

APPANOOSE TO CONNECTICUT

Paul Edward Waggoner.

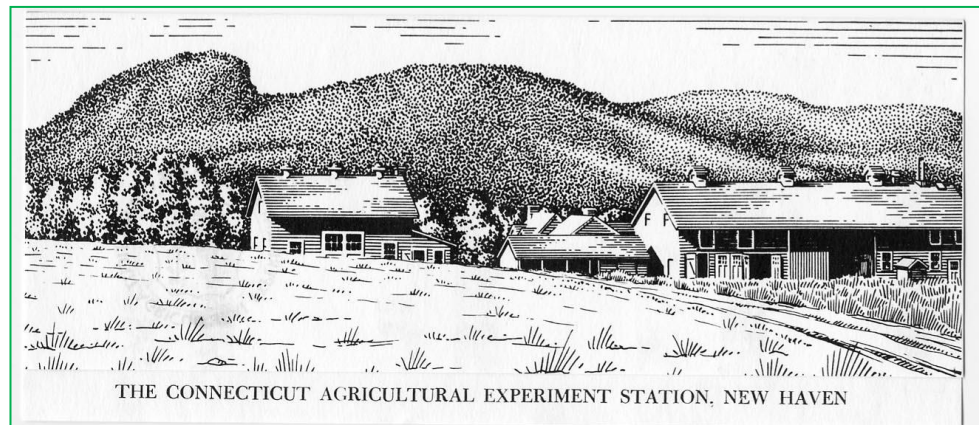
December 2011

The names of Sauk chieftain Appanoose and the Pequot name for the long river Connecticut frame my life--- so far.

A surveyor separated the Iowa territory from Missouri after a Nineteenth Century political decision. In 1843 the territorial legislature drew a boundary around 496 square miles of Iowa north of the Missouri border and named it for Chief Appanoose.

Eighty years later on March 29, 1923, I was born in my grandmother's house in the community of Exline in Appanoose, but my parents Kathryn and Walter promptly carried me to the county seat in Centerville.¹ I abbreviate these details by saying that I was born in Appanoose, a more distinctive name than Exline and far more striking than Centerville. The distinctive name allows me to drop County and call it simply Appanoose.

After nearly three decades in Iowa, with only a few years detour into the Army, I crossed a divide in both North America and my life. East of the divide lay Connecticut, the state named for the Pequot's long river.



On the first of July 1951, I began working at The Connecticut Agricultural Experiment Station in New Haven, where I can still retreat into an office among the books and papers accumulated during a half century of science. I can visit the Lockwood Farm in Hamden, where hybrid corn was invented about the time I was born, and where I experimented from 1951 to 1987. The backdrop for the Farm is the ridge of the Sleeping Giant. Or I can descend to my home office, look out through the adjoining greenhouse, and tap away at this memoir framing my life from Appanoose to Connecticut.

My memoir tells how I grew and prepared to cross the divide from Appanoose to Connecticut. It tells about my upbringing. I'll relate the thrill of seeing new places, as when a teen-ager from Iowa, I first saw water so wide the far shore was out of sight; it was Lake Michigan. I shall tell of schooling in Iowa, about three colleges, and about weather forecasting in the US Army Air Corps. Also tell about finding Barbara Lockerbie in Wisconsin. Barbara and I started our family in Appanoose with Von Lockerbie and completed it in Connecticut with Daniel Maring. And chapters tell about my research at The Connecticut Agricultural Experiment Station. The present version tells details until I became director of The Station in 1987 and summarizes the years 1987 until the

present, 2011. First, however, what was Appanoose like when I was born, and how did my ancestors get there?

APPANOOSE



The 1837 Treaty with the Sauk and Foxes signed at the end of the Black Hawk War lists among the Sauk, “Appan-oze-o-ke-mar, The Hereditary Chief, (or He who was a Chief when a Child,)”.²

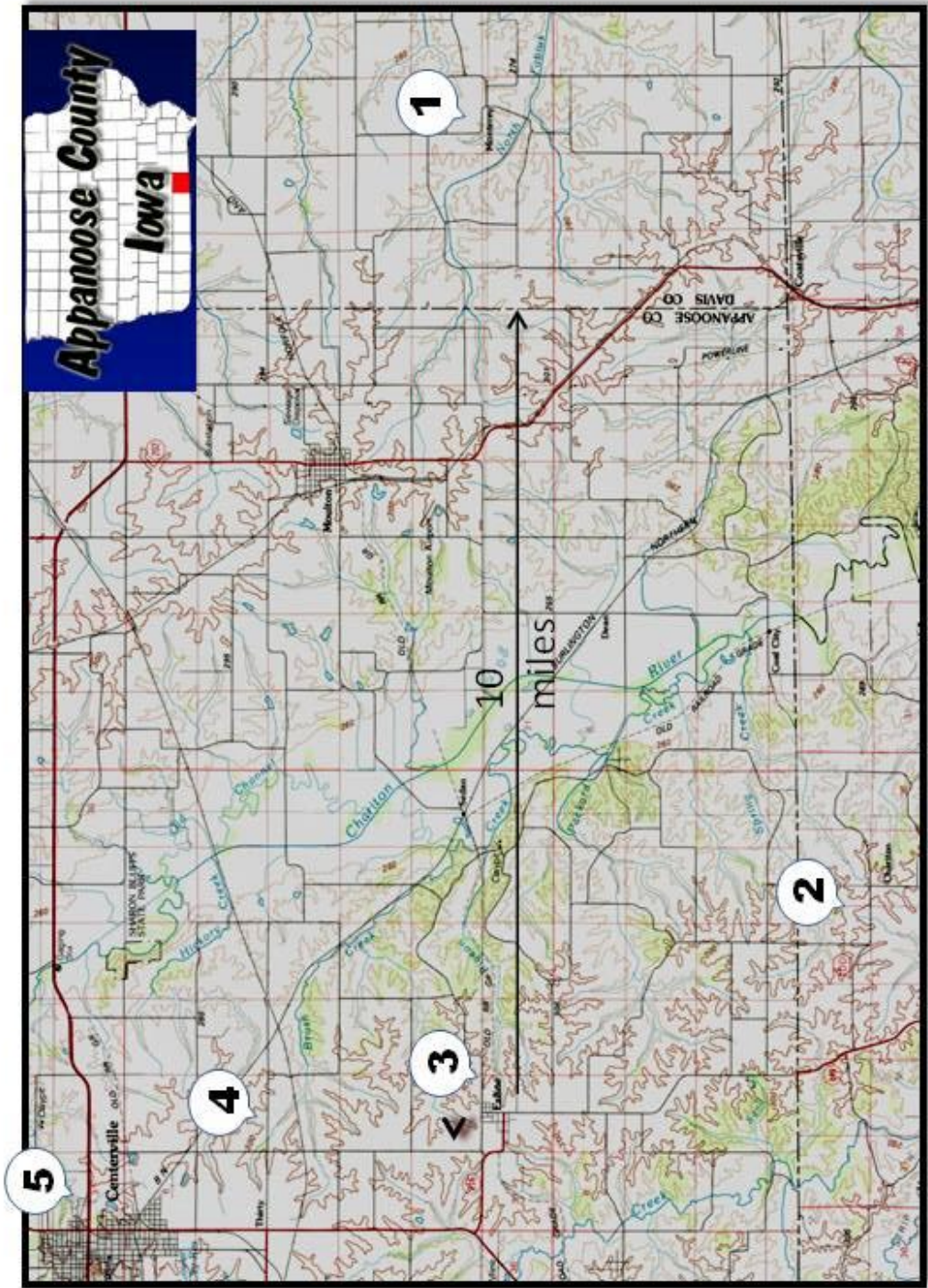
The nearby map locates the county named for him. Because my story will stray east into Davis County and south into Putnam County, Missouri, the map shows the topography of parts of three counties. I include Davis County to the east where my father Walter Loyal was born and Putnam County to the south where my mother Kathryn Marie Maring was born. The Chariton River bisects the map. Numbers identify places mentioned in my tale, beginning with 1 for my father’s birthplace, and 2 for my mother’s.

My great grandfather Amon brought the Waggoner name from Virginia to Davis County, just east of Appanoose. Before he migrated, the 1840 US Census found Amon in what the Civil War transformed into Lewis County, West Virginia. Sixteen years later, the 1856 Iowa Census tallied him in Davis County, Iowa. Portions of the two censuses nearby help visualize Nineteenth Century census-takers, riding nags and trudging to farmhouses, dipping a pen in an inkwell, and filling out a form to record the Waggoners.

Amon and his family from Virginia were typical settlers in southeastern Iowa.³ A University of Chicago professor advised by another University of Chicago professor plus three Noble laureates studied Appanoose because it was on the frontier in 1850, did not develop a significant city, and had few foreign-born residents. This scholarly overkill from the University helps tell my story. White settlement of Appanoose began shortly after the county’s southern lands were ceded to the United States by the Indian treaty, ending the Black Hawk War--and Abraham Lincoln’s brief army career. After disputes between Iowa and Missouri, including Missouri authorities arresting an Iowa sheriff for infringing on their lands, Appanoose borders were finally drawn in 1850. Many streams fringed by timber crossed Appanoose. Its early population quadrupled from 3 thousand in 1850 to 12 thousand in 1860 and on to 16 thousand in 1870. Although its 1850 population density of six people per square mile was well over the two per square mile defining the frontier, neighboring Wayne County on the west still had less than one person per square mile. No town in Appanoose had as many as two thousand in 1870. The first railroad arrived in 1869.

Like one in eight of the 1860 Appanoose inhabitants, the Waggoners came from Virginia plus what would become West Virginia. Also like many others, their family was fairly large and headed by a father near 40 years old. Although two-thirds of Appanoose residents in 1850 moved on within a decade and were replaced by new immigrants, the Waggoners stayed put in neighboring Davis County. Although not wealthy, Appanoose residents were improving their lot faster than the average American of the time.³

Only 4% of the Appanoose people were born outside the United States. Many who moved to southern Iowa before the Civil War came from Virginia, and the newer states of Ohio, Indiana, and Kentucky.



Appanoose and adjacent Davis and Putnam counties.
1-Monterey, 2-Chariton, 3-Exline, 4-Ten Acres, 5-Hatchery.

AMON LEAVES VIRGINIA FOR APPANOOSE

One hundred and fifty-one years before I migrated east from Iowa in an under-powered Plymouth pulling a trailer overloaded with a refrigerator and other possessions, the Amon Waggoners migrated west from Virginia. In 1850 mother, father and eight children left Mare Run, which the Civil War separated from Virginia and placed in West Virginia.⁴ Amon was 40, wife Elizabeth Cox Waggoner was 35 years old.

Perhaps with money from the sale of his land, Amon bought passage on the Ohio River on a steam boat, the Belle of the West. Tragically, travel by boat was dangerous; boilers exploded, and steam boats burned.

On May 17, 1850 the Schenectady *Reflector* editorialized:

AWFUL DISASTERS

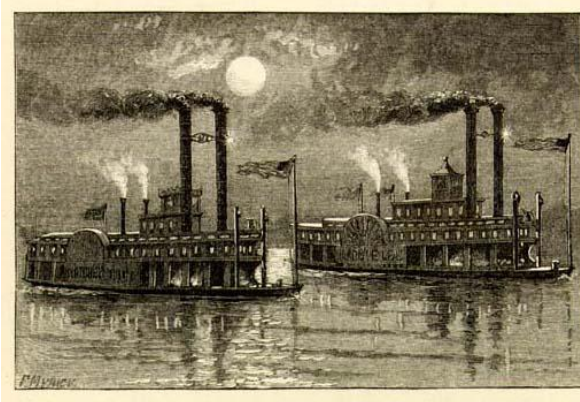
We have never before been called on to record so awful destruction of human life on the western waters as since the opening of navigation, the current season. The disasters to steamboats already number four of which two have been by explosions of boilers- the TROY on Niagara river and the ANTHONY WAYNE on Lake Erie- one by fire the BELLE OF THE WEST the Ohio river, and one by collision, the DISPATCH and COMMERCE on Lake Erie, The loss of life by these four calamities as near as can ascertained, will not fall short of Two Hundred and Fiftv! Two hundred and fifty human beings sent into eternity in this brief space of time by steamboat accidents! Were they accidents beyond the power of man to foresee or provide against. If so what perils encompass the traveler at every step of his journey, in these days of Improvement and. science! ⁵

On March 1 the Cincinnati *Daily Dispatch* had provided specifics about the Belle of the West:

AWFUL STEAMBOAT DISASTER--DESTRUCTION OF THE BELLE OF THE WEST

Our city was thrown into gloom on yesterday afternoon, by the arrival of the heart-rendering intelligence that the steamer "Belle of the West," on her way to St. Louis, from this port, was burned to the water's edge, on Monday night about 12 o'clock, two miles below Warsaw, Ky., and in all probability from fifty to one hundred persons had perished in the flames. The Belle had on board one hundred registered cabin passengers, not including a number of children attached to families, whose names were not registered, and on deck there were about one hundred emigrants and others, whose names had not been taken down. The boat was fully freighted, and had on the luggage and moveables of numbers of emigrants, and some forty or fifty persons on their way to California. The fire was discovered in the hold by the smoke issuing from aft the hatchway, and is supposed to have been occasioned by carelessness in leaving a candle burning. Prompt efforts were made to suppress the flames without giving the alarm, but the fire gained so fast that the officers and crew were compelled to yield to it. The engineer called to the pilot, through the trumpet, to run the boat ashore, which was immediately done and the alarm given. The greater portion of the passengers being asleep in their rooms, the officers of the boat rushed into the cabin, into which fire and smoke had already commenced pouring, and those who could not be awakened by the alarm were dragged from their beds. The doors were burst open; numbers who were insensible from fright were carried out by the crew, and, in fact, as we have it

from an eye witness, all connected with the boat periled their lives to save those on board. The boat was totally enveloped in flames, fore and aft, in less than four minutes, and amidst the crackling roar of consuming fire, the shrieks of the helpless, the doomed to certain death, were distinctly heard--the voices of men, women, and children; mothers, fathers, and offspring--mingling in the roar of death and horror. The steamers Hermann and Useter brought up a number of the survivors, and a portion of the freight that was saved. The houses in Florence were filled with the sufferers, and every attention to their comfort was bestowed by the citizens. The register of the boat was saved, but the contents of the iron safe, including the money, etc., were destroyed. The Belle of the West was commanded by Capt. James. Mr. Salsbury, of Hanging Rock, who was on board--a deck passenger--says he knows of two families, one consisting of four and the other of seven persons, who perished; they were from Pennsylvania. Numbers leaped over board and were drowned, while others were awakened too late to escape the horrid death which surrounded them. The scene, as described by Mr. Thomas Rutherford, of this city, who, in company with Thomas Lawsen, had retired to his berth but a short time before the alarm was given, was awful and heart-rending.



The officers of the boat repairing to the cabin, upon the first alarm aroused the passengers by knocking at each state-room door. In a moment all was confusion and disorder beyond description. Shriek upon shriek broke upon the midnight air. Mothers in their night dresses, with babes pressed for safety to their breasts, rushed to and fro in frantic agony in search of other loved ones of their flock, whom they sought to save. Every part of the boat was filled with the dense and suffocating

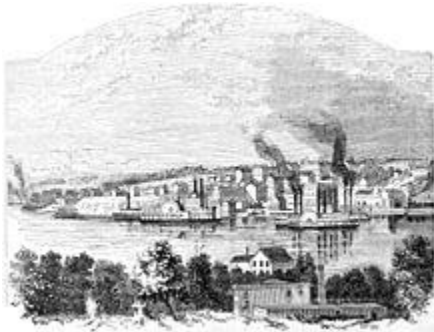
smoke which had been so long pent up in the hold, where the destroying element was preying on the vitals of the ill-starred steamer. The lurid flames shot up through the thick smoke in tortuous windings like fiery serpents enveloping their victims, amid whose agonizing cries the demoniac crackled and laughed in mad mockery and direful derision. Many in the insane fright of the moment leapt into the water from the hurricane deck, their egress being cut off below, preferring to stem the current of water to the current of flame; others jumped overboard from the guards and the after part of the boat; some saved themselves by swimming ashore, while others only escaped the fire to perish in the water. The bow of the boat only struck the shore, the stern swung round, the boat struck, and the only chance was in reaching the shore by the bow. So great was the rush of deck and cabin passengers that many were prevented from saving themselves through that channel. Many were jostled and trampled upon, and so rapid was the progress of the fire that, notwithstanding the communication with the shore, it is estimated that not less than from fifty to one hundred passengers perished by fire and water. The Louisville Journal says: "We have heard some thrilling incidents attending the great calamity. Of a family of a man named **Amon Waggoner**, of Virginia, consisting of himself, his wife, and eight children, three children were lost, a daughter of 17, another of 13, and a little son of 4. They were on their way to Iowa and lost all they had. About 50 German Moravians from near Lancaster, Pa., were on board, and many of these lost children and other relatives." A young lady, in her

endeavor to escape, had gained the hurricane deck, and was observed clinging on to the casing of one of the chimes, but unable to retain her clasp, she sank down amid the flames, and was seen no more.⁶

Forty seven years later when wife and mother Elizabeth died at age 83, her obituary said:

The ill-fated boat on the Ohio River, in which they embarked, one night while all were sleeping, suddenly took fire. An awful scene followed. A hundred people imprisoned in that burning boat perished in the flames. Three of that number were children of Father and Mother Waggoner, one daughter, grown to young womanhood, another daughter of 13 or 14 summers, and a little son of but three tender years. Five of their children were saved from the awful death. Weeping and with hearts almost broken they again took up their journey westward.⁷

Undefeated, the parents and five surviving children likely boarded another boat. They likely landed at the communities of Keokuk or Ft. Madison in Lee County the southeastern tip of Iowa bounded by the Mississippi and Des Moines rivers. The picture shows Keokuk fifteen years later in 1865.⁸



In 1853, Keokuk outfitted Mormons on their way west. Samuel Clemens' visits with brother Orion in Keokuk inspired Mark Twain's stories of life on the Mississippi. Earlier in 1842 and before John C. Breckinridge became vice president and ran for president against Lincoln, he practiced law in Burlington, Iowa. During his life in Iowa, he joined a "buffalo hunt" with nearby Sauk and Fox Indians. At a council meeting he saw mighty chief Keokuk standing on a mound and recalled, "In person, and manner the chief was the most impressive man he had ever seen."⁹

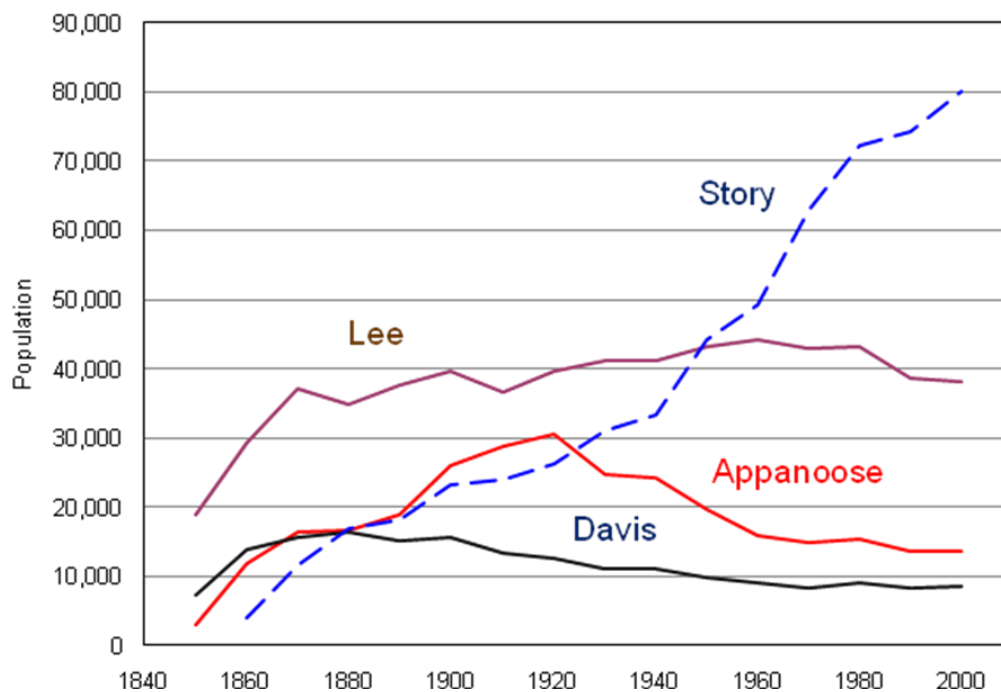
In mid 19th century, Mississippi ports dominated the American heartland. During the Civil War, Union troops embarked in Keokuk, and injured ones returned to Keokuk and its several hospitals. In 1850 Lee County on the rivers was Iowa's most populous with 19 thousand people, and it would grow to 29 thousand within 10 years, as the chart below shows.

