

FIVE PARALLELS IN THE LIFE, CAREER AND ACCOMPLISHMENTS OF JOHN A. ROEBLING; WHICH CONTINUE TO INFLUENCE CONSTRUCTION ENGINEERS TODAY.

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The citation on the 2005 Roebling Award presented to me reads: *“For his outstanding contributions to the advancement of engineering within the construction industry throughout his career as exemplified by his involvement in the Isle of Palms Bridge in South Carolina and the Mississippi River Bridge in Greenville, Mississippi.”*. Reflecting upon my own career, the significance of the honor being bestowed and the man in whose name the honor is made; a single thought came to mind, “What was it about John A. Roebling’s life, career and accomplishments that continues to influence us, as Construction Engineers today?”

John Roebling’s life and career is well documented and the results of many of his engineering accomplishments are still with us today. In reviewing his life, career and accomplishments five key parallels stand out that are still appropriate to consider in the lives, careers and accomplishments of Construction Engineers today. The five are heritage, education, passion, proportion and legacy. By reflecting on these five elements in our lives we like John A. Roebling will continue to influence the next generation of Construction Engineers. The 2005 Roebling Lecture will reflect on the career of the recipient and explore the five parallels to the life of John A. Roebling.

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Introduction

When Marvin Oey formally notified me of my selection to receive this award and advised me that it is customary and expected that the recipient deliver the Roebling Lecture, I was spell bound; first for having received such recognition, and second by the requirement to deliver the Roebling Lecture. Because it has been 200 years since John Roebling's birth, Marvin's instructions further suggested that topics being considered for this lecture included John A. Roebling's development as a civil engineer, his projects, his influence on other civil engineers and civil engineering, and the Roebling family legacy. As I reflected upon the enormity of the challenge, as well as the vastness of the topic, I centered on a single thought, "What was it about John A. Roebling's life and career that continues to influence us, as Construction Engineers today?"

John Roebling's life and career is well documented and the results of his engineering accomplishments are still with us today. In reviewing his life, career and accomplishments five key areas stand out that are still appropriate to consider in our lives, careers and accomplishments as Construction Engineers today. The five are heritage, education, passion, proportion and legacy. By reflection on these five elements in our lives we, like John A. Roebling, will continue to influence the next generation of Construction Engineers.

Reflections and applications from John Roebling's life:

First, Heritage (*something you are born to and influenced by*)

John Augustus Roebling was born in Muhlhausen, Germany (Prussia) in 1806 to Christoph Polycarpus Roebling and Friedericke Dorothea Roebling. John was the youngest of five children. He was born and raised in a world of unrest and a period of Napoleonic influence. He grew up in a time where the older students put on uniforms, shouldered muskets, and marched off to stop Napoleon and his army. In spite of this unrest, he enjoyed music and was accomplished in the flute and piano. He developed an artistic talent at an early age. He also built a model bridge that was similar to his ultimate engineering/construction creation: -- the Brooklyn Bridge.

John Roebling was not born to privilege, wealth or position, but to a lower middle class family. His father was a tobacco vender and his mother an ambitious, grimly determined, culturally stagnant housewife.

John's father was lethargic and content with his station in life. He was comfortable puffing his pipe, looking over the medieval architecture of the city, enjoying a beer, entertaining customers and seemingly at peace. John's mother, Friedericke was radically different. She was five years older than John's father, impatient, discontented and rebellious to her dull non-progressive status quo existence. She was alert, ambitious and determined to break out of complacent provincialism and poverty, if not for herself then for her youngest son. It was in her youngest son John, in whom she saw her own nervous energy, quick intelligence and active brain, that she focused her ambition. John would have all the opportunities she dreamed of. As a result she was the catalyst and compulsion for creating opportunity for John. She toiled unceasingly; she worked and slaved, scrimped and scraped, patched and mended, fasted and denied herself to earn and save every penny to afford opportunity for John.

John Roebling, in spite of his humble origin, had two significant things which became his heritage that we should take to heart. First, he was the product of the union of his Mother and Father. Genetically he had the heart and soul of his parents; good and bad. Second, he had a mother who saw his potential and who did whatever she could to guide her son and create opportunity for him to be everything he was capable of becoming, not knowing what that might be.

The lethargy and indifference of John's father and the dogged determination of John's mother left no room for loving compassion and encouragement. Yet, John was not the victim of his circumstances; he was the product of those circumstances.

