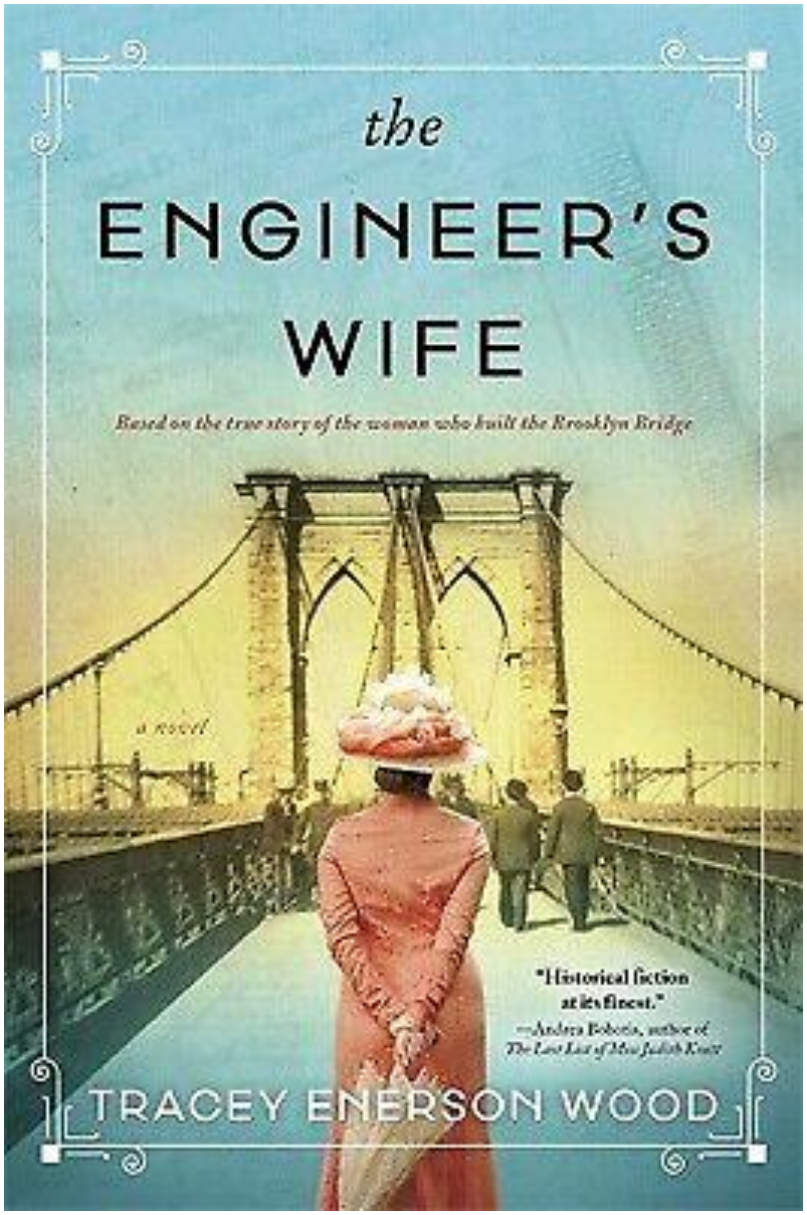
VIRTUAL BOOKENDS CAFÉ AT

THE MANHASSET PUBLIC LIBRARY

FEATURING



BOOK SUMMARY

She built a monument for all time. Then she was lost in its shadow. Discover the fascinating woman who helped design and construct an American icon, perfect for readers of The Other Einstein.

Emily Warren Roebling refuses to live conventionally—she knows who she is and what she wants, and she's determined to make change. But then her husband Wash asks the unthinkable: give up her dreams to make his possible.

Emily's fight for women's suffrage is put on hold, and her life transformed when Wash, the Chief Engineer of the Brooklyn Bridge, is injured on the job. Untrained for the task, but under his guidance, she assumes his role, despite stern resistance and overwhelming obstacles. Lines blur as Wash's vision becomes her own, and when he is unable to return to the job, Emily is consumed by it. But as the project takes shape under Emily's direction, she wonders whose legacy she is building—hers, or her husband's. As the monument rises, Emily's marriage, principles, and identity threaten to collapse. When the bridge finally stands finished, will she recognize the woman who built it?

Based on the true story of the Brooklyn Bridge, The Engineer's Wife delivers an emotional portrait of a woman transformed by a project of unfathomable scale, which takes her into the bowels of the East River, suffragette riots, the halls of Manhattan's elite, and the heady, freewheeling temptations of P.T. Barnum. It's the story of a husband and wife determined to build something that lasts—even at the risk of losing each other.

DISCUSSION QUESTIONS

1. Before accepting Wash's proposal, Emily worries about losing a sense of herself. How would you characterize the changes Emily undergoes during her marriage? Were any of these changes negative?

2. Wash returns from the war a different man, with what today would be diagnosed as PTSD. Discuss the ways you think his time in the war affected him long- term. How did his behavior change? How did he change emotionally?

3. Emily juggles working at the bridge and managing office work while taking care of a young child. Discuss the difficulties of being a working mother. What kinds of challenges does Emily face? How do they differ from challenges modern working mothers face?

4. Building the Brooklyn Bridge was a dangerous process— working in the caisson results in multiple deaths and injuries, and men like O'Brien and Supple die during construction. Do you think sacrifices like these were/are justified, then or now? Do losses undermine or enhance the image of the bridge?

5. Emily is forced to choose between continuing her work with the bridge— thereby fulfilling Wash's dreams— and being a part of the suffragist movement. Did she make the right choice? Put yourself in her shoes. What would you do? Do you think Wash was right to make her choose in the first place?

6. PT asks Emily if she loves him or the idea of him. What does he mean by this, and which is true?

7. Emily admits to underestimating the women around her. Discuss the effects of this internalized misogyny. How do you think this affects her relationships with other women?

8. As Emily rises to the occasion and does the job of the chief engineer, Wash becomes listless and reclusive. Why do you think this is? Is he threatened by Emily? Discuss how masculinity was perceived at the time.

9. How do both Wash and PT help Emily take risks and become the person she was meant to be?

10. Though they can't vote, the group of suffragettes finds ways of being influential behind the scenes. Discuss the ways that women have enacted change while avoiding the public eye throughout history.

11. Emily becomes frustrated with the suffragist meetings because of the infighting and the lack of agreement on central issues. Can you think of other movements that have suffered in this way? In what ways were they still successful?

12. Throughout the course of the book, Emily and Wash lose many people they love— siblings, friends, and parents. How do you think they each cope with grief differently? Which character's loss did you grieve the most?

13. Emily is in a difficult position: she is married to Wash but also loves PT. How do you feel about Wash's ultimatum to Emily? What would you do if you were given a similar choice? Whom did you think she should have chosen?

14. Which of Emily's traits are your favorite? Do you relate to her?

15. Emily has a lifelong habit of breaking societal rules and conventions. How do the important people in her life— her mother, GK. Wash, and PT— either encourage or try to limit this?

16. After twelve people die from the panic on the bridge, Emily almost loses her will to continue working on the project. Have you ever faced a crossroads like this? What did you do to keep going?

AUTHOR INFO

Tracey Enerson Wood has always had a writing bug. While working as a Registered Nurse, starting her own Interior Design company, raising two children, and bouncing around the world as a military wife, she indulged in her passion as a playwright, screenwriter and novelist. She has authored magazine columns and other non-fiction, written and directed plays of all lengths, including Grits, Fleas and Carrots, Rocks and Other Hard Places, Alone, and Fog. Her screenplays include Strike Three and Roebling's Bridge.

Other passions include food and cooking, and honoring military heroes. Her co-authored anthology/cookbook *Homefront Cooking, American Veterans share Recipes, Wit, and Wisdom*, was released by Skyhorse Publishing in May, 2018, and all authors' profits will be donated to organizations that support veterans.

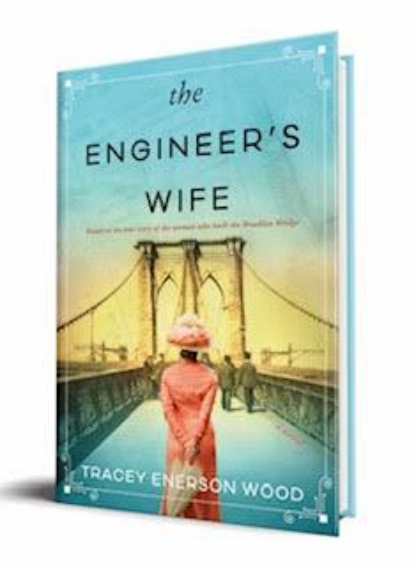
A New Jersey native, she now lives with her family in Florida and Germany.

Women Writers, Women[s] Books

My obsession with Emily Warren Roebling and the Brooklyn Bridge

April 5, 2020 | By Tracey Enerson Wood |

***She built a monument, then was lost in its shadow*.**



I grew up in northern New Jersey, and New York City was like Oz to us. Not being able to afford the fancy restaurants and shows, we did the free stuff. My father loved to go to the highest points, so we climbed the Statue of Liberty, the Empire State Building and the Twin Towers.

We walked across the George Washington Bridge (which sways, yikes!). And although I don't recall walking across the Brooklyn Bridge, we frequently admired it from the river shore.

Some years ago, I was writing theatrical plays, and I was brimming with a specific concept, but needed the right story to bring it to life. Coming from a mult-generational military family, the theme I wanted to explore was this: What dynamics are in play, when a family shares a career or occupation through many generations?

What if, like the military, that very occupation that sustains them and binds them together, might also kill them?

I wanted to write a fictionalized version of a real family in such a situation, from the female perspective, but wanted to stray from the well-worn path of military and war. I

thought of the photographs of construction workers sitting on skyscraper beams high above the earth, reminding me of the heights I climbed in my youth. But I could find no family story to tell.

So I searched for a woman who did incredible things in a forgotten time, someone who changed history, yet we know little about. I wanted to explore what would happen if that same woman was also blazing forward in a dangerous career path previously followed by the men in the family. In my research, I discovered the Roebling family, and most especially, Emily Warren Roebling.

I was immediately fascinated by Emily, and the times in which she lived. Her pluck, bravery, and sheer determination, in the midst of an enormous task that was destroying her beloved family, was irresistible. I was driven to learn more.

Although there are several books on Washington and John Roebling, Emily's husband and father-in-law, I could find only one biography, and a children's book on Emily, and no novels. It seemed a story very worth exploring, and that I was the one who needed to write it.

In my research, I learned many fascinating facts. I knew, of course, that women were not given the right to vote nationally until 1920, but was unaware of the numerous other barriers they faced. Laws restricting their work or what they could wear, for example. Not just societal norms, but actual laws against women wearing pants.

I discovered the incredible hazards faced by the workers, the corrupt political environment of the time, and the many challenges faced building this enormous project in an age of steam power and sheer human physical strength.

I learned that P.T. Barnum was one of the richest and most powerful people in New York at the time, and that he marched his elephants across the bridge to prove its safety. I also learned that his other connections to the bridge are mysteriously missing in history. In my novel, I got to explore what might have happened to silence a most public figure.

But perhaps the most surprising thing was the extent of my heroine's involvement in completing the Brooklyn Bridge. I have no doubt that if she hadn't stepped up to the task, the project would have stalled for perhaps decades, changing the development of one the world's greatest cities. I think I could write another book—an alternative history, where Philadelphia or Newark become the huge fashion, entertainment, and financial powerhouse that is the current New York City.

This story is important even today, because it illustrates the power of a single individual, even one that is challenged at every step, and then hardly recognized for their work, to make huge changes.

I hope readers enjoy this exciting story as much as I enjoyed writing it.

http://booksbywomen.org/my-obsession-with-emily-warren-roebling-and-the-brooklyn-bridge/

PRAISE

“Well-researched with great attention to detail, The Engineer’s Wife is based on the true story about the exceptional woman who was tasked to build the Brooklyn Bridge. Though the great bridge would connect a city, it would also cause division and great loss for many. Tracey Enerson Wood delivers an absorbing and poignant tale of struggle, self-sacrifice and the family transformed by the building of the legendary American landmark during the volatile time of women’s suffrage, riots and corruption. A triumphant debut not to be missed!” **—Kim Michele Richardson, bestselling author of The Book Woman of Troublesome Creek**

“The Engineer’s Wife is just the sort of novel I love and-I hope-write. Against all odds, a dynamic, historic woman builds a monument and changes history as she and her surrounding cast leap off the page. What a life and what a beautifully written and inspiring story! ” **—Karen Harper, New York Times bestselling author of The Queen’s Secret**

“Who really built the Brooklyn Bridge? With its spunky, tough-minded heroine and vivid New York setting, The Engineer’s Wife is a triumphant historical novel sure to please readers of the genre. Like Paula McLain, Tracey Enerson Wood spins a colorful and romantic tale of a storied era.” **—Stewart O’Nan, author of West of Sunset**

“The Engineer’s Wife is historical fiction at its finest. Tracey Enerson Wood crafts the powerful and poignant story of Emily Warren Roebling, the compelling woman who played an instrumental role in the design and construction of the Brooklyn Bridge. This is necessary fiction for our time—paying tribute to women’s overlooked contributions and reminding us of the true foundations of American history.” **—Andrea Bobotis, author of The Last List of Miss Judith Kratt**

“Tracey Enerson Wood’s immersive debut novel, The Engineer’s Wife, brims with lush period detail, deft plotting, and memorable characterization, bringing to vivid life the story of the incomparable Emily Warren Roebling. Wood tells a tale so poignant, well-researched, and page-turning, it seems to turn back time. She skillfully evokes the Civil War, post-war era, and Old New York with a cast of historical figures, from Reverend Henry Ward Beecher to Ringmaster P.T. Barnum, alongside the heroic John and Washington Roebling. Navigating her way from ingénue to Civil War bride to bridge builder, Emily struggles to find her identity. She sidelines people and causes near and dear—friends, husband, son, and suffragism—to devote herself to rescuing the family enterprise. In this compelling tour de force, Wood raises Emily Roebling from the historical depths, giving her voice in a fully-realized story worthy of the woman who saved the Brooklyn Bridge**.” —Anne Lipton, M.D., Ph.D., Putting the Science in Fiction and Harlequin Creator Fund Recipient**

“Readers will appreciate the nuanced depiction of Emily’s struggles to overcome male resistance and balance her own needs with her partner’s. Wood’s satisfying historical feels true to its era yet powerfully relevant to women’s lives today.”**—Publishers Weekly**

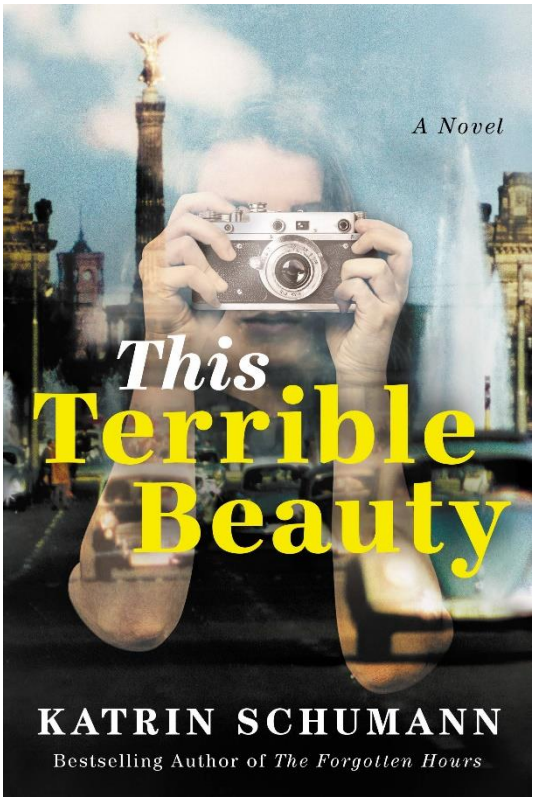
“This important work of historical fiction brings to life the strength and resolve of a nineteenth-century woman overshadowed by men and overlooked by history books.”**—Melissa Nordstedt, Booklist**

SHE READS

Inspiring books to read during Women's History Month

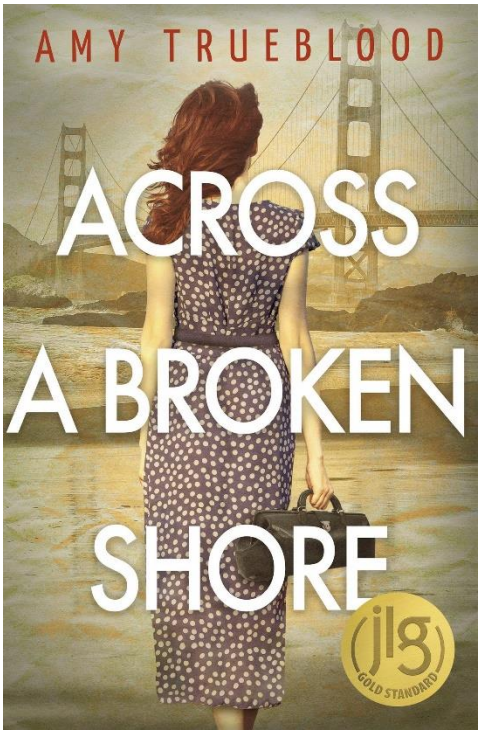
by STEPHANIE ELLIOT

Women's History Month – recognized in March each year – highlights the contributions of women to events in history and contemporary society. From stories about surviving world wars, immigration, historical photos, famous bridges *and* wedding dresses, we've got quite the selection of historical fiction for you. Here are our picks to honor Women's History Month!



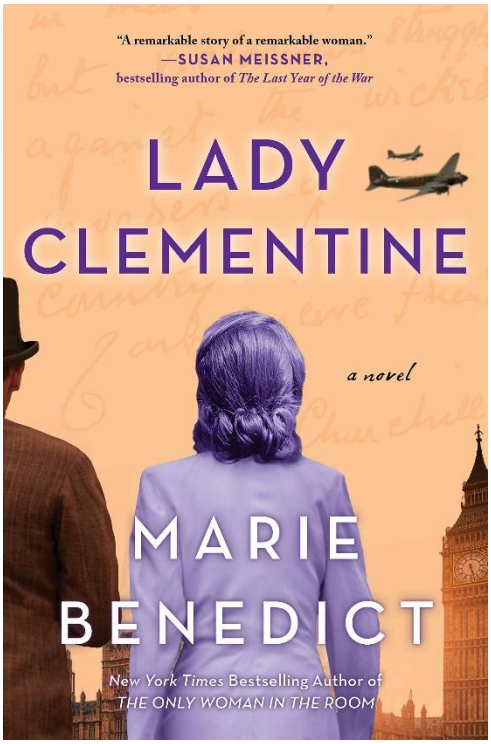
This Terrible Beauty
by Katrin Schumann

Bettina must pick up the pieces and build a new life after surviving WWII. A marriage to a dangerous man and an illicit affair will cost her more than she could have ever expected, including being separated from her daughter. After a move to America and a decade of turmoil, the arrival of an unexpected stranger will help her to return home and take back what rightfully belongs to her.



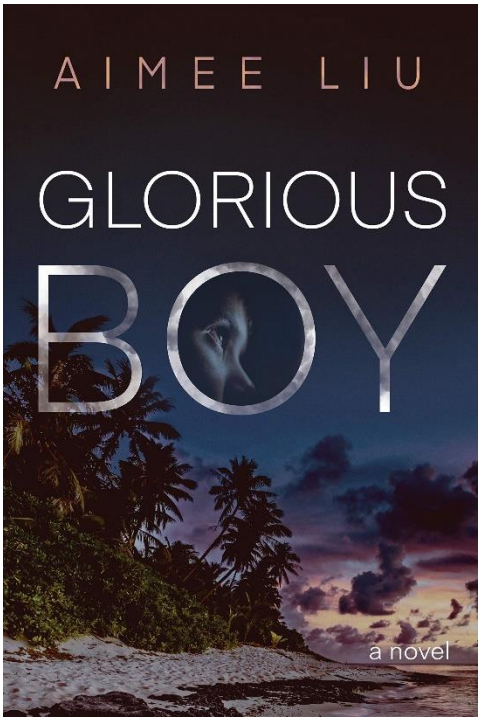
Across a Broken Shore by Amy Trueblood

Willa's family wants her to become a nun, yet all she desires is to help a doctor who has set up a field hospital near the new bridge that's being built. While Willa tries to hide her chaotic life in medicine from her family, she becomes intrigued by a young ironworker. As risks mount near the bridge, Willa will have to decide if keeping a secret about what she really wants is worth it all.



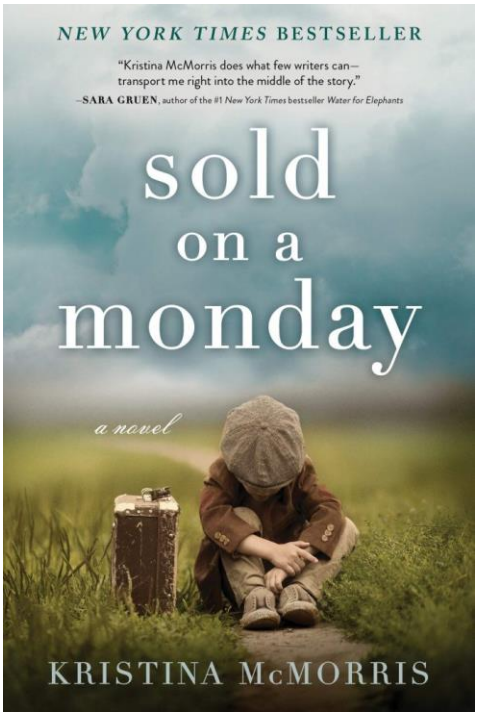
Lady Clementine by Marie Benedict

Lady Clementine is the story of the ambitious woman who was married to Winston Churchill. Through the darkness of war, Clementine continues to stand by her husband where she will not surrender to expectations or to enemies, and she will most certainly have a lasting influence during WWI and WWII as a remarkable woman to remember.



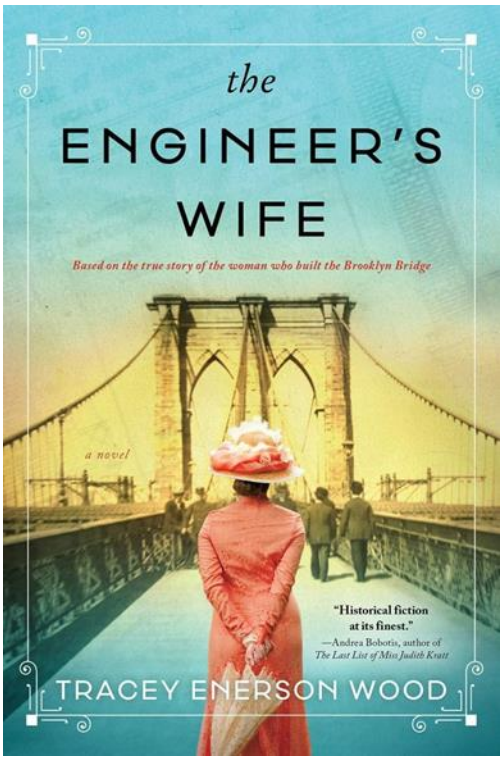
Glorious Boy by Aimee Liu

Anthropologist Claire and her husband Shep are forced to evacuate their home in 1942 when the Japanese invade. Just before they are set to leave, their young son and a local girl disappear. While Shep stays behind to find their son, Claire leaves for Calcutta and is completely cut off from her family. A desperate odyssey will follow as Shep and Claire will take risks to find and save their child, their 'glorious boy.'



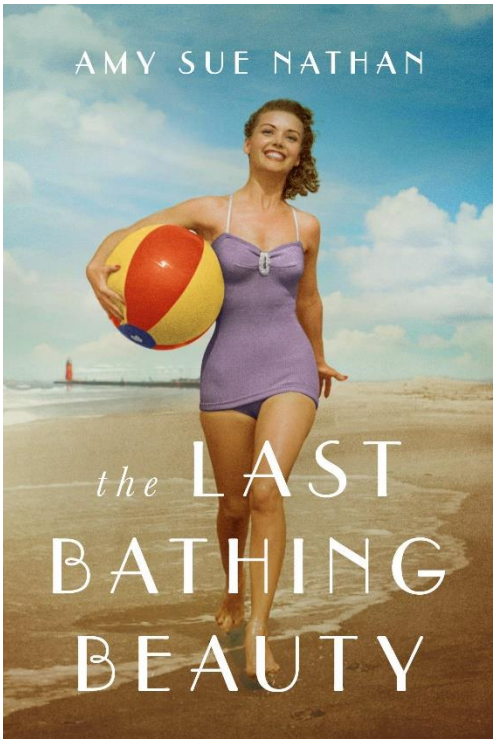
Sold on a Monday by Kristina McMorris

When reporter Ellis Reed takes a photo of two children for sale, he never thought the photo would be published, he never expected the photo to lead to his big break. He never imagined the consequences would be so devastating. This is a story about love and redemption that was inspired by an actual photograph that shocked the nation.