Six years after Amon's migration, the 1856 Iowa census found him in Wyacondah, just east of Fabius Township, Davis County. In 1850 the approximately 500 square miles of Appanoose and Davis had populations of 3 and 7 thousand people. Within a decade the Davis population doubled and the Appanoose quadrupled. These weren't trifling populations, compared to, say, Story County, where Iowa State University now stands. Story County wasn't organized in 1850 and had less than 5 thousand people in 1860. The centrality of river transportation and importance of southern Iowa was evident during the Civil War. When Amon's sons joined the Union Army, they were mustered in Keokuk, the regional metropolis. When a Davis County hero returned from the war after receiving the Congressional Medal of Honor, he attended medical school in Keokuk. The Nineteenth Century saw glory days in southern Iowa.

Besides painting the background for the Waggoner's arrival, the county populations also show how times changed during the ensuing decades, propelled in part by soil. Appanoose and Davis counties lie outside the rich soils of the Des Moines lobe of the Wisconsin glacier, Story County lies inside the lobe. Across southern Iowa, erosion carved earlier glacial deposits into the steeply rolling, well-

drained Southern Iowa Drift Plain. The percentage of farmland planted to corn and soybeans in the twenty-first century demonstrates the disparity between soils of southern and northern Iowa. During 1999/2001 those crops grew on about 9 acres in 10 of the farmland north of Des Moines, while only 2 to 3 in 10 grew corn and soybeans in Appanoose and Davis counties.¹⁰

The population of agricultural Davis County peaked in 1880. Propelled by coal mining not farming, Appanoose continued to grow, reaching 30 thousand people in 1920.¹¹ The coal mines drew immigrants from Europe, they settled especially in a section of Centerville called the Levee, and by the 1930s they provided me with classmates bearing Italian, Bohemian, Croatian, Jewish and Swedish names. Unbeknownst to me when I was born in 1923, mining was already declining, and by 2000 Appanoose population had halved. Shrinking populations in Appanoose and Davis and a lack of growth in Lee County contrast with the steady growth of an average Iowa county and with Story County's 19-fold multiplication, 1860/2000. Nevertheless, when the Waggoners came, in the nineteenth century there were glory days in southern Iowa.

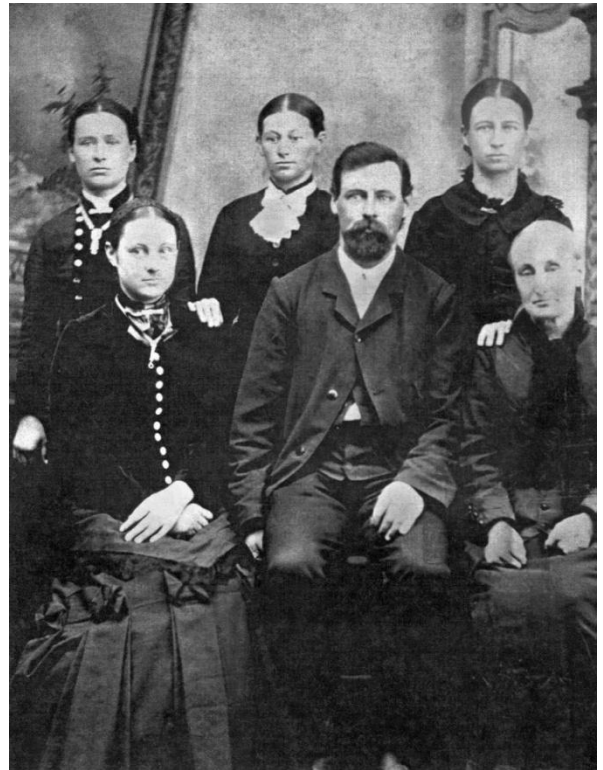


OTHER GREAT GRANDPARENTS WENT WEST.



Two other great grandparents, Samuel and Eliza Barnes, were some of the few immigrants to the region from New York State. They stopped a few miles short of Appanoose and settled in Davis County. The Barnes came from Westchester County, New York. In Westchester you can see the memorial of Samuel Barnes maternal grandfather and Revolutionary War veteran, Michael Ogden, in Sparta Cemetery near Ossining, New York. In Quaker Friends Meeting House burial ground at Lake and Purchase St, Purchase, New York my relative Don Severs and I found rows of Barnes lined up. Don placed a video of our discoveries of Barnes memorials on line.¹²

Samuel Barnes, in the picture nearby, took his family to Davis County. The family stopped over near Elmira, New York, where Emma Augusta Barnes was born. Emma is in the center of the back row of the portrait of John Barnes' family nearby. She married Daniel Thomas Waggoner and became my grandmother. She told me that her mother Eliza Cahuac Barnes, born to a Huguenot family living in London, spoke with a cockney accent. Samuel Barnes, my father told me, was a skilful carpenter and made a prized chair brought from New York State in Barnes' covered wagon. Although I remember the chair and being scolded when I used it for a saw horse and cut it, the chair has been lost.

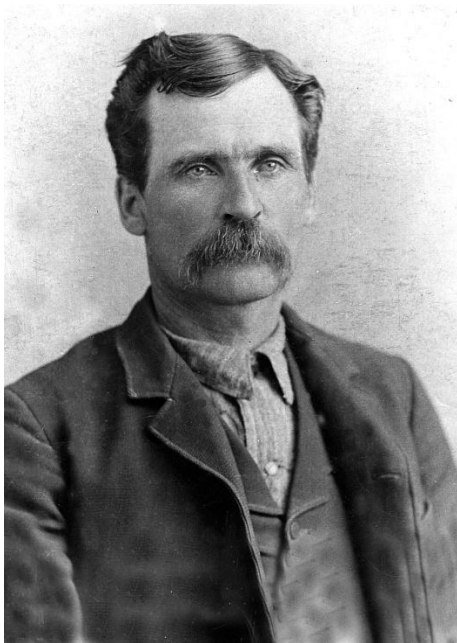




In 1884 a fall from a water tower lacerated Samuel Barnes's liver, and he died at age 63. The nearby picture of Eliza with a charcoal drawing of her husband of 43 years shows her grief.

Switching from Waggoners and Barnes, I describe the Marings, my mother's side. Much that I know, plus pictures of the Marings and the Hutchison family, came from another grandchild of Moses Monroe, my cousin Bernice Ryals McCalment. Clues to the name Maring are the town Maring in the Mosel Valley of Germany, and the nearby town of Arloff bearing the same name as the first name given to a son in the Maring family. After living in Belmont County, Ohio across the river from Wheeling, West Virginia, the Marings headed west. Moses Maring Sr. migrated with his son Samuel and grandson Moses Monroe Maring, both born in Ohio. They lived in Putnam

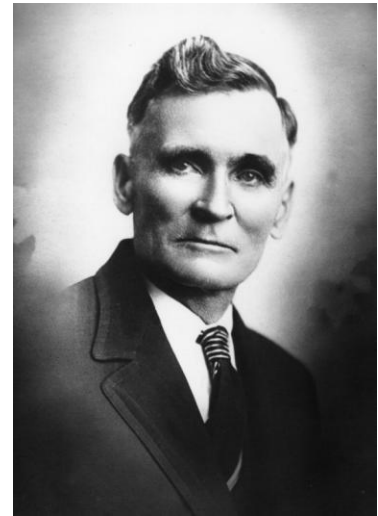
County, Missouri and also Caldwell Township of Appanoose. In 1860 more heads of household in Appanoose were born in Ohio than in any other state.



Moses Monroe became my grandfather. As a young man, he wore a mustache. He was the first teacher in a school near the small community of Chariton in Putnam County, Missouri. He farmed nearby and built a barn sound enough to still stand.



Later, Moses Monroe moved to Exline in Appanoose and, as I recall hearing, became an investor in coal mines and a bank director. You can believe that the older, clean-shaven man in another picture was a bank director.



Moses died in the house with the wide porch in Exline, pictured nearby and marked as 3 on the map of Appanoose. On the front porch of the Maring home are Moses, son-in-law Clyde Ryals, daughter Amanda

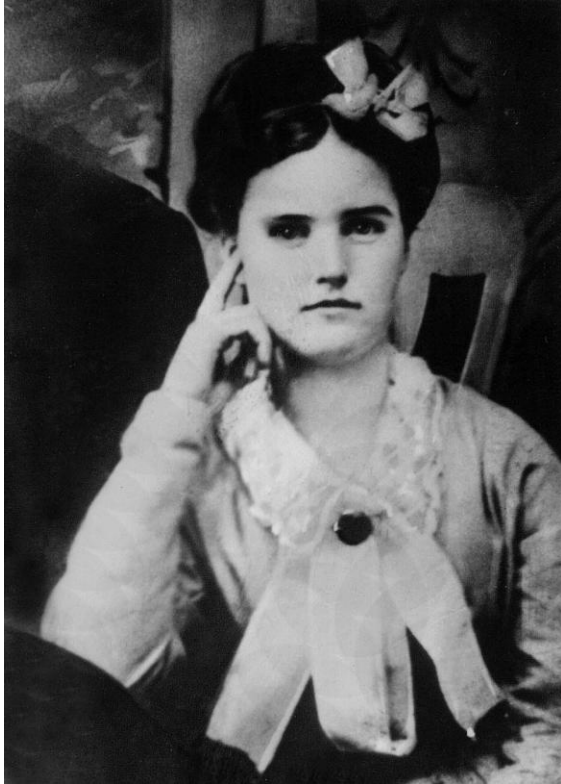
May Maring Ryals, son Clyde Raymond Maring, wife Mary Ann Hutchison Maring and granddaughter Bernice Ryals.

Crippled by two childhood falls, Moses walked—and plowed, too—with the crutch that he holds as he stands on the porch. One month after Moses' death, I was born in the Maring house.

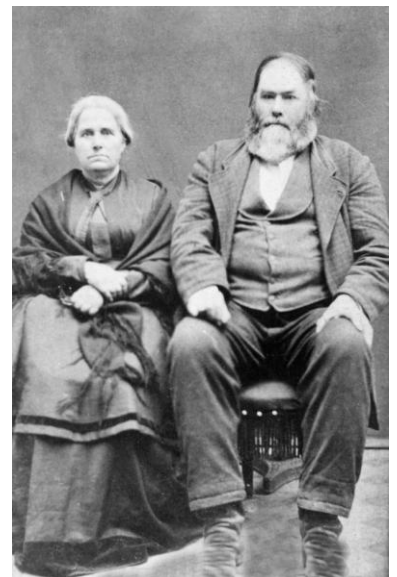
Now, back to more arrivals in Appanoose. James Hutchison brought his family name from County Antrim, Ireland to Pennsylvania and then Ohio. In 1776, he married Jane Kelly, also from County Antrim, and although I lack documentary evidence, I believe he fought the British as an Irish boy

should. James and Jane's grandson with the thoroughly American given name of Andrew Jackson carried the Hutchison name to Appanoose. Three of Andrew Jackson's children married Marings, a clue that the 12 thousand residents of Appanoose in mid-Nineteenth Century and people next door in Missouri were a close community.

Moses Monroe Maring chose the second Hutchison girl, Mary Ann. If all three Hutchison girls resembled Mary Ann's picture, the Maring boys chose well. My grandmother Mary Ann has already been shown on their front porch in later life. Before the Marings moved to the house in Exline, they lived and my mother grew up in the house shown beside Mary Ann's picture.



Introducing a great-great grandfather ancestor with a remarkable name and an imposing presence justifies an excursion back to Mary Ann's maternal grandfather, Andrew Jackson Clinkenbeard. Another demonstration of the outburst of sons named for the seventh President. Like one in eight immigrants to Appanoose, Clinkenbeard came from Kentucky.



THE CIVIL WAR



Memories of the Civil War 60 years before my birth persisted in southern Iowa. Neither World War I nor Teddy Roosevelt's charge up San Juan Hill had dimmed memories of the Civil War. During my childhood, people still attributed all pithy stories and aphorisms to Lincoln. In the 1930s on Memorial Day when I marched with Boy Scouts, a Civil War veteran rode at the head of the parade, and at the cemetery a classmate recited the Gettysburg Address. In July, the county sheriff, Sherman West, grew a beard, and on the Fourth he dressed his lanky form as Abraham Lincoln. If I close my eyes, I can hear firecrackers and cherry bombs explode while Sherman West as Lincoln walked beside the Civil War cannon on the Appanoose courthouse lawn, as I photographed him about 1940

My great grandmother Waggoner's obituary conveys why memories of the Civil War endured. A month after the Battle of Bull Run, my 18-year-old great uncle Amon Waggoner, Jr. enlisted, and four months later, he was brought home dead. During the next summer his 20-year-old brother Evan enlisted, and the next summer he was brought home dead. The brothers enlisted in Company D, 3rd Cavalry Regiment Iowa. The 3rd fought in the war in the West, in Missouri and Arkansas.¹³ Private James Dunlavy of Company D, 3d Iowa Cavalry and of Davis County won the Medal of Honor for capturing Confederate General Marmaduke, single handedly. Troopers of the 3rd Iowa Cavalry won fully five Medals of Honor.¹⁴ But disease killed the two Waggoner brothers before they fought any battle. Monuments for the two brothers stand in Bethel Cemetery in Davis County. Government-issue monuments for the two lean on their parents' monument. Lucky for me, Daniel Thomas was born in 1851, a year after the migration and boat fire, and he was only 11 years old when the War began. Daniel Thomas became my grandfather.

Maring also fought in the Civil War. At the ripe age of 39 my grandfather's Uncle Nicholas enlisted in Company G, 36th Infantry Regiment Iowa. The 1860 US Census tallied Nicholas and his family in Caldwell Township, Appanoose. Brother Arloff Maring, although sixteen years younger, enlisted on the same day and in the same Company G as his brother Nicholas. Rebels captured many of the 36th Iowa regiment in April 1864 during the Battle of Marks Mill, Arkansas and imprisoned them at Camp Ford near Tyler, Texas for nearly a year. Although I cannot find the Maring names among the prisoners at Camp Ford, Cousin Bernice's notes about Nicholas state "Civil War. Died while a prisoner." Nicholas was buried in the Little Rock National Cemetery. Nicholas

had 6 children, ages 1 to 13, and after he died, his widow Hannah received a pension, as the record above confirms and she richly deserved and direly needed. Younger brother Arloff Maring survived

NAME OF SOLDIER: <i>Maring, Nicholas</i>				
NAME OF DEPENDENT:		Widow: <i>Maring, Hannah</i> Minor: <i>Kinkade, Joseph, Gdn.</i>		
SERVICE: <i>G-36 Iowa Inf.</i>				
DATE OF FILING:	CLASS:	APPLICATION NO.	CERTIFICATE NO.	STATE FROM WHICH FILED:
<i>1864 Oct 28</i>	<i>Invalid</i>	<i>696-34</i>	<i>42,637</i>	
<i>1872 July 7</i>	<i>Widow</i>	<i>210 207</i>	<i>166 441</i>	
OTHER: <i>RT</i>				

the War, and in August 1965, the 36th Iowa Infantry, including Arloff, was mustered out at Duvall's Bluff, Arkansas.¹⁵

Whether the two Marings were prisoners or not, Swiggert's description of prison life at Camp Ford merits reading. Captain S. A. Swiggert of the 36th Infantry had been the postmaster at Blakesburg, Iowa before enlisting. He escaped Camp Ford twice, was captured twice, and was the last man out of the prison camp.

Before the Civil War, other relatives served in American wars. Cousin Bernice's records say that the Official Roster of Soldiers of the American Revolution stated that James Hutchison, who died in Wayne County, Ohio in 1817 came from County Antrim in Ireland and served in the American Revolution. I have seen the flag-holder beside the grave of James' son Daniel in Zoar cemetery in Appanoose, signaling Daniel's service in the War of 1812. James Hutchison, son of Daniel and grandson of the Irish immigrant James served in the Mexican War, according to Bernice's record. Bernice's record also shows that in the next generation, Daniel Hutchison Jr. served in the Civil War. Four generations of Hutchisons in four American wars, two against the English, one against the Mexicans, and finally one generation against the Confederates during the Civil War.

Nothing in those generations of soldiers, however, matches the tragedies of three out of four Waggoners and Marings dying. Missouri was a sharply divided state during the Civil War. My mother told me that when the Unionist Waggoner sons were brought home to Davis County, some neighbors would not attend their burial in Bethel cemetery, south of West Grove in Davis County at the crossing of roads Fawn and 250th.

MY PARENTS



My father, Walter Loyal Waggoner (1896-1976), was born in Davis County. The Waggoners lived near Monterey, like other place names in Iowa, a reminder that veterans of the Mexican War were leaders when Iowa was settled and places named. Palo Alto, Buena Vista and Cerro Gordo counties commemorate Mexican battles, and Ringgold County, west of Appanoose, commemorates Samuel Ringgold, an innovative artillery officer and the first US officer to die in the Mexican War (1846-1848). Monterey, Iowa still commemorates Zachary Taylor's victory in Mexico, but when I visited Monterey Iowa a decade ago, it had shrunk to a crossroads with a sales barn and church. Nevertheless, when I was a child my Grandmother Emma Augusta's eyes sparkled when she recalled for me Monterey on its hill overlooking Fabius Creek. While Walter was still a child, Grandfather Daniel Thomas signed the note of a man who failed, Daniel Thomas lost his farm in Davis County, and thereafter, he and Emma rented farms near Exline in Appanoose.

South of Exline, Walter walked across the fields to one-room Boston School, first to light a fire in the stove, and then to learn the three R's. About a century later when I visited Boston School with my own family, it was filled with bales of hay, and cattle were grazing beside it. Nevertheless, when my son Von climbed over the hay inside, he found lessons still chalked on the blackboard.

Even on Daniel Thomas' rented, subsistence farms, book learning interested Waggoners. Walter's older sister Mina left Appanoose when she graduated from school, taught high school in Chicago, and earned a Masters degree at the University of Chicago. Walter attempted to attend high school in the county seat, Centerville, but running out of money, he had to return to Exline high school. He learned the barber's trade and cut hair to support himself at a college in Des Moines. He moved to Tristate College in Angola, Indiana to study electrical engineering. In 2011 the college has changed its name to Trine College, but a third of its students still study engineering. In 1917 in college, Walter enlisted for officer's training. He was still underage, however, and his mother vetoed his enlistment.

After a year at college, Walter had the best education in Exline, and when the superintendent of the Exline high school was drafted, Walter took the job. He taught until the draft took him in turn.

At school he shared lunches with another teacher, Kate Marie Maring. Kate disliked the name Kate, which she said was fit only for a mule. During the 1920s she decided her name was Kathryn, and thereafter all called her Kathryn.

The diary that Walter kept in France tells his wartime adventures. The bulge in Walter's pocket must be the diary that Katie gave me on Walter's death in 1976 and that I transcribed as chapter three of *Stories for The Waggoners and Marings*.

On his return to America, Walter made a beeline for Kathryn's Exline home to claim my mother. Her picture shows that she merited, first, the letters Walter had written from France, and then, his return to claim her.

When she was 86, she dictated memories into a tape recorder. The separate booklet, *Kathryn Marie Maring Waggoner Reminiscences in 1982*, relates them.



VIGNETTES REMEMBERED BY A CHILD

A child remembers bits of his early years, snapshots that my son Daniel Maring called vignettes, and I borrow his word to label this section. Before my birth and storing my first vignette, my parents returned to Centerville after the vicissitudes recorded in *Kathryn Marie Maring Waggoner Reminisces*. The Waggoners lived at Seventeenth and Wall Street with Kathryn's sister May, her husband Clyde Ryals and daughter Bernice. In October, typhoid killed Clyde Ryals, wife May and daughter Bernice moved, and Walter and Kathryn occupied the house alone. It was—and still may be—a typical Centerville house: Square foundation and pyramidal roof.

