

From the Roundhouse to the Moon: 150 Years of Oneonta Entrepreneurs

by

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Introduction

Oneonta. To every point on earth one can ascribe meaning. In 3-dimensional space, the position of every point is specified by 3 coordinates, for example, latitude, longitude, and altitude. Albert Einstein added a fourth coordinate: time. When I look at a place, I am compelled to consider not only what is there now, but what occurred at that point at key times in the past. I live in four dimensions; I am a historian of science and business. To look at key locations in Oneonta at present and understand how earlier events came to influence how life is lived today on this planet and beyond requires the need to tell stories. This work is motivated to telling some of these stories, which for the most part have been forgotten. My goal is that from now on, whenever one passes through or speaks about Oneonta, he or she will do so with a sense of pride in the existence of something we call the American dream.

Physically, Oneonta is located on the Susquehanna River, the second oldest river on earth. It is also located in the midst of a bowl of mountains, from whose heights streams descend to the Susquehanna. Personally, Oneonta is where my grandfather operated a tailor shop on Main St. in the 1930's, and where my mother, working as a secretary at her uncle's business, ordered gondola cars from the Delaware and Hudson Railroad (D&H) to pick up scrap metal. Later, my parents married and settled in their hometown of Syracuse. After my father joined the Marines to fight in the Pacific in 1943, my mother would visit Oneonta and always remembered having to change trains in Binghamton, two little girls

and luggage in tow, across exposed tracks. Oh, I almost forgot to say that all through this period my mother and grandparents lived on 166 Chestnut Street, in a hillside home overlooking the D&H roundhouse, the largest in the world.

As one approaches Oneonta from Sidney on I-88, the ride is 20 miles of driving along an almost imperceptible curve to the west. Taking the first exit, one ends up on Chestnut St. Where the former intersects Main St. is the focal point of Oneonta today, as it was almost 200 years ago, when the stories told here began. The Chestnut - Main St combination is the rib called NYS Rt. 7 penetrating west-to-east. North of this rib is the residential part of town, along with the hillside campuses of two colleges: SUNY Oneonta and Hartwick. South of the rib are the flatlands, drained swamp land which at one time housed the shops and roundhouse of the mighty D&H. We are fortunate that the stations of both the D&H and the Ulster and Delaware (U&D) are still extant and perform admirable service as local watering holes.

Definitions

In the context of this paper, let us define an entrepreneur as one who, using his own or borrowed money, advances the development of a business venture which provides a new kind of service or device which improves and enriches human life. Specifically, we will document the Oneonta entrepreneurs who created railroads (the D&H, the Central Pacific, the Pacific Electric), information processing industries (IBM), and fabricators of integrated circuits (Fairchild Electronics). The impacts of the businesses they created were at the local, regional, national, international, and extraterrestrial levels. Indulging in the parlance of professional boxing, we will show that Oneonta (never having more than 14000 people) punched way above its weight class.

The Growth of Central New York

In December 1959, my mother and I accompanied my sister on a slow D&H milk train from Binghamton to Albany so that she could interview at SUNY Albany. It would have delighted those early Oneontans who dreamed of such a service before it existed.

In 1800 central New York state was literally the wild west. Adventurous trailblazers from New England would cross the Hudson at Catskill, NY to begin trekking west on Indian paths or paths they cut themselves. In 1800 there was no New York State Department of Public Works. The state government gave private companies the right to buy land at a fair price, build roads into the interior, and charge tolls to cover costs. For Central New York a mostly stone covered toll road called the Catskill Trail was the most important. The trail continued west through Cairo, Manorkill, Gilboa, Stamford, West Harpersfield, Treadwell, Franklin, Unadilla, Greene, Whitney Point, Ithaca and ending at Bath, NY.^{1 2} It took a stage coach four days and nights to cover the 160 mile trail between Ithaca and Catskill.³ It was hard on the animals, horses and oxen, to pull over the often rutted trail. Entire herds of cattle, sheep, and goats also traveled by trail. Imagine hauling an iron stove by wagon from Catskill to Ithaca! As well as the stage lines, another business, tavern/ hotels, flourished in serving the trail trade. Reverend Timothy Dwight, president of Yale University, traveling in 1804 observed that most of the taverns were "mere dram shops; of no use other than to deceive, disappoint, and vex travelers, and to spread little circles of drunkenness throughout the state."⁴

As far as it was concerned, there was another key drawback for Oneonta: the Catskill Turnpike bypassed it by 3 miles. This detail was corrected by the Oneonta entrepreneurs in the years after it opened in 1806.⁵

Early Days of Oneonta

A Dutch immigrant named Joachim Vanderwerker built a log cabin in 1775 somewhere near the entrance of Neahwa Park and is credited as the first settler of Oneonta⁶. Between 1773 and 1779 he bought 300 acres of land which encompassed Oneonta.⁷ In 1798, a man named Frederick Brown arrived in Oneonta and bought a large farm from Vanderwerker which became Oneonta's core. Brown also operated a store at the corner of Maple and Main St.⁸ When Eliakim Reed Ford arrived on May 11, 1822, he boarded with Brown and worked at the store. Having \$500 savings on his arrival, E.R. bought out Brown's store on May 20, 1824. With his growing wealth, Ford bought three farms including

Brown's. He earned more capital by selling parts of these farms to others. Clearly, E.R. was coming on strong in early Oneonta.

Meanwhile, Oneontans were eager to be located on the Catskill Turnpike. In 1835, a 3-mile connection to Franklin was completed⁹. A 20-mile connection to West Harpersfield was opened in 1834 along the valley of Charlotte Creek, following the path of Chestnut and Main Sts.¹⁰ It replaced the Catskill Trail because of its gentler path. This left Oneonta where it wanted to be: directly on the Catskill Trail and able to profit from its passengers and trade. So now stagecoaches and cattle drives passed directly through Oneonta. In 1841, E.R. Reed became principle stockholder of the Charlotte Pike, so his fortune continued to grow.¹¹

What were the drawbacks of the trail? As we have seen, the roughly 200 miles between Bath and Catskill required 96 hours to traverse, for an average speed of 2 mph. This is moderate walking speed. The gravel path was susceptible to rain, snow, ice, and the ravages of uneven maintenance. What alternatives existed? Canals could carry heavier cargo but still at animal speed. The state-owned Erie Canal had opened in 1825 but was 50 miles away from Oneonta. The D&H Canal was built in 1828 from Honesdale, PA to Kingston, NY to ship anthracite coal.¹² But canals were useless in the winter ice.