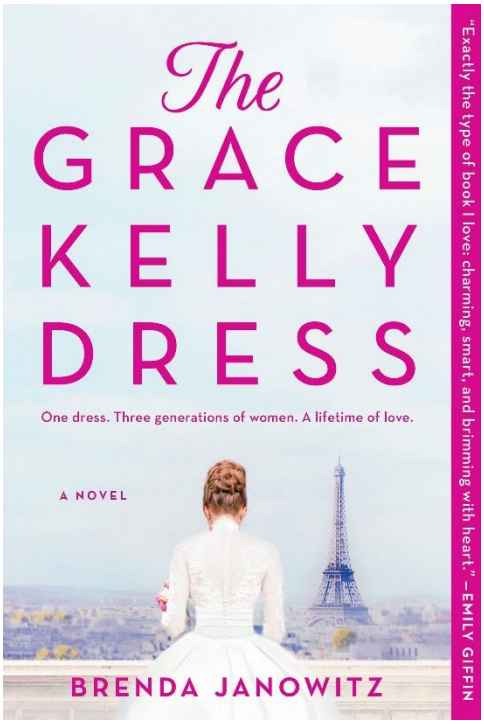
The Engineer's Wife by Tracey Enerson Wood

When Emily's husband asks that she give up her dreams to support him, she puts her life on hold. Her husband, Wash, is the chief engineer of the Brooklyn Bridge, and when he is injured on the job, Emily takes over, and what was once her husband's dream becomes hers. Through obstacles and resistance, Emily directs the project, and her marriage, her principles and her identity. As the bridge is completed, will Emily recognize the woman she once was or will she step into the woman she has now become?



The Last Bathing Beauty by Amy Sue Nathan

In this heartfelt novel about fate and second chances, a young beauty queen embraces her last summer before college, competing in an annual pageant, spending time at the beach, and falling in love. Decades later, Betty, who is known as 'Boop' recalls the choices she made that one fateful summer when she thought her future would be everything she had imagined.



The Grace Kelly Dress by Brenda Janowitz

What's a bride-to-be to do when she's inherited a beautiful wedding dress she doesn't want to wear? Rachel knows she will break her mother's heart yet her mother is insistent she wears the family heirloom. There is history behind the mysterious dress – secrets from the original owner and the seamstress who made it. As the story of three women converges with the dress at the center of it all, the past will need to be confronted in order to embrace the future, and the secrets of the dress will need to be revealed.

https://shereads.com/books-for-womens-history-month/

POPSUGAR. CULTURE

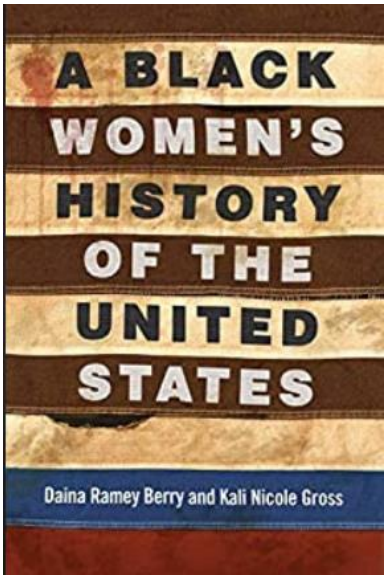
8 Books About Remarkable Women in History Ideal For Diving Into This Month

March 21, 2020 *by* TRACEY ENERSON WOOD

You've probably heard of Marie Curie, but do you know the story of her daughter Irène, who brought X-rays to the battlefields of WWI, won a Nobel Prize, and was instrumental in the development of nuclear fission and power? You may know of the WWII spy Virginia Hall from books and movies, but have you heard of the unassuming bravery of Andrée Griotteray, the French Resistance fighter who smuggled intelligence to the Allies and helped people escape occupied France, right under the Nazis' noses? Many of the most revolutionary and innovative women in history performed their remarkable feats under the radar, and this Women's History Month is the perfect opportunity to hear their stories.

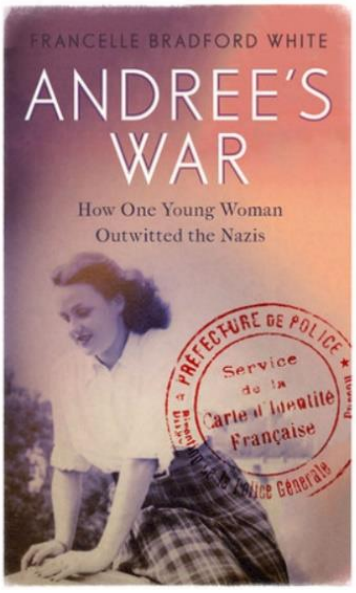
Next month, Emily Warren Roebling, the untrained engineer who took over the construction of the Brooklyn Bridge, will get the spotlight in my debut novel, **The Engineer's Wife**. Learn her story below, and get seven more books recommendations, a mix of non-fiction and historical fiction, that will reveal the unheralded or shed new light on women you thought you knew.

A Black Women's History of the United States by Daina Ramey Berry and Kali Nicole Gross



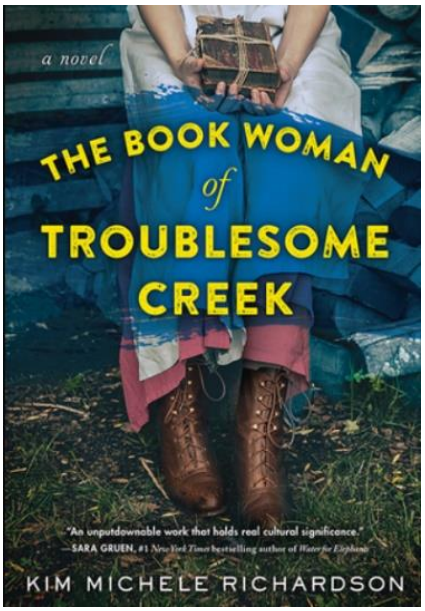
Hear the many voices of black women, from the enslaved, to religious leaders, artists and activists, in **A Black Women's History of the United States**. Be enchanted by their determination and grit, and humbled by their bravery in the face of oppression. This not-to-be missed non-fiction book reveals women who were instrumental in developing our country, and celebrates their spirit and courage.

Andrée's War: How One Young Woman Outwitted the Nazis by Francelle Bradford White



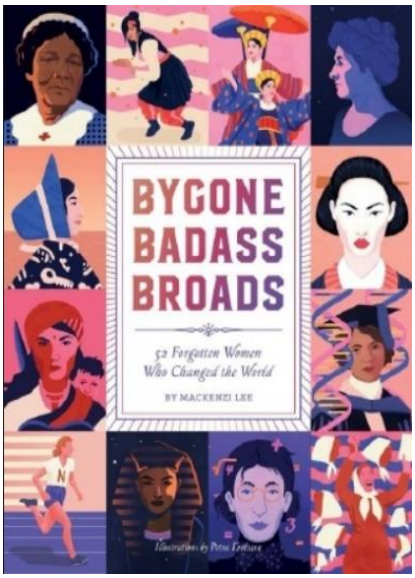
The daughter of Andrée Griotteray reveals what her mother was too modest to share in her book **Andrée's War**. At 19 years of age, Griotteray worked in a passport department in occupied Paris. She joined her brother's underground intelligence and communication network, and stole and forged documents to help the persecuted escape France. Working side by side with Nazis, she risked her life every day, and was eventually betrayed and arrested. This fascinating account is the first time her story has been made available in English, and it's a must-read for Women's History Month.

The Book Woman of Troublesome Creek by Kim Michele Richardson



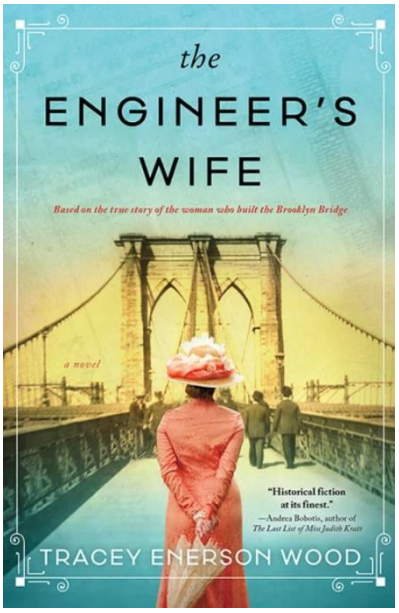
If you didn't already believe librarians are superheroes in disguise, just wait until you learn about the Pack Horse Librarians of Depression-era Appalachia. **The Book Woman of Troublesome Creek** brings to vivid life the women who rode horseback through poverty stricken and desperate places, where prejudice and persecution ruled, in order to bring books and other resources to a population starved for them.

Bygone Badass Broads: 52 Forgotten Women Who Changed the World by Mackenzi Lee



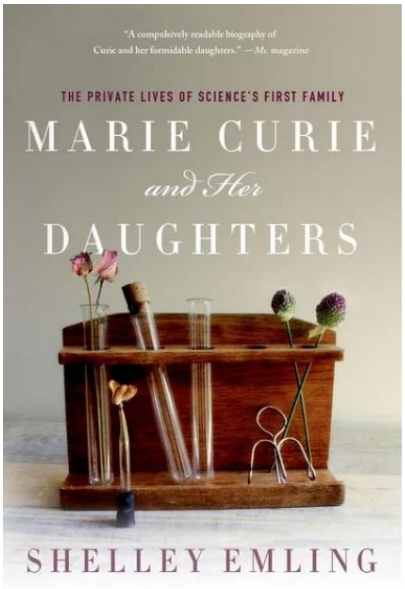
I f you want to learn about *dozens* of trailblazing women, forgotten by history, look no further than **Bygone Badass Broads**. Mackenzi Lee's brief and witty bios shine light on women who defied the norms, and paved the way for women of today.

The Engineer’s Wife by Tracey Enerson Wood



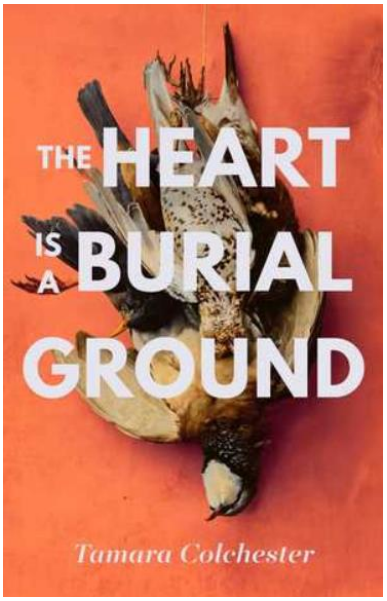
The Engineer's Wife is based on the true story of Emily Warren Roebling, whose life was transformed when she was asked to complete her husband's magnum opus—the Brooklyn Bridge, a project of unthinkable scale. In this historical fiction novel, she journeys into the bowels of the East River, suffragette riots, the halls of Manhattan's elite, and the heady, freewheeling temptations of her new friend P.T. Barnum. And yes, she completes the bridge and becomes the first person to walk across it.

Marie Curie and Her Daughters: The Private Lives of Science's First Family by Shelley Emling



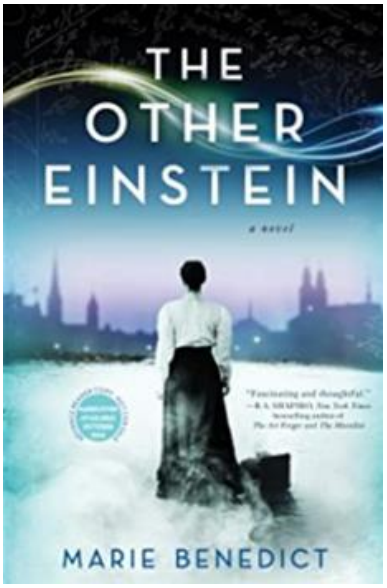
Marie Curie and Her Daughters is a biography that tells the story not only the quite well-known Madame Curie, but also her two daughters, Irène and Eve. The three of them broke barriers in chemistry and physics, saved lives by introducing x-rays during World War 1, and travelled extensively on speaking tours to educate the public on new developments. This book includes actual letters written by the Curies, and it's a fascinating journey for anyone interested in science or women's history.

The Heart is a Burial Ground by Tamara Colchester



Anyone who loves a scandal could hardly resist reading **The Heart Is A Burial Ground,** about Caressa Crosby. This novel explores the notorious American blue-blooded publisher, whose love affairs, wild parties, and drug use were shocking, even for the Roaring '20s. She defied laws by dating a black man, published the most controversial authors, and somewhere along the way invented the bra. This multi-generational look at women who knew no boundaries is hugely entertaining and riveting.

The Other Einstein by Marie Benedict



Like some other women on this list, Mileva Maric was a ground-breaking scientist, overshadowed by a much more famous husband. But the wife of Albert Einstein was a genius in her own right, who may have had a critical role in his most famous work: the theory of relativity. **The Other Einstein** brings her story to life, along with the barriers faced by women in science.

https://www.popsugar.com/news/photo-gallery/47292861/image/47292869/Heart-is-Burial-Ground-by-Tamara-Colchester

Bossy Librarian

2/25/2020 -- Alison Kelly

SHE HAS A NAME!: C*ORRECTED BOOK TITLES*

For a long time I couldn't figure out why the books with "Whoever's" Wife or Daughter as the title rubbed me the wrong way. I knew that I didn't like them, but I didn't know why. The realization was gradual, but I feel like I now fully understand my issue with these books.

The problem is the possession. The "This-Man's" Wife or Daughter. Like she does not exist without that relationship. She is defined by what some male relation does for a living. She is not her own person.

Many of these books have a good premise. Many of them feature a wife or daughter who is the real hero of the story. I can understand why an author or publisher might chose that title. Maybe she is breaking free of His shadow or secretly responsible for all of His accomplishments. However, there are other, better options. **She Has a Name!**

While there are legions of books with "So-And-So's" Wife or Daughter as the title, the opposite is not true. I have been hard pressed to find books with "Some-Lady's" Husband or Son as the title. I guess men aren't usually defined by their women, weird.

Here are the books with the best opportunity to be re-christened. They feature strong female lead characters who are their own people, with their own lives and accomplishments. I have included my corrected title suggestions. **Please comment below with your own ideas!**

Alchemist's Daughter by Katherine McMahon - Raised by her father in near isolation in the English countryside, Emilie Selden is trained as a brilliant natural philosopher and alchemist. When Emilie against her father's wishes experiences the passion of first love, she is banished to London.
Corrected Title: The Alchemist's Banishment

Aviator's Wife by Melanie Benjamin - When Anne Morrow, a shy college senior with hidden literary aspirations, travels to Mexico City to spend Christmas with her family, she meets Colonel Charles Lindbergh. The two marry in a headline-making wedding. In the years that follow, Anne becomes the first licensed female glider pilot in the United States.
Corrected Title: The Glider Pilot

Engineer's Wife by Tracey Enerson Wood - When Emily Warren Roebling marries 'Wash' Roebling a lifetime of family fun and happiness seems within her grasp. But then Wash accepts the position as Chief Engineer on the Brooklyn Bridge, it changes both of their lives forever. Wash convinces Emily to be his messenger to the site. Little by little, Emily finds herself taking over the project-with no formal training. Emily throws herself into building the bridge but faces suspicion and disparagement at every turn as she supervises dangerous construction sites and argues for the safety of the bridge amongst Manhattan's male elite.
Corrected Title: Emily's Bridge

Hangman's Daughter by Oliver Potzsch - Magdalena, the clever and headstrong daughter of Bavarian hangman Jakob Kuisl, lives with her father outside the village walls and is destined to be married off to another hangman's son. A drowning and gruesomely injured boy, tattooed with the mark of a witch, is pulled from a river and the villagers suspect the local midwife, Martha Stechlin. Convinced she is innocent, Magdalena races against the clock to find the true killer.
Corrected Title: Magdalena in the Time of Witches

Shoemaker's Wife by Adriana Trigiani –Enza's family faces disaster and she, is forced to go to America with her father to secure their future. Enza begins her impressive career as a seamstress at the Metropolitan Opera House that will sweep her into the glamorous salons of Manhattan. A portrait of the times, the places and the people who defined the immigrant experience, claiming their portion of the American dream with ambition and resolve, cutting it to fit their needs like the finest Italian silk.
Corrected Title: The Seamstress

Zookeeper's Wife by Diane Ackerman - When Germany invaded Poland, Stuka bombers devastated Warsaw. Zookeepers Jan and Antonina Zabinski began smuggling Jews into empty cages. Antonina kept her unusual household afloat, caring for both its human and its animal inhabitants.
Corrected Title: Antonina's Zoo

While I was writing this post, it made me realize how pissed I would be if someone wrote a book about me and gave it one of these titles. FYI, it would be "The Contractor's Wife", gag. So, just in case, my biography is to be called "Bossy Librarian" (obviously), because I am Bossy and a Librarian.

https://www.bossylibrarian.com/blog/she-has-a-name

EMILY WARREN ROEBLING-BIOGRAPHY

Born: 1843
Died: 1903
Nationality: American
Occupation: Engineer, Lawyer
Other Names: Roebling, Emily; Warren, Emily

Emily Warren Roebling was the wife of Washington A. Roebling, the chief engineer for the construction of the Brooklyn Bridge the longest suspension bridge in the world--from 1869 to 1883. When her husband became gravely ill, Roebling assumed the position of his assistant and took over the management of the huge project. She visited the construction site daily to carry instructions between her husband and the construction supervisors and to inspect the work in progress. In time, she learned enough about bridge construction to prepare engineering sketches and make design decisions on her own. When the bridge opened, she was publicly given credit for her role. Bronze plaques on the towers at each end of the bridge acknowledge her outstanding contribution.

Emily Warren was born in 1843 in the town of Cold Spring on the upper portion of the Hudson River in New York. Her father was Sylvanus Warren, who had wisely invested in the nearby West Point Foundry, which made cannons and other large guns for the military. Her mother's maiden name was Phebe Lickley. While the Warrens were not considered rich, they were well off and were important members of society in the local area. Emily was the second youngest of 12 children, of whom only six lived to become adults. Her oldest brother, G.K. Warren, graduated with distinction from West Point Academy and embarked on a career as both a soldier and an engineer in the army. In 1859, he returned to Cold Spring to teach mathematics at West Point. That same year, their father died, and G.K. took

charge of raising his younger brothers and sisters. Emily showed a natural skill for mathematics, as well as an interest in science, and her brother encouraged her in her studies.

Marries Into a Bridge-Building Family

During the Civil War, G.K. Warren rose to the rank of general. In 1863 he was assigned a new aide named Washington A. Roebling, whose father, John A. Roebling was a noted bridge engineer. Emily met young Roebling in 1864 during a grand ball held for the officers of her brother's unit. They fell in love immediately, corresponded constantly, and were married in Cold Spring on January 18, 1865. The war ended a few months later.

After the war, Washington joined his father in Cincinnati, Ohio to help in the construction of a bridge across the Ohio River. Emily and Washington lived there until 1867, when they left for a belated honeymoon tour of Europe. As part of the trip, they visited and inspected several modern steel bridges. Of special interest to Washington was the use of caissons, large chambers lowered into a river and pressurized with air to allow the manual excavation of the riverbed in order to form a solid footing for bridge piers. Washington's father was at that time involved in the design of the Brooklyn Bridge across the East River between Manhattan and Brooklyn, and caissons would be necessary in the construction. It was a new, and somewhat dangerous technique, and Washington and his father wanted to learn all they could.

By this time, Roebling was pregnant. Their son, John A. Roebling, II, was born in Germany. Shortly before giving birth, she had a serious fall and suffered from internal bleeding for nearly a month. The injury was so severe that she knew she could not have any more children. When they returned to the United States, Washington began working with his father on the Brooklyn Bridge project, while Roebling took care of the baby.

On June 21, 1869, the final bridge plans were approved. A few days later, Washington's father was involved in an accident when an incoming ferry boat crushed his foot while he was inspecting one of the bridge towers. Doctors amputated his toes, but the senior Roebling insisted on binding the wound and taking the matter in his own hands. Within a week, he began to show signs of tetnus infection, also known as lockjaw. He died on July 22, 1869.

Husband's Illness Forces Her to Take Charge

With his father's death, Washington assumed the position of chief engineer for the project. Work progressed steadily until late 1870, when a fire was discovered inside the timbers of one of the caissons beneath the river. All efforts by the workmen failed to extinguish it, and Washington himself entered the smoky, pressurized chamber to direct the firefighting. When he emerged several hours later, he was stricken with a case of the "bends" caused by too rapid decompression upon returning to normal atmospheric pressure. This was not an unusual occurrence for workmen in the caissons, many of whom suffered from a variety of medical problems. At the time the reasons were not well known, nor were the means of prevention. Although Washington recovered quickly from his first attack, he suffered a

second, more serious, case of the bends in 1872. This attack left him weak and nauseous, with pain in his limbs, sharp mood swings, and an inability to concentrate. The stress of managing the enormous project began to affect him. After battling his illness for months, he and his wife left for a health spa in Germany, leaving his subordinates to carry on the work.

The trip to Germany failed to restore Washington's health, and they returned to the United States early in 1874. They took up residence in Trenton, New Jersey, while Washington supervised work on the bridge through correspondence and meetings. By 1877, his condition had improved slightly, and they moved to a house on Columbia Heights in Brooklyn near the bridge construction, where he could watch the work through binoculars from a window in his bedroom. He was still seriously ill, and Roebling shielded him from visitors.

Washington's prolonged absence from the job site caused speculation that he was totally incapacitated and was no longer fit to be chief engineer. To head off these rumors, Roebling passionately addressed the American Society of Civil Engineers, defending her husband's role. She was the first woman ever to formally speak to the organization. She also began taking a more active role in the project. She had been involved since they had moved to Trenton, writing his correspondence and managing his affairs, and in the process she had learned a great deal about bridge-building and project management. Now she personally attended the job site daily and discussed engineering details with construction supervisors. After their initial shock, the supervisors found Roebling to be extremely knowledgeable and began to tell her about their daily problems and progress. On one occasion, a contractor had a question about how a part should be formed, and Emily made a sketch and explained each step in the process. When an important decision needed to be made, a delegation of officials would troop up to the Roebling house and present the facts to her. Whatever decision she made, it would be accepted as if it had come directly from the chief engineer himself.

Roebling's daily visits to the construction site earned her the admiration and respect of everyone involved with the project. In December 1881, they paid her the ultimate compliment when she was invited to join a group of officials in a walk across the partially completed bridge. In a way, it was as much a test of her courage as it was an honor because the walkway consisted of nothing more than a few planks laid side-by-side on an otherwise open bridge structure. With a light breeze blowing, she led the party, chatting and remarking on the views. When they reached the New York side, almost 1,600 feet away, everyone toasted her with champagne.

When the bridge officially opened on May 24, 1883, Congressman Abram S. Hewitt publicly praised Roebling for her role, and her husband told her "I want the world to know that you, too, are one of the Builders of the Bridge." Later, the Roeblings moved to Troy, New York, to be near their son, who was attending Rensselaer Polytechnic Institute as his father had done. In 1888, they moved back to Trenton, where they had a large house built. Although Washington continued to live a quiet, secluded life, Roebling entertained often. She became vice president of the Daughters of America, and was active in many other organizations.

She also attended New York University, where she studied law and got her degree, and became an activist for women's suffrage.

Roebling's health began to fail about 1900. She collapsed in 1902 while her husband was in a hospital in recuperating from intestinal surgery. The doctors diagnosed her as having stomach ulcers. Washington returned home to be with his wife, who died of stomach cancer on February 28, 1903. Washington eventually remarried and lived until 1926, when he died peacefully in his sleep at the age of 89.

"Emily Roebling." Notable Women Scientists, Gale, 2000. Gale In Context: Biography, https://link.gale.com/apps/doc/K1668000367/BIC?u=mhlopacplus&sid=BIC&xid=d521f667. Accessed 19 May 2020.

OVERLOOKED – EMILY WARREN ROEBLING

1843-1903

Emily Warren Roebling

Oversaw the construction of the Brooklyn Bridge after her engineer husband fell ill.

BY JESSICA BENNETT

Oil portrait of Emily Warren Roebling by Charles-Émile-Auguste Carolus-Duran, 1896. | Roebling was once described as a woman of "strong character" with an "almost masculine intelle
Brooklyn Museum

It was not customary for a woman to accompany a man to a construction site in the late 19th century. Petticoats tended to get in the way of physical work.

But when Washington A. Roebling, the chief engineer of the Brooklyn Bridge, fell ill, it was his wife, Emily Warren Roebling, who stepped in -- managing, liaising and politicking between city officials, workers, and her husband's bedside to see the world's first steel-wire suspension bridge to completion. She would become the first person to cross the bridge, too -- carrying a rooster with her, as the story has it, for good luck.

