Chapter 1

The Foundation of Achievement

St. Louis 1920 –1941

Walter Evans's journey toward revolutionizing control systems engineering began in St. Louis, Missouri—a city that shaped generations of thinkers, innovators, and engineers. His roots—both familial and intellectual—were deeply embedded in the city's educational institutions, intellectual circles, and values. Walter's role models—and St. Louis itself—valued achievement.

A Family That Valued Achievement

Walter Evans was the youngest of four children in a family that placed a high value on education. His maternal great-grandfather, James X. Allen, served as a surgeon in the Civil War. In the 1870s, he attended a medical college that later became part of Washington University's School of Medicine—an impressive achievement for the time. His grandfather, Samuel Rostron Burgess, helped found the West End Chess Club. His grandmother, Eveline Allen Burgess, was the United States Women's Chess Champion in 1906. Walter's mother, Sybilia Burgess Evans, graduated second in her high school class.



Walter Evans, St. Louis c. 1932

Chapter 2

The Power of Partnership

Schenectady 1941-1946



Upon graduation from college, Walter accepted a job offer from General Electric. In July 1941, he took up residence at Lake Lodge on Ballston Lake, New York, a few miles north of Schenectady. It appears his job did not begin until October, when he moved to an apartment on Bedford Road in Schenectady. His wedding to Arline Pillisch was set for April 11, 1942. Before returning to St. Louis, the 22-year-old was apparently homesick, based on the letter he wrote to his mother.

Dear Mother,

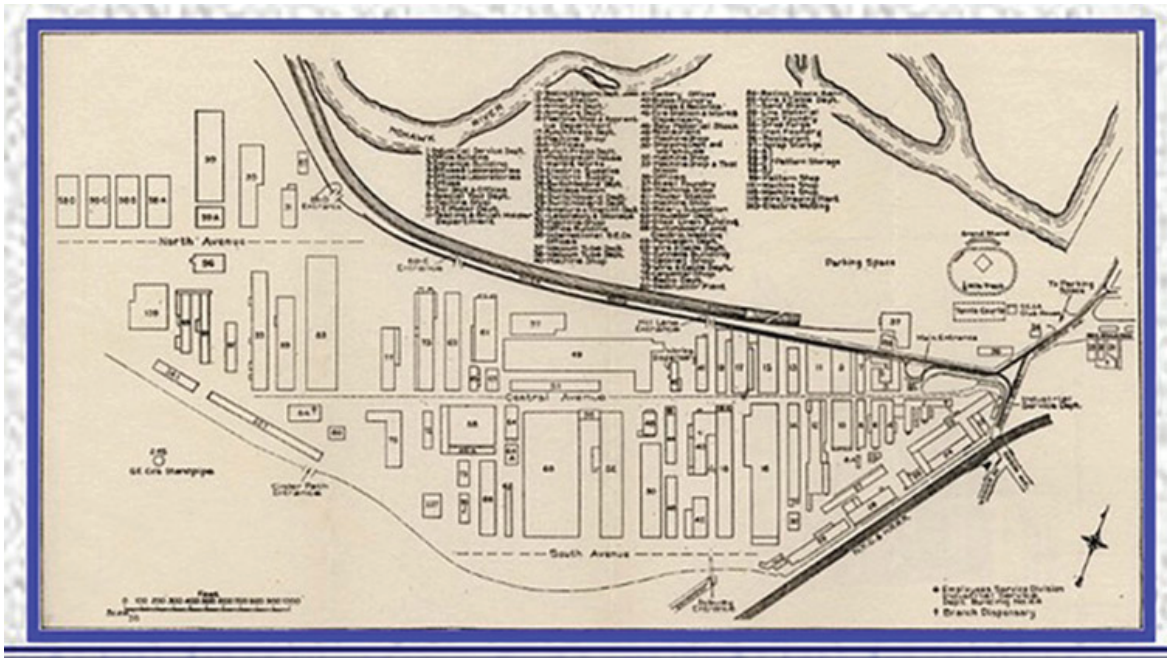
Being away from home for a year is highly touted as a great experience for a boy in teaching him to cope with the responsibilities of life. Admittedly, I have learned quite a few facts, particularly concerning human behavior, but I really don't feel changed noticeably from last year in St. Louis. And most of the things I have noticed here in Schenectady recall conclusions that you had expressed before.

Chapter 3

Understanding Beats Memorization

The GE Advanced Course 1941-1946

The primary attraction for Walter when seeking employment at General Electric Corporation was its famed Advanced Course, an elite training program for promising engineers. Washington University had developed a tradition of its top engineering graduates applying for entry into the program, and Walter followed in the footsteps of several distinguished predecessors.