The Erie Canal afforded farmers along its route a channel for receiving manufactured goods as well as bringing their produce to market. Farmers in southern New York felt left out. Some responded by supporting the development of lateral canals from their locales to the Erie. Some laterals, like the Chemung Canal from Elmira to Watkins Glen were successful. Others, such as the Chenango Canal from Binghamton to Utica, were not. The Delaware & Hudson Canal profitably shipped coal from Honesdale, PA to Kingston, NY on the Hudson until 1898.

The Railroad Alternative

Oneonta merchants like E.R. Ford, and others saw the benefit of a railroad named the Albany and Susquehanna (A&S) which would follow the Susquehanna and

Schoharie Rivers between Binghamton and Albany with a midpoint at Oneonta. This would allow goods to be shipped in and out at railroad speed (40mph) on longer trains than animals could power at concomitantly lower cost. When the railroad was incorporated in 1851, E.R., a director of the A&S, and other Oneontans sold shares of stock to towns along the proposed route.¹³ (The population of the village of Oneonta was 275 in 1850)¹⁴. Not nearly enough shares were sold to begin construction of the road, but a state appropriation of \$500,000 in 1863 was enough to begin building the road west from Albany. The A & S reached Oneonta (pop. 774) on August 29, 1865 pulled by a locomotive named "E. R. Ford" after one of its most esteemed directors.¹⁵

Strategic and Tactical Implications of the A&S

The A&S reached Binghamton on January 12, 1869.¹⁶ Here it connected to the Erie Railroad, which, when completed between Piermont-on-Hudson and Dunkirk, NY, was the longest in the world.^{17 18} At Albany, Oneonta shippers gained access to the Hudson River as well as the railroads being built on each side to New York City. Remember the D&H Canal? The owners built a rail line connecting Carbondale with Nineveh on the A&S. They leased the A&S in February 1870 and the road became known for the next century as the D&H.¹⁹ Animal locomotion had been replaced by steam power able to pull far larger loads of anthracite coal at far higher speeds for the most part all year around. The result was lower shipping and passenger costs due to higher efficiency and economies of scale.

But there were even more benefits for Oneonta. The D&H directors logically decided to locate the shops for the railroad in the flatlands of Oneonta, its midpoint. The central roundhouse was built. Jobs in the thousands became available. In the 1870's the population of Oneonta tripled; in the 1880's, it doubled to 6272.²⁰

The passage of coal between Carbondale and Nineveh crossed the Endless Mountain range at Ararat, Pennsylvania. In order to pull and push massive coal trains over this obstruction, the D&H bought a number of steam locomotives of the 1500 series. These were essentially dual locomotives which rotated in the middle to negotiate larger track curvatures. These articulated locos closely

followed the design of the Union Pacific (UP) Challenger 4-6-6-4 class.²¹ Their huge size was one factor which drove enlargement of the Oneonta roundhouse to become the world's largest.

E.R. Ford remained a director of the A&S until his death in 1873.²² His oldest son Dewitt had two daughters named Julia and Ada.²³ After considering further strategic impacts on American railroading by E.R. Ford's Oneonta contemporaries, we will return to the story of how his granddaughters advanced American industry along a different but equally powerful path.

The Shop Around the Corner

An 1841 map of Oneonta shows E.R. Ford's shop on South Main St. in the flats near the river.²⁴ That same map depicts a long, narrow plot of land owned by S. (Solon) Huntington on Main St. His younger brother Collis P. Huntington, aged 22, joined him there in 1843 to co-run the shop. If you stand today on the north-west corner of the intersection of Chestnut and Main Streets, and you look across Main St. to the south east, you will see the site of their market. Collis was a bluff, hands-on guy who could throw a sledgehammer (as a sport) and, having experimented with early fire-fighting apparatus, was elected Oneonta's first fire chief in 1848.²⁵ In 1849, spurred by news of the Gold Rush, Collis migrated to Sacramento, CA not as a miner but with the intent to establish the west coast branch of S.& C. Huntington.²⁶ Its goal was to service the growing numbers of prospectors with supplies of all kinds. Always able to spot a coming trend, a natural deal maker who lived a quiet, abstemious life with the wife he sent for from Oneonta, C.P. prospered in partnership with another thrifty transplant from Henderson, NY named Mark Hopkins.²⁷ Their joint business was located at 54 K Street in Sacramento. As a result of the construction of Interstate 5 in 1970, the store was moved to Old Sacramento, where it can still be visited today.²⁸

The Dream Fulfilled

By 1850, the western frontier of the civilized eastern United States had been pushed from the Hudson River to the Missouri.²⁹ As a staunch Republican, C.P. undoubtedly knew that the building of a Pacific Railroad uniting Iowa and

California over a route including the Nebraska, Colorado, Utah and Nevada territories was a plank of the 1860 party platform.³⁰ For all passenger or freight customers, the benefit of replacing a voyage around Cape Horn or a trek from the Atlantic to the Pacific side of Panama as part of a shorter voyage were obvious. Fortunately, an RPI-trained railroad builder named Theodore Judah had, with the help of Daniel Strong, surveyed a buildable right-of-way across the 7000 ft crest of the Sierra Nevada between Sacramento and Truckee, CA. In November, 1860 Ted Judah held a public meeting in Sacramento at the St. Charles Hotel on K Street to discuss his survey findings and how they might tie up into the coming Pacific railroad bill. Unlike most of the enthusiastic audience, C.P. held back his support but asked Judah to stop by his office some night for another discussion.³¹ At that meeting, Judah, who had been a Lobbyist in Congress for a conglomerate of California railroads, explained to C.P. the interlocking self-interests of the numerous roads vying for a piece of the Pacific road. He also said the surveyed right of way could quickly be turned into a wagon road to Nevada (a precipitous Catskill Turnpike, if you will). The immediate prospect of profits enticed C.P., who explained that Judah's method of trying to sell a few shares here and there at meetings would never pan out. What was needed was to find four other Sacramento businessmen who would put \$1500 down payment on stock to become directors of Judah's railroad.³²