During the winter of 1921-2, my father Walter took LaSalle correspondence courses in business, bookkeeping and writing. He finally found a job with the county Treasurer and then a job as bookkeeper at Swift & Co. that paid a little more. The meat packers, Swift & Co., had a poultry plant in Centerville. In May 1922, Kathryn took the job that Walter left at the Treasurer's and continued to work there until November. She was pregnant. In those days people didn't work in maternity clothes, and when they showed they were pregnant, they quit work. During the winter Kathryn waited for Paul and sewed. In February 1923 Moses Monroe died in the Maring house, where he stood in the picture above.

On March 28, Kathryn and Walter visited Exline. Walter's temperament let him sit and think, but Kathryn was always bustling. So when workers took the pump out of the Maring well, Kathryn leaned down to pound rust off the pump. Her water broke, and she knew that her time had come. Kathryn had not seen a doctor about the baby, but when her pain became severe Dr. Sturdivant of Exline came and said, "Yes, the baby is coming." She suffered severely, and about 4 o'clock in the morning, the doctor got out his instruments and delivered me, Paul.



After the difficult arrival, Kathryn thought Paul never would amount to anything. When friends visited with big babies sitting on their laps, Paul was in a basket with a long, slim head. After Kathryn had stayed a couple of weeks in Exline with her mother, Clyde Maring took Kathryn and Paul to Centerville, and the new family of three settled in their own home. After a year and half, Paul's head rounded out, and Kathryn sat with him to be photographed.

At some time during his work as a bookkeeper at Swift's, poultry captured Walter's interest. Decades later, I still recall breeds of chicken pictured in booklets as glossy and about the same size as *National Geographic*. Walter's poultry handbook on the American Ideal came into my hands, and I gave it to my brother Wayne and his wife on their Golden Wedding anniversary.

Back in Centerville in the 1920s, Walter had to have his own chickens. He made enough for the family to live on and bought a place on South Main. He bought chicks, raised them in a building behind the house, and sold fryers. People came to get the fryers, chickens smaller than a hen and larger than a broiler. In the days before easy refrigeration, a fryer could be eaten in a single day

with no leftovers to refrigerate. Fried chicken carried in a shoebox with bread and butter was an ideal meal for traveling by train.

Soon ambition outgrew the house in town, and it was traded for The Ten Acres southeast of town. Because we returned to what-we-called The Ten Acres when I was about 7 years old, I recall the place well and honor it with capital letters and mark it 4 on the Appanoose map. The land was the sort that poultry men like: Too hilly and eroded to be valuable cropland but cheap and well drained for chickens. An eroded ditch, dignified as The Ditch, cut the northern pasture. I have no photographs of The Ten Acres from our residence but later returned and photographed its remains..

The Ten Acres were landlocked by other farms and reached by rutted lanes from the county road, which is now grandly called 230th Ave to help emergency vehicles navigate. The farm was about 2 miles south of Iowa route 2, and a mile south of the Burlington branch line into Centerville from the southeast. Kathryn's sister Alma and her husband Sherman lived on the adjacent farm. Obviously, Uncle Sherman's father marched through Georgia.



Near the southern boundary of The Ten Acres stood a four-room house under the typical pyramidal roof. An earlier owner built a smokehouse on the east end of the kitchen. Silver maples between the fence and house shaded the house. On hot days the shade would attract cattle from the adjacent pasture, they would draw flies and we would shoo cattle and their flies away. Under the shade trees a cistern collected soft water that ran off the house roof. Water was drawn by a series of cups about 2-inches in diameter lifted on a chain driven by a sprocket within the pump housing. The cistern water was prized for washing Monday laundry and dirty hair because it was soft, while the water from the dug well was hard. Also the cistern was a cool place to hang milk and butter. Its curb was the right height to support the hand-powered ice cream maker full of cream, ice and salt. The favored person pulled the dasher from the ice cream maker when the crank could no longer be turned and dump the salty water on the asparagus.

North of the house a short distance stood a common cast iron pump with a heavy handle to draw water from a dug well. South and down slope from the well, stood the privy, always furnished with a catalog, a nail keg holding lime and a dipper. Still further down the slope was the barn with a lean-to that sheltered our car. Walter and Kathryn kept cows, raised chickens, sold chickens and eggs. They made a little money and saved it.





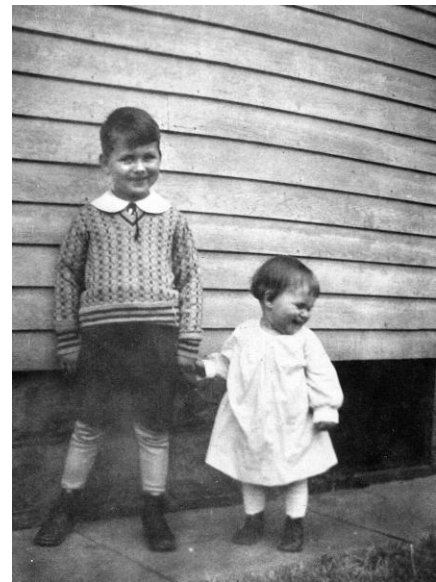
The incentive for moving to The Ten Acres was building a hen house. My parents proudly thought they built large, but later realized they built small. The hen house was of "hollow tile", light weight terracotta building blocks, fragile, and grooved for plastering or stuccoing. Appanoose had plenty of clay, and a brick factory smoked in Centerville. In 1946, I

photographed the ruins on The Ten Acres. In 2011 searching for the old hen house foundation or a shard of the terracotta blocks would be an archeological adventure, not excavating Pompeii but still a small adventure.

Swift & Co. promoted bookkeeper Walter to manager of their store in Knoxville, the county seat of Marion County, 51 miles north of Centerville, through Albia and on the highway to Des Moines. In preparation, the Waggoners sold their accumulated chickens and cows.

They were racing the stork, but he flew fast, and my sister Margaret was born on the night of August 27, 1926. Kathryn remembered that her trouble delivering her second child was mainly getting rid of a crowd of visitors. The manager of Swift's plant in Centerville arrived for supper but was sent home. Walter called the neighbor lady and doctor and went to get mother Maring. Kathryn's nephew brought his mother and her husband, discharged them down by the barn and drove away, leaving them until he returned. Walter and Kathryn had three living parents and 15 brothers and sisters plus in-laws, many living nearby. Although relatives are a refuge in time of need, they crowded Kathryn's small house on the prairie.

Kathryn also remembered that Paul approved the name Margaret but nevertheless misbehaved, probably jealous of the new arrival. A picture of Margaret and Paul, taken a few years later, shows that they inherited the blond genes of Marings and Hutchisons rather than the slim genes of Waggoners or brunette genes of Huguenot Cahuacs. In 1927 wet weather made travel muddy.





Grandfather Daniel Thomas Waggoner had a prized horse named Bird. I write Daniel Thomas to differentiate him from his great grandson Daniel Maring Waggoner. The three, Bird, Daniel Thomas and I posed for a photograph.

In Appanoose horses could navigate the muddy roads. An apocryphal story told about a traveler who spied a hat on a puddle in the middle of the road. Finding a man's head under the hat, he asked, "Muddy?" The head replied, "Not here but up ahead where the team is, it's really muddy." Moving to Knoxville during stormy autumn weather demonstrated the principle.

The day after Margaret was born, while a girl stayed with Kathryn and her children, Walter began his new job in

Knoxville. Later on a stormy day, helpers loaded the Waggoner's possessions on a truck, but it mired down in The Ditch before it even left The Ten Acres. When the truck reached Centerville, the furniture was dried in a barn until loaded onto a train. The truck with wheels suitable for spinning in mud could not have carried much furniture. The nearby picture of a Model TT Ford, a flivver, illustrates.



At last my writing has reached a vignette in my own mental scrapbook, rather than a vignette borrowed from family stories. Kathryn carrying Margaret in her arms, and 3-1/2 year old Paul carrying a gun his father had whittled, boarded the interurban from Centerville to Albia, where they transferred to the train for Knoxville. I remember the interurban conductor controlling the motor by rotating a lever on top of a large rheostat, perhaps in Number 9. Number 9 was built in 1912, acquired by the interurban in 1925, and in 1966 bought by a museum, perhaps the Midwest Central Railroad in Mount Pleasant. The train ride on from Albia must have been humdrum because only the conductor and big rheostat on the rocking interurban stuck among my memories.¹⁶

During my childhood and even into the 1950s professional photographers recorded more than graduating seniors, blooming brides and bashful grooms. The professionals had studios, loaded plates into cameras framed in wood, disappeared behind a hood, and sent proofs for approval. Parents chose black and white portraits from proofs that soon faded. My parents chose the photograph of Margaret and me below.



Although we lived in Knoxville only two or three years, my memory holds so many vignettes that I list them to hint at a boy's life in the late 1920s. Kathryn liked to move from rental to rental, but most of the vignettes were taken on East Main Street, next door to my first memorable playmate, Charles Murphy, son of the agent at a branch railway line station, perhaps the Wabash.

-At the railroad station large wet cells in glass jars generated electricity for the clicking telegraph key.

-Charles and I climbed the water tank. When we were stuck, Charles's father--the agent--told us to get down the way we got up.

-Large snakes sunning on the ties and ballast made hiking along the rails memorable.

-The mournful railroad whistle at night promised adventure but put me to sleep.

-When the Murphy's were away, Kathryn tossed me a ball on the lawn between our houses, I hit the ball, it broke a

window in the Murphy's house, and we swept up the glass and replaced the window before they returned.

-A nearby lady had a GE frig with a large heat exchanger on top. She gave us ice cubes to suck. Sometimes the iceman would give us chips of ice.

-A cousin visited on a motorcycle and showed how turning the handgrip controlled the accelerator.

-Walter parked our new Pontiac in the street and secured it by leaving it in gear. I got in the car alone, played I was driving, put the gearshift in neutral, and the car and I rolled down the hill until we climbed the sidewalk and ended in a privet hedge. No harm was done, to either the fenders or the image of Chief Pontiac on the radiator. On the Fourth of July, the radiator ornament held a cluster of flags.

-On rainy days, we would swing in the porch swing and sometimes eat popcorn and spit out the hard, un-popped kernels.

-During the winter a neighbor fell while scooping snow off his flat garage roof and died. A boy slid down the hill on a Flexible Flyer, struck the abutment of the Wabash railroad bridge and died.

-The circus came to town, and I watched elephants parade and a circle of roustabouts drive stakes for the big top.

-At the county fair, motorcycles roaring inside a wooden tower and held to the sides by centrifugal force amazed me. My mother sewed me a cloth helmet, and I posed on my scooter.

-A man brought a plough on his wagon, unhitched the horse, unloaded the plow and plowed the garden behind our house. Another man pulled a two-wheeled cart, unloaded a ladder and table, trimmed wallpaper with very long shears, and papered our dining room.

-Returning from a Sunday drive, we found that a neighbor had strung a radio antenna from his house across Main Street to our house to improve reception.

-Kathryn and a neighbor lady stood in the garden and discussed Herbert Hoover versus Al Smith for president in 1928.



-The railroad that Charles Murphy's father worked for was a branch line. The agent and crew would run a northbound engine onto a turntable and manhandle it with levers. Then it could depart southbound. I once helped turn the engine around, or at least I put my hand on the levers. Now I illustrate the turntable with a photograph from the archives..

-I started school. When another boy and I talked too much, the teacher fastened paper napkins over our mouths—but we stuck out our tongues behind the paper, soaked the paper and escaped the punishment (I forget what happened next.)

-Walter prospered with Swift & Co, beginning with a simple storefront to buy produce from farmers. Machinery was acquired and the dressing of poultry began, even enough to fill a reefer car with dressed chickens that were packed in barrels of ice for Chicago. Dressed meant feathers plucked, the bloody head wrapped in a triangular paper but the innards still inside. When Walter proudly took the family to inspect the reefer car, I learned about metal seals on the door to prove no one tampered.



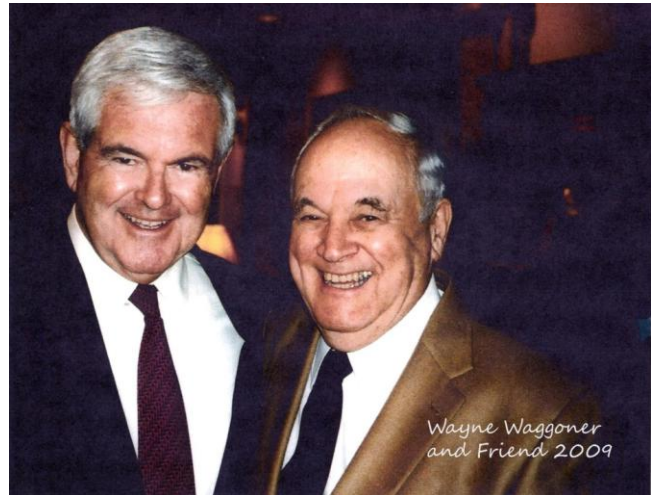
-One night Swift & Co. caught fire. After the fire, wet, charred barrel staves and egg crates were hauled to our coal bin, and my memory of the smell of wet, partially burned wood that permeated our house on Main Street proved that an odor is the best mnemonic.

A lucky side effect of the fire was beginning Walter's friendship with C. L. Pine. Pine owned the building that burned and owned another across the street where Swift & Co. moved temporarily. Pine owned a small loan company under his name. His headquarters were in Knoxville, and he had a few branches. Pine will play a critical role later in my story.

My brother Wayne was born in December 1929. He inherited the brown eyes of his Huguenot ancestors via grandmother Emma Barnes Waggoner, daughter of Eliza Cahuac Barnes. He also inherited our father's enterprising nature, now called entrepreneurship. By 1931 he showed an interest in wheels

Wayne is venturesome. I once remarked to Wayne that our father was venturesome, and Wayne replied, "Dad is a gypsy." With his hundreds of trucks in 2010, Wayne outdistanced Walter, as the nearby photo with a friend testifies..

In 1929 Walter exhibited his gypsy nature by investing in his own business, a monument dealership in Sioux Falls, South Dakota. My vignettes from Sioux Falls include watching Walter make rubbings of monuments to copy their styles. He selected the Waggoner monuments in the Exline cemetery. When we drove, we would visit cemeteries, and a family recollection is 3-year old Margaret saying, "Daddy, there's a temetry." Walter showed me how hard the monument granite was by scratching his office window. A scratch may survive in a



window on an upper floor of a Sioux Falls building because only demolition could remove it. At some time, Walter sold a few insurance policies whose premiums would become a godsend in the next chapter of our lives.



The Crash of 1929 halted monument sales, and about 1930 the Waggoners retreated to a rented house near Drake Avenue in Centerville until March 1, moving day in farm country, when we could return to The Ten Acres. Walter and Kathryn probably counted themselves lucky that they had not mortgaged the farm to invest in the Sioux Falls business.

THE TEN ACRES AGAIN, BUT DURING DROUGHT AND HARD TIMES.

In 1929 we left The Ten Acres after building the hen house shown in ruins in a picture above. We left with prospects bright in Knoxville with Swift & Co. After a failed excursion into the monument business in Sioux Falls, we returned in 1931 for several hard years. We left in the rain with high hopes but returned for Dust Bowl and Depression. We moved to The Ten Acres a few weeks before my eighth birthday, and at this point, I'll switch the names Kathryn and Walter to Mother and Dad.

Nearly a lifetime later, writing about Connecticut farming during the Napoleonic era, I began,

A laborer in overalls stringing barbed wire around an overflow of cows at a country auction about 1932 first connected the times to farming for me. Hammering a staple into a flimsy post, he hit his thumb and swore, "Damn Hoover." My dad explained how hard times that cut prices in half connected barbed wire and a swelling thumb to the President's name in 1932. Near 1800 the farmers ... saw hard times, too. When hard times after the American

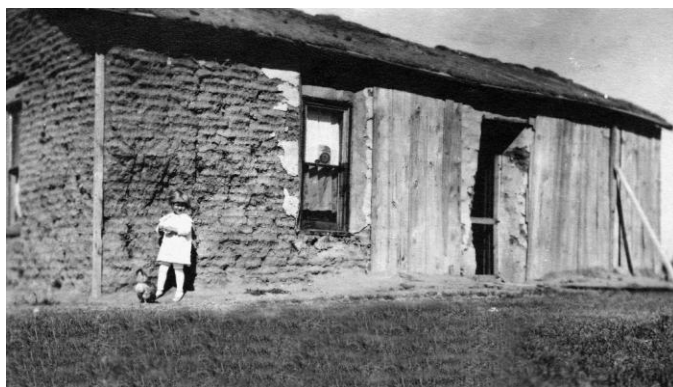
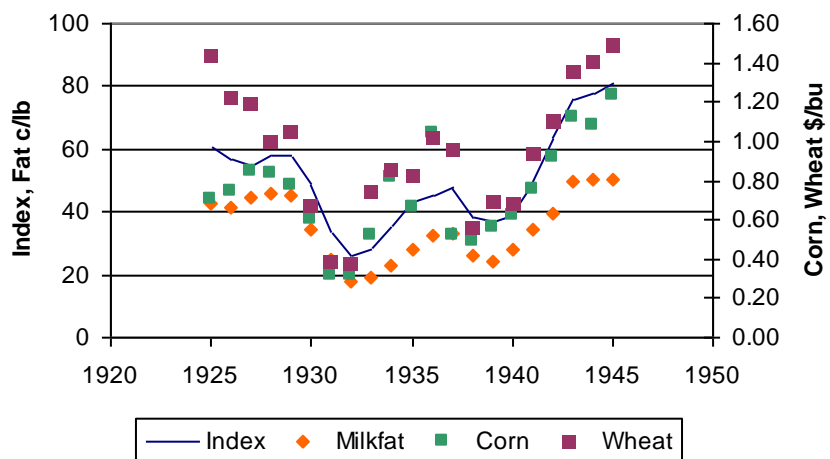
Revolution cut prices to less than half, Shays led a farmers' rebellion in Massachusetts. When the Embargo stopped exports, farm prices fell nearly a quarter in 1808. And when the Napoleonic wars ended, the Panic of 1819 cut prices to half between 1817 and 1821.¹⁷

By those Napoleonic standards, how bad was 1929. An article *Descent into the Depths* 1930¹⁸ put it this way:

Commodity prices had collapsed. Cotton dropped 3 cents (18%) in one week. Predictions of bumper crops added to world wide agricultural miseries. The world's wheat surplus was reported at almost 600 million bushels (almost 1/7th of total world average production). Farm Board buying was now conspicuous by its absence. Wheat dropped 19 cents in June, hitting 86 cents by the beginning of July. Cotton hit 13 cents with a 6 million bale carryover, 1 million of which was in the hands of the Farm Board. The carryover equaled just under half of average consumption for a full year. Beef prices plummeted.

A chart of farm prices from 1925 to 1945 proves that while Hoover and Roosevelt presided, American farmers struggled with prices that fell as much as the halving during Monroe's presidency. During the 1930s, corn fell to 58%, and butterfat to 49% of levels that farmers enjoyed during the late 1920s.

The fall of wheat was even more precipitous. During three years of World War I, American farmers collected \$2.05 to 2.19 per bushel for wheat, which attracted two of Kathryn's brothers and one brother-in-law to migrate to western Kansas and eastern Colorado.



The sod house where my cousin Bernice stands illustrates what they found.

Added to the hardship of cold winters, torrid summers and sod houses, a bushel of wheat dropped nearly two-thirds more to 38 cents. In two more years, by 1934, the signal of price in the market and disaster of drought in the Dust Bowl cut production by a third.¹⁹ Farmers suffered as severely during the Great Depression as during President Monroe's Panic of 1819. Two of

Kathryn's three brothers and brother-in-law returned to Iowa. Appanoose may be harder to farm than the Corn Belt in northern Iowa, but drought and the plummeting price in only three years from 1929 to 1932 made Appanoose seem a refuge.²⁰

Hitting his thumb while hammering a staple, a farmer could swear, "Damn Hoover."

Where in the world did my parents find the money to buy a cow, a horse, seed, and chicks to start anew on The Ten Acres on moving day, March 1? Where did they get a heating stove to warm a room and a kitchen range to warm water and cook meals? What did they exchange for coal? All that I remember is the name Great Western cast into the belly of the heating stove.

Later joined by Margaret, I went to Elm Grove #5 school by walking westward along a hedge between my Uncle Sherman's farm and one owned by a local business man and grazed by the cattle that I described gathering in the shade of the elms near our house. A hedge of Osage orange grew beside our path to school. Farmers split Osage orange trunks into hard, durable fence posts and hauled them to northern Iowa where they traded the posts for corn. We tossed the hedge apples of the Osage orange, they oozed sticky latex when struck by a ball bat, and they made sticky hands.²¹



A coal stove in the corner warmed Elm Grove #5 and about a dozen children in eight grades.

