he was in his 90's.

Carl's contributions to the field of material science and crystal growth technology produced significant improvements to the quality of life in the 20th century.

When Carl finally did "retired" and after he had his first stroke, he began research on the Effigy Mounds of Ohio blending his knowledge of Astronomy, Chemistry, TLD (dating techniques) and historical perspective to give new theories to explain the mysteries of the mounds. His passion then moved on to proving that the "Shroud of Turin" was indeed the burial cloth of Christ. See some of his writings at <http://www.swinehartgeo.com/carlswinehart/index.html> A complete set will eventually be available.

A gentle and kind spirit, a genius, loving husband, devoted father and "grandpa", who loved the Lord, lived a full and rich life until he was taken home on 8 February 2004.