C.P.'s first choice as an additional investor was logically Mark Hopkins. His second was a local jeweler named Charles Bailey. The third was a wholesale grocer named Leland Stanford, a one-time lawyer from outside Albany, New York. And the fourth was Charles Crocker, a Troy, NY native who like C.P. was a shopkeeper. With the resignation of Bailey, the *Associates* (Huntington, Hopkins, Stanford, and Crocker) became the directors of what Ted Judah was to coin the Central Pacific Railroad (CPRR).³³ After completing a final, detailed survey of the Sierra Nevada line, Ted Judah was sent to Washington to lobby for the CPRR when consideration of the Pacific Railroad came to the Congressional docket in 1862. Local stock subscriptions would not be enough to finance the CP railroad, government subsidies were needed to offset the tremendous construction costs the railroads were taking on. On July 1 1862 President Lincoln signed the Pacific Railroad bill.³⁴

What this amounted to was that two railroads, the Central Pacific building east from Sacramento, and the Union Pacific building west from Council Bluffs Iowa, would be heavily subsidized in bonds and adjoining land for every mile built, and would meet at some intermediate point, which in fact turned out to be Promontory Point, Utah. The delays, labor and supply problems, Indian fights, and obstacles of mountains challenged and crossed are beyond the scope of this paper and are ably described in Bain's book. The meeting of the two lines occurred on May 10, 1869.³⁵ C.P. Huntington went on to control an empire consisting of 6000 miles of track so that he could board a train in New York and travel to San Francisco entirely on lines he owned. His fortune grew to \$200 million.³⁶ It had been a long ride from Main St. Oneonta to Fifth Avenue, New York.³⁷

A Trip to Southern California

In 1869, Solon Huntington's 19-year old son Henry, possessed of a high-school equivalent education, left Oneonta to join his Uncle Collis in building and administrating railroads.³⁸ His first assignment was running a sawmill at St. Albans, West Virginia which was engaged in building ties for Collis' latest acquisition, the Chesapeake and Ohio Railroad.³⁹ By the 1870's, the name of Collis Huntington's principal railroad had changed from the Central to the Southern Pacific whose presidency he retained. The 1870 census showed a population for San Francisco (near Sacramento) of 149,473 while 5728 people lived in Los Angeles.⁴⁰ Since the transcontinental railroad had opened in 1869, it stands to reason that San Francisco would continue to grow as California's largest city until a branch was constructed to Los Angeles, which until then would remain a backwater. That branch was completed in 1876, and although Los Angeles was now a port of call for Eastern settlers its population had only risen to 11,200.⁴¹

Before continuing our story of how Henry Huntington contributed to Southern California's explosive growth, some definitions are in order. The LA Basin (or the "city of Southern California") is the flat area extending south from the San Gabriel Mountains to the Pacific Ocean bordered on the west by Santa Monica and on the east by Pomona, encompassing an area of about 25 by 25 miles. The city of Los

Angeles is basically at the center of the basin, which roughly encompasses LA County. In 1895, two entrepreneurs named Sherman and Clark opened up an electric interurban railroad between Los Angeles and Pasadena 10 miles to the northeast. An interurban railroad is essentially a railroad where large trolley cars travel between two cities in most cases on private roadbeds. The schedules were hourly, as opposed to perhaps twice a day on a steam railroad (if one existed) between the same places. Since it would be 20 years before the mass auto age, the interurban created a sensation. In 1896, Sherman and Clark opened another interurban between Los Angeles and Santa Monica, 15 miles to the west on the sea. Property values rose along these routes and at their endpoints. The model of Southern California growth was established: build the interurban to a destination, and the population of homeowners would follow. However, Sherman and Clark were unable to pay their bondholders and their properties were foreclosed, to be taken over by other owners.⁴²

Here's where Henry Huntington enters the picture. By 1900 he had acceded to the post of vice president of the Southern Pacific. In that same year, the SP president, Uncle Collis died. The main share of his estate was shared between Henry and Collis' wife Arabella. (Arabella was much younger than Collis, she and Henry hit it off, and she became his second wife in 1913). To get an idea of their mutual worth, when they sold their inherited SP stock to E.H. Harriman in 1901 they received proceeds of \$22.3 million.⁴³ Now Harriman had enough other interests in the SP that he essentially gained control of it, and Henry lost his dream of becoming the SP president. He was ready for his new career as a builder of Southern California.

Huntington's three main businesses became interurbans, real estate development, and electrical power generation. As the latter served the former enterprises, we will emphasize the first two. In 1898 his syndicate purchased the downtown-oriented Los Angeles street railway. They incorporated the interurban Pacific Electric (PE) Railway in 1901.⁴⁴ Huntington possessed the wealth and power to build on speculation on interurban line to any terminal city in the LA Basin, buy the land there, and wait for homeowners to purchase the plots. Freidricks gives examples of this that spanned the homeowners range of wealth.⁴⁵

The Oak Knoll subdivision between Pasadena and San Marino was opened in 1906 with 1 to 10 acre plots costing from \$5000 to \$20000 and minimum construction costs arrayed from \$6000 to \$15000 and with a luxury hotel anchoring Oak Knoll to a PE branch. Oneonta Park, now an upper middle-class section of South Pasadena, was connected to downtown LA by the PE and offered one-third to one-half acre lots where homes had to have a minimum worth of \$3500.⁴⁶ Finally Dolgeville (now part of Alhambra) was a model industrial town built around a felt factory (unsuccessful but eventually followed by more solid industries) offering modest single-family lots at \$300 to \$400.

That Huntington's model was a success is reflected in the growth of Southern California from 1900 to 1920, during which the population of the City of LA went from 102,479 to 576,673 and the county from 170,298 to 936,455.⁴⁷ Clearly, another entrepreneur from Oneonta, NY had scored big on the national stage.