Emily Warren Roebling was not an engineer. But she was a woman of ''strong character'' with an ''almost masculine intellect,'' as the biographer Hamilton Schuyler once described her, who was instrumental to one of the greatest architectural feats of the 19th century. Connecting Brooklyn and Manhattan for the first time, the Brooklyn Bridge was the world's longest suspension bridge at the time. Fourteen years in the making, its construction was complicated by corrupt politicians and crooked contractors. Upon completion, it was immediately proclaimed the ''Eighth Wonder of the World.''

''I don't think that the Brooklyn Bridge would be standing were it not for her,'' said Erica Wagner, the author of ''Chief Engineer: Washington Roebling, the Man Who Built the Brooklyn Bridge,'' a biography of Emily Roebling's husband. ''She was absolutely integral to its construction.''

Emily Warren was born in 1843 in Cold Spring, N.Y., one of 12 children of Sylvanus Warren, a New York State assemblyman, and his wife, Phebe Lickley Warren. In her teens, she traveled to Washington to attend the prestigious Georgetown Academy of the Visitation, where she studied history, astronomy, French and algebra, among other subjects -- in addition to housekeeping and needlework. ''Her intelligence, liveliness and charm were always apparent to those around her,'' Wagner writes in ''Chief Engineer.''

She met her husband, the civil engineer Washington A. Roebling, through her brother, G.K. Warren, a general in the Civil War under whom he served. The son of John A. Roebling, a German-American engineer known for building suspension bridges (and for his short temper), the younger Roebling was struck by Warren right away, Wagner said. After they were married, he would describe his wife as ''a woman of infinite tact and wisest counsel.''

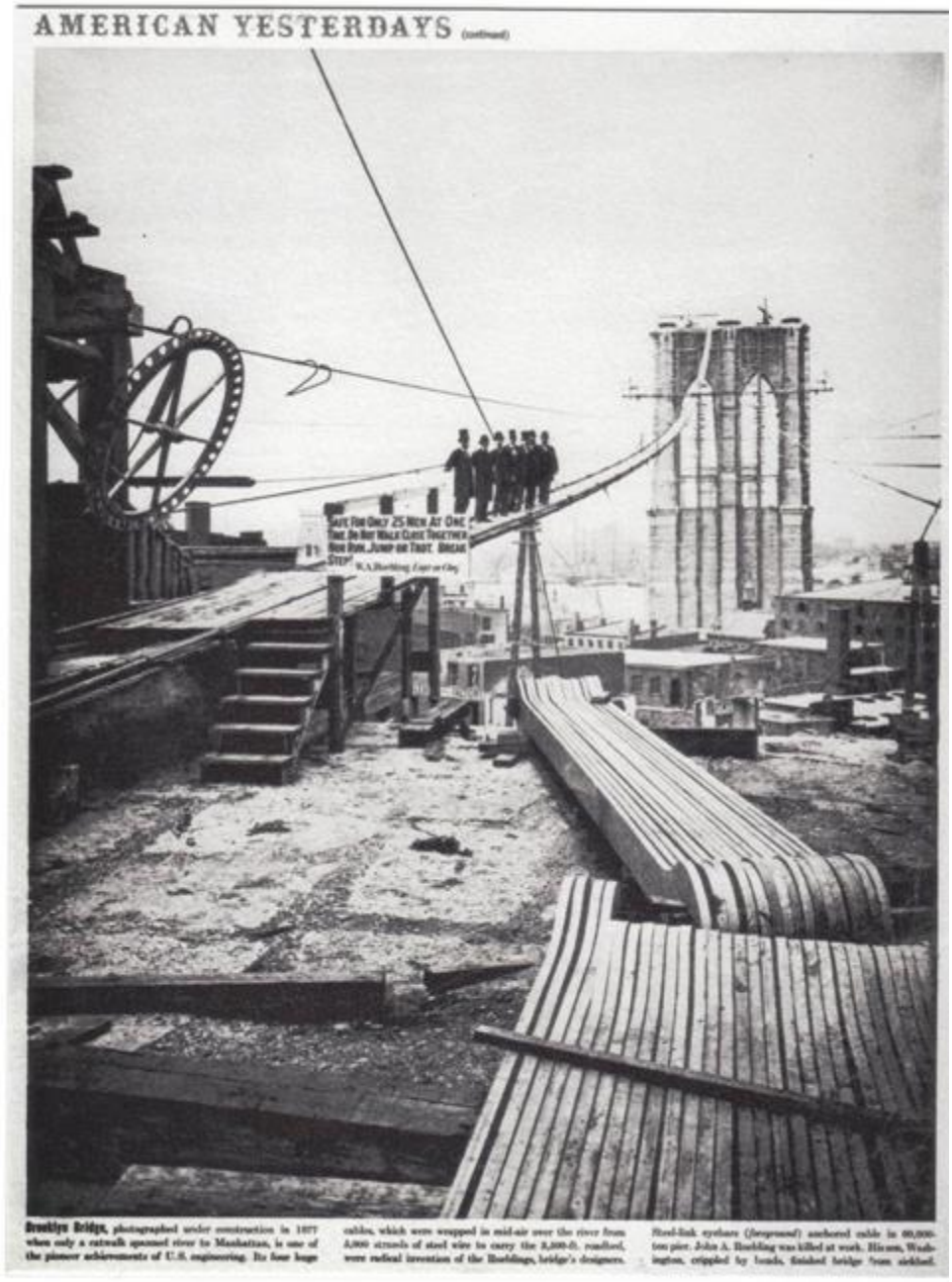
The Roeblings married in 1865 and soon set off for Europe, where a pregnant Emily would accompany her husband in the study of caissons, the watertight structures filled with compressed air that would later enable workers to dig beneath the East River. Back home, the elder Mr. Roebling was preparing for construction of a suspension bridge across the East River that he boasted would be ''the greatest bridge in existence.'' In those early days, it was called the ''Great East River Bridge.''

The Brooklyn Bridge would go on to become, at least according to lore, the most photographed structure in the world; a gateway to that ''shining city,'' as Thomas Wolfe once described it, whose granite towers and thick steel cables have inspired countless artists, musicians, engineers and architects.

But its construction was far more treacherous than most casual pedestrians know.

Just a few days in, while surveying the construction site, the elder Mr. Roebling had his foot crushed in the pilings of a Brooklyn pier when a barge came in to dock; he contracted tetanus and died less than a month later. His son succeeded him as chief engineer -- only to later become incapacitated by a mysterious illness that left him partially paralyzed, blind, deaf and mute, according to reports at the time. (It was later believed that Mr. Roebling suffered from ''caisson disease,'' or the bends, a kind of decompression sickness caused by changing air pressure not uncommon on bridge-building sites.) At least two dozen other men died working on the bridge, according to David McCullough's ''The Great Bridge.''

''It was a struggle physically, it was a struggle politically, it was a struggle financially,'' said Richard Haw, the author of ''The Brooklyn Bridge: A Cultural History'' and a coming biography of John Roebling. ''The bridge was built by hand, so there were a lot of lost fingers. There were falls, and no safety net to catch you. There was a huge amount of undocumented injuries.''



The Brooklyn Bridge under construction. Fourteen years in the making, its build was complicated by corrupt politicians and crooked contractors.

Enter Emily Warren Roebling. A woman who, in later life, would study law at New York University and argue in an Albany law journal article for equality in marriage. She became her husband's ''eyes and ears,'' Haw said.

She began as secretary, taking copious notes. She went back and forth to the construction site. She negotiated the supply materials, oversaw the contracts, and acted as liaison to the board of trustees. Eventually, she became a kind of ''surrogate chief engineer,'' according to a biography of Warren by the historian Marilyn Weigold, a professor at Pace University. She used her ''superb diplomatic skills'' to manage competing parties -- including the mayor of Brooklyn, who tried to have her husband ousted from the project.

During the final years of the bridge's construction, her husband looked out from his bedside window in Brooklyn Heights -- using a telescope and binoculars to watch the bridge grow.

''All along, he is present,'' Wagner said. ''But he is not able to go to the bridge, and he's not able to see anyone. But amazingly, he holds this extraordinary structure in his head. And she is able to help him transmit his thoughts.''

As Emily Roebling put it, years later, in an 1898 letter to her son: ''I have more brains, common sense and know-how generally than have any two engineers, civil or uncivil, and but for me the Brooklyn Bridge would never have had the name Roebling in any way connected with it!''

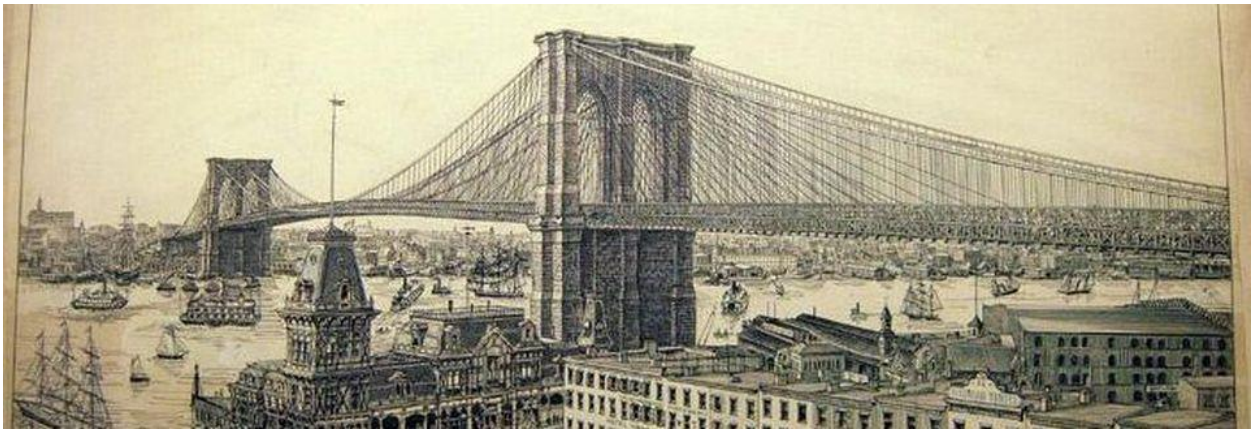
The bridge finally opened on May 24, 1883, to great fanfare. On that day, thousands crossed, under a sea of fireworks, with The Times declaring that ''no one man can be given the credit of this colossal undertaking.'' In another article, The Times reported ''How the Wife of the Brooklyn Bridge Engineer Has Assisted Her Husband.''

Today, there is a plaque on the bridge honoring all three Roeblings. It reads: ''Back of every great work we can find the self-sacrificing devotion of a woman.''

Emily Roebling died on Feb. 28, 1903, in the Roebling's Trenton home, of stomach cancer.

Jessica Bennett is gender editor at The Times and the author of Feminist Fight Club. She lives in Brooklyn, a stone’s throw from the Williamsburg Bridge, which is much less beautiful but took half the time to construct.

https://www.nytimes.com/interactive/2018/obituaries/overlooked-emily-warren-roebling.html



Emily Warren Roebling: Building the Brooklyn Bridge and Beyond

May 30, 2018 by Women at the Center

On Tuesday, May 29, 2018, one block of Columbia Heights between Pineapple Street and Orange Street in Brooklyn was officially renamed in honor of Emily Warren Roebling. Roebling lived on the block with her husband, Col. Washington Roebling, while he served as Chief Engineer of the Brooklyn Bridge from 1869 to 1883. City Council Member Stephen Levin, who co-sponsored the renaming and shared quotes and photos from the ceremony on Twitter, explained Roebling's significance. "It's thanks to Emily Warren Roebling that the Brooklyn Bridge is what it is today," Levin wrote. As he told the crowd,"the legacy of Emily Roebling endures as an example of perseverance, aspiration, and dedication to fighting for equality." It seems only fitting that a woman who did so much to shape Brooklyn should see her own name inscribed into the borough's streetscape.

Columbia Heights between Pineapple Street and Orange Street in Brooklyn is renamed "Emily Warren Roebling Way." May 29., 2018. Photo Credit: Council Member Stephen Levin (center, in tie) via Twitter.

Of course, Brooklynites have long known that Emily Warren Roebling was a key player in the building of the their bridge, which was the longest, tallest suspension bridge in the world when it opened on May 24, 1883. Still, the naming of "Emily Warren Roebling Way" comes as Roebling herself enjoys a moment in the limelight. Last Thursday, the bridge celebrated its 135th birthday, which generated fresh discussions of Roebling's essential role in the project. Roebling was also recently featured in the launch of the *New York Times*' "Overlooked" project, which chronicles the lives of women overlooked by the *Times*' obituary section. And, for the past year, Roebling has appeared in our *Women's Voices* interactive exhibition at the Center for Women's History at New-York Historical Society.

As the "new" obituary of Roebling explained to the *Times*'s international readership, "It was not customary for a woman to accompany a man to a construction site in the late 19th century … But when Washington A. Roebling, the chief engineer of the Brooklyn Bridge, fell ill, it was his wife, Emily Warren Roebling, who stepped in — managing, liaising and politicking between city officials, workers, and her husband's bedside to see the world's first steel-wire suspension bridge to completion." Roebling never held any official title, and thus went "overlooked" in official records, but her contributions were clear to everyone around her at the time, and have, in the course of time, come to be properly acknowledged in both scholarly accounts and public memory.


(Photo by Aime Dupont.)

MRS. WASHINGTON A. ROEBLING,

Who Died at Her Home in Trenton, N. J., Yesterday.

Emily Warren Roebling (detail from her 1903 Brooklyn Daily Eagle *obituary). Brooklyn Public Library.*

As the *Brooklyn Paper* noted, New York's "paper of record" may have missed Roebling's death in 1903, but the *Brooklyn Daily Eagle* did not, publishing a long, laudatory obituary and a photo the day after she died at home in Trenton, New Jersey. The *Eagle* dutifully described "the part which she took in superintending the building of the Brooklyn Bridge" as Roebling's "chief claim to fame." However, it also described her as "one of the best known club women in the country" and cited her "prominence among the women of the country in all movements which looked toward the so-called emancipation of the sex." The first twenty years of Roebling's adult life were dedicated to building the Brooklyn Bridge alongside her husband. In the twenty years that followed, she made another career for herself as a voice for women's equality. If a part of Emily Warren Roebling's legacy has been overlooked, it is her latter contributions to a movement that was taking flight just as she passed away in 1903.

"A woman of infinite tact and wisest counsel": Emily, Washington, and the Great Bridge

Emily Warren was born in 1843 to a prominent family in Cold Spring, New York. Her father, Sylvanus, was a New York State Assemblyman, and her brother, Gouverneur K. Warren, was a West Point graduate and civil engineer. Thirteen years her senior, Gouverneur helped fund Emily's tuition at the Georgetown Visitation Convent, an elite preparatory school for girls, and after he led the successful defense of Little Round Top at Gettysburg during the Civil War, he invited Emily to join him and some of his officers in camp. There, she met Col. Washington Roebling. The two quickly fell in love (their romance is captured in their letters, archived at the Brooklyn Historical Society), and were married in 1864, when Emily was just 21 years old.

After the war, Washington and Emily embarked on a European honeymoon, with a twist. Washington's father, John Augustus Roebling, was a wire manufacturer and the world's leading architect of suspension bridges. In 1867, he was commissioned to build a bridge spanning the East River between New York City and Brooklyn. Not only would such a bridge have to be the longest ever built, but it would have to sail over one of the busiest ports in the world. While in Europe, the young couple visited construction sites to learn of the latest engineering techniques, including the use of "caissons" – pressurized watertight chambers – to build underwater foundations. Washington planned to work alongside his father, but the elder Roebling contracted tetanus during a construction accident in 1869 and died less than a month later. All of a sudden, at the age of 32, Washington A. Roebling became the Chief Engineer of the Brooklyn Bridge.

Brooklyn Bridge under construction, ca. 1873-1880. Stereocard. Library of Congress, Prints and Photographs Division.

Like his father, Washington was a hands-on engineer, and he joined his workers in the caissons that sank below the East River to create stable foundations for the bridge's towers. At the time, the dangers of working under compression were not understood, and Washington, like many others, was stricken with "caisson's disease," known today as decompression sickness or "the bends." Due to the formation of nitrogen bubbles in the bloodstream upon decompression, the bends can cause all manner of life-threatening conditions. In Washington's case, the sickness nearly paralyzed him, and what may have been a series of minor strokes left him unable to endure bright lights, loud noises, or chaotic scenes for years. Though he remained Chief Engineer, he could scarcely leave the

house, and it was Emily Warren Roebling who began to oversee the day-to-day construction of the Brooklyn Bridge.

This part of Emily Warren Roebling's story is well known, despite the fact that she herself worked carefully to keep the extent of her husband's illness, and her involvement in the project, a secret (in part because the Mayor of Brooklyn, Seth Low, sought to replace Washington with a friend in 1881). However, Roebling's constant presence at the construction site, board meetings, and all other functions could not be ignored. By the end of the project, as David McCullough wrote in *The Great Bridge*, E. F. Farrington, the chief wire engineer on site, was referring to Roebling as "the first female field engineer" and announcing to audiences at the Cooper Union that he spoke from her notes. She was the first to cross the completed roadway when it was ready, and at the official opening, on May 24, 1883, New York City Congressman Abram Hewitt thanked her extensively. As he put it, "The name of Emily Warren Roebling will … be inseparably associated with all that is admirable in human nature and all that is wonderful in the constructive world of art." The Brooklyn Bridge itself would stand as "an everlasting monument to the self-sacrificing devotion of a woman" declared Hewitt, and to "her capacity for that higher education from which she has been too long disbarred." At a moment of triumph for the Brooklyn Bridge and its builders, the Congressman's comment foreshadowed Emily Warren Roebling's later work on behalf of women's equality.

The grand display of fireworks and illuminations at the opening of the great suspension bridge between New York and Brooklyn on the evening of May 24th, 1883. Currier & Ives. Library of Congress Prints and Photographs Division. Featured in Women's Voices*.*

While Emily Warren Roebling was never officially employed as an engineer or architect of the Brooklyn Bridge, and never claimed any such title, it was clear to everyone involved that her knowledge of engineering, as well as her political acumen, were essential to its completion. In 1951, a plaque was dedicated to the "Builders of the Bridge" on the bridge's South Tower; Emily receives top billing. Today, she is acknowledged by the American Society of Civil Engineers (founded in New York in 1851) and the Scientista Foundation, among others, as a pioneering woman in the STEM (Science, Technology, Engineering, and Math) fields.

Publicly, Roebling never acknowledged that she was more than a vessel for her husband's ideas, but in private, she asserted the importance of her role. Writing to her son, John, in 1898, she averred "I am still feeling well enough to stoutly maintain against all critics (including my only son) that I have more brains, common sense, and know-how generally than any two engineers civil or uncivil that I have ever met, and but for me the Brooklyn Bridge would never have had the name of Roebling in any way connected with it! It would have been Kingsley's Bridge if it had ever been built! Your father was for years *dead* to all interest in that work." Roebling's "tact," in public, was a tactic, designed to preserve her family's role and prominence in the

greatest public-works project of the age. In private, she made sure that her family knew just how much they owed her.

"One of the best-known club women in the country": Emily Warren Roebling's Life Beyond the Brooklyn Bridge

Though the Brooklyn Bridge was completed in 1883, Emily Warren Roebling continued to focus on her family's needs for the rest of her decade. Her son, John Roebling, suffered from a heart condition, which Roebling monitored closely. She moved with him to Troy, New York, while he attended college at Rensselaer Polytechnic Institute (Washington's alma mater, as well), from which he graduated in 1889. When John married and moved to Oracle, Arizona after college, Roebling turned, for the first time, to public life on her own terms. As Roebling's biographer, Marilyn Weigold, writes, "For three-quarters of her life, Emily Warren Roebling was a veritable stranger to the world of women" — specifically, the world of wealthy, society women — but "in the 1890s, she emerged as a prominent figure in women's organizations."

Portrait of Emily Warren Roebling. Charles-Émile-Auguste Carolus-Duran, 1896. Brooklyn Museum.

As Weigold chronicles, Roebling became deeply involved with women's clubs both in Trenton, where she lived with her husband near the family's wire-production facility, and in New York City, where she joined the legendary club Sorosis. She put her skills as an organizer and manager to use with the New Jersey chapter of the Federation of Women's Clubs, helping create materials for the 1893 World's Columbian Exhibition in Chicago and the 1895 Cotton States and International Exposition in Atlanta. In 1896, she traveled alone to Europe (Washington was ill), where she was received by Queen Victoria at the Court of St. her declining health.

"A Wife's Disabilities": Emily Warren Roebling as an Advocate of Women's Equality

James and attended the coronation of Czar Nicholas II of Russia. She returned and gave lectures on her experience in Russia, traveling with the Federation of Women's Clubs to Nashville, Cincinnati, St. Louis, Kansas City, and Denver in 1897 and 1898. In the same years, she became involved with the Daughters of the American Revolution, and was nominated for the presidency of the national organization in 1901, before withdrawing due to

Roebling's travels and commitments were not atypical of an active society lady of her generation or standing, but as Roebling deepened her involvement in these organizations, she began to articulate a vision of women's equality. In 1899, she took and passed the Women's Law Course at New York University, a semester-long course of study that offered a certificate for women in business or other fields in which a knowledge of law might be useful (the regular law course, at that time, was only four semesters). Many elite women merely audited the course, but Roebling insisted on studying for the exams. She also entered the program's essay contest, which she won at the age of 55 with a piece titled "A Wife's Disabilities."

Emily Warren Roebling in academic dress after receiving her law certificate, 1899. Portrait File, New-York Historical Society Library.

At the graduation ceremony, Roebling's essay was read aloud. She opened by arguing that women wished "to avail themselves of the possible rights given them under the fourteenth amendment to the Constitution" in order "to have a voice in deciding questions of interest to them in laws made by the legislatures of different states." Turning to marriage law and inheritance, she noted that male lawmakers were "unwilling to make laws which add to the independence of wives or the freedom of action of widows." Citing the British jurist William Blackstone, who claimed such laws "favored" women, she wryly remarked "favoritism of women was a pretty compliment which had little foundation on facts." The rest of her essay enumerated the inequalities in married women's and widow's property rights, as well as a broader set of inequalities in the ways in which criminal law was applied to men and women. While the focus on property demonstrated Roebling's station in life, her broader critique focused on the need for women to shape the laws that affected them.

Roebling's health began to deteriorate in 1901, but for two years, she expounded on these themes to audiences across the country. At Sorosis, as the *Atlanta Constitution* reported, she

read three papers as she stood for president of the DAR. One, on “Philanthropy,” emphasized the need for women “to be your own executor and giv[e] your money to charity while you were still on earth to see that proper use was made of it.” Another described her work with settlement houses and urged “better homes for the poor.” A third, unsurprisingly, was on the “Advantages of Legal Education for Women,” a lecture that she gave several times in these years, according to Weigold.

Across a range of themes and topics – education, property, the law, and philanthropy – Emily Warren Roebling advocated women’s equality at the dawn of the twentieth century. She died of stomach cancer in 1903, just as the suffrage movement and women’s activism more broadly was beginning to rise again to prominence in American politics. As Weigold writes, “had she lived well into the next century, she might have become a leader in the fight for the women’s suffrage amendment.” While we will never know what Emily Warren Roebling herself might have said or done, we do know that a new generation of well-educated, professional women — lawyers and engineers among them — joined the march for suffrage in the 1900s and 1910s. Roebling might well have smiled at the sight of women engineers, in academic dress, parading down 5th Avenue to assert their rights.

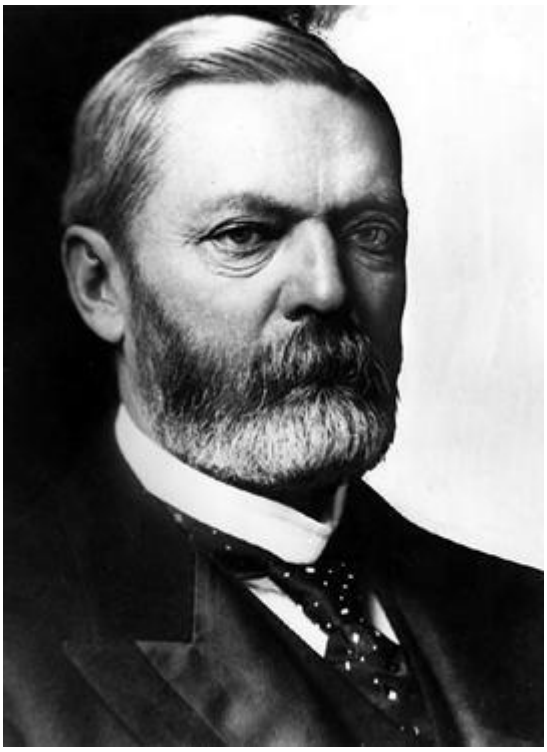
Professional Women Suffrage Parade, 1913. Unidentified photographer, New-York Historical Society Library (as featured in

The Brooklyn Bridge stands as Emily Warren Roebling’s best-known and greatest achievement, and for good reason. However, when we remember Roebling, we would do well to remember the woman beyond the bridge. In the decades that followed, she put the talents that served New York City so well toward the cause of women’s equality. The fullness of her legacy includes both her example as an “unofficial” engineer and her willingness to speak out so that other women might one day be officially recognized in all professions.