GE Schenectady Works Plant Map circa 1941

Chapter 4

Great Ideas Can Come from Anywhere

The Graphical Analysis Paper 1946-1948

In a 2003 letter to the author (see Appendix 3), Gordon Walter recalled a pivotal moment in Walter's intellectual journey.

> *Walt and I spent quite a few evenings together in the otherwise deserted Advanced Course office, preparing material for our students while managing our day-to-day jobs on B-29 fire control. One evening, Walt began reading a paper by a Swiss mathematician on a different way to analyze the roots of a polynomial equation. He was intrigued, spent more time thinking about it, and eventually developed an interest in applying it.*
>
> *We had been exposed to feedback theory in Advanced Course classes, and Nyquist diagrams [Harry Nyquist] were in vogue. Our assignments involved servo systems. For whatever reason, this was when Walt caught the bug that led to root locus analysis and the Spirule. He had the insight, determination, and ability to take the initial concept to a higher theoretical and practical level. I just happened to be in the same room when the bug first bit him.*

To quote the 21st century poet Lin-Manuel Miranda, Gordon Walter was "in the room where it happened."

Chapter 5

Opportunity Meets Preparedness

North American Aviation 1948

The end of World War II had precipitated a bust to the aviation industry boom years of around-the-clock factory aircraft assembly lines. Industry executives realized they would have to reinvent their companies to survive.



Companies like North American Aviation (NAA) in 1948, which had thrived on the wartime demand for bombers, fighters, and trainers, were suddenly faced with the challenge of peacetime adaptation. Southern California, a hub for aircraft manufacturing during the war, now teetered on the edge of economic uncertainty as thousands of skilled workers and engineers wondered what the future held. For many aerospace firms, survival hinged on diversification and innovation. Some transitioned to civilian markets, producing commercial aircraft or leveraging their expertise in other industries. Others sought opportunities in the nascent fields of guided missiles, jet propulsion, and experimental technologies.

Chapter 6

Building a World-Class Organization

The Aerophysics Lab 1948 –1954

The Aerophysics Laboratory at North American Aviation became a crucible of innovation, fostering a collaborative environment where physicists, engineers, and technicians tackled complex technological challenges. As one of the first facilities of its kind in the United States, it embodied a broader shift in which private industry assumed roles traditionally held by academia or government laboratories. NAA's strategic foresight in establishing this facility ensured its relevance through the uncertain postwar years and well into the Cold War.

The largest contract awarded to the Aerophysics Lab was a powered rocket called the Navaho. During the development of the rocket in the early 1950s, Walt began to ascend the management ladder. "Headed for the vice-presidency?" his Washington University professor Roy Glasgow might have asked. Recall that Glasgow had steered Walt away from his declared major of engineering administration.

Fueling America's aerospace industry in the 1950s was the threat posed by the Soviet Union. The USA and USSR were in an arms race. Schoolchildren were subjected to duck-and-cover drills, in fear not of a shooter, but of an atom bomb.

Chapter 7

Ideas Find Their Own Way

The Spirule 1948-1952

"Engineers must love gadgets." Walt wrote the line with a hint of bemusement, still surprised by the steady demand for the devices he had begun to produce. What started as a practical aid for a handful of students had taken on a life of its own.

The root-locus method required a way for designers to sum angles and measure distances from a trial point *p* in the *s*-plane to other fixed points. Walt's 1948 notes captured his first attempt to meet that nee*d:*

> *Place a transparent sheet on top of the diagram, draw a line for reference, stick a thumbtack through at the guess point to serve as a pivot.*

It was ingenious, but it was not enough. Engineers rejected the makeshift solution. They wanted something better—something precise, durable, and repeatable. No one, including Walt himself, anticipated how dramatically the plotting problem would grow in importance. The answer would become a tool called the Spirule.

Chapter 8

Practice Before Publication

The Root Locus Paper 1948-1950

Six months after Walt Evans submitted to the American Institute of Electrical Engineers his revolutionary method for achieving flight stability, his frustration reached a breaking point on Saturday, May 7.

On that same day—May 7, 1949, half a world away—the Soviet Union demonstrated a major advance in flight stability. In short, while the Soviets achieved a breakthrough, Walt encountered a breakdown.

Occasionally history delivers such a coincidence—so striking as to defy explanation—two events, separated by distance yet bound by meaning. July 4, 1826, had been such a date. May 7, 1949, was another.

Fifty years to the day after the signing of the Declaration of Independence, two giants of the Revolutionary War—John Adams and Thomas Jefferson, at times bitter political rivals but by then reconciled—both passed into history within hours of each other, one in Massachusetts and one in Virginia.