Henry Huntington's Lasting Legacy

Huntington began building a palace-like home in San Marino after divorcing his first wife Mary in 1906.⁴⁸ At its completion in 1910 he announced his retirement. Into this home he moved his collection of rare books, including a first folio of Shakespeare's plays and Gainesborough's painting "Blue Boy".⁴⁹ In 1919 Huntington announced his intention to turn his estate and precious artifacts into a non-profit foundation open to scholars and the public. After his death in 1927, the estate was transformed to the Henry E. Huntington Library and Art Gallery which is open to this day and remains a perennial favorite site for a casual art tour and a relaxing conversation over coffee in its garden. Meanwhile the PE continued to grow to 1164 track miles by 1926.⁵⁰

To Oneonta, NY he contributed his boyhood house as a public library. Behind the large grey painted wooden building there is a park and a plaque containing this inscription: Huntington Memorial Library and Park (HMLP) for Public Education and Recreation, Oneonta, NY "On the 9th day of July 1920 the HMLP were opened as a perpetual memorial to Solon Huntington and his wife Harriet Saunders Huntington for the use of the people of Oneonta by their son Henry Edwards Huntington."⁵¹

Family and Friends

Earlier in this work, before we had left Oneonta to pioneer the American West, we mentioned the granddaughters of E.R. Ford named Julia and Julia Ada. They must have been popular girls, for in June 1882 Julia married Harlow Bundy of Oneonta, a Hamilton College-educated lawyer in partnership with his uncle.⁵² On June 24 1886, Julia Ada Ford married A. Ward Ford (no relation), who partnered with his father in a general store in Windsor, NY.⁵³ In the hopes of not sounding crass in the face of marital bliss, it can be stated that both sisters were quite wealthy due to their family inheritance, while the same cannot be said (based on available evidence) at the time for their husbands. Harlow's older brother Willard an Auburn, NY horologist, had inventing a recording time clock which, for every employee with a special key, left the imprint on a paper roll of both the time and the employee's identity when he entered and left the workplace.⁵⁴ When the Bundy Manufacturing Co. was incorporated in Binghamton on September 30, 1889 to produce the recording time clock, Harlow Bundy was the treasurer and general manager while A. Ward Ford became the secretary.⁵⁵

Harlow Bundy had a friend in Oneonta named George Fairchild, who had apprenticed as a printer, practiced that skill at locations around the country, and finally returned to Oneonta to become owner of the *Oneonta Herald* newspaper and U.S. Congressman from 1905 to 1917.⁵⁶ Although the original growth of Bundy Manufacturing was slow, sales began to take off. In 1896, Harlow Bundy invited Fairchild to join in managing the increasingly challenging business, and the latter invested \$5000 of his own in the company. By 1901, several competitors had been purchased by Bundy under the name International Time Recording Co. (ITR). Still, a newly-incorporated Bundy Manufacturing Co. arose in 1904 and George Fairchild became President, and at the same time Vice-President of ITR. By 1906 he was the President of ITR. Fairchild invested from \$7000 to \$10000 in the new Bundy firm. It is also probable that in 1904 Fairchild went door-to-door to sell ITR stock to his many friends in Oneonta. His pitch went like this: "I would like to sell you \$2000 to \$3000 of ITR common stock, but this is surely a speculation. You should not buy this stock unless you would not greatly mind losing it all." Many bought, including State Supreme Court Justice Abraham

Lincoln Kellogg, a lawyer and educator from nearby Treadwell.⁵⁷ History would show these to be wise investors. By the end of 1909 ITR controlled 85% of the world's time recording business.

In 1911 financier Charles R. Flint incorporated a holding company called the Computing-Tabulating-Recording Co. (CTR) composed of the Computing Scale Company of America of Dayton, Ohio, the Tabulating Machine Company of Washington, D.C., and ITR of Endicott, N.Y. His reasoning was that in a combination of businesses making different products, if one product had a bad year, the profits from the other two would keep the whole business profitable.⁵⁸ The concept was similar to the conglomerates like Litton Industries of the 1960s. Owning the most shares of CTR, George Fairchild was chosen by Flint to be President of the new CTR.⁵⁹ At his death in December 1924, he was chairman of International Business Machines (IBM), to which CTR had been renamed in February of that year.⁶⁰ In 1935 IBM sold off the Computing Scale Company to the Hobart Company of Dayton.⁶¹ In 1958 IBM sold the Time Recording Co. to Simplex. By then the tabulating business, followed by electronic computers, far outweighed the other two.

Harlow Bundy, still with ties to Bundy Manufacturing, became General Manager of CTR in July, 1911.⁶² He had his hands full. In the formative days of CTR, as consolidated management of the three companies was achieved, it was income from the ITR portion that enabled Tabulating to reach a profitable state.⁶³ Parts for the first tabulating machine were fabricated in the former ITR plant.⁶⁴ In a day when newcomers like Tesla have equal market valuation to GM while producing a fraction of the latter's volume, we can perhaps see Flint's rationale for including the initially unprofitable Tabulating company in the mix - i.e. high hopes. In the 20s, these hopes were achieved as Tabulating became IBM's main business. By 1915, Bundy was in ill health, retired, and bought an estate in Huntington's Oak Knoll development.⁶⁵ Unfortunately, he passed away a year later. Thomas J. Watson was hired to take his place.

Living Industrial Archaeology in Endicott and Oneonta

In August 1905 a new building to make Bundy adding machines was built on the vacant plains of Endicott, NY some 10 miles west of Binghamton.⁶⁶ Just eight months later plans were made for additional buildings to the east of the Bundy which would enable all ITR operations of the Water. St. Binghamton plant to be moved to Endicott.⁶⁷ These buildings were built, and as the size and scope of IBM manufacturing grew, they became imbedded in what I call the "white cliffs of Dover" complex at the northeast corner of McKinley Avenue and North St. The ITR building was horseshoe shaped with the open part of the U facing North St. Eventually the open side was covered by a structure with a broadly peaked roof at the apex of which today is a well preserved white-against-blue globe-girdling IBM logo. About 15 years ago manufacturing left Endicott but the Bundy and ITR artifacts are still left to be enjoyed. And Google Maps in satellite mode provides opportunity for armchair exploring!

In Oneonta the brick Masonic Temple is located in the former mansion of George W. Fairchild at 318 Main St.