– Nick Juravich, Center for Women’s History

http://womenatthecenter.nyhistory.org/emily-warren-roebling-beyond-the-bridge/

WASHINGTON AUGUSTUS ROEBLING-BIOGRAPHY



Born: May 26, 1837 in Saxonburg, Pennsylvania, United States
Died: July 21, 1926 in Trenton, New Jersey, United States
Nationality: American
Occupation: Civil Engineer
Other Names: Roebling, Washington Augustus

Roebling, Washington Augustus (May 26, 1837 - July 21, 1926), civil engineer and industrialist, was born in Saxonburg, Butler County, Pa., eldest of the nine children of John Augustus Roebling [*q.v.*] and Johanna (Herting) Roebling. His father was the leader of a group of German colonists who settled Saxonburg in 1831. Washington spent his boyhood in that town under stern paternal discipline, sharing the privations and limitations of pioneer life until his thirteenth year. At that time the family moved to Trenton, N. J., where John A. Roebling established a new factory for the production of wire rope.

Washington all his life used English and German with equal facility. As a little child he had a tutor; he now entered the Trenton Academy, and after four years of preparation, matriculated at Rensselaer Polytechnic Institute, Troy, N. Y., then the leading school of professional engineering in the country. The Rensselaer curriculum of the day he described as "that terrible treadmill of forcing an avalanche of figures and facts into young brains not qualified to assimilate them as yet" (Schuyler, *post,* p. 173); his class numbered sixty-five on entering but only twelve were graduated three years later. Immediately after receiving his degree as civil engineer, young Roebling started to work in his father's wire-rope mill, in which he had already had some experience, and apparently for considerable periods of time he was in charge during his father's prolonged absences. After a year in the mill he joined his father at Pittsburgh to assist in building the Alleghany River Bridge, and remained on that job until its completion in the summer of 1860, when he returned to Trenton. On Apr. 16, 1861, four days after the attack on Fort Sumter, he enlisted as a private in the National Guard of New Jersey, in June joined the 83rd New York Infantry, and in January 1862 became a second lieutenant in the 6th New York Battery, from which he was discharged in April 1864 to accept a commission as major of volunteers. On Dec. 2, 1864, he was brevetted lieutenant-colonel for gallant service before Richmond and on Mar.

13, 1865, he was brevetted colonel of volunteers, "for gallant and meritorious service during the War." His duties were mainly those of an engineer officer and included a considerable amount of bridge building, notably the construction of suspension bridges across the Rappahannock and Shenandoah rivers. He served on the staff of Gen. Irvin McDowell and later on that of Gen. John Pope [*qq.v.*]. He took part in the campaign which ended in the second battle of Bull Run and was also at Antietam and South Mountain. At one time, after Chancellorsville, it was his daily task to ascend in a captive balloon to observe and report on Confederate movements. He was on the staff of Gen. Gouverneur K. Warren [*q.v.*] at the battle of Gettysburg and throughout the fierce campaign around Richmond.

The war over, he returned to his profession of civil engineering. For two years (1865-67) he assisted his father in completing the bridge between Cincinnati and Covington, Ky. He then spent a year abroad conferring with the leading engineers in England, France, and Germany and studying especially the principles and practice of caisson foundations, with a view to helping his father in the newly projected Brooklyn Bridge, of which the elder Roebling had been appointed chief engineer. Immediately on his return from Europe, he entered his father's office as principal assistant and prepared the detailed plans and specifications for the great bridge. The elder Roebling died just as the field work was beginning and his son succeeded him as chief engineer.

For the next three years Roebling's work was continuous and unusually severe. The Brooklyn Bridge project was unprecedented in many ways and the details of procedure needed constant watching and direction. The foundations of the great towers were built by the caisson method, under compressed air, and the chief engineer spent long hours in the damp high-pressure of the caisson chambers. Caisson disease, the dreaded "bends," attacked the laborers; at that time little was known of methods of treatment and much had to be learned by costly experience. One afternoon in the spring of 1872, Roebling was taken almost unconscious from the caisson on the New York side, but in a few days he was back on the work. By the end of the year, however, his health had been seriously and permanently affected, and he did not visit the bridge site again. From that time until the bridge was finished in 1883, except for six months abroad in a vain attempt to regain his health, he directed the work from his house in Brooklyn, too sick to leave it. Such a record, a decade of exacting work, is a rare tribute to the man's mental alertness, minute knowledge of technical detail, and gift for effective organization. During much of this time he maintained an active part in conducting the business of the John A. Roebling's Sons Company, of which he became president upon its incorporation in 1876.

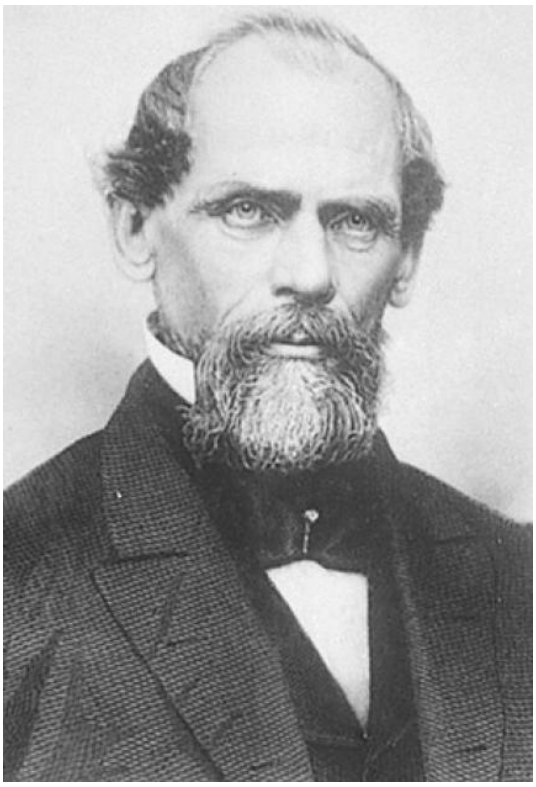
Shortly after the bridge was completed and opened to traffic, he moved with his wife to Troy, N. Y., where they lived from 1884 to 1888 while their son, John A. Roebling II, was a student at Rensselaer Polytechnic Institute. They then removed to Trenton and established a permanent home. Owing to his seriously impaired health, Roebling took no further active part in professional engineering work, although for a short time, at the age of eighty-three, after the death of his nephew, Karl G. Roebling, he resumed the presidency of the Roebling company, and during his brief administration took and filled the contract for the Bear Mountain Bridge over the Hudson. For the most part, however, he lived quietly in Trenton,

read widely, and indulged his hobby of collecting rare minerals, of which he had some fifteen thousand specimens. His remarkable collection is now in the Smithsonian Institution in Washington. In 1924 he wrote a paper on the early history of Saxonburg for the Butler County Historical Society.

Washington Augustus Roebling was twice married. His first wife, whom he married Jan. 18, 1865, was Emily Warren, of Cold Spring, N. Y., daughter of Sylvanus Warren and sister of Major-General G. K. Warren on whose staff Roebling served during the Civil War. By her he had one son, born in Mühlhausen, Germany, the birthplace of his ancestors. Mrs. Roebling died Feb. 28, 1903, and five years later, Apr. 21, 1908, Roebling married Mrs. Cornelia Witsell Farrow, of Charleston, S. C. He died at his home in Trenton a few weeks after his eighty-ninth birthday.

"Washington Augustus Roebling." Dictionary of American Biography, Charles Scribner's Sons, 1936. Gale In Context: Biography, https://link.gale.com/apps/doc/BT2310004510/BIC?u=mhlopacplus&sid=BIC&xid=eafa292b. Accessed 19 May 2020.

JOHN AUGUSTUS ROEBLING-BIOGRAPHY



Born: June 12, 1806 in Mulhouse, France
Died: July 22, 1869 in New York, New York, United States
Nationality: American
Occupation: Civil Engineer
Other Names: Roebling, John

Roebling, John Augustus (June 12, 1806 - July 22, 1869), engineer, bridge builder, and manufacturer, was born in Mühlhausen, Thuringia, Germany, the youngest son of Christoph Polycarpus Roebling and his wife, Friederike Dorothea (Mueller). The family traced its history in a direct line to Nicholaus Roebling, or Rebeling, who was born in Tennstedt in 1560. He appears to have been a man of substance and a city official. Christoph, the father of John Augustus, is noted in the records of Mühlhausen as a tobacco manufacturer.

For the time and place, John's education was unusually good. He attended the Mühlhausen public schools and the city Gymnasium, and was also tutored privately to qualify him for entrance to the Royal Polytechnic Institute in Berlin. For his opportunity to study there he was chiefly indebted to his mother, whose determined self-denial and thrift had made it possible, because the family circumstances were far from affluent. In the Institute his course included architecture and engineering, bridge construction, hydraulics, languages, and philosophy. He was a pupil of the great Hegel, and there is a tradition in the Roebling family that he was the philosopher's favorite disciple. At the age of twenty he was granted the degree of civil engineer, and for three years thereafter worked for the Prussian government on road building in Westphalia. His keenest interest was in bridge construction, especially that of suspension bridges. He made a special study of a chain suspension bridge at Bamberg, in Bavaria, and subsequently presented his observations of the structure as a thesis for his state examination.

Roebling showed already that originality and inventiveness which was later to carry him so far in the field of long-span bridge construction. He was eager to develop his ideas but found himself hampered by red tape and official intertia. It is not surprising therefore that his thoughts turned to America, whither so many of his countrymen were looking. With his brother he planned carefully the contemplated step and read as widely as he could on opportunities in the United States. He seems to have decided that the best field to enter would be agriculture, and it was with the intention of buying farm land in the new country

that he left Germany. His strong feeling against slavery, considered by many essential to agricultural progress, turned him definitely against the South and in favor of the North. With his brother Karl he left Mühlhausen for Bremen in the spring of 1831 and a little later sailed for Philadelphia on the bark *August Eduard,* intending to find and purchase a tract of land for some of their countrymen. They reached Philadelphia on Aug. 6, and after a few weeks in that city, left for Pittsburgh, traveling mainly by the Pennsylvania Canal, and crossing the mountains by means of the inclined planes of the Allegheny Portage Railroad. Roebling kept a journal of the trip which was printed in 1832 and a century later, translated from the original German by Edward Underwood, was published under the title, *Diary of My Journey from Muehlhausen in Thuringia via Bremen to the United States of North America in the Year 1831, Written for My Friends* (1931). The brothers bought seven thousand acres of land in Butler County, about twenty-five miles from Pittsburgh, and settled it, in company with the little group of thrifty German colonists with whom they were associated. The small town or hamlet was first known as Germania and afterwards as Saxonburg. The colonists kept in touch with their friends and relatives in Germany, persuading a number of them also to emigrate and join the community in Butler County. Among these later emigrants was Ernst Herting, who came to Saxonburg from Mühlhausen in 1834. In May 1836 John Roebling married Johanna, Herting's eldest daughter.

Roebling was not a successful farmer. This cannot be charged, however, entirely to his lack of experience, for the colonists certainly chose anything but prime agricultural land when they settled on the western slope of the Alleghanies. It was not many years before he felt a yearning to get back to the professional work for which he had been so well trained. The year after his marriage (1837) he went to Harrisburg and applied for employment by the state as an engineer. In this year he became a naturalized citizen of the United States. He spent several months on the state canal projects, mainly in building dams and locks on Beaver River, then joined a surveying party which was laying out a railway over the mountains.

At this time the canal era was about at its height, and the Allegheny Portage Railroad was an important link between the eastern and western sections of the Pennsylvania Canal. Roebling was evidently impressed by the long reaches of steeply inclined railway, up and down which the canal boats were moved in specially constructed wheeled cradles, and by the clumsy and expensive cables used for hauling the cars up and down the slopes. These hawsers, generally about three inches in diameter, made of Kentucky hemp, were subjected to severe usage which necessitated frequent replacement. Roebling conceived the idea of substituting for these hempen cables ropes of twisted wire which would give far greater strength and longer life, with the added advantage of smaller diameter and consequently greater ease in handling. He made a number of experiments and had the usual difficulty of the pioneer in convincing the Pennsylvania board of public works that the idea was of value. These obstacles were finally overcome, however, and in 1841 he manufactured the first wire rope made in America in a small factory in Saxonburg equipped with machinery of his own design and fabrication. Additional uses for the new wire rope were found and although the demand for the product for canal use waned with the diminishing importance of the canals, rope for rigging vessels, for tow lines, and for dredges was increasingly demanded. Roebling wrote an article describing his product which was published in the

American Railroad Journal of November 1843. In 1848 or 1849 he moved his factory to Trenton, N. J.

While becoming a manufacturer he also continued his interest in bridge building and designed a number of notable structures. In 1844-45 he built a wooden aqueduct for the Pennsylvania Canal, comprising seven spans of 162 feet each, carried on two continuous wire cables each seven inches in diameter. The design was without precedent in America although it made use of some of the principles of the chain suspension bridge at Bamberg, Bavaria, which Roebling had studied in his youth. In 1846 he completed his first suspension bridge, built to carry a highway over the Monongahela River at Pittsburgh. This bridge comprised eight spans of 188 feet each, supported by two 41/2-inch cables which were constructed on the bank of the river and hoisted into place from flatboats. Roebling described it in an article in the *American Railroad Journal,* June 13, 1846. The structure was in use for thirty-five years. In the years 1848-50, Roebling constructed four suspension aqueducts for the Delaware & Hudson Canal.

In spite of his early interest in canals and canal operation, he readily foresaw that the faster and surer agency of the railway must absorb the greater part of the service heretofore given by the canals. In 1847 he read a paper before the Pittsburgh Board of Trade in which he strongly advocated a railroad through Pennsylvania. Early in 1850, four years before Cyrus W. Field [*q.v.*] became actively interested in such a project, Roebling wrote to the *Journal of Commerce,* expressing his conviction that a transatlantic telegraph was perfectly feasible. He gave detailed estimates of the cost, which he believed should not exceed $1,300,000.

The list of Roebling's works in the field of important bridge construction is a long one. In many ways the most striking structure was the pioneer railroad suspension bridge which he built at Niagara Falls in the years 1851-55. In addition to the natural obstacles to be overcome, there was a cholera epidemic at the bridge site in 1854. The bridge was opened in March 1855, and stood for many years, a monument to the ingenuity and resourcefulness of its builder. It was described by him in a memoir included in *Public Works of Recent Construction Both British and American* (London, 1856). In 1856 Roebling's plans for a bridge over the Ohio River, between Cincinnati and Covington, Ky., were accepted and work was begun, but the undertaking was interrupted by the Civil War and not completed until 1867. In 1858-60 the bridge over the Alleghany River at Pittsburgh was built, in which work Roebling and his son Washington A. Roebling [*q.v.*] were associated. Roebling's hatred of the institution of slavery had continued unabated and he vigorously supported the Union cause, encouraging his son Washington to offer his services to the Federal army.

In June 1857, Roebling had written a letter to Abram S. Hewitt [*q.v.*], of New York, suggesting the possibility of a bridge over the East River between lower Manhattan and Brooklyn which would not interfere with navigation, but it was ten years later before the project finally assumed shape and a charter for the construction of the work was granted. Roebling was appointed chief engineer, and plans for the bridge were perfected by him and received the approval of the commission early in 1869. The surveys had been made and

work was about to begin when he suffered the accident--at first believed not to be serious--which cost his life. On June 28, 1869, he was making certain observations at the bridge site, from a point of vantage on a cluster of piles at the Fulton Ferry slip on the Brooklyn side. A ferry-boat entering the slip pushed back the piling on which he was standing, catching his foot and crushing several of his toes. He was taken at once to his son's home in Brooklyn, and the injured toes were amputated. Although he was in considerable pain, there was every expectation that with his vigorous physique he would soon be about again, but tetanus set in, and he died on Thursday, July 22, less than six weeks after his sixty-third birthday.

Roebling at his death was a rich man for his time. He had accumulated his wealth by means of mental and physical energy of a high order and relentless personal industry. In addition to his professional activity and the management of his factory he was a prolific writer for technical and scientific periodicals, and at the time of his death a book by him, *Long and Short Span Railway Bridges* (1869), was in press. His one recreation appears to have been music, and he usually found opportunity for practising the flute and the piano. He was jealous of his time, never wasted it himself, and would not allow others to do so. Punctual to the minute himself, if an associate was five minutes late in keeping an appointment, Roebling would postpone the conference. When he established the wirerope factory in Saxonburg in 1841 and began the manufacture of a product up to that time unknown in America, he founded an industrial dynasty. The John A. Roebling's Sons Company of Trenton has developed without a break from the little ropewalk in Saxonburg, and at no time has it been out of the control of the Roebling family--sons, grandsons, and great-grandsons of the founder. John Augustus Roebling and his wife Johanna had nine children, of whom four sons and three daughters were living at the time of their father's death in 1869. The youngest daughter, Josephine, became the wife of the pianist Charles H. Jarvis [*q.v.*]. Johanna (Herting) Roebling died Nov. 22, 1864, and Roebling married, second, Lucia W. Cooper, whom he survived five years.

John Augustus Roebling." *Dictionary of American Biography*, Charles Scribner's Sons, 1936. *Gale In Context: Biography*, https://link.gale.com/apps/doc/BT2310004511/BIC?u=mhlopacplus&sid=BIC&xid=857fd145. Accessed 19 May 2020.

LIBRARY OF CONGRESS Roebling and the Brooklyn Bridge

On **June 12**, 1806, John A. Roebling, civil engineer and designer of bridges, was born in Mühlhausen, Prussia. The Brooklyn Bridge, Roebling's last and greatest achievement, spans New York's East River to connect Manhattan with Brooklyn. When completed in 1883, the bridge, with its massive stone towers and a main span of 1,595.5 feet between them, was by far the longest suspension bridge in the world. Today, the Brooklyn Bridge is hailed as a key feature

of New York's City's urban landscape, standing as a monument to progress and ingenuity as well as symbolizing New York's ongoing cultural vitality.

New York & Bridges from Brooklyn. Irving Underhill, c1913. Panoramic Photographs. Prints & Photographs Division

John A. Roebling came to design suspension bridges through his earlier work on canals. Trained as an engineer at Berlin's Royal Polytechnic Institute, Roebling emigrated to the United States in 1831, helping to settle the farming community of Saxonburg in western Pennsylvania. He was soon employed to work on the extensive canal system then being built for travel across the state. One element of that system was a series of inclined planes used to haul barges along railway tracks over steep terrain. Troubled by their reliance on dangerously breakable hemp rope, in about 1839, Roebling turned his efforts toward the manufacture of strong but flexible wire rope as an alternative. Roebling's invention soon was being used by the Allegheny Portage Railroad; he received a patent for his "new and Improved Mode of Manufacturing Wire Ropes" in 1842.

Roebling quickly found additional uses for his invention. His first wire cable suspension bridge (1844-45) was a wooden aqueduct that carried Pennsylvania's main east-west canal above and across the Allegheny River into downtown Pittsburgh. He received additional patents in 1846 and 1847. Roebling's Delaware Aqueduct (1847-48) followed closely on his earlier design and is the oldest surviving suspension bridge in America. In pursuing these projects, Roebling developed a viable method of spinning the heavy wrought iron wire cables on site, as well as a simple and secure way to anchor them—both of which made the construction of long suspension bridges feasible.

Roebling moved his family to Trenton, New Jersey, in 1848, where he established a business manufacturing twisted wire cable for a wide variety of engineering applications. (This successful business continued as the John A. Roebling's Sons Company through the mid-twentieth century.) Bridges that Roebling designed, such as the Niagara River Gorge Bridge (1855) and Pittsburgh's Sixth Street Bridge (1859) were admired for their technical innovation as well as their expressive design. His Covington & Cincinnati Suspension Bridge (1856-67), which was itself the longest suspension bridge of its time, served in part as a prototype for his monumental East River project.

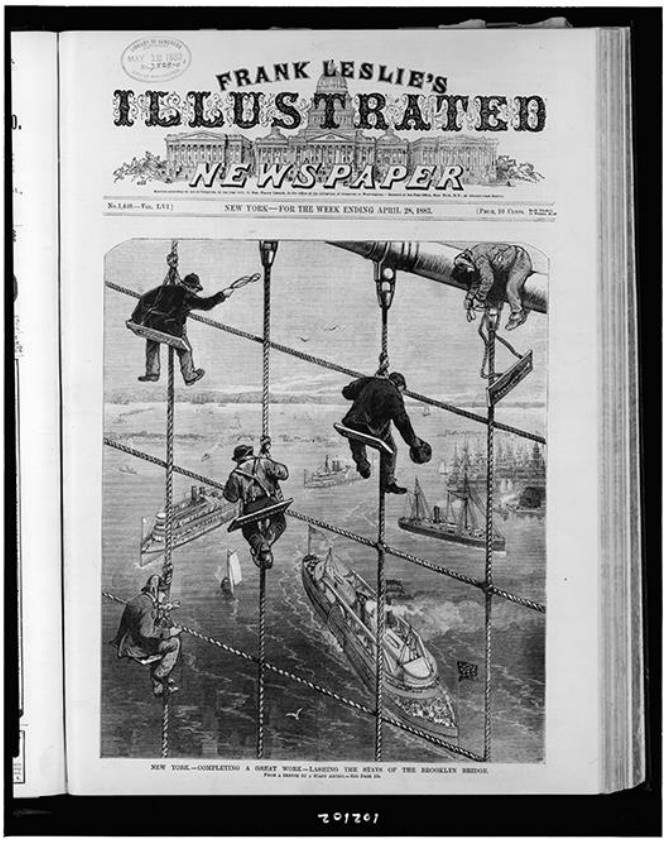
On the Promenade, Brooklyn Bridge, New York. Strohmeyer & Wyman, c1899. Stereograph Cards. Prints & Photographs Division

New Yorkers had long desired a bridge directly linking Manhattan and Brooklyn, which were by 1860 the country's first and third largest cities, respectively. Roebling's first plan for an East River bridge, developed in the 1850s, was nearly as ambitious as the one that was eventually built. In late 1866, a private Brooklyn-based venture called The New York Bridge Company was founded (with the infamous Boss Tweed as a trustee). Roebling—whose Cincinnati bridge had just opened to great acclaim—was soon hired as chief engineer.

Roebling planned his Manhattan and Brooklyn Bridge (its most official name at the time) to be made with newly available steel wire, which allowed it to be stronger, larger, and longer then any bridge yet built. The two-tier design External offered cable car transportation as well as roadways for vehicles and an elevated pedestrian promenade. The project soon met with full approval, receiving New York state funding as well as Congressional authorization by 1869.

In July 1869, soon after construction of the Brooklyn Bridge began, John Roebling died from tetanus contracted when his foot was crushed in an accident on site. Almost immediately, Roebling's 32-year-old son and partner, Washington A. Roebling, was named chief engineer in his place. Other mishaps, including an explosion, a fire, contractor fraud, and Washington Roebling's own illness, hampered timely completion of the project.

Pressurized pneumatic caissons, eventually sunk to a depth of 44.5 feet on the Brooklyn side and 78.5 feet on the Manhattan side, provided dry underwater space for workers to dig the bridge's foundations down to solid rock. Alas, working in the caissons often brought on "the bends"—a serious medical condition caused by moving too quickly out of a high-pressure atmosphere. Washington Roebling himself was among the many workers permanently impaired (or in some cases killed) by this little-understood "caisson disease," now known to be decompression sickness. As a result of his disability, after 1872, Washington Roebling's wife, Emily, became actively involved in supervising construction—carrying messages and instructions back and forth between the bed-ridden chief engineer and his staff.



New York—Completing A Great Work—Lashing the Stays of the Brooklyn Bridge / from a sketch by a staff artist. Illus. in: *Frank Leslie's Illustrated Newspaper*, April 28, 1883, [149]. Prints & Photographs Division

In 1876, with the bridge towers completed to their final height of 277 feet above water, construction of the four great cables that suspend the bridge's roadway began. The longest and heaviest cables that had ever been made (containing over 14,000 miles of wire weighing almost 3,500 tons) were created using the same method that John A. Roebling had patented some thirty years before. Because of the scale of the operation, just making the cables took eighteen months. When it came time to finally build the bridge's deck, steel-manufacturing technology had improved so much that it was possible to use steel instead of iron, further strengthening the bridge. With the deck floor in place, the bridge's supporting trusses were assembled and the visually stunning diagonal stays that stabilized the cable system were installed.