In 1946, Winston Churchill famously declared in Fulton, “An iron curtain has descended across the continent.” His speech acknowledged a post–World War II reality: an undeclared Cold War had already begun between two countries that had once formed an alliance of convenience to defeat Nazi Germany but had quickly pivoted to become rivals.

Chapter 9

Let the Sunshine In!

The Textbook 1949 – 1954

*A version of Chapter 9 appeared as "*Bringing Root Locus to the Classroom, *... ... Control Systems Magazine, December 2004, Vol. 24, No. 6.*

In 1948, John Wiley and Sons published *Principles of Servomechanisms* by Gordon Brown and Don Campbell of MIT. It quickly became a landmark text in the field. Meanwhile, McGraw-Hill's distinguished *Electrical and Electronic Engineering Series* had no entry in the rapidly developing field of servomechanisms. Frederick Emmons Terman, consulting editor of the series, launched the series with his 1937 book *Radio Engineering*. Terman is known as the "father of Silicon Valley" because he encouraged his Stanford engineering students to start companies that would create jobs for graduates. Two students who did, Bill Hewlett and David Packard, founded HP in 1939.

The publisher turned to electrical engineering Professor Koopman of Washington University in St. Louis about preparing a textbook on the subject. Shortly thereafter, however, Koopman succeeded Roy Glasgow as department chairman. Progress on a manuscript slowed dramatically. Koopman suggested to McGraw-Hill that they ask a former Washington University instructor, Walter R. Evans, whether he would be interested in writing a book using course notes developed at Washington University, Emerson Electric, and North American Aviation. On August 2, 1949, McGraw-Hill editor John Wight wrote to Walt:

Chapter 10

The Fork in the Road

Autonetics 1955 –1959

After his decade of accomplishment (1944–1954), Walt had firmly secured his place in the history of control theory. The publication of his textbook coincided with those of many other books of the time, all of which dedicated extensive sections to the root-locus method of design. On the home front, two significant events made 1954 a milestone year in his life.



Randy, Gary, Nancy, and Greg, in 1954 at 9728 El Venado Dr., Whittier, CA,

Chapter 11

The Entrepreneur's Balancing Act

The Spirule Company 1952 – 1980

On March 27, 1952, Dad sent a Certificate of Business form to *The Whittier News*. On April 8, 15, 22, and 29, the paper published a notice.

> *The undersigned does hereby declare that I am conducting a mail sales business at 1706 Maple Street under the fictitious name of The Spirule Company.*



Mom's Office

And so, in a modest, 1200-square-foot residence in Whittier, California, the Spirule Company was born. Coincidentally, Dad and Mom celebrated their tenth wedding anniversary that April. Ironically, it had been exactly two years since Professors Wheeler, Osterbrock, and Meserve had learned from Dad that NAA had no plans to manufacture Spirules because they were "not worth $30 and the demand is far short of 500 for a $0.50 stamped model."

Chapter 12

Success Through a Child's Eyes

My Stories of Dad 1957 –1999



Stephen Evans at Washington University in 2010 (Left) and 2015 (Right)

When I was born on August 16, 1947, I was given the name Gregory Walter Evans. I am proud to have "Walter" as a middle name. I'm proud that my son Stephen, a 5th-consecutive-generation Evans engineer, also has Walter as his middle name. Like his grandfather, he earned his undergraduate degree from Washington University in St. Louis. Although I have no memories from the 1940s, I point out that the spark for root locus was Paul Profos's June 1946 journal article. Dad mulled its ideas over in his brain during the nine months I was in Mom's womb. Dad mailed his first letter to Profos on August 11, five days before I was born.

Like Dad, I am a son of St. Louis. I will always be as old as root locus.

Resilience After Tragedy: Epilogue



Arline and Walter Evans in Whittier c. 1992

On the afternoon of Monday, June 2, 1980, I was sitting at my desk when the phone rang. I recognized my brother's voice, but not the tone. "Dad is at Presbyterian Hospital," he said, his voice cracking. "He had a stroke."

That evening, I walked into Dad's hospital room and was shocked by his appearance. His face was expressionless. My brother Randy was there. "Mom was here but has gone home for the night," he told me. When the neurologist arrived, it was just the two of us. His report was unequivocal: Dad would never walk again or regain his speech. The stroke had destroyed a large portion of his left hemisphere, including Broca's region—the center of speech production.

We left in shock. Early the next morning, I sat with my mother in the bedroom and relayed the grim prognosis. What followed was a flurry of phone calls to friends and colleagues, breaking the news. I had always known Dad loved his work, but that day, I learned something new—his colleagues loved him, too. The pain in their voices revealed the depth of their admiration. It underscored an essential truth: The impact of his work was deeply personal to those who had learned from him.