Bookshelves in the stove corner held books to be read while classes other than your own were reciting. Because sister Margaret was bright and the sole student in her class, the teacher efficiently promoted her to the next grade, where 2 students were enrolled. The teachers were all high school graduates. The school board for Elm Grove #5 was also responsible for the school called #30, a name

shared with a coal mine that employed many people in the joint district. Dad took me across the fields to the meeting to elect the school board, where votes from #30 overwhelmed the votes from Elm Grove #5. The county superintendent of schools visited each year, and one year, after his trip to visit his daughter in the Philippines, he described to us the wonders of the International Date Line.

A right-of-way that was graded for a never-completed railway ran through the woods behind the schoolhouse. In 1896, five railways--the Rock Island, Burlington, Wabash, Keokuk and Western, and Iowa Southern--all crisscrossed Appanoose, but the right of way behind our schoolhouse was never completed. In the fall we collected hickory nuts and walnuts in gunnysacks of burlap, hulled them and stained our hands with the walnuts. West of our school, a flowing spring in the woods filled a concrete watering tank, where we dipped ourselves in summer and watered cattle in dry weather.

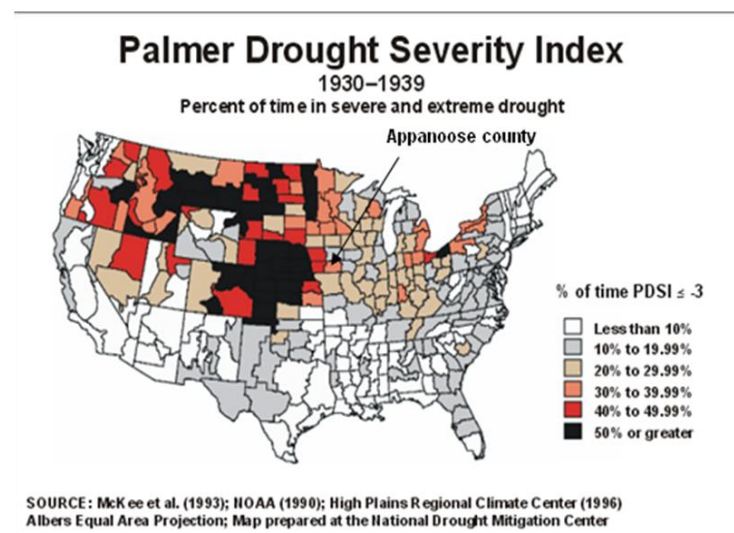
Several fruit trees stood northeast of our house. I remember a Yellow Transparent that yielded apples, during July and August, and a pear tree. Dad attempted to apply lime sulfur spray to the fruit trees with a tank sprayer, probably borrowed. When he pumped up the pressure, the lime green mixture oozed out of the top, and I heard rare profanity. Dad had been provoked as much as the fellow at the sale barn who hammered his thumb and swore, "Damn Hoover".

One night a tornado scattered the planks of the lean-to on the barn across the pasture, but miraculously stood the roof between the barn wall and our Pontiac that had been sheltered in the

lean-to. In 1946 photographs of The Ten Acres that I showed on an earlier page, the remaining barn stands in the view between two trees. Dad bought some wet, spoiled corn, cheap, and unloaded it from the family Pontiac at the edge of the little orchard. Margaret and I were set on the pile and told to sort the good for the cow and chickens and discard the spoiled. A pink web with an unusual smell covered wet corn. Decades later I experienced the truism that an odor is the strongest mnemonic: In the lab, I pulled the cotton plug from a test tube growing a web of pink *Fusarium oxysporum*, and the odor carried me back to the pile of spoiled corn, sorted by 5-year-old Margaret and 9-year-old Paul in 1932.

Although I do remember neighbors comparing Hoover and Smith in 1928, I don't remember the politics of the 1932 election. I do remember my venturesome Dad disapproved of the National Industrial Recovery Act (NIRA), which authorized President Roosevelt to regulate industry and permitted cartels and monopolies to stimulate economic recovery. The Waggoners who left western Virginia and fought in the Civil War were unreconstructed Republicans. My grandfather Maring, on the other hand, took his sons to hear William Jennings Bryan orate from a Wabash railroad car in Moulton and raised Democrats. My Republican Dad and his Democrat brother-in-laws disagreed about regulations. My youngest uncle, Clyde Maring, was nevertheless enterprising: He bought neckties and talked me into selling them in Centerville, door-to-door, and for 25 cents. Clyde and my Dad built a prototype of a pinball game that was going to make both rich.

A winter blizzard isolated us for several days. Although a few men scandalized the Methodists by trekking for tobacco, most never thought of going to town. Our cows, a Guernsey and a Jersey, were snowbound and hungry in a pasture near the school. Dad and I outfitted ourselves with heavy clothes. A large trunk that we hauled with us for years and from house to house held a supply of clothing, to be cut up for patches or worn when the weather was freezing. It merited the capital letters of The Trunk, and it yielded the heavy clothes and gloves that Dad and I wore to struggle through drifts to feed the cows, about a mile away. To a boy about 10 years old, the drifts seemed deep.



Rather than wading snow drifts, however, drought and Dust Bowl are the dominant vignettes of life on The Ten Acres. Severe or extreme drought afflicted Appanoose a third of the time during 1930-1939. Arthur Rothstein's photograph of a father and children fleeing a dust storm, Worster's *Dust Bowl: The Southern Plains in the 1930s*, and especially, the odyssey of the Joads told in Steinbeck's *Grapes of Wrath* dramatize the drought farther west.²² For the Waggoner and Maring families, the picture of Bernice Ryals in front of a sod house in Colorado suffices.

The Waggoners stayed put on The Ten Acres. Drought made the water spring in the woods west of Elm Grove #5 a lifesaver. Riding bareback across The Ditch, out the lane to the county road, and into the woods behind the school, Paul drove the cows to the spring.

In a gully or draw west of our house on The Ten Acres, Dad saw a crawfish or crawdaddy, a small pink crustacean that looked like a small lobster. Following the clue of the crawfish and using a posthole digger, Dad dug a shallow well about 8 inches in diameter. Using a can on a string, we ladled up a few quarts of water each day. The well and pump north of the house yielded enough water for chickens and us.

A contemporary of my parents, Carl Elfstrom, decades later recalled for me that he fled hot Centerville on a Sunday in the 1930s for a picnic with his wife and two daughters. He pulled off the road under a tree, but drought had left no leaves for shade. The family climbed back in the car, returned home, and ate in the basement.

During a torrid day I joined Uncle Arch a few miles south toward Exline. We sat in his cave, both a storm cellar and an underground cellar for storing jars of canned fruit and vegetables. A few of the jars contained sausage. At the open door of the cave stood a flytrap, made like a lobster trap of screen wire. Sitting in the cave, we kept cool while the trapped flies entertained us.

Back at The Ten Acres, we hung a bucket in the cistern to cool butter and milk.



In the 1930s, Iowa levied a poll tax, which could be worked off on the county road. Dad took his horse, and the county furnished scoops. Horses pulled on a hitch in front, and men held handles on the rear. My Uncle Roy's team illustrates horses and harness. For the road work to pay poll tax, a single horse pulled a scoop, while a man maneuvered the blade of the scoop to smooth the road. Then he stopped the horse and flipped up the handles and scoop, emptying it in a pothole. I proudly walked about a mile from home with Dad's lunch, learning how the

scoops graded the rutted road. I witnessed a blade catching on a spike in a bridge plank, surprising horse and man when the scoop flipped of its own accord.

Medicine was not advanced. From a peddler my parents bought a bottle of a patent medicine called, Pain Oil. When Dad had a bad spell, he took it. When I cut my knee on a broken bottle when playing hide and seek, Pain Oil sterilized the wound, and the scar has faded. A neighbor slid down a rope from his hayloft, impaled himself on a pitchfork and died. Returning from school along a road, a friend was struck in the head by the door handle of a passing car and died. Children were cautioned to be careful; lockjaw caused victims to crush toothbrush handles that were put in their mouths to hold them open. And if further caution were needed, mothers provided it by telling that an infected blister raised during a tennis match left President Coolidge's son dead.

All was not lost. The neighborhood shared the Depression and Dust Bowl, together. At Christmas my grandmother Waggoner gave me half dollars, which I kept in the corner of a drawer and enjoyed admiring it frequently. My parents gave me a globe, about 4 inches in diameter, small enough to afford, but large enough to inspire wonder about other continents and the global curvature that hid them from sight. My parents bought me peanut seed, and although moles ate the nuts, peanut seed

had begun my career in agricultural experimentation. After removing the front seat from the Pontiac, Dad brought home some exotic bales of hay with beans attached, my first sight of soybeans.

We peddled vegetables from our garden, and especially, dressed chickens. Years later, Mother recalled:

We dressed chickens night and day in the little room that we had built on the end of the long hen house. We put an oil stove in the room, put a boiler on the stove and scalded the chickens. We bought geese, dressed them and sold them to the Jews. We bought turkeys and sold them. When the roads were bad we carried baskets of dressed poultry to the gate; our farm didn't have a road to it, and we had to cross a field and the Ditch to the road. We put a basket between us, each picked up a handful of poultry with our outside hand, and headed for the gate where the car was parked. The car was a green Pontiac that we had bought in Knoxville; we took the seats out to haul more chickens and so forth.

Some nights Walter and Paul would start late to deliver the poultry; then I would tell the children to be good, and I would head out to the pasture where the cows were. The milk was separated, and the cream peddled. Some cream was churned, and butter and buttermilk were peddled. We did everything we could to make a living.

Our family made it through.

Enough Jews lived in Centerville to support a synagogue and Rabbi Chaim Kramer, who impressed me with the ritual of an orthodox dispatch of a goose. I remember being entrusted with delivering some dressed chickens to Centerville, taking a diagonal short cut across Iowa's rectangular section lines by walking along the Burlington railway.

Trading chickens in the Pontiac, hoeing gardens and an amelioration of the Depression allowed some luxuries. Dad bought a battery powered radio to listen to the produce markets, and on Saturday night I was allowed to listen to WHO Barn Dance because we could put the battery in the Pontiac and recharge it on a trip to town. For Mother, Dad bought a gasoline powered Maytag washer with a muffler at the end of a flexible metal exhaust.

OFF THE GOLD STANDARD AND BACK TO TOWN

In 1933 President Roosevelt took America off the gold standard. Within a year, prices rose 10% and within three years by 23%.²³ C. L. Pine, the owner of the finance company that watched Dad during his time in Knoxville, foresaw the coming inflation, wanted his money invested in solid goods and offered to back Dad in a new business. As Mother recalled:

One day when it seemed we had reached the end of our rope, a letter came from Mr. Pine saying, "Walter why don't you come to Knoxville and start a poultry plant?" Walter wrote right back, "That would be fine, but I think it would be better in Centerville." Mr. Pine wrote back, "It can be in Timbuctu if you'll look after it. I'll furnish the money." Mr. Pine did furnish the money. He never questioned us about any check we wrote. Thus, in 1935 we started our store in Centerville.

Overhearing schoolmates at Elm Grove #5 tell about trading at the new Waggoner's Produce puffed me up. On Saturdays farmers came to Centerville to trade, and stayed into the evening, shopping gossiping and walking around the courthouse square. One Saturday Dad kept me with him at the store, and took me across the street to eat my first Maid-Rite hamburger, loose hamburger spread on a bun, and a delicious novelty for a 12-year-old farm boy. We left The Ten Acres for Centerville. Soon, Waggoner's Produce moved to larger quarters, a brick building constructed for a bakery that went bankrupt. There the store continued for decades. Stores in Albia and Chariton, a hatchery and farms were added. A snapshot behind our Chariton store proves that when rain fell, farmers had to travel muddy roads in buggies; or they parked their flivvers on the more solid county roads at the end of their muddy lanes. Waggoners Produce bought chickens, eggs, and butterfat from farmers and sold them feed, flour, chicks and even veterinary medicine.



Over time, Waggoners acquired trucks. They hauled feed from mills in Nebraska, carried cream to a creamery in Pella, and transported chickens to poultry markets in Chicago. Wearing a trucker's cap and accompanying a driver over night, across Iowa and Illinois to Chicago, thrilled me (Pix).. I helped attach troughs to the coops of chickens to feed them along the road, assuring that they would be heavy with feed when weighed next morning in Chicago. I rode to Kansas City to pick up our first semi trailer. Waggoner Trucking²⁴ sometimes publishes the picture of that semi on Maple Street in Centerville.

The heart of the business was always the store in Centerville, where I stood outside on Saturdays, waiting to carry in crates of eggs, braces of chickens and cans of cream. Inside, Jake Rinkle would test the cream for butterfat, and Jennifer Green would pay for it. In a darkened room behind, two ladies would candle eggs. On the curb I also stood ready to load feed and flour into flivvers. Loading

flour in a bag that was cotton print to be made into a dress or apron--if I didn't snag it on auto latches and locks—challenged me. This trading and commerce connected the multitude of small, almost subsistence farmers, on the one hand, to grain from the Great Plains, and on the other hand, to dinner tables in cities.

Times improved. We rented a house in Centerville. When I enrolled in sixth grade at nearby Central School, I met Jack Elgin. Because I was tall for my age, Jack chose me for his side when we played softball. Although I disappointed him by swinging like a barnyard gate, and was no match for him over the years at tennis, we remained life-long chums. Next I attended the two-story junior high school built where 90 years before the Mormon Trail had passed through Centerville. All boys attended manual training, all girls attended home economics. We sat on the second floor in alphabetical order, in rows of desks, each attached to the seat in front. When the fire alarm rang, we drilled by swinging through a window into a chute.

One Christmas, Santa presented me an A. C. Gilbert Erector set made in New Haven, Connecticut, and its wooden case is still in my attic with a few screws and metal brackets. I received my first, black bike with balloon tires. Santa also brought me a chemistry set, and an A. C. Gilbert microscope. After visiting my chum Charles Murphy in Knoxville and seeing him magically sprinkle HQ powder in a Bakelite tray, add water sink paper, and conjure up an image, I wanted and received a camera, chemicals and HQ powder. The kit included a Bakelite camera and printing frame. When we bought and remodeled a house on Maple Street, I had a dark closet in the attic. I advanced to a 35-mm camera and an enlarger. (The enlarger served me into the Twenty-first Century in a basement in Connecticut. And the smell of acetic acid still reminds me of darkrooms, even though my camera is now digital.)



Jack Elgin and his dog Queenie across the street, Larry Klepfer down the street and I formed the Maple Street

Gang, whose signal accomplishment was setting a derelict house afire throwing cherry bombs at another gang inside as they threw plaster outside at us.



Jumping the hedge between our houses, Larry tripped on a hidden wire and broke his arm. In autumn 1937, I entered high school.

In the spring my mother watched Centerville High School burn. Mother watched from the window of the hospital, where my sister Janet had arrived. Along with other students, I filed safely out of the school and joined onlookers, gawking in the spray from pulsing, leaking hoses snaking over the streets.



Undismayed the school district rented rooms. Miss Wright taught algebra in the Christian church, and other teachers taught typing near doctors' offices on Pill Row and Spanish in the Presbyterian Church. I listened to civics—and clicking billiard balls—in a classroom above a pool hall.

Miss Hall taught me composition and Latin in the armory, where on a hardwood floor; I also attempted to learn to waltz. On the same

hardwood floors, the Centerville Company G of the Iowa National Guard drilled. Across the USA, beginning September 1940 the Guard was mobilized, and I recall Company G in floppy fatigues, drilling with wooden sticks around the school grounds pictured beside the burning school.

When chicks hatched, pullets and cockerels were indistinguishable—we thought. The pullets would become valuable hens, laying eggs. The less valuable cockerels would only justify feeding for a few months until they grew into fryers. If they could be separated, the cockerels could be discarded, saving feed. The Japanese had learned to separate the two, sexing the chicks. Although Japanese were excluded from the US during the run-up to World War II, they did come to Canada, where they tutored among others, a man from Seattle. He in turn tutored a few students in a vacant store in Boone, where Dad sent me for a few weeks. I returned to Waggoners Hatchery, sexed chicks in the spring, and guaranteed 90 plus percent accuracy. At a penny a chick, I earned \$8 an hour, a princely sum.

About here, I distinguished the opposite human sex, girls. The first symptom was finding that because it separated me from friends in Centerville, accompanying my parents, sisters and brother to the international poultry congress in Cleveland interested me less than would be expected. Traveling to the shore of Lake Erie with my family attracted me less than expected for a boy who sailed model boats on ponds smaller than Lake Erie and wanted a globe for Christmas, years before. Back in Centerville, boys and girls promenaded around the Appanoose Courthouse Square. Boys waited near the popcorn stand on the sidewalk for girls to descend from the Masonic Hall where Rainbow Girls met. With a driver's license and a Plymouth coupe, I discovered attractive girls filled both Centerville and Albia, the county seat to the north. The culmination of my discoveries was Joan Griffin, whom I escorted to the Junior Prom. But she got away.



The grand march as pictured by the Iowegian photographer. In the front line are Jack Helmes, Margaret Deahl, Paul Waggoner and Joanne Griffin.

After supper Dad often covered the oilcloth on the table with pencilled numbers, reducing some business possibility to what is now called a business plan. He amused himself by adding columns of two, by rows of numbers. He had taken the LaSalle correspondence school course in Higher Accountancy as he had taken their course in Poultry Husbandry. With the approach of war, he counseled me that, while he was below in muddy World War I trenches, bookkeepers worked above in dry offices.

After I graduated from Centerville High School (Scarlet and Black, hip hip hooray) my parents sent me to the State University of Iowa in Iowa City to prepare for a career of accountancy. Or so they planned.

THE BEGINNING OF AN IRREGULAR COLLEGE EDUCATION

On December 7, 1941 Jack Elgin and I were in our dormitory room in the Quadrangle. Soon after, the Navy commandeered the dormitory, and we moved to an old frame house across the river. I switched my enrollment in analytical geometry to navigation. During the summer, I worked in an office in the Old State Capitol, disappointing my parents who could have used me at Waggoners Produce.

In autumn 1942 when I enrolled in calculus, I quickly realized taking navigation might help me reach pilot training in the Army Air Corps, but it was no substitute for analytical geometry. A math instructor took pity on me, and sitting in the Memorial Union, he gave me the needed pointers.

Meeting the daughter of a professor of geology set me on still another path. The professor's living room was open longer hours than the girl's dormitory, and I likely overstayed his welcome. As I sat with his daughter on his davenport, he cleverly told me the advantages of meteorology, a discipline similar to his own geology, and added the news that an Army training school had opened at the University of Chicago. Taking the train from Iowa City in cold winter weather, as the professor of geology likely planned, I searched for Army meteorology. What I found was a sergeant in a cubbyhole. He gave me a postcard, told me to return to Centerville, get drafted, and entrust the

postcard to the US mail at the induction center in Camp Dodge. A classmate, who was secretary of the Appanoose draft board, had no trouble arranging my draft.

After receiving a lockjaw shot, donning a giant overcoat and mailing the postcard to Chicago, I boarded a railroad car heated by a coal stove and shielded from spying eyes by drawn blinds. My picture taken at the PX shows a subdued buck private. We chugged west, none so dismayed as an accompanying farm boy, who had new gas mask glasses, was his mother's sole support and never before left his home county. In cold, bleak Cheyenne I



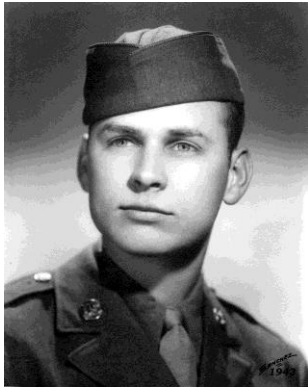
dodged off the train briefly to mail a card to Iowa City. Its Wyoming postmark on his daughter's card reassured the geology professor that I was far from his living room.



The trail from Iowa City to Chicago was indirect. We debarked from the rail car on a winter morning on a plain south of Salt Lake City with a view of the Wasatch Mountains to the east and endless space to the west. We refreshed our skill at close order drill, while

an Indian who spoke no English challenged the drillmaster's communication skill. After ROTC at Iowa City, the close order drill was postgraduate for me, but the ROTC practice with a rifle didn't improve my aim with a Colt 45. My barracks mates from Alabama regularly over stoked the potbelly stove with soft coal and blew off the door. Irritated by the mess sergeant during KP, one stole a butcher knife and improved the ventilation of the barracks by throwing it through the thin Cellotex wall. My friend Bill McGrath from St Louis and I filled the scuttles at the coal bin behind the latrine.