The Brooklyn Bridge opened to citywide celebration on May 24, 1883. Over the next hundred years, the bridge became part of the romance of New York City. Poets and artists have long found the bridge a worthy subject and the Brooklyn Bridge continues to serve as the backdrop in countless photographs and films.

On September 11, 2001, the Brooklyn Bridge took on a different form of symbolism. In the wake of the attacks on the World Trade Center, thousands of pedestrians used the bridge to escape Lower Manhattan on foot.

New Brooklyn to New York via Brooklyn Bridge, no. 2. United States: Edison Manufacturing Co., 1899. Inventing Entertainment: the Early Motion Pictures and Sound Recordings of the Edison Companies. Motion Picture, Broadcasting & Recorded Sound Division

Night View Looking NW Showing Bridge Lighted. Jet Lowe, 1982. Brooklyn Bridge…Brooklyn, New York County, NY. Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey. Prints & Photographs Division

Learn More

- Detroit Publishing Company contains over fifty photographs of the Brooklyn Bridge, including pictures of the Manhattan entrance and the approach from the Brooklyn side. Search the collection on *Brooklyn Bridge*. Examine a collection of stereoscopic views of the Brooklyn Bridge, part of the New York Public Library's Robert N. Dennis Collection of Stereoscopic ViewsExternal, that include many construction photographs. Search the Dennis collection on *New York* or *Brooklyn* for additional city views. Search the Library of Congress pictorial collections for even more views of the bridge.
- The Life of a City: Early Films of New York, 1898 to 1906 includes two filmic panoramas that feature the Brooklyn Bridge, as well as many related New York landmarks.
- Several Today in History pages focus on New York City landmarks. Read features on the Metropolitan Opera House, Radio City Music Hall, the New York Subway System, the New York Public Library, the Empire State Building and Central Park.

- Search Panoramic Photographs on *bridges* to access almost 100 remarkable panoramic photographs of bridges.
- The John A. Roebling's Sons Company contributed to the construction of many major suspension bridges in the United States, including the George Washington Bridge, Golden Gate Bridge, and Williamsburg Bridge. Search on *bridge* and on other engineering terms such as *aqueduct, canal, factory*, or *railroad* to find engineering surveys in Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey, or browse the collection by place to find a broad variety of New York and Brooklyn structures.
- President George Washington signed the first federal patent law in 1790. The present Patent Office was established in 1836. Today, the United States Patent and Trademark Office provides a database of all U.S. patents ever issued. John A. Roebling's important bridge-related patents include No. 2720 (July 16,1842), No. 4710 (August 26, 1846), and No. 4945 (January 26, 1847). These patents document Roebling's method for manufacturing and using wire cable in suspension bridge construction.

https://www.loc.gov/item/today-in-history/june-12/

GOUVERNEUR KEMBLE WARREN -BIOGRAPHY

Born: January 08, 1830 in Cold Spring, New York, United States
Died: August 08, 1882 in Newport, Rhode Island, United States
Nationality: American
Occupation: General
Other Names: Warren, G. K.

Warren, Gouverneur Kemble (Jan. 8, 1830 - Aug. 8, 1882), soldier and engineer, was born in Cold Spring, N. Y., across the Hudson from West Point, the son of Sylvanus Warren, a close personal friend of Washington Irving and a prominent citizen of Putnam County. Fourth of twelve children, the lad was named for Gouverneur Kemble [*q.v.*], proprietor of a foundry at Cold Spring and sometime member of the House of Representatives. After some instruction in his native town and at Kinsley's School across the Hudson, Warren at sixteen was appointed to the United States Military Academy, with the admonition from Kemble: "We expect you to rank, at graduation, not lower than second." Carrying out instructions literally, he finished number two in his class, July 1, 1850, and was appointed brevet second lieutenant in the restricted Corps of Topographical Engineers. During the next four years he served successively as assistant engineer on the survey of the Delta of the Mississippi River, member of the board for the improvement of the canal around the Falls of the Ohio, head of surveys for the improvement of Rock Island and Des Moines Rapids, and, with Capt. A. A. Humphreys [*q.v.*], as compiler of maps and reports of the Pacific Railroad exploration. Promoted second lieutenant, Sept. 1, 1854, he was chief topographical engineer of the Sioux Expedition of 1855, receiving his baptism of fire on Sept. 3, in the battle of the Blue Water. Promoted first lieutenant, July 1, 1856, he was engaged in making maps and reconnaissances of Dakota Territory and Nebraska Territory until August 1859, when he was detailed as assistant professor of mathematics at the Military Academy.

The opening of the Civil War found him still teaching at West Point, but on May 14, 1861, he became lieutenant-colonel of the 5th New York Volunteers, seeing action at Big Bethel Church, June 10, and subsequently aiding in the construction of defenses around Baltimore and Washington. He was promoted colonel of his regiment Aug. 31, and captain of topographical engineers, United States Army, Sept. 9. In the Peninsular campaign of 1862 he was engaged in the siege of Yorktown and commanded a brigade at Pamunky River and Hanover Court House (May 26, 27). He was wounded at Gaines's Mill, June 27, and

brevetted lieutenant-colonel, United States Army, for gallant and meritorious service in that battle. Four days later he commanded the force that repulsed Wise's division at Malvern Hill, and the next day participated in the engagement at Harrison's Landing. He took part in the second battle of Bull Run and the skirmish at Centerville (Aug. 30, Sept. 1, 1862), and commanded a brigade in the Maryland campaign and its sequel, from Antietam to Falmouth, Va. (September-November 1862). Promoted brigadier-general of volunteers, Sept. 26, he served at the battle of Fredericksburg in December. As chief topographical engineer of the Army of the Potomac from Feb. 4, 1863, he saw action in May at Orange Pike, Marye Heights, and Salem. He was promoted major-general of volunteers June 3, 1863, and served as chief engineer, Army of the Potomac, from June 8 to Aug. 12, 1863.

It was at Gettysburg (July 1-3, 1863) that he rendered his most distinguished service. On the second day of that vital struggle, sent at his own suggestion by Meade to examine the Union left, he discovered that Little Round Top, the commanding position, was undefended except for a few signalers. He perceived Longstreet's threat and, intercepting some of Sickles' supports and Sykes's troops on the Peach Orchard road, practically commandeered them for the defense of the hill, just in time to keep Little Round Top from falling into the hands of the Confederates. Had this critical point been taken by Longstreet, it is agreed that the whole Union army would have been forced back in disorder and the day lost. Warren was brevetted colonel, United States Army, for his services in this battle, and in 1888 a bronze statue of him was erected to mark the spot where his alertness and energy came into play. Despite a wound received during the defense of Little Round Top, he continued in action, and was subsequently in temporary command of the II Corps from Aug. 12, 1863, to Mar. 24, 1864, participating in a number of engagements, notably that at Bristoe Station. He was placed regularly in command of the V Corps, Mar. 24, 1864, and with this corps participated in the actions of the Wilderness, Spotsylvania, Cold Harbor, and other engagements, as well as the various assaults on Petersburg. He was promoted major, United States Army, June 25, 1864, and brevetted major-general, United States Army, Mar. 13, 1865. At Five Forks, Apr. 1, 1865, the last decisive battle of the war, his corps, after conflicting orders, arrived with dispatch on the flank of the Confederates and offered to the cavalry's hard-pressed troops the signal aid that clinched the victory, but to the astonishment of his subordinates and others engaged in that critical action, he was summarily relieved of his command by Sheridan, who had been given authority by General Grant. Transferred to command the defenses of Petersburg and the Southside Railroad, he served here during April and the first half of May, then commanded the Department of Mississippi, May 14-30, 1865. On May 27 he resigned his volunteer commission and reverted to the status of major of engineers, United States Army.

During the later sixties he prepared maps and reports of his campaigns and elaborated for publication the results of some of his early explorations. He served as member of the board of engineers to examine the canal at Washington, D. C., as superintending engineer of surveys and improvements of the upper Mississippi, and as member of the commission to examine the Union Pacific Railroad and telegraph lines. He was also in charge of the survey of the battlefield of Gettysburg. For almost a year, in 1869-70, he supervised the building of the Rock Island bridge across the Mississippi, and there through exposure and over-exertion received the impairment to his health which ultimately caused his death. He

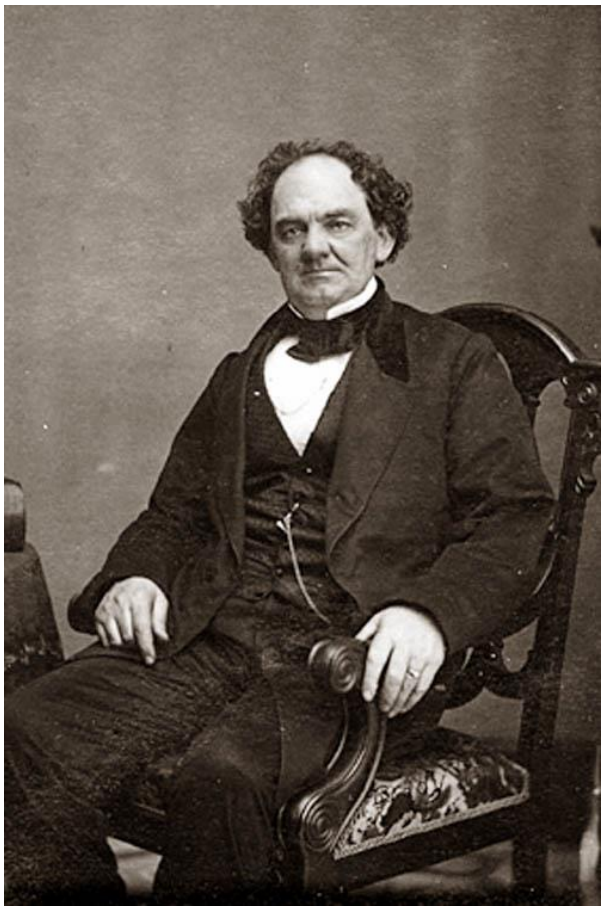
continued for twelve years more, however, in the river-and-harbor work of the Corps of Engineers--in the upper Mississippi Valley, along the Atlantic Coast, and in the Great Lakes. On Oct. 10, 1878, he was made a member of the advisory council of the Harbor Commission of Rhode Island, and on Mar. 4, 1879, he was promoted a lieutenant-colonel of engineers. Throughout this period he made repeated requests for a board of inquiry to examine into the causes of his ignominious relief at Five Forks, but since the authorities implicated were then in power, his request was not granted until December 1879. The court then appointed not only fully exonerated and applauded him, but cast reflections upon the manner of his relief. Ironically, however, the findings vindicating him were not published until three months after his death.

Among Warren's published writings were: "Examination of Reports of Various Routes," with Capt. A. A. Humphreys, in *Reports of Explorations and Surveys . . . for a Railroad . . . to the Pacific Ocean,* vol. I (1855); *Memoir to Accompany the Map of the Territory of the United States from the Mississippi River to the Pacific Ocean, Giving a Brief Account of Each of the Exploring Expeditions since A.D. 1800* (1859); *An Account of the Operations of the Fifth Army Corps* (1866); *Report of the Survey of the Upper Mississippi River and Its Tributaries* (1867); *An Essay Concerning Important Physical Features Exhibited in the Valley of the Minnesota River* (1874), *Preliminary Report of Explorations in Nebraska and Dakota in the Years 1855-'56-'57* (1875); *Report on the Transportation Route along the Wisconsin and Fox Rivers . . . between the Mississippi River and Lake Michigan* (1876); *Report on Bridging the Mississippi River between St. Paul, Minn.; and St. Louis, Mo.* (1878). He was a member of a number of scientific organizations, including the American Philosophical Society and the National Academy of Sciences.

Warren was a firm friend, a generous enemy, gentle, sensitive, kind, and staunch. He was passionately fond of flowers. After the death of his father in 1859, he assumed much of the responsibility for the younger members of the family, whose welfare he guarded faithfully and tenderly. On June 17, 1863, he married Emily Forbes Chase of Baltimore, by whom he had a son and a daughter; two years later his sister Emily married his former aide, Washington A. Roebling [*q.v.*]. Warren died at his home in Newport, R. I., at the age of fifty-two.

"Gouverneur Kemble Warren." ***Dictionary of American Biography*****, Charles Scribner's Sons, 1936.** ***Gale In Context: Biography*****, https://link.gale.com/apps/doc/BT2310001169/BIC?u=mhlopacplus&sid=BIC&xid=120a2e9a. Accessed 19 May 2020.**

PHINEAS TAYLOR BARNUM-BIOGRAPHY



Born: July 05, 1810 in Bethel, Connecticut, United States
Died: April 07, 1891 in Bridgeport, Connecticut, United States
Nationality: American
Occupation: Circus Owner; Entertainer; Impresario; Lecturer; Politician; Promoter;
Writer Other Names: Barnum, Phineas Taylor; Barnum, Phineas T.

Phineas Taylor Barnum (1810-1891), America's greatest showman of the 19th century, instructed and amused a nation with his museum and later his circus.
Speaking of his youth, P.T. Barnum said, "I was always ready to concoct fun, or lay plans for moneymaking, but hard work was decidedly not in my line." Indeed, he succeeded in making a great deal of money by working hard at having fun. His love of a joke came to him naturally. When he was born in Bethel, Connecticut, in 1810, his grandfather deeded him a parcel of land known as lvy Island. The growing boy was constantly reminded of his property. When he was 10 years old, he went to visit his estate and discovered it to be "a worthless piece of barren land."

Early Occupations and Joice Heth

When Phineas was 15, his father died, leaving his widow and five children penniless. Phineas immediately became clerk in a country store, where he learned the fine art of Yankee trading. During the next 10 years he was a shop owner, director of lotteries, and newspaper publisher. When he was 19 he eloped with a local seamstress, Charity Hallett (who would remain his wife for 44 years and give him four daughters). At 22, as publisher of the *Herald of Freedom,* he was jailed for libelously accusing a deacon of usury; upon his release 60 days later, Barnum was met by a band and "a coach drawn by six horses" for a parade back to town.

The embryo showman was developing, but it was not until 1835, when he encountered Joice Heth, that the Prince of Humbugs was born. Joice Heth was a disabled African American woman who, her sponsors claimed, was 160 years old and had been the infant

George Washington's nurse. Seeing her possibilities as a human curiosity, Barnum purchased the right to exhibit her, along with the documents validating her age, and set her upon her couch in Niblo's Garden in New York City. She was extremely popular, but when interest began to flag, a newspaper item appeared suggesting that Joice was not human at all but an "automaton" made of whalebone, indian rubber, and springs. The exhibition hall was full once more, for Barnum always knew how to use the news as well as the advertising sections of newspapers. Finally, upon her death in 1836, when an autopsy proved that Joice had been no more than 80 years old, Barnum was as surprised and indignant as anyone else. He had learned, however, that "the public appears disposed to be amused even when they are conscious of being deceived."

American Museum

For the next four years Barnum was an itinerant showman in the West and South. By 1840 he was back in New York, poor, weary of travel, and without prospects. When he heard that the struggling Scudder's American Museum (with its collection of curiosities) was for sale, Barnum determined to buy it. "With what?" asked a friend. "Brass," Barnum replied, "for silver and gold I have none." He mortgaged himself to the building's owner, proposing for collateral good references, a determination to succeed, and a "valuable and sentimental" piece of property known as Ivy Island. By the end of 1842 the museum was his, and a year later he was out of debt.

Barnum's American Museum was to become the most famous showplace of the century. Here, in constantly changing and elaborately advertised parade, the public could see educated dogs and fleas, automatons, jugglers, ventriloquists, living statuary, albinos, obese men, bearded women, a great variety of singing and dancing acts, models of Paris and Jerusalem, dioramas of the Creation and the Deluge, glassblowing, knitting machines, African Americans performing a war dance, conjoined twins, flower and bird shows, whales, mermaids, virtuous melodramas such as *The Drunkard,* a menagerie of rare animals, and an aquarium--"all for twenty-five cents, children half price."

His showman's delight in seeking out the splendid and the curious knew no bounds. "The one end aimed at," he said, "was to make people think, and talk, and wonder, and ... go to the Museum." His Great Model of Niagara Falls with Real Water was actually 18 inches high; the Feejee Mermaid was really a monkey's head and torso fused to a fish's tail; the Woolly Horse of the Frozen Rockies had in truth been foaled in Indiana. Only half in jest did Barnum seek to buy Shakespeare's birthplace, hire the Zulu leader who had recently ambushed a British force, and tow an iceberg into New York harbor. Altogether, the museum showed over 600,000 exhibits during its existence.

Tom Thumb and Jenny Lind

General Tom Thumb was Barnum's greatest attraction. Charles S. Stratton, a native of Bridgeport, Connecticut, was 25 inches tall and weighed 15 pounds when he entered Barnum's employ in 1842. When he died in 1883, at the age of 45, he had made millions of

dollars and delighted international audiences. In the first of Barnum's many European junkets the General entertained Queen Victoria, King Louis Philippe, and other royalty with his songs, dances, and impersonations in miniature. Of the 82 million tickets Barnum sold during his lifetime for various attractions, Tom Thumb sold over 20 million.

In 1850 Barnum turned impresario, introducing the most renowned singer of her time, Jenny Lind, to the American public. The immensely profitable tour of this gracious "Swedish Nightingale" was prepared with ingenious public relations but conducted with dignity and generosity by Barnum. Its success initiated the vogue of European concert artists visiting the United States.

Fires and Bankruptcy

Barnum's irrepressibility helped him overcome numerous professional misfortunes. Five times he was almost ruined by fire, but each time he recouped. In 1857 his famous house, Iranistan, fashioned after George IV's Pavilion at Brighton, burned to the ground. The original museum burned in 1865, and new museums burned in 1868 and again in 1872. Finally, in 1887, the great circus in its winter quarters, with most of its menagerie, was lost. But the showman's greatest financial catastrophe had nothing to do with show business. For years he had cherished the dream of building a city out of the farmland of East Bridgeport--a benevolent endeavor, he thought. To attract business, he signed some notes guaranteeing the debts of the Jerome Clock Company. As a result, he lost all he owned. Thus, in 1855, at the age of 46, the great Barnum was bankrupt. But he worked his way back, in part from successful lectures on "The Art of Money Getting," and by 1860 he was free of debt once more.

Throughout his life Barnum was a political liberal, serving in the Connecticut Legislature in the late 1860s, where he diligently fought the railroad interests, and as mayor of Bridgeport in 1875-1876. A year after the death of his first wife, Charity, in 1873, Barnum married Nancy Fish, an English woman 40 years his junior.

"The Greatest Show on Earth"

In April 1874 Barnum opened his Roman Hippodrome in New York; this was to grow into the great circus. He did not invent the circus, an ancient form of entertainment, but along with his enterprising young partner, James A. Bailey, whose circus merged with Barnum's in 1881, he made it a three-ring extravaganza the likes of which had never been seen before. Barnum's last great coup was his 1881 purchase from the London Zoo of the largest elephant in captivity, Jumbo. Violent objections by the English only made Jumbo and the circus that much more appealing. The variety and splendor of the show delighted the American audiences that Barnum had trained, over the years, to be delighted. In 1882 the circus opened its season in Madison Square Garden, where it was to become an American institution; and everywhere the "big top" traveled, a "Barnum Day" was declared. Circling the arena in an open carriage as leader of the parade always brought roars of approval (and great satisfaction) to the aging genius.

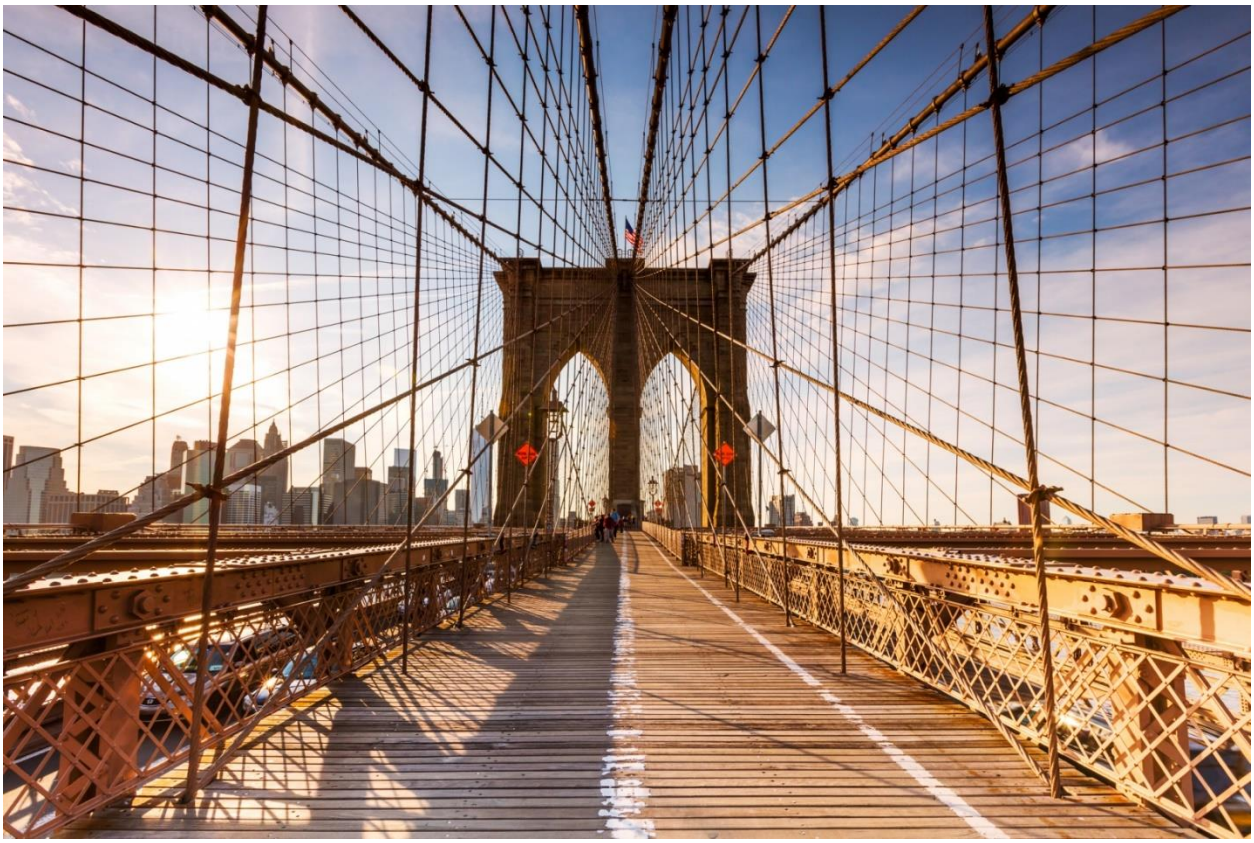
By 1891 Barnum's body began to fail, though not his spirit. His child's delight in the joke, the curious, and the splendid had set an entire nation to wondering and laughing and buying. A few weeks before his death, Barnum gave permission to the *Evening Sun* to print his obituary, so that he might have a chance to read it. On April 7 he asked about the box office receipts for the day; a few hours later, he was dead.

Barnum's life and endeavors have fascinated moviegoers for decades. He and his circus have been featured in numerous films, television movies, and documentaries. Hugh Jackman portrayed Barnum in the movie *The Greatest Showman* in 2017.

"Phineas Taylor Barnum." ***Encyclopedia of World Biography Online*****, Gale, 1998.** ***Gale In Context: Biography*****, https://link.gale.com/apps/doc/K1631000457/BIC?u=mhlopacplus&sid=BIC&xid=7cf9a20e. Accessed 19 May 2020.**

The Amazing Story of the Brooklyn Bridge, a NYC Landmark

By Kevin Walsh/Nov. 27, 2018



A rare moment of quiet on the pedestrian walkway of the Brooklyn Bridge. Everyone knows the bridge — but do you know its amazing backstory?

The Brooklyn Bridge, constructed between 1870 and 1883, is perhaps the most storied and most famous bridge in the world. With a main span of 1,595.5 feet, it was the longest suspension bridge in the world from its opening until 1903, and the first steel-wire suspension bridge ever built.

The bridge remains an essential stop for all New York City sightseers, who stroll its pedestrian path between Manhattan's Civic Center and the charming residential enclave of Brooklyn Heights. The Brooklyn Bridge changed New York forever when it was built, and remains an essential transport link today. But whose idea was it, and how did it get built? Read on for the incredible tale of how the Brooklyn Bridge came to be — and what it's like today.

History of the Brooklyn Bridge

Brooklyn Bridge architect John Roebling (1806-1869) was born in Mühlhausen, Prussia. Though he had humble beginnings, his mother recognized his keen intelligence and sent him to Berlin to study architecture and engineering. In 1831, with his brother Carl, Roebling moved to western Pennsylvania, founding a farming community called Saxonburg. (His house in Butler County still stands.) After the agrarian colony failed, Roebling turned back to engineering.