Lessons for us to reflect upon regarding Heritage:

We each are the product of our parents, good and bad. We need to reflect upon that heritage to understand our true potential as well as our weaknesses. We should be constantly thankful for the opportunities created for us by the sacrifices of our parents. Sacrifices which we may have never seen or we are yet to fully appreciate.

I am in the fall of my life and winter of my career. I essentially ran away from home to pursue my career in construction, without maintaining close ties with my own family. It is only now, as I have been near my spent and ailing parents, that I am rekindling my appreciation for the unique individuals they are and sacrifices they made to create opportunity for me. Every morning as I look in the mirror to shave I see in me both the good and bad of my parents and yet I am thankful for who I have become because of them.

Second, Education (*something we gain through study and experience*)

John Roebling attended the public schools of the Gymnasium in Muhlhausen (at the age of 14, John passed the examination for the title of Master Builder or “Baumeister”). Through John’s mother’s sacrifices and his uncommon intellect, John secured enrollment in the Royal Polytechnic Institute in Berlin where he studied architecture and engineering, bridge and foundation construction, hydraulics, and philosophy graduating in 1826 with a degree in Civil Engineering. John studied engineering and construction under the best instructors of the time. He studied philosophy under the famous German philosopher Georg Hegel. John became Hegel’s protégé as well as friend.

To understand the influence and impact Georg Hegel had upon John Roebling we need to understand a little about Georg Hegel. Georg Wilhelm Friedrich Hegel, 1770 -1831, was a German philosopher, teacher and deep thinker. He was born in Stuttgart and received his education in the seminary of the Protestant Church in Wurttemberg. Drawing from his religious convictions, he believed that the universe was not random but directed. He believed that this direction was God’s Will and that Will was represented in the world by Man’s reason. He believed that Man’s reason was unlimited because it came from God. This faith in man’s reason was derived from faith in God and this faith influenced his whole work.

Hegel first introduced the idea that History and the concrete are important for getting out of the perennial problems of philosophy. He understood that “cause and effect” are progressive and that when channeled correctly they would result in true progress, understanding and freedom -- approximating the will of God. He introduced a system of understanding the history of philosophy and the world itself, as a progression in which each successive movement of history emerges as a solution to contradictions in the preceding movement. As an example, for Hegel, the French Revolution constituted the introduction of real freedom into western societies. Yet, this hard won freedom was ultimately consumed by the brutal Reign of Terror. History, however, progresses by learning from its mistakes, resulting in the existence of a constitutional state of free citizens embodying both rational government and ideals of freedom and equality. For Hegel, freedom was found in the state, but that individual interests must be reconciled with that collective freedom. That is, true freedom is found not only in the state but in self as well. Hegel speculated that the absolute expression of freedom would not be realized in nineteenth century Europe. Prophetically he wrote: “America is therefore the land of the future, where, in the ages that lie before us, the burden of the World’s History shall reveal itself.”

It is no wonder that the companionship, teaching and friendship of Georg Hegel had a profound influence upon John Roebling. This influence evidenced itself in the capacity and ability to take the essential engineering theories and principles combined with the understanding of man’s purpose and capacity to reason, to produce what history has shown to be the most

influential engineering and construction accomplishments of its time. John learned to think logically and clearly and to see himself in the foreground of eternity and thereby to rely upon the validity of his own reasoning and conclusions. It was George Hegel's understanding of true freedom contrasted with the political situation in Europe and the prophetic understanding of the future place of America in world history that influenced John Roebling to emigrate to America.

Following his graduation John was obligated to give three years service to the state, which he spent on road construction in Westphalia. It was not long before the general unrest in Europe, the loss of democratic government to authoritarian governments, combined with the absence of economic mobility and career advancement, caused John unrest and with his brother, Karl, and friends he determined to emigrate to America. So, in 1831, John, his brother and a handful of friends made the eleven week crossing of the Atlantic to establish a farming settlement and home in what became known as Saxonburg, Pennsylvania. John was a poor farmer and it did not hold his interest for long. He did, however, support the community he established for six years before he felt the freedom to pursue his life quest and passion – he had to build bridges!

Lessons for us to reflect upon regarding Education:

What part of your life's experience has most shaped you to be who you are today? Who has been the most influential person to shape your understanding of yourself and your place in the foreground of eternity today?