Chubby

In 1891, Josephine Mills Sherman, daughter of a prosperous farmer from nearby Davenport, enjoyed an inheritance from an uncle who had been a successful '49er. She went down to the office of the *Oneonta Herald* to pick up some extra copies of the article describing this event for family and friends. George Fairchild was favored to handle her request, Josephine returned the favor by meeting Fairchild at the alter soon after.⁶⁸ In 1896, their only child Sherman was born. Locally, his nickname was Chubby. He was mechanically gifted, as he successfully dismantled and reassembled his first car at in early age. While still a boy Sherman had the run of the CTR factories in Endicott, enabling him to pursue refinements in his interest in cameras.⁶⁹ As a young man, Chubby attended both Harvard and the University of Arizona, but had to withdraw from both due to lung problems, never graduating from either. At Harvard, he designed and demonstrated at a local boxing match a precursor of the news flash camera.⁷⁰ During WWI he attempted to join the Army but was turned down due to his medical conditions. Some local wags painted the word "Slacker" on the sidewalk next to his home,

and this led to a lifelong resistance as a super-successful businessman, to Oneonta charitable requests (with small scale exceptions) ⁷¹ .

But Sherman didn't give up. His father got him in to see Captain Betts of the Army science and research division in Rochester, NY, who said that the Army needed an aerial camera with a large between-the-lens shutter. Sherman promised to meet the specifications, and by March 1919 had designed a shutter more advanced than any other, employing the help of CTR craftsmen.⁷² But by then the war had ended and Army interest waned. Sherman resisted his father's offer of a CTR vice-presidency in a business the former considered "too well established". At that point, George offered his son \$150,000 based on the theory that "If you lose it-you'll be a damn sight smarter than if you didn't try your own business." Sherman founded the Fairchild Aerial Camera Co. to make and sell cameras. The Army relented and ordered 20. In 1921, Sherman formed Fairchild Aerial Surveys. To demonstrate his pilots and cameras capabilities. he bought a used WW1 Fokker D.VII biplane and cut a hole in its floor to enable the camera to be aimed at the ground. His first contract was for an aerial survey of Newark, New Jersey.

Pioneer

In order to understand Fairchild's next major innovation, this time to benefit aviation itself, we need to digress a bit on airplanes and how they fly. The basic configuration of airplanes has not changed markedly in nearly a 100 years. Imagine yourself calmly sitting on a New York-to-Chicago flight midway along its route. You may be reading a magazine and drinking a non-sloshing cup of coffee. With the window shade closed, you appear not to be moving at all. We call this flying straight and level. That is, following Newton's 1st Law of Motion, the total force on the airplane is zero. The total force has two components: vertical and horizontal. The downward force of gravity of the plane is balanced by the upward force of lift on the wings. The thrust of the plane's engines provides a force to the tail of the jet that is balanced out by air resistance (or drag). Ideally, neither you nor the pilots feel any wind discomfort or cold if the airplane's sealing and heating systems are operating normally.

This was not the case in WW1 aircraft, as typified in movies like Howard Hughes' *Hell's Angels*. Planes usually had a pilot and one passenger, each sitting on a bench within the airplane with their heads exposed to the wind and whatever temperature it was outside. Most planes were biplanes, where the crew sat slightly forward of two wings, one stacked on top of another. The need for two wings was because the lift of a single wing was not sufficient to cancel out gravity, while the lift of two wings was. What causes lift in a wing is its cross-sectional shape, where the air passing over the top section must travel a longer distance than that travelling over its bottom section. By the 1920's, the science of designing high-lift wings had advanced to allow enough lift for a single wing to be used, this configuration was called a monoplane. This is the configuration of nearly all modern airplanes.

Aerial surveys had to be made at high altitude. In Canada, Fairchild observed his crews returning from the open cockpit biplane flights exhausted and freezing from the cold.⁷³ They all agreed that a high-wing monoplane with a heated, enclosed cabin and large side windows was needed. The absence of the lower wing obviated the need to cut a hole in the floor to get a clean shot, while the benefits of the enclosed cabin to crew comfort were obvious. Since no such plane existed Sherman formed yet another company, Fairchild Airplane Manufacturing, to build it. Thus, Fairchild is credited with building the first enclosed cabin monoplane.⁷⁴ The extension to the modern passenger jet goes without saying.

Titan

On June 14, 1926, the completed FC-1 aircraft was towed out of the Farmingdale factory to Curtiss Field near Hempstead, Long Island. It reached 97 mph and on another day 9800 ft.⁷⁵ Two years before, George Fairchild had passed on, and it can be inferred that he bequeathed his son with an amount of IBM stock that by 1960 helped Sherman Fairchild to become the largest individual stockholder of IBM (99,864 shares).⁷⁶ But Sherman was prepared to press on in his own enterprises. Sensing a market beyond that of aerial photography into general aviation, Canadian bush piloting, and national defense, Fairchild capitalized on this demand by offering the FC-2, with larger cabin, room for 3 passengers

instead of 1, and a more powerful engine. Orders rushed in for this model, and by the end of 1927, Fairchild had become the second largest producer of commercial aircraft in the world.⁷⁷ As the 20's evolved into the 30's, Fairchild continued making rugged, adaptable, mainly high wing monoplanes. Then a series of single engine military training planes, the PT-19/ PT-23/ PT-26, were sold in large numbers such that by 1944 more WW2 pilots had received their initial flight training from them than from any other craft.⁷⁸ Post-war Fairchild made the cargo-carrying Packets and Flying Boxcars used in Korea and Vietnam.

Last Aviation Activities

On September 29, 1965, stockholders approved a sale of the Republic Aviation Corporation to the Fairchild Hiller Corporation, and the result was called Fairchild Republic.⁷⁹ Republic, also on Long Island, had a reputation for tough, fast, and bulky fighter/ground attack planes ranging from the P-47 Thunderbolt of WW2 to the F-105 Thunderchief which had carried the bombing war against North Vietnam. Fairchild Republic's final production aircraft, the A-10A Thunderbolt II, was a low-level twinjet carrying a large 30mm GE rotary cannon designed to nullify massive Warsaw Pact tank formations on European battlefields. Because of this straight-forward mission, the A-10A was built with relatively primitive avionics (aviation electronics) systems. A total of 715 were produced between 1972-1984.⁸⁰ When the Warsaw Pact disappeared in 1989, so seemingly had the A-10's mission. However, the A-10 proved its capability in Desert Storm in 1991 as a low-level system for close-in protection of friendly ground troops. Its popularity soared, and during the first decade of the 21st century, Lockheed Martin took over from a by-then defunct Fairchild Republic as prime supplier to the USAF for an upgrade called the A-10C.