Even by the middle of the 19th century, there were few bridges over major rivers; goods were floated across on barges, and people rode ferries. In 1841, Roebling began producing wire rope strong enough to support bridge roadways, and was hired to produce a number of river crossings, the first over the Monongahela River in Pittsburgh in 1845. After a number of successful commissions, he built a large wire rope plant in Trenton, New Jersey.

In the following decade, Roebling designed a railroad bridge over the Ohio River between Cincinnati, OH, and Covington, KY, which resembles a smaller version of the Brooklyn Bridge. He first conceived of the Brooklyn span in 1852, but it took him more than 15 years to secure approvals for it, as the Civil War, among other occurrences, sapped capital and materials. Such a crossing was becoming crucial, because in that era, winters were colder, and barges and boats found the ice-choked river difficult to navigate.

In 1867, aided by a particularly harsh winter, Roebling enlisted the aid of prominent businessman William Kingsley and state Senator Henry Murphy (The "Senator" of Bay Ridge's Senator Street). After two years of negotiations with the city and state, the East River Bridge was approved in 1869. Fully 14 years of construction commenced. John Roebling died from a tetanus-infected wound at a pier accident that year, at the age of 63. But his son, Washington, working from voluminous notes his father had produced, completed the project.

The Brooklyn Bridge, looking from Manhattan toward Brooklyn.

Construction of the Brooklyn Bridge

Much of the initial work on the bridge was done in the riverbed, where the foundations of the bridge towers were built using caissons — large airtight boxes or cylinders in which men, breathing compressed air, dug the foundations, ultimately anchored to the bedrock. It was dangerous work. Washington Roebling personally supervised the workers until he contracted caisson disease, or the bends, and then oversaw construction from his home in Brooklyn Heights, relaying commands via Morse code to his wife, Emily, who herself had studied advanced mathematics and bridge engineering.

Within five years, the tower foundations and towers themselves were complete. The most difficult work was just beginning, as hundreds of miles of steel cables strong enough to support 160,000 pounds per square inch needed to be woven. After the last cable was positioned in 1878, a taxpayers' lawsuit, charging that the bridge was unsound, threatened the entire project. The case dragged on for several months, and Washington Roebling agreed to the addition of stiffening trusses. The last element, the roadway, was finally built from the foundations to the towers, supported by the cables, and the bridge opened to traffic on May 24, 1883.

An engraving of the Brooklyn Bridge at night from 1883, the year it opened

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Walking the Brooklyn Bridge

The Brooklyn Bridge walkway is nearly *de rigueur* for NYC visitors and tourists, though every New Yorker should walk the length of the span at least once. A unique perspective of the Manhattan skyline is available from the wood-planked walkway, which runs between the vehicular roadways on each side.

The Brooklyn Bridge checks off several "first" and "only" boxes. It was the first major bridge to cross the East River; it's the only NYC bridge with masonry-clad towers made of limestone, granite and Rosendale cement, a more durable mortar produced in Ulster County, NY. Its successors, the Williamsburg, Manhattan and all other major bridges reveal their steel skeletons (though the George Washington Bridge was originally planned with brick coverings on its towers). For many years, it was also the only major NYC bridge featuring diagonal suspension cables, though in recent years the cable-stayed Kosciuszko and Goethals Bridges have employed diagonal cables.

The Manhattan skyline isn't the only available vista. Looking south across Upper New York Bay reveals Lady Liberty, the container vessel cranes on the Bayonne shore, and the Bayonne Bridge.

Maintenance of the Brooklyn Bridge

At the two masonry towers, the walkways detour over the roadways and provide a look at the roadways beneath them. The bridge is not immune from graffiti that has to be scrubbed off from time to time. It had become a tradition for people to place padlocks on the cables to profess love and affection. Unfortunately, all that metal added weight to the bridge and risked destabilizing it, hence their removal. The bridge's cables and other aspects are constantly checked for safety. Shortly after the bridge opened in 1883, a rumor spread like wildfire among bridge walkers that it was collapsing, and the resulting stampede caused over a dozen deaths. No such collapse was happening, of course.

The metal braces over the roadways, which strengthen the bridge's integrity, were added in 1948 by engineer David Steinman, who assisted with the Hell Gate Bridge and designed the Henry Hudson Bridge connecting Manhattan and the Bronx at the Harlem River.

The Brooklyn Bridge in the Chambers Street Subway Station

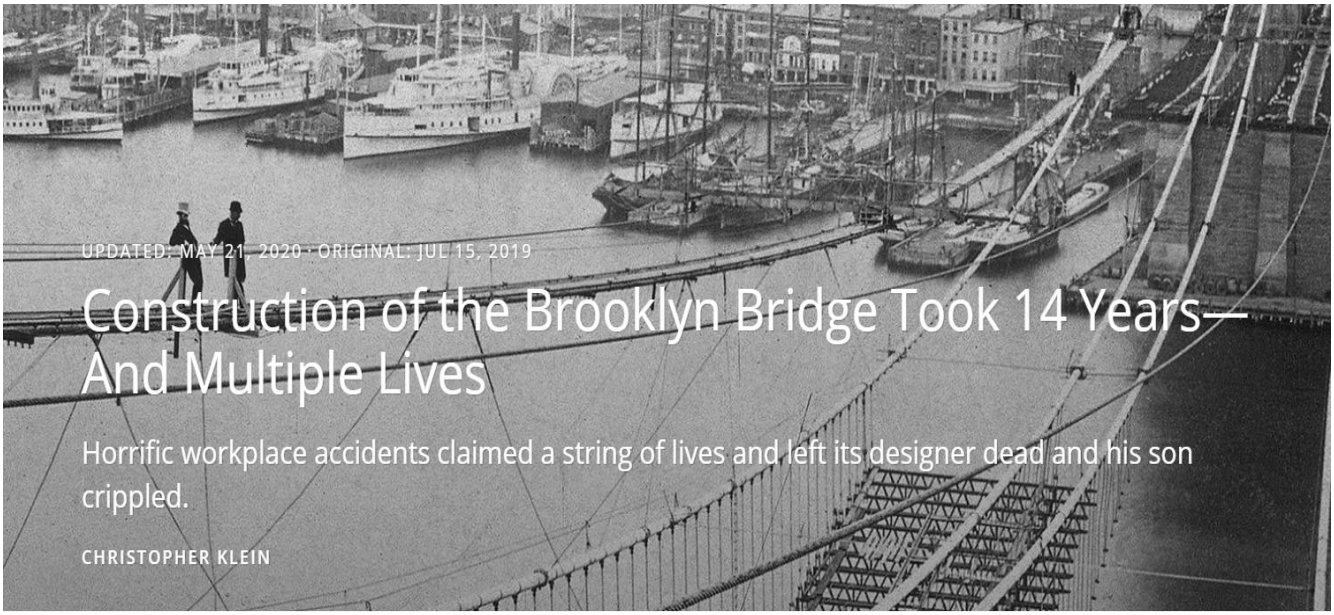
The Chambers Street station, completed in 1913, was originally going to be part of a loop line that would connect the Williamsburg and Brooklyn Bridges with a line through Manhattan. The Brooklyn Bridge connection was never built, but the bridge is depicted on plaques in the station, which reminds us of the former grand plan.

A close look at the plaque reveals an error made by designers George Heins and Christopher LaFarge. The Brooklyn Bridge in the plaque doesn't have any of the distinctive diagonal cables that are its trademark. The reason they were left out is unclear; the plaque is actually four separate small plaques that were seamlessly put together to make one.

On the plaque, we are looking south from the Manhattan tower. The Statue of Liberty can be seen indistinctly in the distance — a measure of the detail artists and designers employed in the execution of the plaque.

Kevin Walsh is the webmaster of the award-winning website Forgotten NY, and the author of the books Forgotten New York (HarperCollins, 2006) and also, with the Greater Astoria Historical Society, Forgotten Queens (Arcadia, 2013)

https://streeteasy.com/blog/brooklyn-bridge/



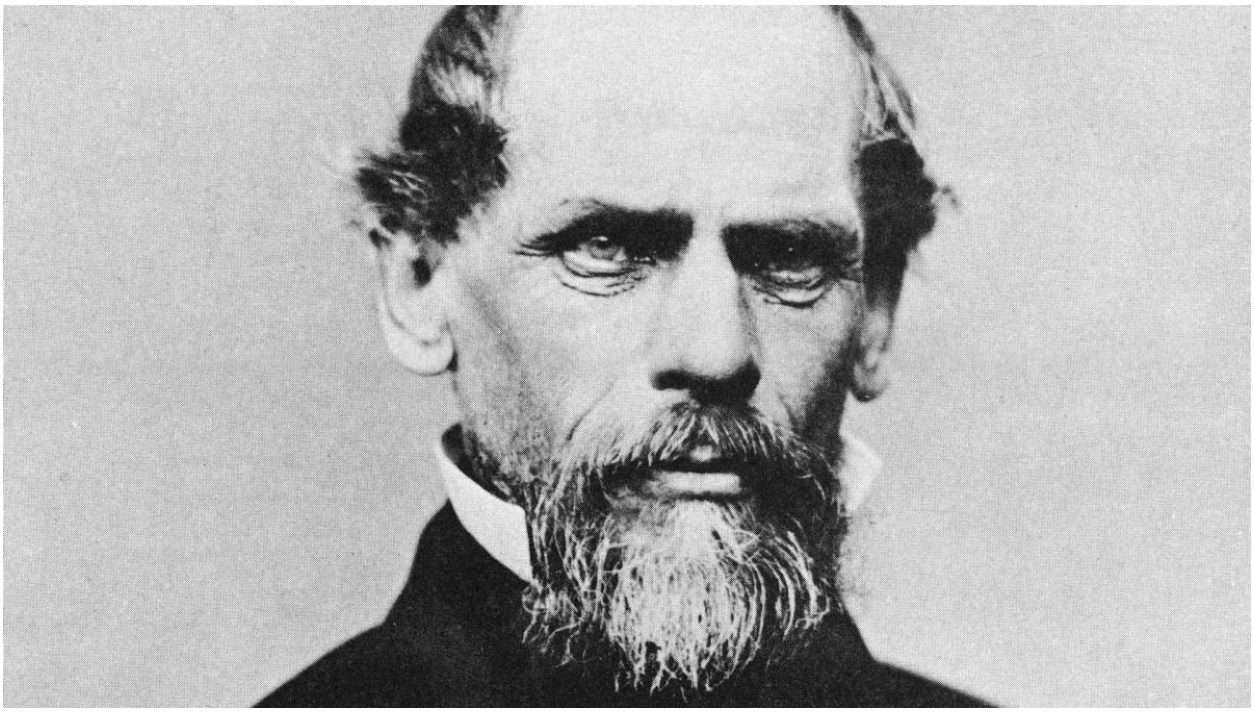
Fourteen tons of fireworks illuminated the New York night on May 24, 1883, to celebrate the completion of one of the greatest engineering feats of the Gilded Age—the Brooklyn Bridge. Billed as the "Eighth Wonder of the World," the longest suspension bridge ever built at the time spanned the East River to link the twin cities of New York and Brooklyn.

But, as that day's edition of the *Brooklyn Eagle* pronounced, "to every human undertaking there seems of necessity to be a dark side." In the case of the Brooklyn Bridge it was the lives lost during its 14-year construction.

As first assistant engineer C.C. Martin told the *Brooklyn Eagle*, "Had we thought so many would have been injured we would have kept a list, but we never imagined any one would be hurt, or that the bridge would have occupied so long a time in building,"

Efforts to tally how many were killed vary. In his book *The Great Bridge*, author David McCullough writes that the construction took the lives of 21 men, most of them immigrants. In his account to the *Brooklyn Eagle*, Martin detailed the accidental deaths of 27 workers, although master mechanic E.F. Farrington estimated the number could be as high as 40.

The Brooklyn Bridge’s First Fatalities



German born civil engineer and designer of the Brooklyn Bridge John A. Roebling, circa 1866.

Months before construction even began, the bridge project claimed its first victim—its visionary designer. On June 28, 1869, German-born civil engineer John A. Roebling was surveying the location of the bridge tower on a ferry slip along the Brooklyn waterfront when his right foot became caught on a rope and was crushed by a docking boat, resulting in the amputation of two toes. Less than a month after the freak accident, Roebling contracted tetanus and died, leaving his 32-year-old son Washington Roebling suddenly in charge of the mammoth project.

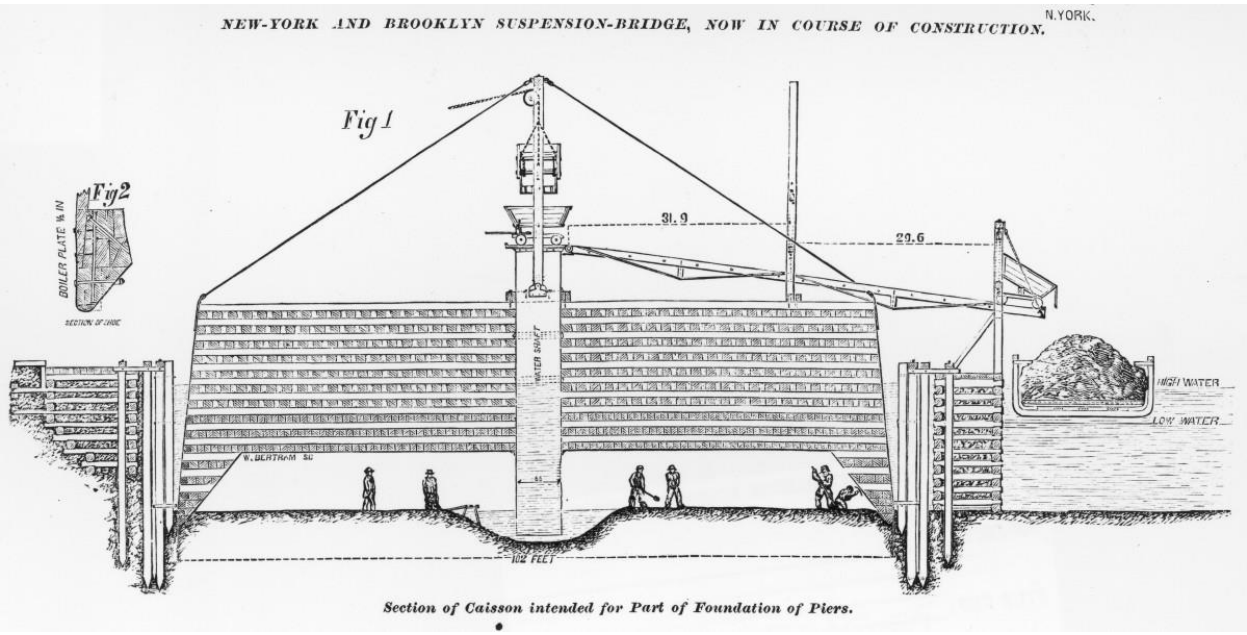
The first construction fatalities occurred on October 23, 1871, when a pair of derricks used to haul granite blocks to the top of the bridge tower on the Brooklyn side suddenly fell. A wooden boom sheared off the top half of rigger John French’s head, while a man named Dougherty was crushed by a derrick mast. John McGarrity died while attempting to leap to safety, and stonemason Thomas Douglas later succumbed to his injuries.

'The Bends’ Claims Three Lives

To construct foundations for the bridge towers, engineers sank a pair of watertight wood-and-steel chambers, called caissons, face down into the East River. Working with shovels and even dynamite to excavate the riverbed, so-called “sandhogs” toiled in stifling heat and at more than double the normal atmospheric pressure due to the compressed air pumped in to keep water out and allow workers to breathe.

The deeper the sandhogs burrowed, the more they began to experience strange muscular paralysis, slurred speech, vomiting, chills and excruciatingly sharp joint pains and stomach cramps upon ascending to the surface. Unbeknownst to the workers, the symptoms of this

"caisson disease," also known as "the bends," were due to bubbling nitrogen in their bloodstream caused by rapid decreases in atmospheric pressure when resurfacing too quickly.



A blueprint for construction of the Brooklyn Bridge detailing the section of caisson intended for part of the foundation of piers, circa February 1870.

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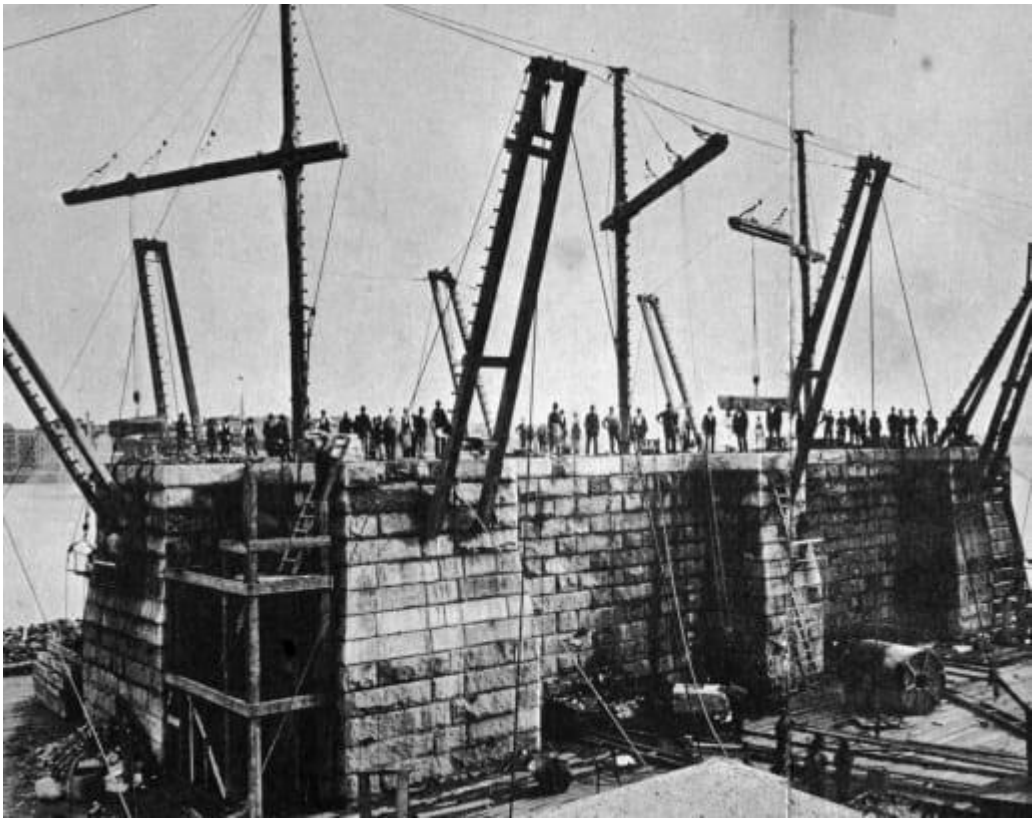
On April 22, 1872, German laborer John Myers became the first laborer to die from the bends after suffering abdominal pain and collapsing at home after his second day on the riverbed. Eight days later Irishman Patrick McKay died after resurfacing, and within a month Daniel Reardon, another Irishman, succumbed to the bends. After the deaths of these three sandhogs in quick succession, Washington Roebling suspended digging for the Manhattan tower and decided not to reach bedrock, fearing it could lead to 100 more fatalities.

Having spent untold hours below the surface monitoring the project, Roebling himself also suffered from the bends. As a result, he eventually became bedridden. Confined to his Brooklyn Heights bedroom with crippling pain, Roebling continued to supervise construction, watching with a telescope and conveying instructions through his wife, Emily.



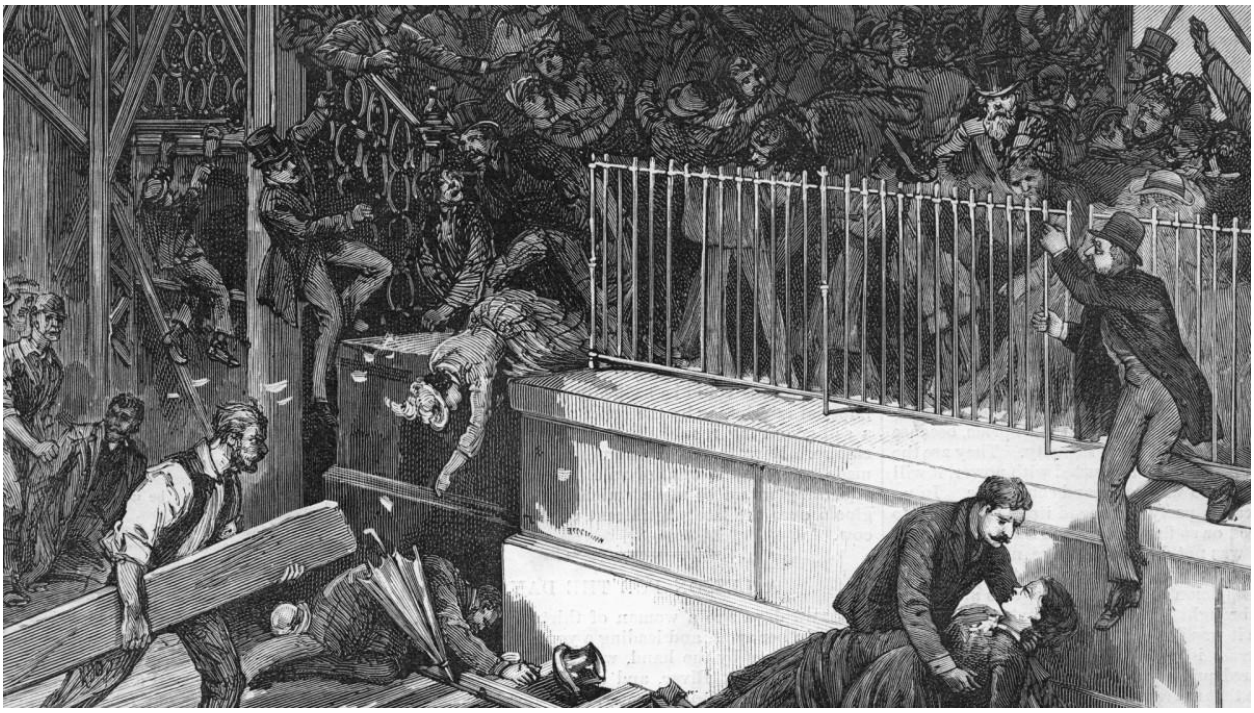
Multiple Men Fall to Their Deaths

Working at dizzying heights to construct the two bridge towers more than 275 feet above water, several laborers plummeted to their deaths while others were killed by falling stones and granite blocks. Irish-born mason Neil Mullen, a widower with five children, died three days before Christmas in 1877 when arches supporting the roadway on the Brooklyn anchorage gave way when temporary wooden supports were removed before mortar had properly set.

Months later, one of the strands from a bridge cable snapped from the Manhattan anchorage and struck Thomas Blake and Newfoundland native Harry Supple, causing them to fall to their deaths. One of the most gruesome casualties occurred in 1873 when German rigger Peter Cope had his leg caught in a rope that wound around a hoisting engine, crushing his limb and killing him almost instantly.

Stampede Kills Dozens After Bridge's Opening

Death continued to stalk the span even after its completion. Seven days after its grand unveiling, people thronged the bridge for a Memorial Day stroll on its elevated promenade. During the late afternoon, an estimated crowd of between 15,000 and 20,000 on the bridge caused foot traffic to logjam at a narrow staircase on the Manhattan side when a woman slipped down the stairs and screams pierced the air. Suddenly, hordes pressed against the pedestrians on the staircases from both sides like a vice.

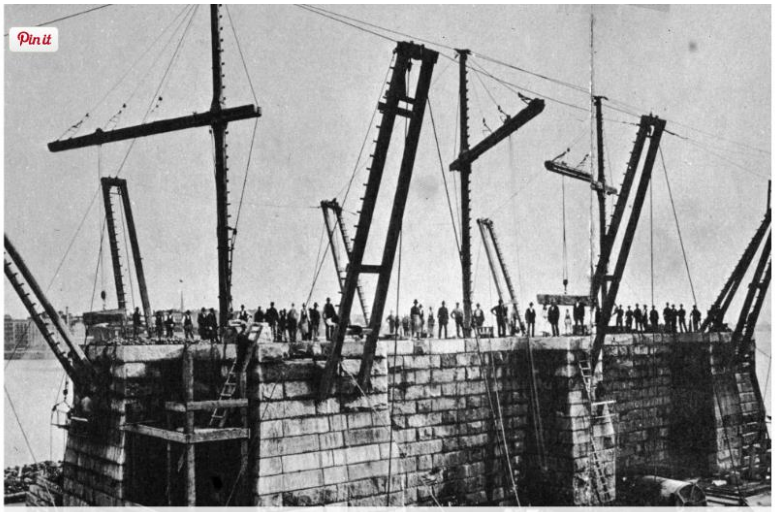


An illustration depicting a stampede that killed 12 people on the Brooklyn Bridge, featured in Harper's Weekly magazine on June 9, 1883.