When I was growing up a man who would later become my father-in law had the greatest influence upon shaping who I am today. He was a small man and a Pearl Harbor survivor who feared nothing and no man. His contribution to my life was his constant reinforcement and encouragement of my natural intellect, talents and latent strengths. He championed me before any one who would listen and he never allowed me to see myself in a negative light. He taught me that whether you are right or wrong it is the way you say something that influences people. I have endeavored to exercise the right side of that equation.

My father and father-in-law because of their character and service in World War Two convinced me of the greatness of this country. We now live in a time when too many citizens are complacent about that greatness. How important do you see the place of America in the history of the world?

Third, Passion (*something that is essential and drives our lives*)

It was Georg Hegel who first instructed John Roebling; "one thing remember, nothing great in the world has been accomplished without passion".

When John was still in the Royal Polytechnic Institute bridge construction was his favorite area of study. In his senior year he learned of a “first of a kind” bridge being built in Germany, a small span suspended from chains. During the holiday season he visited the bridge to see with his own eyes the “miracle bridge”. It was thrilling and unforgettable. It was that experience which would shape his life’s work. The beauty and simplicity of this bridge did not go unnoticed; rather it developed in him the understanding that he could improve its design and its construction. John’s life ambition was crystallized – he would be a builder of suspension bridges. All of the actions of the remainder of his life were directed towards this single driving passion.

This single passion was to first be subordinated to two equally important passions. First, he must secure social, political and spiritual freedom. He, also, must establish and care for a community of his brother, friends and fellow emigrants until they could care for themselves.

The pursuit of freedom started before his employment with the state government, in Prussia, was complete. It became a possibility upon arriving in America in 1831. This freedom was fully realized in 1837 when John Roebling became a naturalized citizen. To John, the attainment of citizenship was a sacrament worthy of the highest reverence.

John’s commitment to the community he established was sacrificial, yet morally essential. John was a poor farmer. He was not meant to be one. Yet, he stayed the course for six years until the community he started was established and he was free to pursue his true passion --- engineering and becoming the builder of the greatest wire suspension bridges in the world.

Lessons for us to reflect upon regarding Passion:

What are you passionate about or for? Are you passionate about your career and opportunities or have you simply become a “place-holder”?

I started in this business in 1965 working for Massman Construction Co. I have always been passionate to do what I am now doing. The fulfillment of that passion was not realized easily. There were times of impossible obstacles, irreconcilable differences and even tantalizing diversions. There were also times when there looked like no future and I fell into the “place-holder” mindset. Even with these hardships I have always been passionate about Massman Construction Co., my capabilities and the opportunities set before me. It is partially a result of that passion that places me before you today.

Where does your citizenship in this great country fit into your passions? How is it evidenced in your life and work? For John Roebling citizenship was a sacrament worthy of the highest reverence. We would do well to revere our own citizenship as a sacrament.

Fourth, Proportion (*a correct or desirable relationship between parts*)

When I considered this “proportional” aspect of John Roebling’s life, I centered my thinking upon his engineering and construction works. I did so because, as a construction engineer, this aspect of his life stood out to me. When I use the word “proportion” I am speaking about the proper proportioning of engineering principles, project constructability, safety, durability, quality, value, beauty, and aspirations and notoriety.

John Roebling always kept his engineering applications, construction activities and career aspirations in proper proportion. During a time in our history when industrialization was the driving energy of the nation, men were becoming rich and famous seemingly overnight. It was easy to market oneself and ideas and to embark on ventures which were not thoroughly planned, adequately designed or properly funded. Yet, they made men famous in the short term. That was not so for John Roebling. When other bridge ventures were failing and the completed structures themselves collapsing, John Roebling was planning, designing and constructing structures that were only taken down after years of successful service or which were made obsolete by the advance of the American industry. Even though he designed and built the largest and most significant bridge structures of the time, none were built for the purpose of immortalizing himself. They each were built to satisfy a need, overcome a challenge and to accomplish something that had not been done before. John seemed to see his accomplishments in relation to eternity rather than the daily headlines. His fame followed his successes.

John Roebling’s engineering and construction works were differentiated from similar and competing bridge projects of the time by his greater understanding of engineering principles, structure stability, wind loadings, lines of force and measurable safety factors. John not only understood how bridges should work, he intuitively understood how they could fail. John designed against failure as much as he designed for service. John’s early bridge projects were not financial successes, primarily because of design changes he implemented during construction to insure safety and capacity.

Engineering and construction works were not inanimate things to John, each had a life of its own. As such, beauty, quality, durability, value and safety were essential to the completed structures.