One bright morning, the next link in the trail to Chicago began on a train via Provo through the Feather River Canyon and on east. Eating powdered eggs cooked on a salamander by an open door in the canyon reminded me of Uncle George Waggoner's tales of railroading on the Denver and Rio Grand. Crossing the Corn Belt a seatmate from Iowa said, "We're passing through Ottumwa"; we missed Appanoose and Davis counties by only 15 miles. My trip ended the next morning on a siding beside the University power station in Madison, Wisconsin, where I debarked with my barracks bags and marched to a dormitory on Lake Mendota's shore. My trust in the geology professor, the Chicago postcard, the US mail and Army classification were working, and my mates and I had reached a Pre-Meteorology school.



During two semesters of physics and math crammed into a few months, my fellows and I marched to class, sometimes in gasmasks. More often we sang "After the war is over we'll all enlist again" to the tune of "John Brown's Body". Learning vector analysis to understand a three-dimensional atmosphere inspired us to sing "Hector the Vector". A photo taken by a Madison photographer shows my morale had risen since the tetanus shot at Camp Dodge and coal stoves in Utah.

Our detachment marched past the girls' dormitory, often double time and wearing gas masks to improve our wind.



A fellow soldier, Don Reckinger, enlisted me for a blind date on the Willow Path along Lake Mendota. I met Barbara Lockerbie of Milwaukee, and unlike my date at the junior prom in Centerville and the professor's daughter in Iowa City, Barbara didn't get away. Our picture outside her dorm, Elizabeth Waters Hall, shows why I didn't let Barbara get away.

Near the end of our Pre-Meteorology training, the Army realizing that it had trained enough meteorologists to staff its weather stations, ordered the closing of meteorology schools. In 1944, however, the Germans and Japanese were creating vacancies in the Air Corps, and I had my eyes tested and applied for pilot's training. In the nick of time, the Army reversed its closure of meteorology training, and good luck sent me to the weather school at the University of Chicago, where the sergeant had given me the magical postcard months before.

LEARNING TO FORECAST THE WEATHER

In 1944 Chicago was the premier meteorology school with world class scientists like Horace Byers of thunderstorm fame and climatologist Helmut Landsberg. The bench of talent was so deep that Reid Bryson instructed us in synoptic meteorology, and Verner Suomi introduced us to radiosonde on the lakefront. Later, had Bull Halsey heeded Bryson's forecast, his fleet would have been spared disaster in the Pacific. Bryson's 1977 *Climates of Hunger* antedated the worriers about climate change by decades. Suomi became the father of satellite meteorology.

Here, my memoirs lack photos. When Captain Starbuck ordered all cameras confiscated lest they reveal secrets to the enemy, I confessed that mine was in my room in International House on the Chicago campus. The offenders, nicknamed the Camera Club, marched in close order on the Midway on several Saturdays, within sight of the Illinois Central railroad that would otherwise have carried us to the fleshpots in the Chicago Loop. The Midway was the site of such rides as the original Ferris wheel, built by engineer George Washington Gale Ferris, Jr., graduate of Rensselaer Polytechnic Institute and a Pittsburgh, Pennsylvania, bridge-builder. It was built as the centerpiece of the Columbian Exposition in 1893 as the Eiffel Tower had been the centerpiece of the Paris Exposition in 1899. Unlike the Eiffel Tower, the wheel was dynamited at the end its fair, perhaps to clear it for the weekly drilling of our Camera Club.

My Aunt Mina, a Chicago teacher, who lived nearby on Blackstone Avenue in Hyde Park, treated me to lunch at a splendid Michigan Avenue hotel, persuading the waiter to overlook the lack of a red point for a steak because I wore an Army uniform. In the USA, soldiers had privileges. A soldier's serial number in the upper left of an envelope carried a letter for free, and in Chicago, a soldier's uniform carried him on the streetcars for free. But my camera was confiscated, and no pictures illustrate this section of *Appanoose to Connecticut*.

NEVER KILLING A PILOT

In June 1945 as other soldiers were landing in Normandy, the Army commissioned me a second lieutenant in the Rockefeller Chapel at the University of Chicago. Aunt Mina pinned on my golden bar. The new shavetails had bought uniforms at Abercrombie and Fitch in the Chicago Loop. In 2010, 65 years later I sent one uniform button to my granddaughter Kristen in Illinois. Once upon a time as a school girl she showed me a collection of foreign postcards that I had sent her. I trust she will preserve the brass button that testifies her grandfather was in the army.

The Army sent me promptly to an Air Weather Regional headquarters in the Ambassador District of Kansas City, much safer than Normandy. There the new second lieutenant chaired a nightly telephone conference with other forecasters from Montana to Missouri. I chaired the conference, but experienced sergeants improved the forecasts, diplomatically and well. One night the station commander, Captain Patton appeared about 1 AM and asked, "What's your forecast?" When I said clear and cold, he retorted, "God damn it, Waggoner. Look out the window. It's snowing." A nearby stable of hostesses stationed at the headquarters of Trans Western Airways provided a consolation from occasional dressings down.

After a few months the Army ordered me to another region, headquartered in New Hampshire but extending across the North Atlantic and forecasting for planes flying to Labrador, Iceland and on to Great Britain to equip the 8th Air Force. Within days the Army ordered me back to Kansas City. My Chicago training included specialization in upper air over Africa and the Mediterranean reserved me for assignment there. The net effect of the snafu was that the Midwestern forecaster saw Boston Harbor, his first view of salt water extending even further than his first view of fresh Lake Michigan. He rode the train through the salt marshes of Connecticut, including Guilford where he would move in a decade and live more than a half-century. And he viewed Manhattan from the top of the Empire State Building. A decade later when a life-long resident of New York who had never climbed the Building offered to take me up, I disappointed him by saying, "I've already been there." My colleague born in Brooklyn had never been to the top and was disappointed that we didn't go up

Evidently military progress in Africa and Italy was sufficient by winter that my special training was unimportant, and the Army ordered me to Peterson Field in Colorado Springs. There I forecast for fighter and transport pilots. A visiting British forecaster tutored us about the D Day forecast, and a sergeant instructed me, "Lieutenant, never change your forecast. You may be wrong twice."

A lieutenant colonel rebuked me with, "God damn it Waggoner, don't you know that an east wind climbs the continental slope, its moisture turns to fog, and we will be socked in?" He later took me with him in a two-seated trainer to Love Field in Texas, ostensibly to teach me real life, but incidentally to visit his wife. My sharpest memory of the flight was flopping from side to side in red dust during a winter blow as we took off from a stopover in New Mexico for fuel. When my colleague from Chicago and fellow forecaster at Colorado Springs drew the graveyard shift at the air base, we would sometimes hike in the nearby mountains as the blue sky in his photograph of me testifies.



Later the turbulent air of the southwest and mountains nearly brought me to grief. I cleared a hospital plane, returning to California to carry casualties from the Pacific to a Colorado hospital. I warned the pilot of turbulence in a dry front over New Mexico, but did not write the warning in my forecast. He struck turbulence over New Mexico, the nurse riding in the empty fuselage was injured, and an inquiry was made. The pilot generously said that I had warned him. Proving that failed forecasts were serious, a colleague failed to forecast a cold front over the Northern Plains, a plane was lost, and he faced a court martial. Thanks to a generous pilot that remembered my warning, I never faced a court martial. I still brag, "I never killed a pilot."

Next the Army ordered me to the Harvard, Nebraska airbase, an army bus ride from Hastings. The B29 bomber group was preparing for the Pacific. Quickly after the Japanese surrender in the summer of 1945, the officers' club raffled such creature comforts as a washing machine that the club had bought.

From the officers' club I telephoned Barbara, Lockerbie where she was teaching in Juneau, Wisconsin, proposed marriage, and she accepted. Barbara and I married on November 3, 1945 at the Methodist parsonage of her church in Wauwatosa, Wisconsin. The day before I gave Barbara a combination engagement-wedding ring from a jeweler's in Milwaukee. Next we applied for a wedding license at the Milwaukee courthouse. The county officer redirected us to Waukesha for a marriage license because Barbara's family had recently moved from her long-time home in

Wauwatosa in Milwaukee county to Elm Grove in Waukesha county. Somewhere, we sandwiched in the Wassermann test for syphilis, a one-time legal requirement that unlike venereal disease has gone out of style. Fortunately Barbara's father had a gas ration to power his auto from jeweler to county to county to blood lab.

Barbara's sister Aline and her friend "Bud" Gage comprised our wedding party. To fumigate us at the reception at Barbara's home, her father had remembered the cigars that I forgot. Barbara and I spent the night at the landmark Pfister Hotel. Next day I impressed the bride by ordering frogs' legs at Mader's Restaurant, like the Pfister, another German landmark. Fortunately the Army had ordered me to Colorado Springs again. Thus we traveled the Milwaukee railroad through Appanoose and visited my parents in Centerville. There I shocked rather than impressed the bride by introducing a former high school girl friend. The only justification: My mother was a tease and encouraged me. In Colorado we climbed to the Will Rogers memorial, and on the way up, I shocked the bride again, noticing she had large shoes. Fortunately although brides may not forget, they tolerate. Still married, the bride returned to teaching at Juneau high school. I completed a tour in Colorado Springs and moved on to an air base near Denver.



During my brief assignment near Denver, a returning forecaster from the Pacific told me how the jet stream had been encountered and perhaps discovered. B29s bombing Tokyo upwind hung in a head wind filled with anti-aircraft fire, or flying downwind, the jet stream swept the bombers along too swiftly to hit a target. Flying higher in mid-latitude, bombers encountered a new phenomenon.

The Army then shipped me to my final base, Sioux City, Iowa. There I encountered an exercise in demobilization: A classmate from the University of Iowa, who had been bombing Italy, returned to the airbase in his home town to run a carpenter shop making wooden boxes to file war records. I still have one of his boxes in my attic, which we liberated from his shop. I recently met a veteran of the Battle of the Bulge who survived to liberate a US tank in Berlin, sold it to Russians and then stole it back, restoring it to its rightful owner. Neither my colleague's duties nor mine in Sioux City kept us from enjoying our last few months in the Air Corps nor hindered a harmless liberation.

BACK AT WAGGONERS PRODUCE IN APPANOOSE

Although I had not followed Dad's advice to become an accountant, I did maintain an interest in our family business, even investing in it some money that I saved from sexing chicks and forecasting weather. Barbara and I assumed that I would return to Centerville and Waggoners Produce, which I did during the winter of 1946. When her school closed in the spring, she joined me.

After the war, housing was scarce, and we moved into a house that grandmother Emma Waggoner had assumed in a foreclosure, and where my parents had lived briefly. It looked respectable but lacked central heating and indoor plumbing, a tough introduction to marriage for Barbara. Appliances were even scarcer than housing, but my dad wangled a kitchen range from the utility in Centerville. At first we stored our food in an icebox, but Barbara and her father soon wangled a refrigerator from a dealer in her hometown, who shipped it to us in Centerville.



I continued as a reserve officer in the air corps, which became the Air Force, and spent a month on active duty at Offutt field near Omaha, the headquarters of the Strategic Air Command and Curtis LeMay. My duty was the familiar one of manning a shift at the Offutt weather station on the margin of the Great Plains, making me a small cog in the wheel rolling toward the Cold War.

By correspondence, I completed courses via the US Armed Forces Institute, as a dean at Chicago had recommended, and I received a bachelor's degree from the University of Chicago. Also Phi Beta Kappa elected me a member.



Barbara's pregnancy and my absence didn't ease Barbara's introduction to marriage without indoor plumbing. Our first son, Von arrived on Valentine's Day 1947.

Although Dad and I worked 6-day weeks in a business that had prospered for more than a decade, the times weren't with us. Quietly and irresistibly, specialized farming was displacing subsistence farming and the farm wife's flock that brought in money year round. When I was in high school Dad had taken me to an introduction to specialized poultry: A community wide promotion in the county that is now home to Tyson Foods. Dealers like Waggoners Produce who sold supplies to small farmers and collected their produce to ship to cities were swimming against the tide. Barbara and I improved our house with indoor plumbing and paint, but profits were thin at Waggoners Produce.

One day I carried a case of eggs into the room where two ladies and a man candled them. Because eggs were bought dozens at a time from assorted farmers, someone candled them, tediously examining each in front of a lamp to judge its interior condition. In the case I carried in that day, the farmer had cushioned the eggs with a newspaper at the bottom. A story in the paper caught my attention. The state



meteorologist of the Weather Bureau, who was a mathematical statistician had inspired Iowa State College in Ames to create a program in agricultural climatology. I promptly went to Ames, was interviewed and was accepted. When I left, Dad had tears in his eyes, but he never voiced arguments or objections to my choice, not once. He was a quiet man.

AGRICULTURAL METEOROLOGY AT IOWA STATE

Iowa State was overflowing with other veterans, supported like me by the GI Bill. During the beginning of the winter quarter because housing for vets with families was scarce, I roomed alone in a subdivided house for several weeks. When I found an apartment, Barbara and Von joined me. Brother Wayne brought them with our possessions in a pickup truck, losing a box of silverware acquired with coupons from cereal boxes. In the apartment that I found, the landlady shouted whenever son Von cried, and she soon drove us out. We found rooms in a subdivided house for a few months.

Then we landed the great prize of a unit in Pammel Court, a village of temporary buildings sheathed in the same corrugated steel as clad Quonset huts, but with vertical walls. Oil carried from the 55-gallon barrel lying on a sawhorse of crossed 2 by 4s beside the front door warmed the unit. Young Von could watch passersby through the screen door. About a block away, a general store and laundromat occupied other Pammel Court units. Our unit of a living-room/kitchen, two bedrooms and a toilet were remarkably comfortable, and a short walk under the Union Pacific railroad reached the campus. On the right at the beginning of the campus, a statue of a veterinarian among pets welcomed us, especially little Von. On the left stood a barn with Percheron draft horses that also impressed infant Von.



Fortunately the bachelor's degree that the University of Chicago had granted me made me a graduate student, freeing me from some troublesome course requirements. The ag climatology program was in the Agronomy department. While I leapt into graduate courses in statistics and climatology, I had to repair shortcomings in undergraduate agronomy, soil physics and chemistry.

When I arrived, C H S Thom, the leader of the ag climatology program, introduced me to Jack Wallin. Plant pathologist Wallin was employed by the US Plant Disease Survey and stationed at Iowa State with responsibilities for surveying and forecasting potato late blight throughout the Midwest. Because the blight notoriously depends on moisture, Wallin had turned to Thom. Soon and happily, I was hired by Wallin and throughout my career in Ames shared his office on the ground floor of the Old Botany building as we studied weather and blight. Studying disease added other academic shortcomings to repair, and I studied botany, including plant pathology and mycology.

Wallin was only a few years older than I was, and he and his family became our lifelong friends. They invited Barbara and me to join a social club that required tuxedos for its formal dances at the Student Union. For \$15 I bought a used tux with a brocade vest, perhaps worn by President McKinley and certainly worn decades later by son Dan at a high school prom.

My education in meteorology, a branch of physics, equipped me somewhat better than other agronomists and botanists for statistics, plant physiology and soil physics. The professor of plant physiology flattered my application of differential equations to an undergraduate exercise. But, he cautioned, "Always explain the meaning in English."



The ag climatology students, mostly army veterans, spanned a range of studies. Robert Shaw studied corn phenology, the dates of tasseling and silking and became professor of agronomy at Iowa State. Another, Gerald Barger, calculated drought probabilities by fitting the Gamma distribution to them and spent his career

with the National Weather Service, at one time directing the national climate office in Asheville NC. Others like Bob Dale and Wayne Decker became state climatologists in Indiana, Missouri, and Michigan. The climatology program at Ames grew to merit its own truck, which was photographed beside Shaw's plots at the Agronomy farm.

My experiments concerned potatoes and late blight. Wallin had experimental plots on peat soil near Clear Lake IA where I mapped the spread of late blight from a central hill of potatoes across circular rows that I inoculated. Looking back, I wonder how I had the effrontery to inoculate plants with the disease that depopulated Ireland a century earlier, smack in a potato-growing region. Fortunately weather was cool and damp for blight to spread enough for me to map, and the commercial growers sprayed sufficiently to avoid losses to their crop. Things went well enough and accidents were few enough that about four decades later the Deutsche Phytomedizinische Gesellschaft awarded invited me to Muenster to accept the Anton deBary Medal honoring the scientists who discovered the fungus causing late blight, *Phytophthora infestans* (Mont.) de Bary

Adjacent to my plots a plant physiologist, as uninhibited by environmental concerns as I was by runaway fungi, experimented with weed control in onions. He tested Stoddard solvent, a paraffin-derived clear, transparent liquid which is a common organic solvent used in painting and decorating. A half-century later, late blight still spreads, and Stoddard solvent still controls weeds.

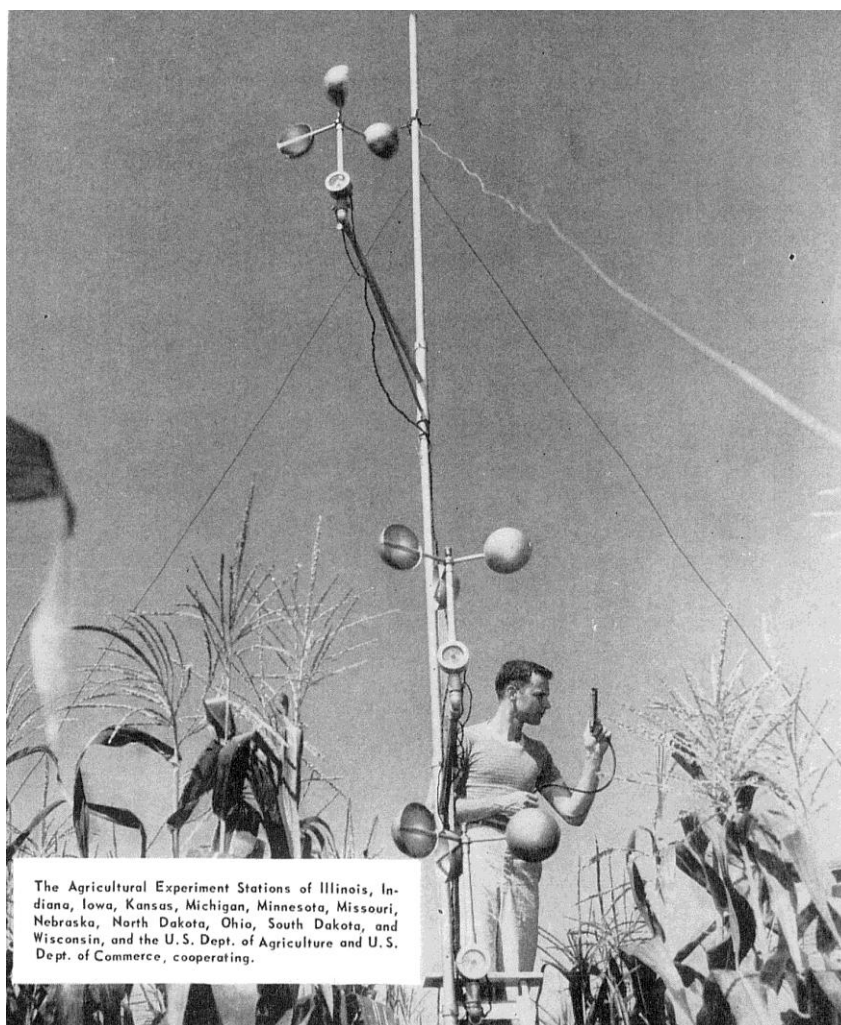
Beyond teaching me statistics, Professor Oscar Kempthorne, affected me twice. He led me to a classic paper by Philip Gregory, whom Kempthorne had known at Rothamsted Experimental Station. Gregory and his wife, a mathematician, had explained pathogen spread by applying the physics of the diffusion of gases, the simplest model of diffusion was spread from a point source, and hence I planted circular rows of potatoes. Kempthorne's other affect on me tilted me toward Connecticut. As I will write below, James Horsfall of the Connecticut Station offered me a job, Kempthorne had read about Horsfall's circular plots designed to expedite fungicide tests, and Kempthorne urged me to join such a clever fellow. For me, the newspaper at the bottom of the egg case in Appanoose and the circular rows in Clear Lake exemplify serendipity, the faculty of finding valuable or agreeable things not sought for.