According to eyewitness accounts, people were packed so tightly that blood gushed from their noses and ears. “Within a few minutes there were piles of crushed and bleeding pieces of humanity at the foot of each flight of stairs and the panic-stricken crowd was trampling them to death,” reported the *New York Tribune*. Twelve people died as a result of the May 31, 1883, stampede on the Brooklyn Bridge.

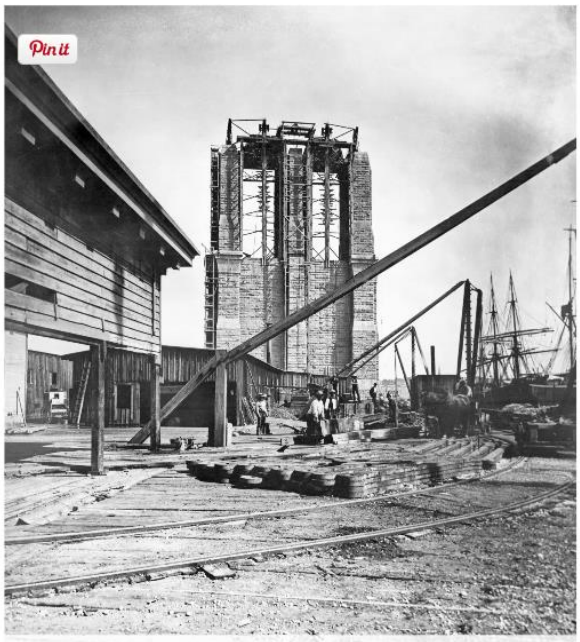
https://www.history.com/news/brooklyn-bridge-construction-deaths

PICTORIAL: CONSTRUCTION OF THE BROOKLYN BRIDGE



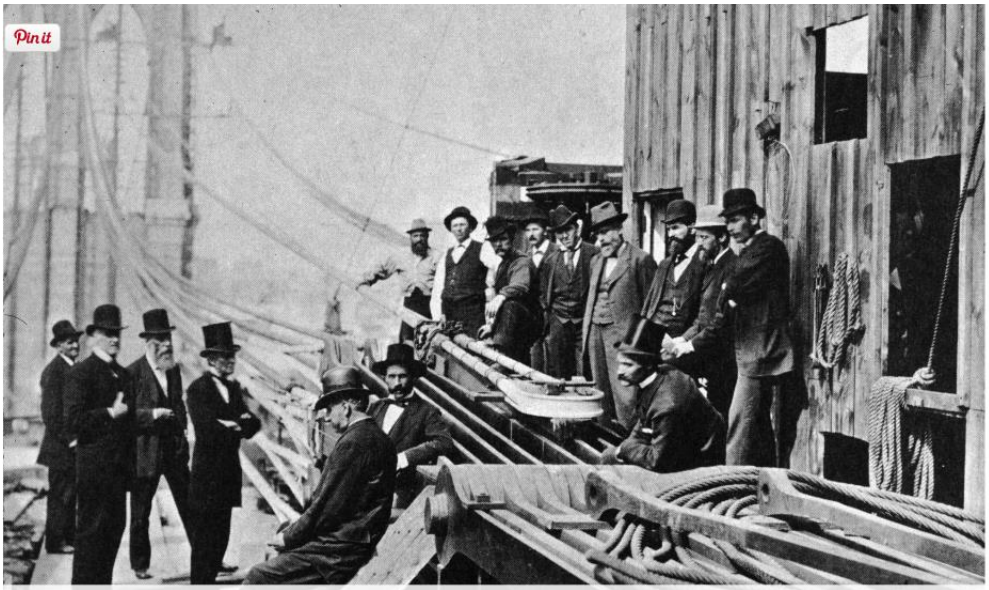
A crowd stands on the early foundations of the Brooklyn Bridge in New York on September 21, 1872. Billed as the "Eighth Wonder of the World," the bridge was designed to span the East River to link the twin cities of New York and Brooklyn.

Hulton Archive/Getty Images



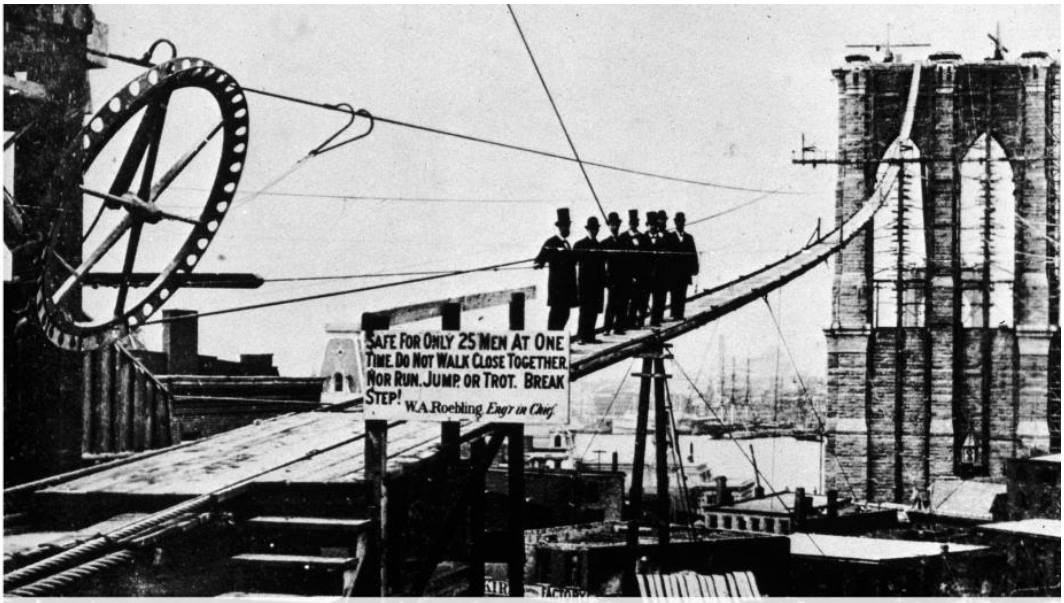
To construct foundations for the bridge towers, engineers sank a pair of watertight wood-and-steel chambers, called caissons, face down into the East River.

Bettmann Archive/Getty Images



A group of men on the tower of the unfinished Brooklyn Bridge, circa 1872. When it was built, the bridge was by far the longest suspension bridge in the world.
Museum of the City of New York/Talfor/Holmes/Pach/Getty Images

Cables are put in place on the Brooklyn Bridge during its construction, circa 1875. The bridge was designed with four main *cables*, which descend from the tops of the suspension towers and help support the deck.
Bettmann Archive/Getty Images



A group of men stood on a walkway where a sign reads, "Safe for only 25 men at one time. Do not walk close together nor run, jump or trot. Break step!" At least 20 people died during the bridge's construction.

Museum of the City of New York/Getty Images

A view of the bridge during construction with the suspended sides not yet connected, circa 1882.

Buyenlarge/Getty Images

Workmen cutting and tying tension cables, circa 1882. Each of the bridge's four main cables is made of 19 separate strands, each of which has 278 separate wires.
Bettmann Archive/Getty Images

Brooklyn Bridge under construction, circa 1883.
Photo12/Universal Images Group/Getty Images

The Brooklyn Bridge opened on May 24, 1883.
Men and women stroll across the Brooklyn Bridge promenade circa 1898. Seven days after its grand unveiling, people thronged the bridge for a Memorial Day stroll on its elevated promenade.

George P. Hall/Library of Congress/Corbis/VCG/Getty Images

Brooklyn Bridge viewed from the Manhattan Bridge, showing lower Manhattan, circa 924. The bridge is considered a brilliant feat of 19th-century engineering and has been designated as a National Historic Landmark by the U.S. National Park Service.

William J. Roege/The New York Historical Society/Getty Images

From the History Channel: https://www.history.com/

LISTVERSE

10 Fascinating Stories From The History Of The Brooklyn Bridge

NOLAN MOORE

It's one of New York City's most iconic structures, right up there with the Empire State Building and the Statue of Liberty. Spanning 483 meters (1,595 ft) across the East River and 1,814 meters (5,989 ft) in total, the Brooklyn Bridge is a testament to 19th-century engineering.

Even today, those gigantic pillars, 84 meters (276 ft) tall above the water, are an impressive sight. And if those arches don't knock your socks off, check out that 26-meter (85 ft) deck suspended by a latticework of crisscrossed steel wires, all hanging from four cables about 38 centimeters (15 in) thick, each made up of 5,434 individual wires. It's a bridge strong enough to hold 145,000 vehicles each day.

But the Brooklyn Bridge is more than just an amazing architectural achievement. It's a piece of US history. Once the longest suspension bridge in this world, and repeatedly sold by con men to the gullible, this American monument is full of stories, some inspiring, some tragic, and some downright insane.

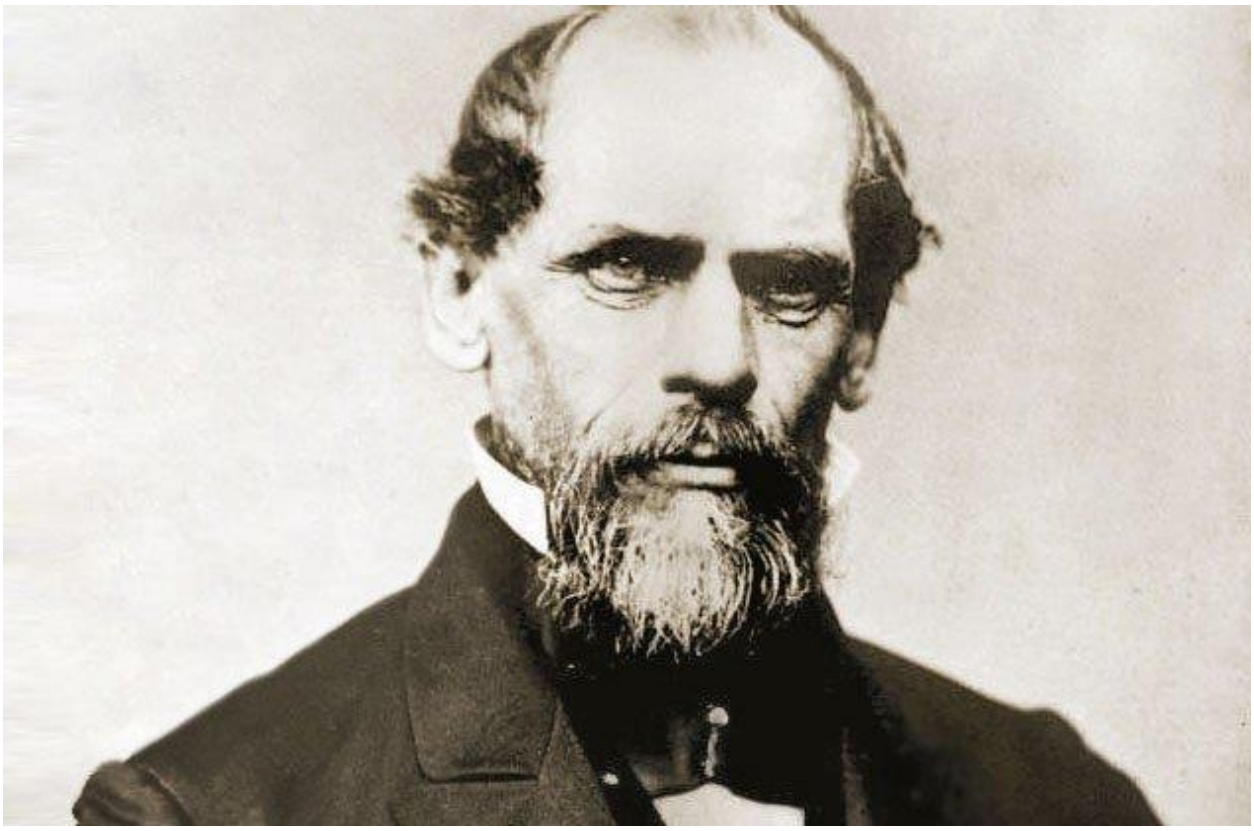
10. The Winter Of 1867

New York City was a vastly New York City was a vastly different place in 1867. There was no Chrysler Building, no Yankee Stadium, no NakedCowboy, and—most importantly—no five boroughs. Up until 1868, Brooklyn, Queens, and Staten Island were their own little cities, totally

separate from the Big Apple. Quite a few people living in those towns still worked on Manhattan Island, and that sometimes posed a problem for Brooklynites.

If you want to get from Brooklyn to Manhattan, you have to cross the East River. Back in 1867, there wasn't a bridge, so folks sailed across on ferries. That was all well and good so long as the boats were running, but every so often, Old Man Winter reared his ugly head and froze the East River solid. The water turned to ice at least five times between 1813 and 1857, and the freeze of '67 was the last straw. Ships got stuck in the ice, and people seriously had to skate their way to work. It was pretty obvious to everybody—especially those who couldn't skate—that somebody needed to build a bridge and fast.

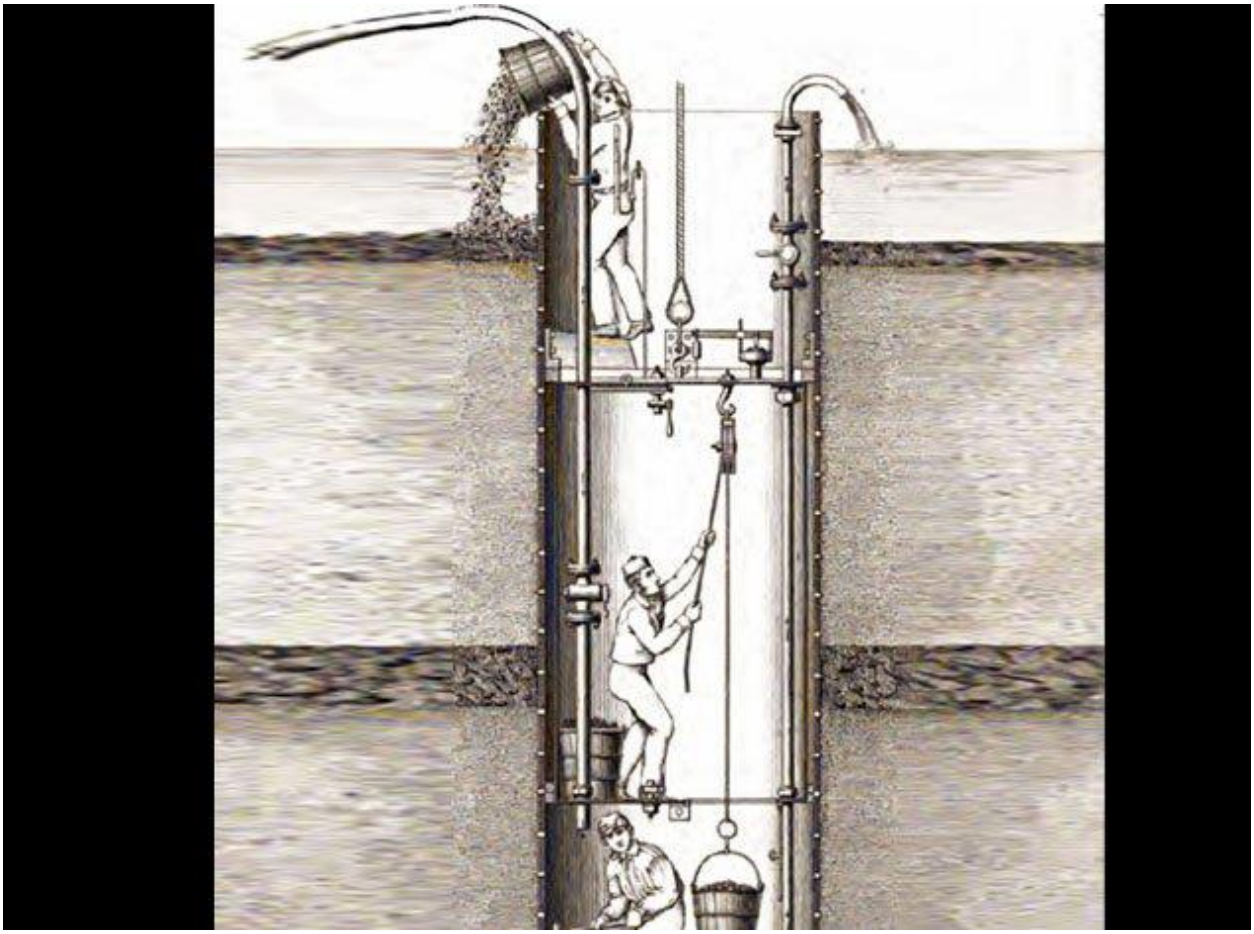
9. Corruption And A Crushed Foot



German-born engineer John Roebling was already dreaming up plans for a bridge before the winter of '67. Since the East River was so rough and constantly full of ships, Roebling wanted to build a suspension bridge. Water and boats could easily pass underneath a bridge hanging from four powerful cables. A few palms needed to be greased before construction could begin, but after New York State Senator Henry C. Murphy paid off corrupt politician William "Boss" Tweed, Roebling got busy drawing up blueprints and picking his crew.

Only Roebling never finished the Brooklyn Bridge. In fact, he never even really got started. One day in 1869, he was taking compass readings when he accidentally stuck his foot between a docking ferry and a waterfront piling. The ship slammed into his foot, crushing bones and forcing doctors to amputate his toes. The operation did little good, and just a few days later, John Augustus Roebling slipped into a coma and died of tetanus. The job of building the Brooklyn Bridge fell to his son, Washington Roebling.

8. Caissons And The Bends



Just like his old man, Washington Roebling was a master of construction. During the Civil War, he'd built bridges for the Union Army and later helped his dad with the Cincinnati–Covington Bridge. He was up to the task in Brooklyn, which was good news because things were about to get difficult.

The first phase involved setting up the two towers, which had to sit on solid bedrock. Somehow, workers needed to get under the water so they could cut through all that soft mud and lay a granite base. The solution wasn't fun. Roebling decided his crews would work inside of caissons, giant wooden boxes forced underwater by granite blocks. Pressurized oxygen was constantly pumped inside so workers, nicknamed "sandhogs," could breathe while they dug and blasted away at the riverbed.

As you might assume, this was all extremely dangerous. The caissons were full of compressed air, and the sandhogs were working with dynamite and gas lanterns. It was a recipe for disaster, and fires broke out on several occasions. On top of all that, it was stiflingly hot, and the workers were prone to headaches and nosebleeds. These sandhogs were definitely earning their two dollars a day.

But while fire was a hazard, the main danger was a mysterious illness dubbed "caisson disease." It struck without warning, crippling workers with intense joint pain, wild convulsions,

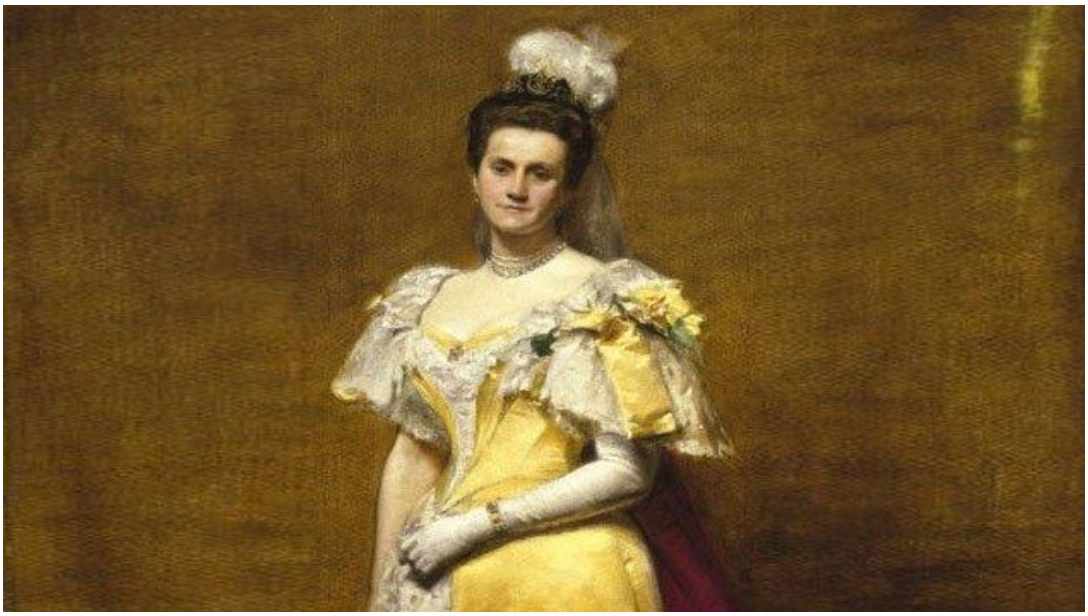
and gut-wrenching nausea. Even scarier, sandhogs sometimes found themselves paralyzed. Caisson disease hit over 100 men, claiming several lives and leaving many hopeless invalids.

Things were especially bad in the Manhattan-side tower. While the one near Brooklyn hit bedrock at 13 meters (44 ft), the earth beneath the Manhattan tower kept giving way. So when diggers reached 24 meters (78 ft), Roebling decided it wasn't worth risking any more lives or money. He called the workers up, hoping the sand was strong enough to support the tower. Fortunately, he was right.

Those caisson workers spent all day working in compressed air. When their shift was over, they rode up to the surface in airlocks so fast that their had no time to adjust. The sudden decrease in pressure caused nitrogen bubbles to dissolve in their tissue and bloodstream, wracking their bodies with violent pain. Today, we know this condition as the bends or decompression sickness.

One of the victims of caisson disease was Washington Roebling himself. The man in charge of the Brooklyn Bridge suffered two debilitating attacks and was left partially paralyzed. Suddenly, the sandhogs needed a new boss.

7. The Woman Who Saved The Brooklyn Bridge



It's almost like the Brooklyn Bridge had a grudge against the Roeblings. Both John and Washington wanted to build it, and both wound up dead or injured. Paralyzed as well as partly blind, deaf, and mute, Washington could only watch the bridge's construction from his bedroom window using a pair of binoculars. But his mind was still fresh, and his crew needed instructions. How could he get his know-how down to the sandhogs?

That's where Emily Warren Roebling came in. The two had met at a military dance and married in 1865, and right off the bat, she was plunged into the world of construction. Already planning the Brooklyn Bridge, her father-in-law sent Washington around the world to learn about caissons. Emily went along and got quite an education in bridge-building. And when John died and Washington became the new boss, she taught herself everything relevant there was to

know about engineering. More than anything, she wanted to help her husband with his new job. Soon, she got more than she'd bargained for.

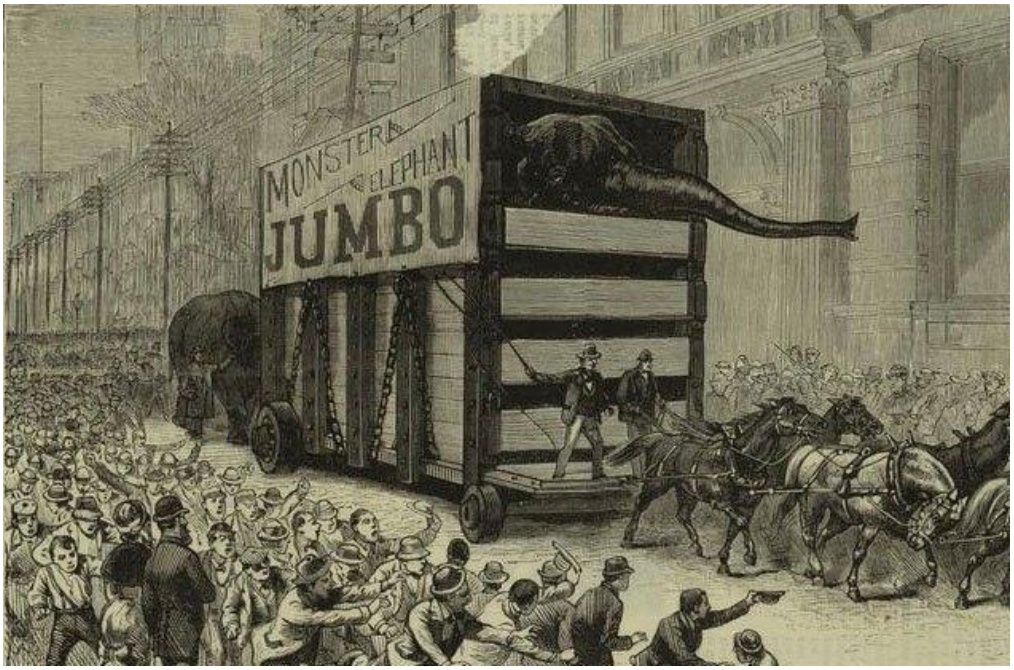
With John sick in bed, Emily became his messenger girl. She regularly visited the construction sites, giving the men John's instructions and carrying questions back to her indisposed husband. However, as time went on, Emily's role started to change. Soon, workers viewed her as the new boss, and as her knowledge and confidence increased, she effectively became the chief engineer, representing the Roeblings and the bridge to the world. She met with officials, held discussion with engineers, and coached the sandhogs.