At the Inflection Point

By 1957, Sherman Fairchild was described as a "playboy millionaire," a meticulous man in his 60's who frequented New York's posh 21 Club and wore 'a

fresh pretty girl every few days like a new boutonniere".⁸¹ He was about to invest in semiconductors at a point where their use in place of the old vacuum tube was exploding in all phases of consumer and defense electronics because they did the same jobs in a smaller, lighter, more robust package with vastly less usage of power and longer life. Examples of semiconductors are the transistor and the diode. They are made of inexpensive elements like silicon doped with slightly more expensive but small quantities of rare earth elements. The transistor is a device that, depending on its use in a circuit, can operate as a switch with two electrical states, like 0 and 5 volts. Thus, its use in computers is obvious. It can also be used as the active element in an amplifier circuit. The 1956 Nobel Prize in Physics was awarded to its inventors, William Bradford Shockley, John Bardeen, and Walter Houser Brattain of Bell Telephone Labs.⁸²

It must be stated that aside from their use in portable radios, TV's, and stereos, the transistor had a much more serious impact on national defense by enabling computers to be miniaturized. The launching of *Sputnik* in 1957 had proved that the USSR had the ability to attack The United States homeland with nuclear-tipped intercontinental ballistic missiles. Responding by building our own versions of these missiles made computer miniaturization imperative so that they could fit in the warheads to provide control and guidance.

The architecture of stored program computers, from the time when they were first built following WW2 until the latest tablet, has remained for the most part invariant. You have the central processing unit (CPU), the memory device (magnetic cores, memory chips, magnetic cards), and the Input/Output (I/O) (punched cards, cathode ray tubes, flat displays, touchscreens). All have benefitted from the semiconductor revolution but none so much as the CPU. By 1957 most were made from tube logic but some designs, particularly for the military, were beginning to use discrete transistor logic.

A Place called Silicon Valley

By 1957 William Shockley had created Shockley Transistor Laboratories with the avowed goals of building transistors using silicon substrates and the process of diffusion, where a semiconductor is cooked in an oven containing appropriate

impurities that then seep into the semiconductor like hickory flavor seeps into meat cooked in a barbecue pit.⁸³ As staff, Shockley had carefully assembled in 1956 eight men under 30 with complementary skills in physics, metallurgy, chemistry and electrical and chemical engineering: Their names and expertise bear recording: Jean Hoerni, Jay Last, Robert Noyce (physicists); Jay Blank and Gordon Moore (physical chemists); Victor Grinich (electrical engineer), Eugene Kleiner (industrial engineer), and Sheldon Roberts (metallurgist).⁸⁴ Their heads were filled with ideas concerning silicon transistors, the electronic switches that are the building blocks of computers.⁸⁵ Now computers are designed using logic diagrams just as a house is built using a blueprint. A basic set of logic elements is required to build a computer. The elements can be built out of transistors which are combined in electrical circuits to achieve certain functions. (Boston University has provided the transistor circuits which implement the logical functions NOT, NAND, NOR at <http://www.cs.bu.edu/~best/courses/modules/Transistors2Gates/>).

Shockley was difficult to work with and was constantly redirecting his team to changed goals. In September 1957 the staff of 8 resigned en masse and founded Fairchild Semiconductor in Palo Alto, California. A security analyst at the New York investment bank Hayden Stone and his boss Arthur Coyle had canvassed more than 30 potential corporate investors before attracting Sherman Fairchild, founder and chairman of Fairchild Camera and Instruments.⁸⁶ One of the first West Coast venture capital deals was negotiated, where Fairchild loaned the founders \$1.38M in exchange for the right to purchase the company if it succeeded.⁸⁷ Now Noyce and his team were free to pursue their own destiny. Among the products they designed was Micrologic in 1961, which was a family of integrated circuits (or chips) which combined many of the computer designer's standard components like NOR, NOT, and NAND on a single piece of silicon.⁸⁸ (Robert Noyce had obtained a patent for the integrated circuit in 1959.⁸⁹) To quote Gordon Moore, "The computer that went to the moon was built using the three input NOR gate from the Micrologic family of circuits."⁹⁰ It turns out that Fairchild by this time (1964) had moved on to more complex integrated circuit design and most of the NOR gates (5600) used by Apollo were built under license

by Philco.⁹¹ No Apollo Guidance Computer, one of which was on each of the Command and Lunar Modules, ever experienced a hardware failure during a mission.⁹²

Coda

The success of Fairchild Semiconductors was relatively short lived. Eventually Fairchild Instrument and Camera (FCI) exercised its option of purchasing the shares of Semiconductor and recasting it as a division of FCI. Largely on the strength of its fast growing Semiconductor division, by 1961 FCI had record sales (\$92 million) and profits (\$3.8 million).⁹³ However, in many areas, internal dissension in Semiconductor was on the rise. Devices that worked in the R&D Lab In Palo Alto often failed to perform the same way after they left the production line in Palo Alto, possibly due to contamination. Innumerable meetings between the two groups provoked frustration. This frustration led to spinoffs. By 1961, 4 of the original firm's founders had left to begin their own firms.⁹⁴ Buoyed by a booming '60s stock market, spinoffs could attract capital easily.⁹⁵ The CEO John Carter of FCI expanded into many products like graphic arts, oscilloscopes, and home movie equipment all of which were unsuccessful but depended on Semiconductor profits.⁹⁶

Noyce served as general manager of Semiconductor. He was assisted by Charles Sporck (originally from GE), head of manufacturing who in time built an operation that guaranteed cleanliness and product control. In 1965, Noyce was named a vice president of FCI and began to spend most of his time in Clifton, New Jersey running a new Instrumentation Division. Sporck took over as general manager, but his innovation of assigning product managers to coordinate production of each specific device came too late.⁹⁷ By the end of 1966, Semiconductor began to miss deliveries. In the 4th quarter FCI profits dropped from the previous quarter. A source of resentment was a five-year cost reduction plan for Semiconductor which was adopted despite the persistent waste of money by FCI over the years.⁹⁸ In March 1967 a disgusted Sporck took several key integrated circuit men with him as he became CEO of National Semiconductor. By this time Noyce, a highly creative man who was spending all his time fending off FCI's unwanted

acquisitions and fighting to keep key employees, was beginning to consider leaving Semiconductor. FCI's earnings for the third quarter slid to \$137000, down 95.5 % from the preceding year's third quarter profit of \$3 million. By year's end, FCI reported a \$7.7 million loss.⁹⁹ Noyce announced his formal resignation from Fairchild on June 25, 1968. In a two-page letter to Sherman Fairchild, Noyce said that he wanted to start a smaller company where he could get close to advanced technology again and enjoy more personal creative work in building a new technology, product, and organization.¹⁰⁰