While mapping the spread of late blight, I also measured the vertical gradients of humidity and temperature above my potatoes and nearby bare peat. By present standards, weather instruments in the 1940s were primitive. Although thermocouples were electronic and a potentiometer recorded their temperatures recorded on unrolling charts, a pencil transferred the numbers for analysis on a hand propelled Monroe calculator. Humidity was more difficult. The climatology group acquired a unique instrument. A themocouple measured the temperature of a mirror that was cooled by conduction from an ice bath below, and then heated when the reflection of light into a photocell signaled that dew had begun to form. The temperature of the thermocouple on the mirror, recorded on a potentiometer, was hoped to indicate the dew point. The entire instrument bulked as large as two suitcases, would only measure one dew point and was unreliable. It did entertain us for hours and days in the corn at the Agronomy farm.

A simpler instrument, an aspirated psychrometer, worked among corn and my potatoes too. Air from a hand-pumped bulb aspirated a wet and dry thermometer bulb, which indicated temperature and humidity. I pumped, wrote down the two temperatures, and looked up humidity in a table. The instrument that I used was about a foot long and weighted far less than a pound. Amazingly, I could sense the vertical gradients above my potatoes and adjacent bare soil. Aspirated psychrometers are still sold and used by air conditioning engineers, but

they now feature battery-powered fans rather than hand-pumped bulbs. The nearby picture is the cover of a Wisconsin bulletin. In the picture I'm standing on a stepladder amid anemometers in a corn field, squeezing the bulb in my right hand and holding the psychrometer in my left. Both the heavy old anemometers and my mercury-in-glass thermometers measured average conditions but certainly not gusts and fluctuations. And the results were written in a notebook and not recorded automatically on a chart and certainly not electronically.

When I submitted my Masters thesis with the grandiose title "Temperature and height relations over bare ground and vegetated plots on peat and mineral soils", the head of Agronomy telephoned me. He said "vegetated" wouldn't do. Repairing to the dictionary, I found "vegetated: to grow in the



manner of a plant; also to grow exuberantly or with proliferation of fleshy or warty outgrowths". My thesis in the Iowa State library says, "Temperature and height relations over bare ground and potato plots on peat and mineral soils" and I've used the dictionary and simple English, assiduously since. The scholarly Bulletin of the American Meteorological Society also preferred simple English, and in Volume 31, page 326 says "Temperature lapse rates over bare ground and over potato plots".

Although I measured temperatures, the core reason that I was in potato fields was disease. After all, the US Department of Agriculture hired me in the Plant Disease Survey branch. Jack Wallin and I, and sometimes I alone, visited potato fields in general and particularly in northern Iowa and in northeastern Indiana. A leader in plant pathology, Stakman of Minnesota, who had surveyed the migration of wheat rust, even collecting spores from an airplane over the Great Plains, inspired the Plant Disease Survey, and I was to survey as well as experiment. Wallin and I turned over many potato leaves, searching for the telltale downy fuzz of the fungus *Phytophthora infestans*. We never found a runaway epidemic in commercial fields. By spraying fungicide, growers took care that no runaway occurred, but we kept on searching.

My thesis, however, depended on experiments in the peat at Clear Lake. I parked my brother Wayne's homemade trailer in a park conveniently near my plots and worked in the plots that I have already described. The results of summers spent inoculating, crawling among the circular rows to count lesions, and pumping the psychrometer plus winters spent cranking a Monroe calculator produced two theses, MS and PhD. The results also produced published papers by me, Wallin and Robert Shaw in *Phytopathology*, the *Bulletin of the American Meteorology Society* and the *Plant Disease Reporter*. The subjects ranged from disease forecasting and micrometeorology to spread of *Phytophthora* and variation in its pathogenicity. A file called WagPub.doc lists all my publications.



Fellow student Barger, friend Martin Polhemus and I were reserve officers in the air corps and now Air Force. Barbara and I had no auto, and she transported Von to nursery school in the basket on the front of a used Raleigh bicycle. Others of the reserve officers, however, did have autos, which carried us periodically to Offutt field. A week end from the swing shift on Friday evening to the graveyard shift on Monday morning netted us four days of active duty and a useful supplement to students' income. A highlight of one Sunday morning shift was General Curtis LeMay prowling the weather station to keep the troops alert.

During 1950, Barb and I did buy a used Plymouth auto and drove to Washington DC, where I spent a summer month forecasting weather at Andrews field. We drove from Ames to Washington in convoy with the Barger family in their Hudson auto, because Barger was also spending a month on active duty. We were lucky to drive in convoy with Barger because our used Plymouth failed from time to time.

By the winter of 1950/51, my prospects for a PhD were bright enough to look for a job. In those days, graduates rarely became postdocs, but instead they sought regular jobs, usually by presenting a paper at a national meeting of a scientific society. Advised by my professors in plant pathology, I submitted papers for the annual national meeting of the American Phytopathological Society in

Memphis. Wallin and I rode to Memphis in his Ford. I underestimated how long my presentation at the conference would last and exceeded my allotted time. Nevertheless an introduction by George McNew made the mission a success.

McNew had led the US Rubber lab in Connecticut and collaborated with James Horsfall in fungicide development (Remember Horsfall's circular plots). McNew became head of Botany at Iowa State, while I was there. He moved on to direct a lab in Yonkers NY and renewed his acquaintances in Connecticut. In Memphis he introduced me to director James Horsfall and chief pathologist Albert Dimond of the Connecticut Agricultural Experiment Station. The picture at the right shows Dimond. After Horsfall and Dimond checked my references, they invited me to New Haven for an interview in 1951 for a job financed by the Atomic Energy Commission (AEC) to learn the effects of radiation on plant disease. So among snowdrifts, we drove to Columbus, Ohio, where Barb and Von stayed with her sister, while I rode the train on to New Haven.

The interview with Dimond and Horsfall went well enough that Connecticut offered me a job. Before I could accept, however, I had to deal with my reserve status with the army air corps, which had become the Air Force. The US was fighting the Korean War. Horsfall parlayed my future employment in the AEC-financed job into a deferment, and more than a half century later, I'm still on deferment.

PLANT PATHOLOGY IN CONNECTICUT

Back in Ames a mechanic specialized in homemade trailers for departing students, and after seeing it constructed from the rear axle and wheels of an old auto topped by a bed of oak, I bought one for about \$50. Because many students were leaving Pammel court after graduation, we helped each other load our goods. We loaded a table and chairs plus the refrigerator, bought in Barbara's hometown, shipped to Centerville, hauled to Ames in brother Wayne's pickup, and now loaded for Connecticut. The used Plymouth did pull the trailer successfully over the Pennsylvania turnpike. Reaching the turnpike over the hills of southwestern Pennsylvania did, however, take our breath away. Trucks ground over the hills in low gear, slower than I could pull the trailer in my lowest gear. When I was forced to stop while a truck ground ahead, the clutch slipped, and slipped some more, before I could get Plymouth, Barb, Von, trailer, table, chairs and refrigerator moving again.



We held our breath, and when we approached New York City, I didn't want to hold my breath in New York City traffic. We swung north to the Bear Mountain Bridge, a suspension bridge carrying U.S. Highways 202 and 6 across the Hudson River near West Point. The hills along the Hudson may have been a poor choice: A half century later the hills and two-lane roads descending to the bridge, have left the Bear Mountain Parkway still unfinished. Nevertheless, reaching New Haven through the hills along the Hudson river, crossing the Hudson over Bear Mountain Bridge and driving on the top of the Stevenson dam across the Housatonic river introduced us to Connecticut scenically, and we have stayed ever since. The refrigerator that Barbara's father had wangled in

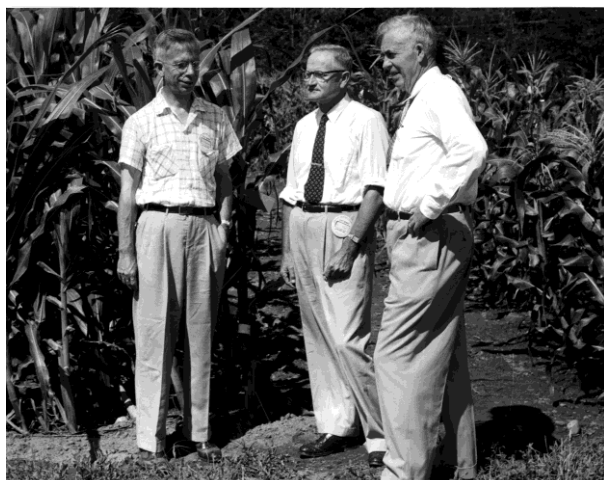
Milwaukee for our first home in Centerville failed within a year or so and then served as a paint locker in the basement until 2010. Son Von and I drug it out of the basement, and two men, marveling at the weight of the 1946 frig trucked it away. Small wonder that our Plymouth struggled to pull the trailer and it from Iowa.

Entering New Haven, we found no lodging and drove eastward out the other side of New Haven on Route 80. Still finding nothing, we went north on Route 5 to North Haven. In the town hall a policemen recommended Braghieri's cabin camp. During our fist supper in New Haven, Von complained of a pain in his jaw, and a nurse at St Rafael's hospital diagnosed, "Mumps". He suffered little, and we lived in Braghieri's cabin for about a month.

On July 1, 1951, I reported for work. I learned that a respected elder statesman in Plant Pathology, Earnest Stoddard, lived in Guilford. On the Fourth of July, we drove to see what Guilford looked like. We shall never forget our first glimpse of the Guilford Green, and respect for Stoddard plus the beauty of the Green drew us back to buy a partially finished house on Little Meadow Road in the spring of 1952.

In July 1951, however, I drove to work each morning and turned the Plymouth over to Barbara and Von. Housing was scarce, but I found the Ridgeland Apartments in the Yalesville district of Wallingford. We enjoyed the living room/kitchen on the ground floor and two bedrooms upstairs. We traded the black Plymouth for a blue Henry J, and I bought a table saw from Sears and built some furniture in the basement.

Knowing that I would work on an AEC project, I had given myself a crash course in atomic physics before I left Iowa. With Dimond in the photo on the right, I experimented with tomatoes and the wilt disease caused by *Fusarium*. In a test tube growing *Fusarium*, I encountered the smell remembered as a child when I sorted a pile of spoiling corn. Dimond had equipped a lab for radioactive tracers, and placed a Geiger counter in a former darkroom on another floor, where I counted the clicks from our samples. By radiating plants under an X-ray at Yale, Dimond and I explored the effect of radiation on disease susceptibility. Commuting to Brookhaven lab on Long Island by ferry from Bridgeport, we exposed tomatoes outdoors in a circular field with a radioactive source, usually raised at the center but lowered underground when we entered the field.



Soon after arriving at The Station, I drove to Lockwood Farm to bury radioactive phosphate safely until its radioactivity decayed, half every two weeks. Driving The Station car down a steep hill, the tires kicked up a stone, it struck and broke the brake line and I applied the emergency brake. I don't remember how I returned the auto, but I was evidently forgiven for my dramatic beginning at The Station.

During the annual Field Day in August 1951, I rode behind a tractor in a tumbrel filled with visitors and described experimental plots,

especially the invention of hybrid corn by Donald Jones on that very acreage. During Field Day in a later year, former Vice President Wallace of Iowa and Pioneer Seed Corn fame spoke, confirming Jones invention for the audience and wowing me, a transplanted Iowegian. The photograph shows James Horsfall, hybrid-corn inventor Donald Jones and Vice President Henry Wallace.

In the spring of 1952, Barb, Von and I moved from Wallingford to a partially finished house in Guilford. Dan, our second son, was born in August. During the next seven years on Little Meadow Road, I learned how to build a sidewalk, doorstep, and septic drain field. I built a stone wall that still stands and planted an oak that has grown up. In the attic I built a room and bunk beds for the two sons. Infant Dan crawled across the rafters and flooring as I worked, and stories of all the nail punches he lost in the attic are often told. In the back yard the boys kept a chicken and at another time, guinea pigs.

In the lab, Dimond and I hit it off, and published several reports, establishing the generally increased disease susceptibility of radiated plants. Although I was deficient in biochemistry, Dimond was not, and we ventured to study the toxin lycopersin in wilted tomatoes, and suffered the ribbing of other plant pathologists for the toxin's long name derived from the Latin name of the tomato, *Solanum lycopersicum*.

A more suitable problem for a former meteorologist was measuring the physical affect of strands of *Fusarium* mycelium in the circulatory system of the tomato. Did the actual plugging of the xylem wilt tomatoes, or did a toxin wilt them. We studied hydraulics, studied Reynolds numbers, and measured viscosity. Unlike most models that are miniature, our model was oversize, mimicking 40-millionths-meter wide xylem tubes with a glass tube 1000 times larger. The model mycelium strands were modeled at the same scale. By increasing the viscosity of the fluid that modeled sap flowing in xylem we kept the Reynolds number constant. Fluid dripped through the model. Our report in the *American Journal of Botany* established that mycelium obstructed xylem flow somewhat, but we concluded that additional causes must be wilting the diseased tomatoes. Dimond was an excellent mentor, giving me the courage and effrontery to publish in *Science*, *Nature*, the *American Journal of Botany* and *Phytopathology*. At his wife's funeral in 2010, forty years after Dimond died, I testified that she had enriched his life, which I knew as his closest colleague for twenty years. I added, "He raised me from a pup".

My practical responsibility at The Station was potato diseases, because I had studied late blight in Iowa. After a wet season that damaged potatoes, I experimented with washing muddy potatoes, which made decay worse, and exposed me to some ribbing for a report in the *American Potato Journal* with the undecorated title "Washing muddy potatoes." My other report in the *Journal* had a somewhat decorated title, "Radiation and resistance of tubers to rot". It reported that radiation to inhibit sprouting increased susceptibility to decay. The report caught the attention of the Army and took me on my first commercial flight. The Army called me to Quartermaster headquarters in Chicago. After they inhibited the sprouting of a boxcar of potatoes, they found them rotting and running under the doors. I could only confirm the cause. Radiation inhibited healing of the inevitable scratches and cuts of the spuds. And sympathize.

SOIL SCIENCE AND CLIMATOLOGY IN CONNECTICUT.

Horsfall who tested fungicides in his spiral plots and Jones who invented hybrid corn were not the only giants at The Station. M. F. Morgan devised a simple test for nutrients in soil, which 14 thousand results on Google today verify is still used more than 80 years later. He built concrete frames to test different growth in the soil types that he surveyed in Connecticut, and a lysimeter to measure the evapotranspiration from plants and leaching of nutrients from soils. During World War II, he took leave and became an army officer. When a sniper killed him on Leyte, The Station suffered a great loss.

Morgan's successor failed, and in 1956, The Station Board of Control changed the department of Soils to the department of Soils and Climatology and made me its chief. When the state legislature created The Station, the first in America, in 1875, it placed a Board of Control in charge. The governor is always elected its president, and the director is one of its eight members. "Chief scientists" head departments.

Studies of soil continued in the department, including collaboration with Henry DeRoo to study root distribution. Associating with soil scientists, I applied the same theory that I had applied to spore distribution to the depths of wind blow loess across the Midwest.

While the soil mission continued, I was able to begin climatology anew, beginning with the combination of plant disease spores and their diffusion in the atmosphere. The purchase of a spore trap invented by Jim Hirst at the Rothamsted Experimental Station in England revealed the seasonal and daily cycle of apple scab spores in air of Station orchards. Hirst was a protégé of Philip Gregory, and later I would accompany them on a ferry boat across the Thames to visit the East Malling experiment station in Kent.



My scientific reports of spore trapping omit two vignettes from the orchards: Keeping a one cylinder engine going and the loss and finding my pen knife. To power the suction of the trap far from electric power, the English machine came with an engine. After several interruptions of trapping, I took the engine to the local mechanic who repaired my auto. Intrigued by seeing it was the same brand as on his English motorcycle, he struggled hard to make it dependable. The venture came to an end when, left alone in the orchard, the gas tank leaked and the engine burned without harm to the trap or orchard. An electrical motor and long extension cord made the trap dependable.

The second vignette shows a pen knife with white pearl handle. Former director Bill Slate of The Station, a font of aphorisms, claimed you weren't dressed if you hadn't your knife. Accidentally I dropped my pen knife in the tall grass of the orchard, and a few days later I accidentally spied its

white handle. Prolonged in the telling, the story of the knife with the white handle became an often repeated bed-time story for son Danny.

The Station participated in a regional climate project of the experiment stations in the Northeast, and The Station employed Christopher Bingham, a statistics student at Yale to study the statistical distribution of max and min temperatures. The outcome was the Bingham distribution, named after Christopher Bingham, an “antipodally symmetric probability distribution on the n-sphere.” Although devised for temperatures, the distribution is widely used to analyze paleomagnetic data..

Participation in the regional project introduced me to agronomists at Cornell University, and they invited me to lecture for a month. By Greyhound bus from New Haven via Scranton, I reached Ithaca and spent a profitable month, delivering weekly lectures and meeting faculty and students. My visit was followed by The Station hiring Cornell students: soil chemist Charles Frink and crop ecologists Dale Moss and John Hesketh. When I became director in 1972, Frink, shown in the photo on the right, became my loyal vice director. Watching Moss’s and Hesketh’s experiments with photosynthesis taught me the effectiveness of carbon dioxide concentration and prepared me for National Academy studies on the consequences of rising carbon dioxide and faster photosynthesis.



At The Station, studies of the atmosphere near the ground and among plants proceeded. The photograph of me on a ladder at Iowa State a decade before foretold my tendency toward micrometeorology.

The assertion that the absorption of infrared radiation by polyethylene film made it a peculiarly effective hot cap or row cover to protect plants from frost inspired my series of experiments with films, both over plants and on the soil. A remark about the experiments by a summer helper made as we entered Lockwood Farm illustrated an advantage of an Experiment Station over a merely scientific institution. The summer helper said, “I was once shocked but have become accustomed to hearing as we enter the Farm, “Good. Frost has killed half the plants!”” Without a killing frost, of course, the experiment with frost protection would have been fruitless.

Truly, polyethylene does absorb the infrared radiation that cools the earth and thus brings on nighttime frosts. But although an appealing theory, my experiments showed no difference in frost protection among several transparent films. Another experiment revealed why the several films’ frost protection doesn’t differ. I built frames supported several feet above the ground and measured the net outgoing radiation beneath them at night. With a net radiometer swung, back and forth beneath the open sky and under the film-covered frame, I found that the net loss on a clear night dramatically slowed when dew condensed on the film. The magical frost protection arose not from polyethylene’s peculiar absorption spectrum but from the moisture that condenses on the film as it cools below the dew point. Covers, of course, also slow convective cooling. Inside a row cover or hot cap over transpiring plants and moist soil, the dew point is generally high and water generally condensed on any covering film, day or night. If meteorologists could experiment with earthly globes cloaked in more or less carbon dioxide as I tested different plastic films at Lockwood Farm, the argument whether more radiation-absorbing carbon dioxide will warm the globe could be settled, pronto.

In the 19th century the founder of the Experiment Station wrote, “Observations are like listening to a witness, experiments are like cross examining him.” In the 21st century, I say, “Models are like

listening to a defense attorney, observations are like listening to a witness, and experiments are like cross examining him.” Better than argument from radiation absorption spectra, experiments showed that condensed moisture, not polyethylene’s peculiarity, did the job.

Another assertion about radiation inspired other experiments. As your eye tells you, a black plastic cover, or mulch, on the soil absorbs more light than a shiny transparent film. So, people commonly assert that black film will warm the soil more. My experiments with side-by-side, black versus clear polyethylene film, however, quickly disabused me of that misconception. Ignoring assertions, the soil under the transparent film warmed much more than under the black. The opaque film absorbed sunlight and grew hot, and the hot film then lost much energy to the air. The transparent film transmitted sunlight to the soil beneath, and the sheltering film slowed the loss of heat to the air. A net radiometer swung over panels of different color plastic plus calculations of heat conduction into the soil and convection into the air provided a logical explanation. And because the panels of plastic were not wide, the experiment with a radiometer over panels caused me to learn about “view factors”, the adjustment of radiometric measurements above checkered surfaces. Although I calibrated the radiometer in absolute terms, the experiment of swinging a single radiometer over different covers to contrast them gave me added confidence in the measurements.