John not only designed his own engineering works, he also had the keenest sense of proportion in other engineering works. He was able to observe engineering works and consider their strengths and weaknesses. He almost intuitively could find solutions for their weaknesses; visualize ways of improving their safety, efficiency and durability as well as better ways to construct them.

Lessons for us to reflect upon regarding Proportion:

I said that this proportional aspect of John Roebling career stood out to me because it most accurately represents what I feel is essential in Construction Engineers. That is; they must have the capacity to see engineering and construction works for what they are; they must see intuitively the strengths and weaknesses of the works and find solutions to correct the weakness, improve safety, efficiency and durability as well as better ways of constructing them.

In my career as a construction engineer, I have been less concerned about labor productivity and material costs as I have been about satisfying a need, overcoming a challenge and accomplishing something few have tried before. When done properly the productivity and cost take care of themselves and the company that I work for has been profitable and successful. Most of all, personal aspirations and notoriety are subordinate to everything else. How do you see this proportionality in your career and accomplishments?

Fifth, Legacy (*what we are remembered for and leave behind*)

Our legacy is what we are remembered for and leave behind. It can be good and bad. The same was true of John Roebling. His most remembered legacies are his patents, wire rope, wire suspension bridges and his contribution to the design and construction of the Brooklyn Bridge.

John Roebling, during a time of great industrial growth in this country, developed, patented and manufactured wire rope. This was the direct product of his creative and inventive mind working for a more durable, safer and stronger cable haulage system for the inclined railroads and barge portages which used large woven hemp cables to move their loads over mountain ranges. Upon witnessing the deaths of two workmen, who were crushed under a railroad truck when a hemp cable failed, John came to realize a solution – wire rope! At that moment one of John's most enduring inventions was born. This single invention continues to serve and advance engineering, construction and civilization today.

The invention, manufacture and utilization of wire rope did not satisfy John's true passion – wire suspension bridges. His inventions were not satisfying and a mysterious providence was directing him to his true passion. He attempted to market himself and his ideas to engineers and bridge builders of the time without success and in certain instances with pain and rejection. He was, however, unrelenting and in 1845 he replaced a wooden canal aqueduct across the Allegheny River. This seven span, 163-feet per span, bridge was his first cable suspension aqueduct. This aqueduct bridge was followed by four similar structures. These aqueducts were followed by the design and construction of the replacement of an eight span, 188-feet per span, multi-use bridge across the Monongahela River at Pittsburgh.

As John's successful construction of suspension bridges became known he had his biggest challenge set before him – span the Niagara River with an 825-foot wire suspended railroad bridge. This four year project was complete in 1855. Following the Niagara Railroad Bridge, John directed his energies and time to the construction of the 1057-foot long wire suspension bridge across the Ohio River at Cincinnati. This project, though repeatedly interrupted by financing shortfalls and the Civil War, was complete in 1867 and became the largest bridge span in the world.

With this engineering and construction success complete John's life passion and final bridge would be built – the 1600-foot long wire suspended Brooklyn Bridge. John designed, prepared construction estimates and drawings for the greatest bridge of its time. John said of the bridge “It will not only be the greatest bridge in existence, but it will be the greatest engineering work of the age.” John was correct, but he did not live to see its construction or the final monument completed. He died from infections caused by having his foot crushed while surveying near the Fulton Ferry Dock on the Brooklyn side of the bridge. Yet, John's legacies are still with us today.

Lessons for us to reflect upon regarding Legacy:

What will you be remembered for or leave behind which will become your legacy?

Most of us will not have a dramatic and world changing legacy. Yet, we all have a legacy; for most of us it is a job well done, it is time spent encouraging and training younger engineers, it is the honest and fair dealing with owners, partners, other engineers and subcontractor, and it is the satisfaction of safely and responsibly performing our jobs. This, except for a few special recognitions, will be my legacy.

Finally, Conclusion *(an ending or the part that brings something to a close)*

I am truly thankful for the special recognition given me with the 2005 Roebling Award. I am also thankful that I had this recent opportunity to study and reflect upon the life and work of John A. Roebling and the parallel aspects of his life that are applicable to us today. John Roebling was a great engineer and constructor. He was not a perfect husband, father or man. He was, however, able to see himself and his career in the foreground of eternity and that to pursue other than his passion would deny his purpose and place in history. I pray that we each are able to see ourselves in the same light. Thank you again for this honor.

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