The Events That Followed

A month later Robert Noyce and Gordon Moore established N-M Electronics, a semiconductor memory company they soon renamed Intel.¹⁰¹ On July 24, 1969, Apollo 11 successfully completed its mission to the moon and back using two onboard guidance computers based on integrated circuits designed by Fairchild Semiconductor. Before he died on March 28, 1971, Sherman Fairchild was formally recognized at the Smithsonian Institution for his 50 years in the aviation industry. He gave the Smithsonian a full set of scale models of his aircraft.¹⁰² The set should have included the Apollo 11 lunar module Eagle and command module Columbia, of whose accomplishments Fairchild must have been aware. A good dancer with an eye for pretty girls, he enjoyed entertaining the most stunning models at his Great Neck Long Island estate, always chaperoned by his Aunt May. Geoffrey Hellman wrote in New York Times in 1941: "He approaches girls neither frivolously or romantically, but with the detached, spotty interest of a bachelor taking a half-hour off to buy a lampshade."¹⁰³

Conclusions

Today, June 1, 2017, I view the grave site of the Fairchild family after a strenuous walk to the top of Glenwood Cemetary in Oneonta. In the center is the family stone. To the right are the markers for George Winthrop Fairchild and his wife Josephine Mills Sherman. To the left are the stones of Sherman Mills Fairchild and his beloved Aunt May Fairchild. The site is located in a 100 yard bowl of trees, bordered on the south by an open area giving view to the green hills across the Susquehanna. It is a sunny day as the 70 degree afternoon has overwhelmed the

45 degree morning, though chilly windblasts occasionally overpower the sun's warmth. The chirping birds hold up well against the distant roar of traffic on I-88 700 feet below.

It is appropriate that the headstones of George Winthrop and Sherman Mills Fairchild lie at the top of the steep gravesite. They dominated 20th century innovation emanating from Oneonta just as the Fords, Bundys, and the Huntingtons loomed over the 19th. What all these men had in common was the desire to risk building machines to conquer distance, height, time, and complexity. They took chances, faced challenges, but always went back for more. They built the world we live in today from the smallest cell phone to the gigantic megajets which dominate air travel and much of the world's GDP. As we struggle to overcome the problems of the 21st century let us do so with the heart, daring, and sense of community that let Oneonta's entrepreneurs do so much for so many with such wide generosity of spirit.

¹ Kubik, Dorothy, *The Story of the Susquehanna Turnpike*, Fleischmanns, NY (2001) flyleaf map.

² Morgan, Almyra *The Catskill Turnpike: a Wilderness Path*, Ithaca, NY (1971) p. 5.

³ Morgan, p 15.

⁴ Kubik, p 29.

⁵ After 200 years, there are still portions of the Catskill Trail drivable by auto. Taking SR 206 from Greene to Whitney Point, there are marked sections of the Catskill Trail. The first is on the right about a half-mile out of Greene. The second is on the left just to the west of the Town of Triangle. On I-88, take Exit 11 to SR 357 toward Franklin. There are about 8 mileage markers first starting on the right side of the road and then on the left. They resemble tombstones surrounded by a brick structure topped by a peaked roof. Continue on to Treadwell, where a marker on the left side reads "74 miles to Hudson".

⁶ Milener, Eugene M. *Oneonta - the Development of a Railroad Town*, Oneonta, NY (1997)

⁷ Milener, p 13.

⁸ Much of the data for this paragraph came from Milener pp. 59-60.

⁹ Milener, p. 12.

¹⁰ Milener, p.24

¹¹ Milener, p.64

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- ¹² LeRoy, Edwin D, *The Delaware & Hudson Canal*, (Honesdale, PA (2006), p.21.
- ¹³ The details of the financial buildup toward A & S construction are complex and covered in depth in Milener Chapter IV. Suffice it to say that on his own Reed sold \$50000 of stock (p. 79).
- ¹⁴ Milener, p 120
- ¹⁵ Milener, p. 113
- ¹⁶ Milener, p 110
- ¹⁷ At Piermont, the Erie extended on filled-in land to the middle of the Hudson River. Here cargo and passengers were transferred to boats bound for NYC. The path is still visible (and walkable) from the eastbound lane of the (old or new) Tappan Zee bridge.
- ¹⁸ An museum panel at the Steamtown National Historical Site, Scranton, PA gives this record distance at 450 miles.
- ¹⁹ Milener, p 133.
- ²⁰ Milener, p.175
- ²¹ The UP will arise again in a latter part of our story
- ²² Milener, p 61.
- ²³ Milener, p 538.
- ²⁴ Milener, p 177.
- ²⁵ Milener, p 186.
- ²⁶ Bain, David Howard, *Empire Express*, New York, NY (1999) p. 88.
- ²⁷ Whose name graces the Most famous hotel in San Francisco.
- ²⁸ Old Town Sacramento, Huntington-Hopkins Hardware Store, Teachers Aid, California State Parks 2000/2001.
- ²⁹ Bain, p. 25.
- ³⁰ Bain, p..89.
- ³¹ Bain, p. 87.
- ³² Bain, p.90.
- ³³ Bain, p 94.
- ³⁴ Bain, p.115
- ³⁵ Bain, p. 661.
- ³⁶ Milener, pp. 188-190.
- ³⁷ In the movie *The Lone Ranger* (2013), the building of the transcontinental railroad is embedded in the plot along with the origin story of the lost Texas Ranger. A Collis Huntington look-a-like plays the nefarious railroad president who kidnaps the Lone Ranger's sister-in-law and little boy. Although this subplot portrays a an evil character, there is no evidence that C. P. ever acted out such behavior. Panned at the time of its release because of its parody of the Western idiom, I think in due time it will emerge as a work of art.
- ³⁸ Crump, Spencer, *Ride the Big Red Cars: How Trolley's Helped build Southern California*, Los Angeles, CA(1962) p.47.
- ³⁹ Crump, p.48.
- ⁴⁰ Crump, p. 27.
- ⁴¹ Friedrichs, William B., *A Metropolitan Entrepreneur Par Excellence: Henry Huntington and the Growth of Southern California, 1898-1927*, in *The Business History Review*, Vol 63, No. 2(Summer, 1989, p. 332.