Radiometers and collaboration with Bill Reifsnyder led to measurements of the climate of shade. Like me, Bill was a former Air Corps weather man, and like me, he was employed at an agricultural institution, the Yale Forestry School. We began with the tobacco shade tents introduced by The Station generations before for growing thin leaves to wrap cigars. The Station’s Valley Laboratory in Windsor provided a laboratory for both lab and field studies in the Connecticut Valley, and there I studied potatoes, but especially tobacco.

At the same time that we studied the radiation balance beneath shade tents, I also studied the spread of blue mold beneath the tents. To inoculate tobacco and map its spread without danger to the farmers in the Connecticut Valley, we erected a tent at the Lockwood Farm in Hamden. The staff who came from the deep sandy soil of the Valley Laboratory to erect poles heard a novel sound when post hole diggers struck stones in rocky Lockwood Farm. I saw a new sight when I entered the shade tent at night to inoculate plants: The tobacco leaves that had covered the soil during the day folded neatly to an upright position after dark, separating the plants by neat paths for me to carry inoculum by flashlight.

Eventually our span of micrometeorology extended to a mathematical model of the radiation and microclimate within forests, and even human comfort and discomfort in environments of closed forests, beneath isolated shade trees or on a sandy beach or asphalt parking lot. A picture of son Von measuring radiation on our beach in Guilford provides a true vignette of studying the energy balance on a beach.²⁵

THE ENVIRONMENT, DROUGHT AND FORESTRY AT THE STATION

My recollections have reached the 1960s, when three stars came into conjunction.

- An awakened environmental awareness, epitomized by Rachel Carson's *Silent Spring*.
- Ten of 12 years drier than normal in Connecticut, including; seven straight dry years, some with about only half normal precipitation.
- And at The Station, the retirement of the chief forester and my assuming leadership of forest studies.

In Connecticut, the director and chief entomologist long had statewide responsibilities for insect control as well as research. The state, which suffered malaria epidemics, in 1915, authorized the director to drain mosquito breeding grounds.²⁶ When the gypsy moth, released in Massachusetts spread into Connecticut, the state authorized The Station to survey and control the pest, counting egg masses and dragging spray hoses through the forests. With the discovery of DDT during World War II and soon availability of aircraft, campaigns of aerial spraying for eradication began, and the director had the authority to order spraying. The Station was restrained in ordering spraying, in part because the director and chief entomologist did not believe the pest could be eradicated. A citizen angered by the falling droppings and in the sun beneath bare branches hailed the entomologist into Bridgeport court for failing to order spraying. *Silent Spring* noted The Station's restraint favorably. Nevertheless, environmental activists picketed The Station's annual Field Day. The Station felt the sting of the environmental movement.

The second star in conjunction, drought, encouraged Station scientists to study the stomatal pores that let water transpire from leaves. Station biochemist Israel Zelitch found a chemical compound that would narrow leaf pores, and in 1962, he and I reported that the narrowing pores would slow evaporation through them, so-called evapotranspiration. Proof required an experiment because the firmly held theory at the time said that the perimeter of the pores, not their opening and closing, controlled evapotranspiration. Larger scale experiments than our tobacco leaves drawing water from beakers in a chamber followed.

The third star in conjunction, my new responsibilities in forestry, included the decennial counts of thousands of trees on long forest plots, running up hill and down. In 1927 Station forester Henry Hicock had recorded every stem larger than a half inch on four stands typical of that period. The stands had begun growing around 1900, had a prior history of repeated cutting and farming, and were predominately hardwood. The census of the plots was loyally continued by foresters George Stephens and Jeffrey Ward. When Ward reported the state of the plots in 1997, he chronicled the outcome of 70 years of natural selection, gypsy moth and canker worm defoliations, and the lengthy drought of the 1960s. On the plots undisturbed by humans, the foresters recorded the rise, fall and some persistence of 43,357 stems of nearly 60 tree and shrub species. Hicock began the census in 1927 to learn what species of tree the soils and drainage favored on the long plots. His successors learned how the species array changed. Formally leading but actually apprenticed to foresters, I learned forestry. George Stephens adopted me as a co-author of reports about the long-term plots.²⁷

THE SUBURBAN FOREST

Despite a growing Connecticut population, the state's forests have doubled their expanse since their nadir, a mid 19th century transition from shrinking to expanding. Farmers cleared forests for fields, pastures and firewood. Then in mid 19th century, forests expanded as factories lured people to town. They burned more fossil fuel and less wood, and railroads carried food from the west. Trees now cover about two-thirds of the state. As commuters spread out in the mid 20th century, they generally moved into the woods rather than clearing them. Hence, by the 1960s, much of Connecticut was a suburban forest.



Proceedings of the
LOCKWOOD CONFERENCE
on the
SUBURBAN FOREST
and
ECOLOGY

Accordingly in 1962, the director invited eleven distinguished botanists, ecologists, foresters, naturalists and agronomists to the Lockwood Conference on the Suburban Forest and Ecology. Perhaps by design, the director left the country and turned the show over to me. I became 39 years old on the day after the Conference and my plunge into the Big Time. For three days we talked in Slate laboratory at The Station and sometimes outdoors, in the words of one conferee, in the presence of our subject, The Suburban Forest. Derrick Ovington of The Nature Conservancy in England stayed on, and he, Lois Pierson and I transcribed the discussion, organized them on slips of paper and produced the 100-page Proceedings, Bulletin 652 of The Station.

In the Proceedings one can read how I opened the Conference;

Considerable courage was required to invite 10 distinguished biologists to New Haven and assign the suburban forest as a topic for investigation. We were emboldened, however, by knowing that all, whether from England (Old or New), Texas, St. Louis, Urbana, Ann Arbor, or the Metropolitan East, were well aware of or deeply involved in some aspect of a surprising phenomenon of our times.

I refer to the miraculous increase in productivity that feeds more and more people from each acre and to the technology that taps ancient reasons of carbon for fuel and fabric.

We are, I believe, both the eyewitnesses and the heirs of the most dramatic release of resources the world has thus far known. We meet here to consider particularly the release of land no longer needed for tillage. The landed estate we survey, the wealth we inherit, is indeed vast. Both as eyewitnesses and as heirs, we have our limitations. We shall not be able to agree exactly in our descriptions of what we see. Eyewitnesses seldom do. We shall, I trust, disagree in some measure as to how our inheritance should be used. Heirs commonly disagree. But we can at least walk the bounds together. That is why we meet here on this beautiful spring day in historic New Haven.

Six centuries ago a less beneficent releaser of land, indeed a satanic liberator, cut a swath across Europe. Men called it the Black Death and it swept away perhaps a third of the people in its path. "The scourge passed, and a Europe [awoke] too small for its clothes." ²⁸

The release of land and of people from the land, in our time has not come with the terror of pestilence. But it has left fields untilled and farmsteads unwanted. Our clothes of productivity, so generously fashioned, hang loose upon us despite our growing numbers. We are too small for our breeches.

We are uneasy, like a farm boy newly transplanted in the city, as we seek to adjust our old and familiar ways to new realities. At the same time we know that millions of people elsewhere in the world would like nothing better than to match our opulent attire.

In this time of tumult, in this era of miraculous productivity, lies the opportunity to attain a long-sought goal. This goal of conservationists, inherited through Thoreau, Muir, Pinchot, and Roosevelt, is the freeing of land from tillage and its restoration to perennial plants.

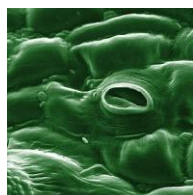
My final words at the end of the Conference reflect the bugaboo of the 1960s and reprise my theme of experiments. "Clearly, we need not only to collect and synthesize information but also to run experiments. Because of the rarity with which the gypsy moth comes back to the same spot, the challenge is here for ecologists to devise suitable experiments."

After a half century, I cannot put the issue better. Scotsman Frazer Darling concluded the Conference, "I thought to myself, well now this is a magnificent opportunity to be a keeper for landscaping a very large area of the state for pleasure. How many places in the world can this even be thought of at the moment?"

Ovington's stay at The Station inspired George Stephens to cut up red pines--needles, twigs, branches, roots and all--portioning and weighing biomass, before the process became fashionable for estimating the carbon sequestered from the atmosphere. When I spent a sabbatical in Britain in 1963, Ovington organized for me a once-in-a-life tour of Nature Conservancy sites in Scotland, and I show him with my sons in a reserve. The Conference on the Suburban Forest continued my apprenticeship in forestry and ecology. Years later when an ecologist supported his impassioned statement by citing the Ecological Society of America, I was able to retort, "I too am a dues paying member of the Ecological Society."



STOMATA AND EVAPOTRANSPIRATION



Microscopic stomata perforate leaves, exposing the moist interiors to the air and allowing carbon dioxide for photosynthesis to enter and water to escape. Although saying that the perimeters, the distance around the swelling and

shrinking guard cells that surround leaf pores, controlled the amount of water escaping from the pores may seem strange today, in 1960 doctrine in plant physiology said it was so. Most physiologists then believed that stomatal control of transpiration was effective only when the stomata were nearly closed. With compounds that open and narrowed the pores, experiments punctured the doctrine. A dental technician introduced my colleague Israel Zelitch to silicone rubber, who learned that silicone rubber and nail polish would make imprints of the microscopic pores that would reveal whether they were wide or closed. He found one organic compound would narrow them and another colleague, Ernest Stoddard, found that the common fungicide, phenyl mercuric acid, would also do the job. Our measurement of changed transpiration from tobacco leaves with their petioles in beakers in a small chamber followed, disproving the doctrine about perimeters rather than width of the openings. Eventually, studies of the narrowing of stomata by carbon dioxide would prepare my mind for the conservation of water by rising concentrations of carbon dioxide in the atmosphere.

A vignette: At a national agricultural meteorology meeting, I told a physicist, Champ Tanner, that narrower stomata slowed transpiration. From theory, he argued that couldn't happen. A bystander said, "Listen to him, Champ. Their experiment proves it."

Attracted by our success slowing transpiration by chemical spray, Israeli scientist Daniel Shimshi joined us. To measure stomatal opening and closing, he had adapted a sphygmomanometer, which usually measures blood pressure,. He attached a pair of rubber rings to a surgical clamp and the hose that normally leads to the band around arm and arteries. To measure stomatal opening, clamp the rings on a leaf, pump up the pressure and watch how fast the pressure falls as air leaks through a leaf. During experiments with stomata-narrowing chemicals in the next few years, we squeezed and pumped adapted sphygmomanometers on foliage more than a nurse in an emergency room squeezes the real thing on arms. Son Von shows how Rothamsted wheat. We called our instrument, a porometer.



To test whether narrowing stomata would alter the sum of water evaporation from soil and transpiration from foliage outdoors we brought back into use soil frames set in the lawn outside our Station laboratory. A quarter century before, M. F. Morgan had poured an array of squares or curbs of concrete, about 2 by 2 feet wide and deep to compare growth in different Connecticut soils, side by side. We filled the frames with the same soil, transplanted tobacco, sprayed on stomata-narrowing chemicals, sampled the soil for water and demonstrated the effect on evapotranspiration. Shimshi spied a rabbit near the tobacco and worried it would eat the experiment. I assured him that rabbits don't chew tobacco. He replied, "You know rabbits don't chew tobacco. But do rabbits know they don't chew tobacco." We needed wider fields.

A sabbatical leave opened wider fields. In 1960 meteorologists estimated evapotranspiration from the net radiation received by foliage and open water. The radiation supplied the required energy to convert water to vapor, a requirement incorporated in the Penman equation. Howard Penman was a physicist working at the Rothamsted Experimental Station. In 1951 Penman and his colleague R. K. Schofield included stomatal resistance in their calculations of transpiration from crops. Nevertheless studies of evapotranspiration focused on net radiation and Penman's equation. I asked Penman if I could work in his laboratory in Harpenden, England during a 6-month sabbatical in 1963.

As it turned out, I mainly worked with John Monteith, Penman's associate. In a field, Monteith had constructed a pair of weighing lysimeters, gigantic beam balances. A pair enabled comparison of treated versus untreated plots. On one end of each lysimeter beam hanging on flexible metal strips was a monolith of soil and crop, flush with the field. On the other end of the beam, reference weights were changed, measuring the gain of water during rain and its loss by evaporation from the soil and crop. In the crucial experiment, I sprayed a stomata-narrowing chemical on the wheat crop on one lysimeter, with the porometer I verified that the stomata had been narrowed, and Monteith's assistant Geza Szeicz recorded the changing weight of each lysimeter and thus evapotranspiration. One exciting morning, Szeicz told me that the predicted slower evapotranspiration from the sprayed plants had been verified. We promptly reported in the journal *Nature*, *Decreasing transpiration of field plants by chemical closure of stomata*, proven by experiment, outdoors in a real crop.

Although the lysimeter experiment provided the highlight of 1963, good fortune blessed the entire English sabbatical. Our trip to England was the first time we had left North America, and we sailed across the Atlantic, east on the Queen Mary and west on the Constitution via the Mediterranean. Our sons attended St George's School; our landlady Elsie Ledger adopted Barbara as a daughter and our boys as grand children. I became personally acquainted with Philip Gregory and Jim Hirst, whose studies of spore dispersal had inspired me and who worked at Rothamsted. During August, we drove from the Netherlands, across Germany, Austria and the Brenner Pass to Venice before heading west to France where the seminal gathering of plant epidemiologists met in the Pau casino within sight of the Pyrenees. Decades later when Don Aylor and I wrote the history of plant epidemiology in the 20th century, the photograph of the attendees at Pau formed the centerpiece.²⁹ My professor Jack Wallin, and Paul Miller, the national leader of the US Plant Disease Survey that employed me as a student, are in the photograph. So too are the chronicler of Irish potato disease, P. M. A. Bourke, the South African, J. E. van der Plank, who changed epidemiology with the logistic curve, and spore trapper Jim Hirst.



Figure 2 Many cited in the review of twentieth-century plant epidemiology attended the NATO Advanced Study Institute at Pau, France, 1963. From left to right. Front row: PMA Bourke, Mme. Czuti, PR Miller, CT Ingold, AJP Oort, Mme. des Tombe, RD Schein, JM Hirst, JE van der Plank, MV Carter. Middle row: EB Cowling, M Urbain, RA Hyre, J Ponchet, JR Wallin, E Forsund, RV Bega, FA Wood, HT Cook, H Schrodter, LP Smith, PE Waggoner, Mme. JC Zadoks, IF Storey, JC Zadoks, D Lapwood, R Corbez, RW Gloyne, Assistant of M Urbain. Back row: RT Burchill, JA Snow, GA de Weille, EP van Arsdell, CE Yarwood, SM Pady, J Rotem, J Palti, TF Preece, J Ullrich, H Bortels.

PROVING THAT, EVEN IN TALL FORESTS, STOMATA AFFECT HYDROLOGY

After testing the stomatal influence on evapotranspiration in crops, my colleagues and I set out to test stomatal influence in forests. Would the narrowing of stomata that we had shown slows evapotranspiration from tobacco leaves in a chamber and wheat in a field also slow the loss of water from such forests as clothe many watersheds?

In the summer after returning from Rothamsted and with the backing of the director, I arranged to test stomatal narrowing on a watershed of the US Forest Coweeta Hydrologic Laboratory, Otto, North Carolina. The US Forest Service created the laboratory in 1934 to study how forests affect streams in a mountainous region. Runoff from adjacent tree-clad coves was metered over weirs. From a helicopter leased from the Tennessee Valley Authority, we sprayed alternate coves with a stomata-narrowing chemical. When I climbed in beside the veteran helicopter pilot, his trifocals for alternately looking ahead, watching instruments and reading fine print made me uneasy. When aloft, he impressed me further by telling me to trust my harness, step out onto the skids and photograph the watershed below.

Unfortunately the experimental results were less impressive than stepping onto the flying skids. We detected no difference between runoff from sprayed versus unsprayed coves.

Undefeated and with a new colleague from Israel, Ben Ami Bravdo, and faithful technician Dwight Downs plus some new tricks, I turned in 1965 to a red pine plantation along the Rhode Island boundary maintained by the Connecticut State Forest department, Fig Voluntown. Trick #1 was randomized plots to be sprayed with phenyl mercuric acetate from the ground. Trick #2 was measuring the change in moisture in the trees by the daily shrinking of their trunks as their crowns demanded water on warm days. Trick #3 was measuring evapotranspiration by the change in the profile of soil moisture beneath sprayed versus unsprayed plots with a neutron meter. This time and with the additional help of Neil Turner from Australia, we observed that stomatal narrowing clearly slowed evapotranspiration, conserving moisture, first in the tree and then in the soil..

The run of dry weather blessed us by minimizing the interference of rainfall to the attribution of soil moisture changes to evapotranspiration. The deep sandy soil allowed us to augur and drive down 2-inch aluminum electrical conduit, which we called access tubes, so that we could lower the neutron source wholly through the root zone of the trees. Our muscle, an augur and finally a maul and a temporary iron cap on the aluminum tubes sank the 6-foot long access tubes in to the soil. We battered the tops of a few aluminum conduits but finally inserted tubes in every plot. A view of Bravdo's sturdy form in the Voluntown pines shows the reader why nothing could stop us. Technician Dwight Downs, who stands with Bravdo worked faithfully, first for M. F. Morgan and then for me. During Israel's 1967 war, Bravdo bemoaned absence from the front and his duty as a reserve officer.



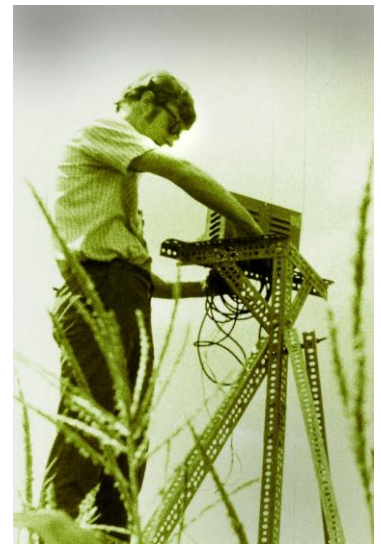
In our plots, small brass washers glued to tree trunks and three nails around them revealed the daily swelling and shrinking of the trees as transpiration sucked on them. Surprising at it may seem, a depth gauge could detect the diurnally changing distances from washer on the bark and nails driven into the wood beneath. A device that we called the bomb confirmed the changing moisture in the trees. A small branch cut from a tree was inserted through an O-ring to hang within the bomb, a gauge indicated pressure with the bomb as compressed air was admitted, and the cut end of the branch was watched through a magnifying glass. The air pressure that finally pressed into view sap from the conducting xylem indicated the hydration of the foliage. Both the shrinking of the trunks and hydration in the foliage indicated that stomatal narrowing brought on by our spraying foliage was conserving moisture.

Profiles of soil moisture beneath the sprayed and unsprayed trees confirmed that we had slowed evapotranspiration as we reported, first in scientific journals and then in 1971 Neil Turner and I reported fully in *Transpiration and Its Control by Stomata in a Pine Forest*.³⁰



The necessity of analyzing thousand of clicks profiling soil moisture, week by week, drove me to computing machinery, a big, main-frame IBM at Yale. My friend George Furnival from the Yale Forestry School taught me to program the monster in Fortran, about which more later. During the years of our experiment in the pines and commuting during multi-day observations, we often slept on the floor of the state forest nursery (which the Department of Environmental Protection would transfer to The Stasion decades later). We ungenerously called the cross roads nearby, Downtown Voluntown and called a homely waitress at a nearby diner, the Ugly Duckling. When we dug a pit to explore the depth of roots and then refilled it, authorities feared what might be buried there and re-dug the pit. With elastic rope, Bravdo strapped the monitor of the neutron meter on a two wheeled golf cart. Son Dan helped record the clicks on the neutron meter. After long days on dry fallen needles with little drinking water and new braces soldered on his teeth, he was not eager to visit Voluntown again.

Back near New Haven at Lockwood Farm with a pair of lysimeters like those at Rothamsted that had shown the consequences of stomatal narrowing, Neil Turner took the demonstration of stomatal effectiveness a step further. He grew corn on the pair of lysimeters. He sprayed water on foliage on one lysimeter where it evaporated unhindered by stomata. Water from the leaf interiors on the other lysimeter had to evaporate and then transpire out through the stomatal pores. With both the lysimeters and the net radiometer he tended from a ladder, he measured the radiation changes accompanying the slower evaporation through stomata versus water evaporating outside and free from their hindrance.



SERENDIPITY IN VOLUNTOWN AND AMONG STOMATA

Alert to clues along a road, the Princes of Serendip described a camel that traveled unseen ahead of them, and the English language gained the word serendipity, the luck of finding valuable things that are not looked for. In Voluntown and among stomata, serendipity brought top-notch recruits and taught new skills.

At Stony Brook on Long Island, which is visible from a trap rock ridge in New Haven on a clear day, engineer Don Aylor measured transpiration from his wife's house plant. His professor praised his scrounging. Aylor enclosed the plant, pumped a vacuum in the enclosure, observed the closing stomatal pores, and measured transpiration from the plant. In 1969 serendipity brought him across the Sound to visit stomatal experimenters at The Station, and we never let him go. He shared my inclination to work at the boundary of physics and biology. At The Station, he tested fancy mechanics and math about stomatal opening between microscopic guard cells. Cleverly he chose to experiment with the tools of toy balloons and masking tape, and he produced a refreshingly understandable report in the *American Journal of Botany*.



Outdoors Aylor investigated the muffling of noise by vegetation. Renting speakers big enough for rock concerts, he then metered how many decibels passed through a cornfield at Lockwood Farm, first with stalks up, and then after leveling the cornfield in minutes. He learned how much perception rather than decibels affected volunteers' sense of the noise from behind a Stonehenge of trees, barriers and gaps that he improvised around a swivel chair at the Farm.

Soon the study of flying spores and pollen, called aerobiology became Aylor's theme. Tracing spores followed The Station's tradition of plant pathology, and tracing pollen followed its invention of hybrid corn. Others, including me, had mapped the patterns of disease spread. It took Don, however, to delve into the mechanics of takeoff, flight and landing of spores that painted the patterns.

After I became director in 1972, Aylor led the department that I had led, and subsequently and for decades, he led plant pathology at The Station. When Aylor and I wrote the history of plant epidemiology during the 20th century, *Epidemiology: A science of patterns*, it was clear that Philip Gregory of Rothamsted led the middle years of the 20th century and Aylor led the remaining decades.²⁹

Another instance of serendipity. Applied mathematician Jean-Yves Parlange was studying the shape of flames at Yale. When I asked a leading physicist at Yale who might like to work part-time at The Station, he introduced me to Parlange. A shower of reprint requests followed Parlange's publication of his first report from The Station, about plants and water. After receiving few requests for his studies of flames, the ready response to his studies of stomata hooked him. For several years Parlange and I, for example, recorded the play of colors across leaves as a coating of liquid crystals showed breezes cooling them, measured the germination of spores in changing temperatures, and even devised a scheme for saving fuel by gambling on degree days.

Preeminently, however, Parlange studied stomata, and a 1988 review of stomatal control of transpiration cited his 1970 analysis in the pantheon of Brown and Escombe (1900) and Milthorpe and Penman (1967).³¹

EPIDEM, A COMPUTER SIMULATION OF A PLANT EPIDEMIC AND SERENDIPITY FROM VOLUNTOWN.

Voluntown's influence extended afield from stomata into plant pathology. Learning to program computers for the analysis of masses of soil moisture measurements equipped me to compose the simulation of a classic disease, potato late blight. The blighting of cobbles first starved the Irish in the 1840s, then gave me a subject for my dissertation at Iowa State a century later and in the 1960s helped me again..

In the 1960s amid my calculation of soil moisture in Voluntown, an invitation to lecture at a biometeorology conference in Oregon landed on my desk. With sheets of computer output from Voluntown on my desk, I saw an analogy between the logical questions IF in Fortran and hourly weather that decided the fate of a spore on a potato leaf. And, I saw an analogy between Fortran's DO's from now into the future with the repetitions of cycles in a building epidemic. Forecasters of potato late blight had generally used histories of weather and epidemics to anticipate new outbreaks. My new tack instead built on the generations of laboratory experiments that had established the relations of moisture and temperature with the success and speed of the pathogen's life cycle stages from spores through germination and infection on to a new crop of spores. Equipped with my new ability to program fast computers, I simulated and then connected the success of each stage of a growing or expiring epidemic. I called the simulator, EPDEM.

Following standard procedure, I sent my manuscript *Weather and the Rise and Fall of Fungi* to Director Horsfall for approval for publication. Because the Director followed the rules of precedence, he would usually invite me to his office. When Director Horsfall instead appeared in my doorway as plant pathologist Horsfall, I knew he was complimenting my work. He was eager to collaborate on a more thorough simulator of a pathogen and disease that he knew from beginning to end: *Alternaria solani* and potato early blight. We proceeded, using existing facts about each stage of the fungus and its environment and adding new experiments where needed to complete the circle of the fungal life cycle, we composed EPIDEM and published the Fortran and rationale in the 80 pages of Station Bulletin 698. Graciously Horsfall later wrote that it was collaborative work, Waggoner did the work and he did the collaborating. Horsfall loved language and is solely responsible for changing awkward EPDEM to the more pleasing sound of EPIDEM.

Correctly fearing that the computer revolution might produce *gigo*, junk in, junk out, our Irish friend P.M.A. Bourke wrote,

Taking to Computers is generally regarded as a sign of maturity in a field of study, in much the same way as experimentation with tobacco and alcohol is a sign that one's children are growing up. The analogy, if a trifle sour, has at least the merit of reminding us that there are inherent dangers in both developments, even though computers are not yet required to carry warning notices.

Bourke, a good friend, head of the Irish Meteorological Service and charming lecturer, studied potato late blight for a life time. He wrote his lecture notes in two colors; black certainly to read, red to skip if the going was slow. Bourke is seated first on the left in the picture above from Pau. I last saw him at The Station on his way to lecture to Boston's Irish police on the history of the blight that had brought many of their ancestors to America. I'm sure he charmed Boston's Finest.

In all events, EPIDEM published with Fortran commands written in blue on its cover was a success. When Southern corn leaf blight arose there was, of course, no history of epidemics to analyze for the likelihood of a repetition of its destruction. Promptly performing lab experiments we produced relations between environment and fungal success and composed EPIMAY, a simulator of Southern corn leaf blight. A coordinated campaign by breeders and seedsmen did remove the gene that had made American corn susceptible to the leaf blight fungus. We had, nevertheless, showed how to anticipate the impact of weather on a pathogen without history. And in 1987 the artist placed a copy of EPIMAY in my hand when he painted my portrait. With a barometer in the background, he recalled my forecasts had never killed a pilot.



A decade later a Swiss, for example, wrote that our *EPIDEM, a Simulator of plant disease written for a computer* was the first simulation model in phytopathology. The president of the National Academy of Sciences cited stomata and EPIDEM when he inducted me into the Academy. Horsfall was in the audience. I owe much to him and in 1996 fulfilled the sad duty of writing his biography in the *Memoirs* of the Academy.

APPRENTICE DIRECTOR

Being the first agricultural experiment station in the Western Hemisphere, The Station in 1875 invented a new management structure, the Board of Control, which the Connecticut statute or charter establishing it specifies. Beginning with the governor, the Board members include gubernatorial appointees and appointees of Yale, Wesleyan and the University of Connecticut. These members elect a director, who becomes a member. Customarily the members elect the governor as president and a member as vice president. The Board may own property, as it does own the Lockwood Farm and the trust funds bequeathed by individuals.

When The Station employed me as an assistant scientist in 1951, Director Horsfall and Chief Plant Pathologist Dimond had found and interviewed me, but officially, a vote of the Board appointed me. Vice president John Lyman, an orchardist and leader of the Connecticut Pomological Society, presided at the meeting that appointed me. His grandson John now runs the Lyman Orchard—and golf course—in Middlefield.³² Grandson John became vice president of the Board and, for example, presided at the 125th Anniversary of The Station. And in 2010 grandson John stood with retiring Governor Jodi Rell, the current vice president of the Board and three generations of directors for a

group photograph. The order from left to right: Terry Jones, vice president of the board, me, Governor Rell, director Louis Magnarelli, past director John Anderson and John Lyman.



Back in 1970 as mtThe Station approached its centennial, Horsfall was only the sixth director. Horsfall had served since 1948 and, with the Board, Horsfall thought about succession.

After the annual Field Day at the Farm, the director called me to his office. In my boots dusty from the Farm, I stood near the fireplace in his office. He told me that the Board had elected me as vice director, an obvious apprenticeship to become director. Surprised, I hesitated, and he said, "Don't you want the job?" Recovering my balance, I accepted, and the deed was done. For 15 years, 1972 to 1987. I would occupy the office where I stood in front of the fireplace after Field Day. First and fortunately, however, I would serve an apprenticeship.

GOVERNOR'S COMMITTEE ON ENVIRONMENTAL POLICY

Before he retired, Director Horsfall performed one more leadership role for Connecticut, 1970-1971. Governor John Dempsey appointed him chairman of his Governor's Committee on Environmental Policy. Environmental policy had both political and social cachet, and prominent people sought membership on the Committee. Commissioner Joseph Gill of Natural Resources encouraged the formation of the Committee, Horsfall's chairmanship, and Tom Malone's vice chairmanship. Lucky for me, I attended the organization of the Committee and its work. A powerful feature of the organization was examining need first, and only then making recommendations. Another feature was organizing around such social functions as housing, agriculture, transportation and waste disposal. The membership included campaigners for conservation and environment but also farmers plus, industrial, utility and banking executives.

During the work, I deepened my friendship and admiration for C. G. Woodhouse, who had been the state Secretary of State and U.S. Congresswoman. About 1966 I had accompanied her and others to Brazil as a representative of the Alliance of Progress. She served on the steering committee of the Governor's Committee on Environmental Policy.

Also, I worked with Henry Pierce, the chairman of the Union Trust Bank, later served on the Board of the Bank and became a fast friend with him and his wife.

Three concrete results of the Committee were the formation of the Council on Environmental Quality and also the Department of Environmental Protection (DEP), which added a large regulatory function to the existing park and forest function of the predecessor Department of Natural Resources. A third outcome was recommending the preservation of farmland in the suburbanizing state, a goal that was attained by Robert Josephy's persistence. Along the way to establishing the preservation program, the governor appointed a study chaired by Charles Stroh, and I drafted its final report. Robert Josephy served long and well as a gubernatorial appointee on the Station Board, even as vice president. He had begun work in the 1920s as a book designer for Alfred Knopf and worked in a foundry as a patriotic duty during World War II. He had shared an apartment with Alexander Calder and knew a range of New York intellectuals. I met Arthur Miller at a dinner party at Robert's orchard.



Although city-bred, Robert taught himself to be a first-rate orchardists, a pomologist. With wife Martha, he owned Blue Jay orchard in Bethel, Connecticut, and sorted the apples. Hence, his campaign to save farms in an urbanizing state and his loyal service on The Station board. We became fast friends, and for example, together visited California, avocado groves with Horsfall's protégé George Zentmyer. Our primary target was a specialist who grew much of America's baby's breath, was anxious about California's precarious water supply, and was interested in buying Blue

Jay orchard. In his 90s, Robert wrote his autobiography, *Taking Part*, and I was proud to find myself on the jacket endorsing the book beside Arthur Miller and Joseph Lieberman.

Another member of the Governor's Committee also served on the Station Board. Ellis Maxcy had presided over a college in New Haven that became the University of New Haven. He had then had taken charge first of the employee management and union negotiations and then became the chairman of Southern New England Telephone. He served on several corporate boards and led a governor's committee to encourage more technical industries in Connecticut. Yale University appointed Ellis to the Station board and through much of my directorship of the Station he was my "elder statesman".

A final outcome of the Governor's Committee was a miscarriage. Despite the Station director's leadership of the Governor's Committee, a legislative proposal to incorporate The Station into the new DEP arose and had to be forestalled to maintain the Station's scientific mission. Lobbying and appearing before the General Assembly to preserve the integrity of The Station provided a graduation rite for a new and no longer apprentice director.

ENOUGH FOR NOW, SEPTEMBER 2011

My taking up the Station directorship in January 1972 provides an earned resting place, for both the reader and me. Since 1972 I have enjoyed still more careers and mention them before ending my 2011 version of the story of myself. The careers were Director of the Station first, but also more than a decade also a director of the Union Trust Company in New Haven and Stamford.

After getting to know Roger Revelle and Jesse Ausubel in the 1980s during a National Academy investigation of climate change, I led--with the help of Roger and under the umbrella of the American Association for the Advancement of Science (AAAS)--an examination of climate change and U.S. water resources.³³ In the early 1990s, leading an examination of adaptations to climate change for the Committee on Science, Engineering, and Public Policy showed me the turbulence and acrimony that plague the subject of climate change.³⁴ In 1992 under the umbrella of the Council for Agricultural Science and Technology, I led the U.S. Department of Agriculture examination of preparations of U.S. agriculture for global climate change.³⁵



Getting to know Jesse Ausubel started a career of collaboration with him at Rockefeller University and the Sloan Foundation. Our initial task was answering *How Much Land Can Ten Billion People Spare for Nature?*³⁶ With Jesse, I have also taken excursions into the inventory of forests, the census of marine life, and DNA barcoding to identify animals.³⁷ An enduring theme has been dematerialization, environmental impact growing more slowly than the combination of rising

population and affluence. For nearly a score of years, we have found dematerialization of impacts ranging from expanded cultivation and consumption of timber to water use and carbon emission.

Since 1923, I have traveled among marvelous sights and in 2011 end my travelogue for now—but not my travels.

Notes

1 About Centerville, see http://en.wikipedia.org/wiki/Centerville,_Iowa

2 *Indian Affairs: Laws And Treaties*. Vol. II, Treaties. Compiled and edited by Charles J. Kappler. Washington : Government Printing Office, 1904. <http://digital.library.okstate.edu/Kappler/Vol2/treaties/sau0495.htm>

3 Galenson, D. W., and C. L. Pope. 1989. Economic and geographic mobility on the faming frontier: evidence from Appanoose, Iowa, 1850-1870. *Journal of Economic History* 49:635-655.

4 Regarding Mare Run, book L, page 65 of the Lewis County records show that Isaac P Cox gave or sold land on Mare Run to Amon in 1840. Because Amon's wife was Elizabeth Cox Waggoner, the land may have been a gift from a father-in-law.

5 <http://images.maritimehistoryofthegreatlakes.ca/62084/data?n=1>. For text about the fire, see ElizaCoxWaggoner.ppt.

6 <http://www.findagrave.com/cgi-bin/fg.cgi?page=gr&GRid=14842759>. The phrase "heart-rendering" always amused my mother. She was stickler for proper speech and knew writers and guessed that speakers meant "heart-rending" instead of rendering, to treat so as to convert into industrial fats and oils or fertilizer.

7 Obituary of Elizabeth Cox Waggoner. About November 1, 1897, *Moulton Tribune*. Photo copies of the obituary are saved as ElizObit...,TIFF and text in ElizaCoxWaggoner.ppt. An 1864 Confederate raid across Davis County and a few miles from the Waggoner home illustrates the ferocity of the war that claimed the two Waggoner brothers in the 3d Iowa Cavalry. "It was toward the end of the Civil War. Despite being on the Iowa-Missouri Border, Davis County had pretty much escaped being a part of the Civil War battles, but on that fateful day, several ruthless riders crossed the Missouri border into Davis County to terrorize, plunder and kill as they searched for money, horses, and vengeance in the name of the Confederacy." After killing a farmer who would not relinquish his horses, the raiders led by Confederate Lieutenant Jackson "then rode south to the home of Eleazor Small, formerly of Company A 3rd Iowa Cavalry. Small thought they were friendly. Without warning, Jackson shot him in the face, then in the neck, and finally in the chest. They took what money he had and pinned a note on his coat. The note said, "Killed in retaliation for David Plunkett, who was murdered by federal soldiers near Glasgow, Mo., by order of James Jackson, Lieutenant, Commanding, Oct. 12, 1864." After the war, Jackson "returned to Missouri and was discovered. The amnesty papers in his pocket did him no good. He and a man named Farley were shot. The people of Santa Fe, Mo. would not allow them to be buried in the cemetery so they dug one grave outside the fence, putting both Jackson and Farley in the single grave." <http://www.bdemo.com/Tourism%202011/TourismFrameset-13.html>

⁸ Sketch by John Warner Barber from *Keokuk* in Wikipedia.

⁹ Davis, W. C. 1974. *Breckinridge, Statesman, Soldier, Symbol*. Louisiana State Univ. Press., Baton Rouge. P. 25.

10 http://extension.agron.iastate.edu/soils/PDFs/cropmaps/pctc_s.pdf

11 For history of Appanoose mining until 1909 see James H. Lees, *History of Coal Mining in Iowa*, Chapter III of Annual Report, 1908, Iowa Geological Survey, 1909, pages 536-537. On line at books.google.com/books?id=1BUMAAAYAAJ&lpg=PA415&pg=PA536#v=onepage&q=&f=false

¹² www.youtube.com/watch?v=0gHuh8_FNCQ&feature=email

13 Overshadowed by campaigns further east, the war in the West has been neglected. See the history of the 3rd at <http://www.iowa3rdcavalry.com/index.html>. Monaghan relates the entire war in the West, in Monaghan, J. 1955. *Civil war on the western border, 1854-1865*. Boston: Little, Brown.. Shea and Hess concentrate on the turning point in northwestern Arkansas in 1862 that saved Missouri for the Union: Shea, W. L. and E. J. Hess. 1992. *Pea Ridge: Civil War campaign in the West*. Chapel Hill: University of North Carolina Press. Both relate the capture of Confederate General John Sappington Marmaduke by Dunlavy of Company D of the 3rd Iowa Cavalry.

14 Dunlavy's portrait is at http://www.homeofheroes.com/photos/1_civilwar/dunlavy_james.html. The four other Medalists are shown at <http://www.iowa3rdcavalry.com/Medal%20of%20Honor.htm>.

15 The abbreviated story of the 36th is at <http://www.civilwararchive.com/Unreght/uniainf4.htm#36thin>. Swiggert's "Bright Side of Prison Life" is a chapter at <http://www.48ovvi.org/oh48cf.html>. Dunlavy's photo is at http://www.homeofheroes.com/photos/1_civilwar/dunlavy_james.html.

16 At <http://donsdepot.donrossgroup.net/dr990.htm>, Don Ross describes the Southern Iowa Railway, owned after 1916 by The Iowa Southern Utilities Co. Site <http://davesrailpix.com/odds/ia/ia.htm#mp> shows the Mount Pleasant collection of trolleys, including Number 9.

17 Waggoner, P.E. 2003. *Fertile farms among the stones*. Connecticut Acad Arts & Sci. Memoir 27 (vol 2):45-58.

18 *Descent into the depths* (1930). The collapse of agriculture. Futurecasts 3(4), 4/1/01. http://www.futurecasts.com/Depression_descent-end-'30.html

19 U.S. Bureau of the Census. 1975. *Historical Statistics of the U.S, Colonial Times to the 1970s*. Washington, D.C.: U.S. Department of Commerce. Hereafter, Historical Statistics of the U.S.

20 Authors have told how the Great Plains defeated farmers immigrating from moister lands to the east. James Michener told their story in fiction, *Centennial*. Jonathan Raban told their story by interviews with survivors in Montana, *Bad Lands*. In both stories, agricultural advisors share blame with the climate because they believed tillage could overcome dry climate.

21 *Maclura pomifera* is in the mulberry family. Its native range in Oklahoma and Texas gave it its name. Its wood is bright orange yellow, hard, flexible, and durable in the ground. Its specific gravity about 0.8 far exceeds white pine at 0.4 to 0.6 and even some oak in its range of 0.6 to 0.9. And Osage orange fence post resists decay and a staple driven in to hold wire fence.

22 Arthur Rothstein's photos are motifs of the Dust Bowl. http://en.wikipedia.org/wiki/Arthur_Rothstein

Worster, Donald. 1979. *Dust Bowl : the southern plains in the 1930s*. New York : Oxford University Press,

Steinbeck, John. 1939. *The grapes of wrath*. New York : The Modern Library,

23 Historical Statistics of the U.S. Index of wholesale prices, E23.

24 <http://www.waggonerstrucking.com/Default.aspx>

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- 32 <http://www.lymanorchards.com/>
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- 36 Waggoner, P. E. 1994. *How much land can ten billion people spare for Nature*" Report 121. Council for Agricultural Science and Technology, Ames Iowa. 64 p. On line at <http://www-formal.stanford.edu/jmc/nature/nature.html>
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