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- ⁴² Crump, pp, 39-45.
- ⁴³ Friedrichs, p.334.
- ⁴⁴ Friedrichs, p.336.
- ⁴⁵ Friedrichs, pp.346-348
- ⁴⁶ Henry Huntington never forgot the upstate NY town where he was born.
- ⁴⁷ Friedrichs, p.238.
- ⁴⁸ Crump, p.82, p.135.
- ⁴⁹ Crump, p.178.
- ⁵⁰ Crump, p. 156.
- ⁵¹ Milener, p. 315.
- ⁵² Steinberg, Marcia & Harvey, *A Small City's Culture, A Worldly Future: How IBM Began - Binghamton, NY and the Bundy Manufacturing Co.* Lawrenceville, NJ (2015), pp. 15-16.
- ⁵³ Obituary, "A. Ward Ford, Industrialist Dies, Founded Firm Taken over by IBM", Binghamton Press (May 24, 1948)
- ⁵⁴ Steinberg, pp. 18-19.
- ⁵⁵ Steinberg, p. 26.
- ⁵⁶ The names, dates, and relationships in this paragraph are derived from Milener, pp. 538-542.
- ⁵⁷ Judge Kellogg built a general school in the town of Treadwell, NY. In order to strengthen his high school baseball team, he hired my Uncle Bob, at age 25, to play on his team. The Judge also let Bob drive his Cadillac V-16 to take prospective job applicants to Endicott for applications at IBM, the eventual successor of ITR.
- ⁵⁸ IBM Archives, https://www-03.ibm.com/ibm/history/exhibits/builders/builders_flint.html
- ⁵⁹ Maney, Kevin, *The Maverick and the Machine, Thomas Watson Sr. and the making of IBM*, Hoboken, NJ (2003), p.51.
- ⁶⁰ IBM Archives, https://www-03.ibm.com/ibm/history/exhibits/chairmen/chairmen_2.html
- ⁶¹ As a teenager slicing delicatessen in my fathers' market for customers in the 1960s, I used a Hobart computing scale to automatically determine the price of say salami weighing 3/8 pound selling at \$1.20 a pound.
- ⁶² Steinberg, p.84
- ⁶³ Lewis, Donald F. *The Man Who Marketed Time*, Hamilton Alumni Review, August 1977 reprinted from the notes for the "Dedication of the Margaret Bundy Scott Field House November 30, 1984". Mrs. Scott, Harlow's daughter, had bequeathed Hamilton with over \$6,600,000 during her life. As the proud granduncle of a student finishing his freshman year at Hamilton, I am indebted with gratitude at the Bundy contribution.
- ⁶⁴ Lewis, *ibid.*
- ⁶⁵ Hamilton Literary Magazine, date unknown, p 499 in the Broome County Historical society Harlow P. Bundy folder.
- ⁶⁶ Luther, Roger, *Lost in the Architecture: What Happened to Endicott's Historic Bundy Building*, <http://nyslandmarks.com/treasures/16feb.htm>, p. 1.
- ⁶⁷ Luther, p. 2. Of course, the original Water St. plant became the home of the Link Theater Organ Co., the incubator of Link Flight Simulation used on a massive scale in WW2, but this exceeds the scope of the current paper.

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- ⁶⁸ Milener, p. 540.
- ⁶⁹ (author unspecified), *Multifarious Sherman Fairchild*, Fortune Magazine, May 1960, p. 172.
- ⁷⁰ Fortune, p.172.
- ⁷¹ Milener, p. 545.
- ⁷² Most of the data in this paragraph derives from Mitchell, Kent A., *Fairchild Aircraft 1926-1987* Santa Ana (1997), p. 6.
- ⁷³ Many of the facts in this paragraph are from Mitchell, p.7.
- ⁷⁴ Fortune, p. 171.
- ⁷⁵ Mitchell, p. 9.
- ⁷⁶ Fortune, p. 171.
- ⁷⁷ Mitchell, p. 14.
- ⁷⁸ Mitchell, p. 109.
- ⁷⁹ Mitchell, p. 168
- ⁸⁰ Mitchell p. 175.
- ⁸¹ Berlin, Leslie R., *Robert Noyce and Fairchild Semiconductor, 1957-1968*, The Business History Review, Vol 75, No 1. Computers and Communications Networks(Spring,2001), p. 74.
- ⁸² See the Nobel Prize website https://www.nobelprize.org/nobel_prize/lists/all..
- ⁸³ Berlin, p 69.
- ⁸⁴ Moore, Gordon E. *The Role of Fairchild in Silicon Technology in the Early Days of "Silicon Valley"* Proceedings of the IEEE, Vol. 86, No. 1, January , 1998. p. 53.
- ⁸⁵ A brilliant video describing how a transistor works is found at <https://www.youtube.com/watch?v=IcrBqCFLHIY>.
- ⁸⁶ Laws, David A., *A Company of Legend: The Legacy of Fairchild Semiconductor*, IEEE Annals of the History of Computing January-March 2010. p61
- ⁸⁷ Laws, p 62
- ⁸⁸ Laws p 66.
- ⁸⁹ Berlin, p. 79
- ⁹⁰ Moore, p 59.
- ⁹¹ Ceruzzi, Paul, *Apollo Guidance and the First Silicon Chips*, posted on Wed, October 12, 2015 at <https://airandspace.si.edu/stories/editorial/apollo-guidance-computer-and-first-silicon-chips>. Ceruzzi is with the Space History Department of the Smithsonian. The numbers are from Hall, Eldon C., *Journey to the Moon: The History of the Apollo Guidance Computer* Reston, Va., (1996) pp. 119-20.
- ⁹² Ibid.
- ⁹³ Berlin, p.81.
- ⁹⁴ Brelin, p.84.
- ⁹⁵ Berlin, p.84
- ⁹⁶ Berlin, p.86
- ⁹⁷ Berlin, p.93
- ⁹⁸ Berlin, p.94
- ⁹⁹ Berlin, p. 96.
- ¹⁰⁰ Berlin, p. 98.
- ¹⁰¹ Berlin , p.99.

¹⁰² Obituary, New York Times, March 29, 1971.

¹⁰³ Ibid.