And she wasn't someone you wanted to mess with. When the American Society of Civil Engineers thought about replacing John, she became the first woman to address the group, delivering an impassioned speech in defense of her husband. The committee was awed and decided to keep John—and thus Emily—on the job.

The Brooklyn Bridge took 14 years to build. For 11 of those years, Emily was the one in charge. When it finally opened on May 24, 1883, she was one of the first people to cross the bridge, riding along with President Chester A. Arthur. New York Congressman Abram S. Hewitt told the delighted crowd that Emily Roebling deserved just as much credit as John, who was watching the whole affair from his bedroom window.

Emily led quite a life before her death in 1903. She met Queen Victoria, attended the coronation of Tsar Nicholas II, helped out relief efforts during the Spanish–American War, and even earned a law degree from New York University. And she did all that while taking care of two kids.

6. Elephants On The Bridge



By the time the bridge was completed, it had cost approximately $15 million and had claimed the lives of 27 men. In addition to caisson disease, some unlucky sandhogs were crushed under falling equipment. At least one worker was hurled to his death when a cable broke loose and knocked him off his feet.

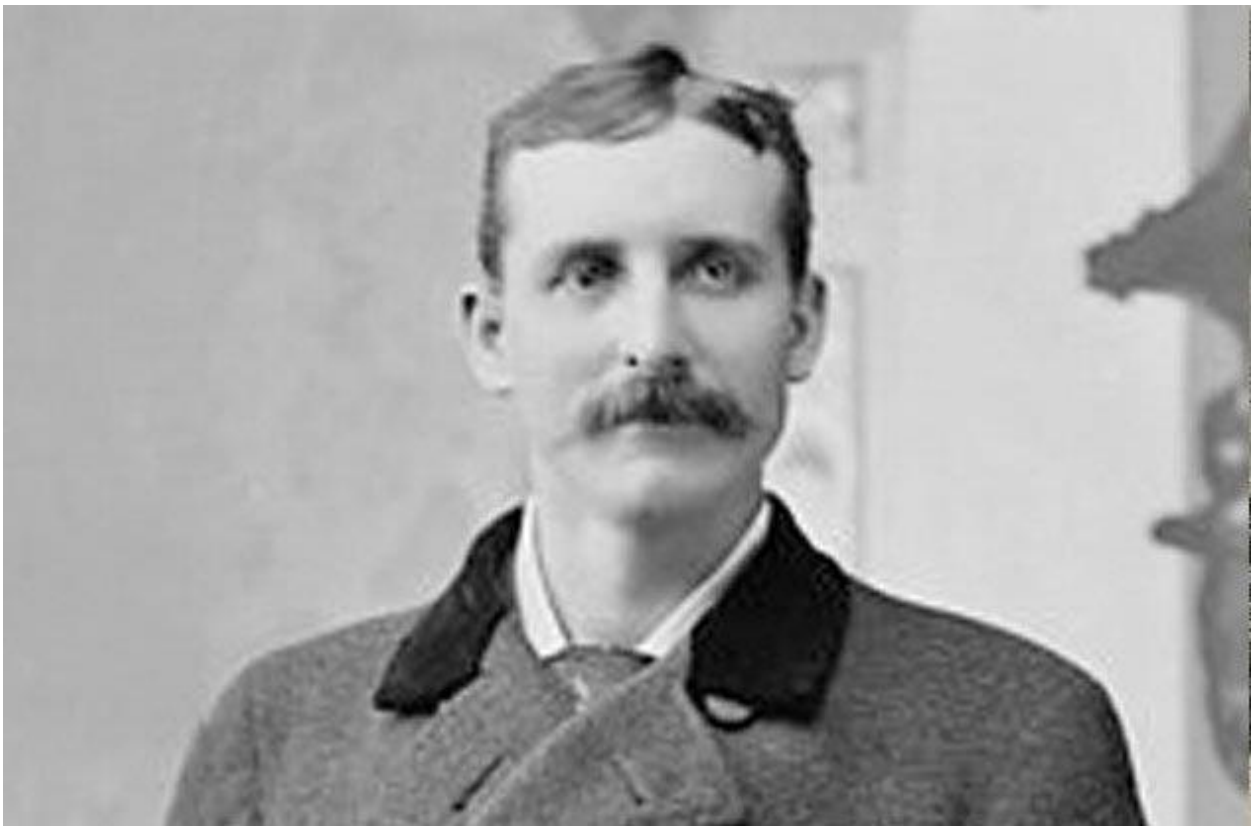
The deaths didn't stop when construction finished. On May 30, just a few days after the grand opening, tragedy struck again.

Everyone was still a bit nervous about crossing the bridge. Sure, it was a wonder of modern engineering, but the thing was just hanging over a river while covered with people, horses, and carriages. So when a woman accidentally tripped, someone panicked and shouted, "The bridge is collapsing!" In the ensuing chaos to get off the bridge, 12 people were crushed to death, and 36 were injured.

Hoping to calm everyone down, city officials turned to one of the country's most famous men: P.T. Barnum. Head of the Barnum & Bailey Circus, P.T. owned one the most iconic animals on the planet, Jumbo the elephant. Barnum proudly declared Jumbo was "the largest known animal in creation," and city officials wanted Barnum to lead the mighty beast across the Brooklyn Bridge. Always on the lookout for free publicity, Barnum jumped at the chance.

On May 17, 1884, he led a massive parade from Brooklyn to Manhattan. Twenty-one elephants led the way, followed by 17 camels. Bringing up the rear was Jumbo himself, 3.5 meters (12 ft) tall and packing 5.5 metric tons (6 tons) of African power. Ten thousand people showed up to watch this massive creature lumber on by, and after witnessing such a spectacle, everyone was finally convinced the Brooklyn Bridge was safe.

5. The First Man To Jump Off The Brooklyn Bridge



In 2013, the tabloids exploded with rage when a woman took a selfie in front of the Brooklyn Bridge—with a jumper in the background. Of course, he was hardly the first to try and end it all by throwing himself into the East River, but not everyone who takes a dive is trying to commit

suicide. In 1993, a French daredevil named Thierry Devaux hooked himself up to a bungee cord and successfully jumped off the bridge eight times.

Interestingly, Devaux wasn't too different from the very first man who leapt off the bridge. Like the Frenchman, Professor Robert Emmet Odlum wasn't trying to kill himself. In fact, his goal was quite the opposite. By jumping off the bridge, Odlum was actually trying to save lives.

Odlum loved two things: teaching about safety and performing dangerous stunts. One of his biggest concerns was convincing people to jump out of buildings. When buildings caught fire, everybody on the top floor had to leap onto a safety net but many feared this, strangely believing they'd suffocate to death on the way down. Odlum, wanting to disprove this theory, jumped off several bridges to prove his point. And when the Roeblings finished the Brooklyn Bridge, he knew he had to take that plunge into the East River.

Cops weren't crazy about the plan, and on May 19, 1885, the day of Odlum's dive, they came out in force. So did the city: Thousands of citizens showed up to watch, and vigilant officers checked every wagon that rolled across the bridge, hunting for the would-be jumper. Odlum had anticipated this and sent a stooge across the bridge to draw the cops' attention. While they were busy interrogating the decoy, the real Odlum hurried to the railing, raised one of his hands above his head to act as a rudder, and made his dramatic dive.

It did not go according to plan. About 30 meters (100 ft) above the water, Odlum accidentally turned, so he hit the river side-first. The force knocked him unconscious, and a friend was forced to swim to his rescue. After he was hauled onto a nearby boat, Odlum woke up and asked if he'd done well. Those were his last words.

The man immediately started spitting blood. By the time an ambulance arrived, Odlum had died, his ribs broken and his kidney, liver, and spleen all ruptured. Yet he had proven his point. It's not the fall that kills you—it's the landing.

4. The Cold War Bunker

The 1950s. The Cold War is raging, the Space Race is escalating, and the superpowers are testing nuclear weapons. Across the country, nervous Americans are building shelters in case the Ruskies launch a sneak attack. Even New Yorkers are getting in on the act, ducking and covering and keeping an eye out for the Red Menace. In fact,

during the Korean War, floodlights and barbed wire were stretched across the city's bridges to keep fifth columnists at bay.

Jump ahead to 2006, and the Soviet Union has collapsed. Nobody got nuked, and most New Yorkers have stopped thinking about the Cold War, until a group of workers inspecting the Brooklyn Bridge make a fascinating discovery. Hidden inside one of the structures on the Manhattan entrance ramp is a room full of boxes and barrels. Upon closer inspection, the workers find that a lot of the boxes are marked "For Use Only After Enemy Attack." They'd stumbled into a Cold War bunker.

The bunker was full of supplies that you'd need to survive the nuclear holocaust. Workers found boxes of medicine, a bunch of blankets, empty metal drums for holding water or serving as toilets, and approximately 352,000 crackers. Almost everything dated back to either 1957 or 1962, the years of Sputnik and the Cuban Missile Crisis, respectively.

Paranoia ran pretty high back then, but these supplies probably wouldn't have done any good. In 1959, the government determined that if the Soviets dropped two hydrogen bombs on the city, about 6.1 million people would turn into toast. Chances are good the Bridge would, too.

3. The Abandoned Champagne Cellars

The Cold War–era bunker isn't the only secret hidden inside the Brooklyn Bridge. On both sides, hidden under ramps leading to the anchorages, are enormous stone caverns, some reaching 17 meters (55 ft) high. Today, they store maintenance supplies, and from time to time, the occasional vagrant wanders inside and sets up camp. But back when the bridge first opened, these mysterious vaults were lined with rows and rows of champagne bottles.

Hoping to recoup some of the cash they'd sunk into the bridge's construction, city officials rented these vaults out to wine merchants who needed a place to stash their champagne. The Brooklyn Bridge cellars were the perfect spot for keeping drinks nice and cool, especially as temperature usually stayed around 15 degrees Celsius (60 °F). During Prohibition, the rooms stored newsprint and tools, but as soon as Congress passed the 21st Amendment, the cellars went back in business holding countless bottles.

The cellars hosted some singing parties to go with the endless bottles of bubbly. Guests gathered inside to sip champagne, while bands played music to entertain the revelers. The walls were covered in catchy sayings, some in French, German, and Italian. But others were in English, like the clever motto that reads, "Who loveth not wine, women, and song, he remaineth a fool his whole life long." And each cellar had its own nickname and persona. For example, one was dubbed the "Blue Grotto," thanks to a statue of the Madonna who watched partygoers drink and dance.

2. The Brooklyn Bridge Shooting

In 2003, a rather incompetent terrorist named Iyman Faris cooked up a crazy scheme to take out the Brooklyn Bridge. This Al-Qaeda Einstein planned on using a blowtorch to cut through every cable holding up the bridge. His plot didn't exactly pan out. Unfortunately, another terrorist with his eyes on the bridge was much more successful.

A 28-year-old Lebanese native, Rashid Baz was an angry young man who considered himself an "Arab soldier" and kept a cache of weapons in his New York apartment. The guns weren't for self-defense. After a Brooklyn-born doctor named Baruch Goldstein gunned down 29 Muslims in the West Bank, Baz armed himself to the teeth and went cruising for revenge.

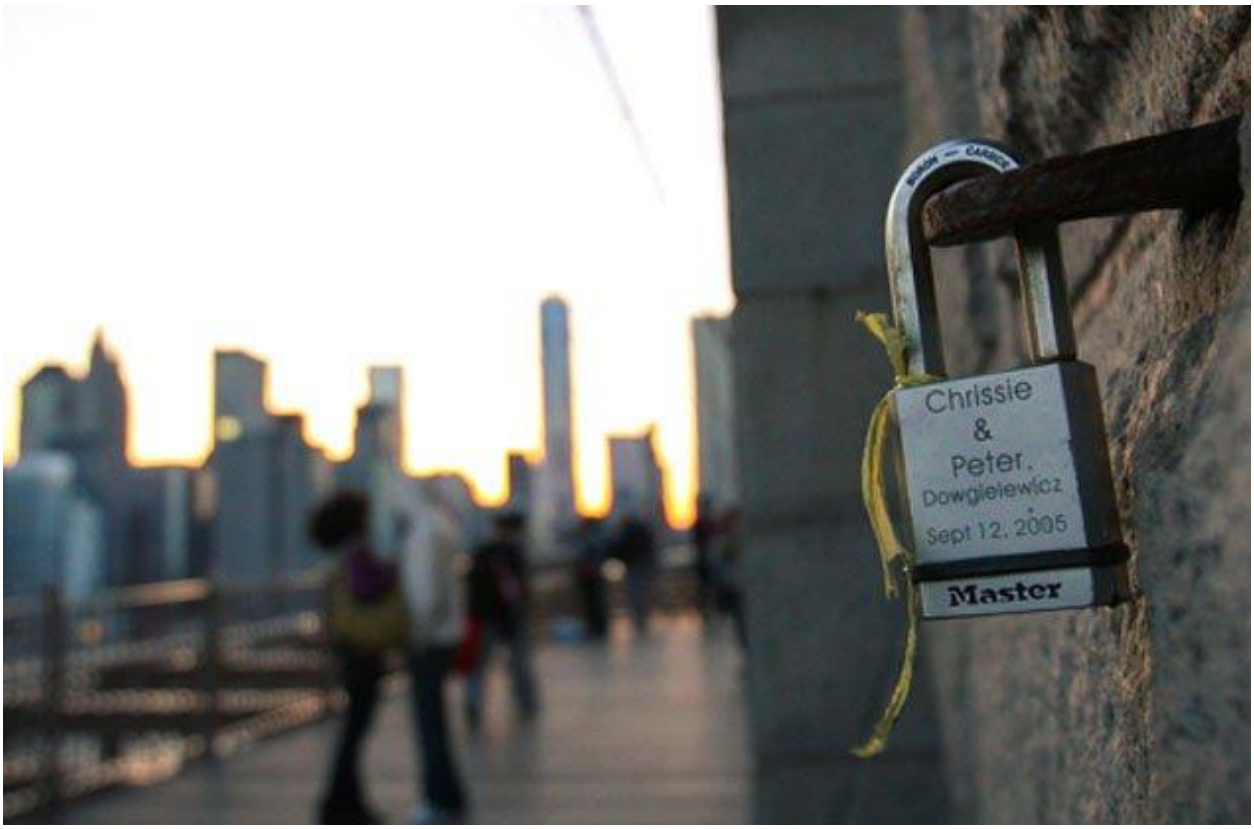
On March 1, 1994, a van full of Hasidic teenagers was crossing over the Brooklyn Bridge when Baz's Chevy Caprice pulled up behind them. He opened fire with a submachine gun, spraying bullets into the rear window and driver's side of the van. When his weapon jammed, he pulled out his pistol, shooting until it, too, malfunctioned. Baz wounded three students and murdered a 16-year-old.

After his rampage, Baz and two associates tried to cover up the crime, tossing empty shells and repairing the car's shattered window. But it was only a matter of time before the cops closed in, and soon Baz found himself in court. After first claiming the whole thing was due to road rage, he pleaded insanity, saying his childhood in war-torn Lebanon gave him a flashback on the bridge. The jury didn't buy his story and sentenced the Brooklyn Bridge murderer to 141 years behind bars.

1.The Brooklyn Bridge Love Locks

Plenty of people associate the Big Apple with romance, and the Brooklyn Bridge is a rather dreamy destination for young couples. Quite a few twitterpated partners have hung padlocks onto the bridge to represent their eternal love.

The locks come in all shapes and sizes, but they all share one similarity. Every padlock bears the name of the couple who locked it onto the bridge. Some lovers write their name with plain old Sharpies while others go to the trouble of blasting their names on with a laser. After the lock



snaps shut, the lovers toss the key into the East River, symbolizing their timeless romance. Well, “timeless” until a city employee comes along and hacks the lock off with a pair of bolt cutters.

City officials aren’t keen on the concept. The bridge is a national landmark, so people aren’t allowed to alter it in any way. Plus, the locks could damage the bridge, as it did the similarly decorated Pont de Arts Bridge in Paris. So, two or three times each month, crews haul off buckets of locks. As of March 2014, they’d cleared away nearly 5,600 of them in less than a year. Let’s hope all those lovers are nevertheless still together.

https://listverse.com/2014/08/01/10-fascinating-stories-from-the-history-of-the-brooklyn-bridge/

15 Fascinating Facts About the Brooklyn Bridge

BY M. ARBEITER/MAY 24, 2018

Don't agree to buy it, but you can never know too much about the most famous way to get across the East River—which officially opened 135 years ago, on May 24, 1883.

1. THE BROOKLYN BRIDGE NEEDED A LITTLE BRIBERY TO GET STARTED.

In its initial conception, the Brooklyn Bridge had an honorable goal: Providing safe passage across the rough and frigid East River for Brooklyn residents who worked in Manhattan. In the 1850s, Prussian-born engineer John Augustus Roebling dreamed of a suspension bridge that would make the commute easier for these working class New Yorkers.

However, the methods employed to get the project rolling weren't quite as honorable. After Roebling was hired by the New York Bridge Company to help span the river, infamous political

kingpin William “Boss” Tweed funneled $65,000 in bribes to city aldermen to secure funding for the bridge.

2. THE BRIDGE HAS GONE BY SEVERAL NAMES.

“Brooklyn Bridge” seems like a natural handle for the hybrid suspension and cable-stayed bridge connecting lower Manhattan to its neighbor across the East River, but the name evolved over time. The *Brooklyn Daily Eagle* first referred to the project as the “Brooklyn Bridge” in 1867, but in its early days it was still referred to as the “Great East River Bridge” as well as the “Great East River Suspension Bridge." At its 1883 dedication, it took on the clunky official name the “New York and Brooklyn Bridge.” (Brooklyn wouldn’t become a part of New York City until 1898.) Brooklyn civic pride led to the name officially changing to the “Brooklyn Bridge” in 1915.

3. ROEBLING PAID A HIGH PRICE FOR THE BRIDGE.

The Brooklyn Bridge was Roebling’s brainchild, but he wouldn’t live to see its completion. While making measurements for the future bridge in 1869, a ferry crushed Roebling’s foot. The engineer developed tetanus as a result of these wounds and passed away in July 1869.

4. ROEBLING'S SON TOOK HIS PLACE AND HAD EQUALLY BAD LUCK.

After Roebling's death, his son Washington Augustus Roebling stepped in as the bridge project's chief engineer. The younger Roebling soon developed a problem of his own. To build the structure's massive foundation, workers labored in caissons, sealed chambers that kept the riverbed dry and allowed for digging. Breathing and working deep in the caissons required compressed air, which meant workers who came up from the depths were vulnerable to "caisson disease," better known today as the bends. In 1872, Roebling came down with this decompression sickness and was confined to bed.

5. THE PROJECT BECAME AN EARLY FEMINIST VICTORY.

After Washington Roebling fell ill, a third Roebling stepped in as the de facto chief engineer of the bridge, his wife, Emily Warren Roebling. Although Emily began her tenure running orders between her husband, who was laid up in a Brooklyn Heights apartment with a view of construction, and his workers, she soon took bona fide command of the project, overseeing the design, construction, and business management of the tremendous undertaking. Emily Warren Roebling is now widely recognized as a pioneering female engineer

and a driving force behind the bridge. Following her work on the bridge, Emily went on to earn a degree in law from New York University and published essays in favor of gender equality.

6. A ROOSTER MADE THE FIRST TRIP ACROSS THE BRIDGE.

Technically, the rooster was tied for first. Emily Warren Roebling earned the honor of being the first human to make the trip across the historic bridge, riding proudly in a carriage a week before its official opening in front of an audience that included President Chester A. Arthur. Sitting in Emily's lap all the while was a rooster, a symbol of good luck.

7. THE BROOKLYN BRIDGE WAS THE WORLD'S FIRST STEEL-WIRE SUSPENSION BRIDGE.

John Augustus Roebling himself is credited with introducing the steel-wire innovation into bridge design. The engineer proudly referred to steel as "the metal of the future."

8. A SNEAKY CONTRACTOR INTRODUCED LOW-QUALITY WIRE INTO THE MIX.

Construction materials were accumulated under the watch of John Augustus R oebling, who failed to notice that he had been swindled on his cable wire. Contractor J. Lloyd Haigh snuck a substantial amount of inferior, even faulty, wire into the mix. The flaw went unrecognized until after the wires were incorporated into the standing bridge, at which point replacing them was impossible. Instead, the construction team doubled down on its security measures, introducing far more wire than calculations deemed necessary while working desperately to keep the discovery from reaching the public. For his part, Haigh escaped prosecution for this crime, but was arrested and convicted for forgery in an unrelated case.

9. THE BRIDGE WAS THE SITE OF A STAMPEDE SOON AFTER OPENING.

The Brooklyn Bridge opened to the public on May 24, 1883 and enjoyed a fairly harmonious first five days in operation. On May 30, however, disaster struck when either a woman tripping or a rumor of a pending collapse sparked a panic among the massive crowd of pedestrians crossing the bridge. The mob's frantic race to escape the bridge resulted in the deaths of 12 people and serious injuries to 36 more.

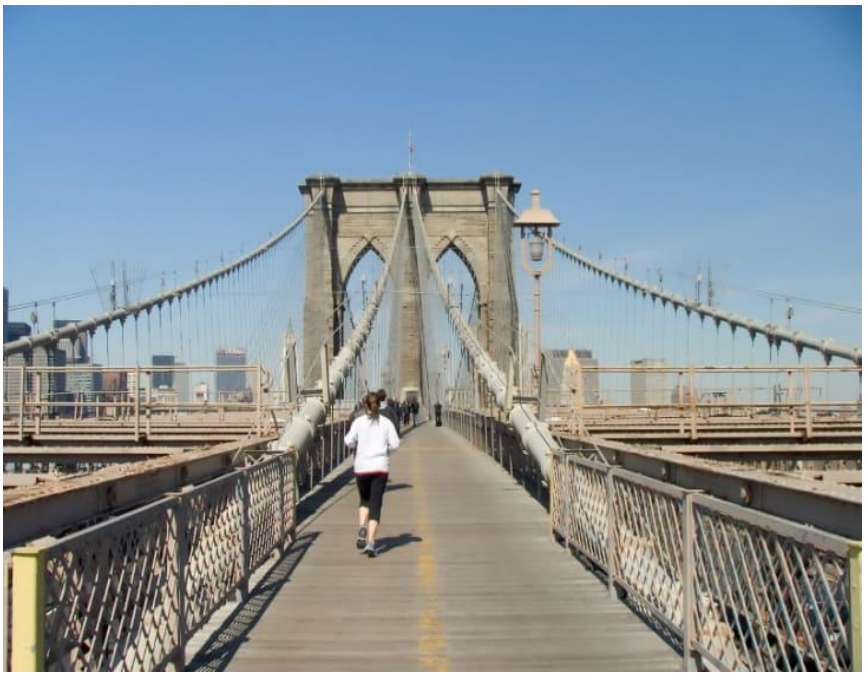
10. TWENTY-ONE ELEPHANTS WALKED ACROSS THE BROOKLYN BRIDGE IN 1884.

How do you convince one of America's busiest cities that its newest bridge can offer safe transport to its many commuters? Elephants. Since the most common haven for trained elephants in the 1880s was a circus tent, the city called upon entrepreneurial showman P.T. Barnum to march 21 elephants across the Brooklyn Bridge in May of 1884 to show just how sturdy the span was.

11. COMPARTMENTS IN THE BRIDGE WERE USED FOR STORING WINE.

If you think a nice glass of wine would be the perfect companion for a moonlit stroll across a river, this is the bridge for you. Engineers built sizeable vaults that were up to 50 feet tall into the bridge beneath its anchorages. Thanks to their cool temperatures, these granite-walled storage spaces made the perfect wine cellars, and they were rented out to the public until World War I. The company A. Smith & Co. Productions forked over $500 a month as rent for the Brooklyn-side vaults, while the liquor distributor Luyties Brothers paid a pretty $5000 for the prime real estate beneath the Manhattan anchorage.

12. ANOTHER COMPARTMENT WAS TURNED INTO A FALLOUT SHELTER.



At some point during the Cold War, one of the bridge's compartments transformed into a survival shelter stocked with food and water rations and medical supplies. After fading into obscurity after the close of the Cold War, this fallout shelter was rediscovered in 2006 during a routine structural inspection of the bridge.

13. NOBODY CAN FIGURE OUT EXACTLY WHAT COLOR THE BRIDGE WAS.

Upon the announcement of a plan to repaint the Brooklyn Bridge in 2010, controversy erupted over the landmark's original color. Some historians insisted that the young suspension bridge wore a proud buff color, renamed "Brooklyn Bridge Tan" for the modern makeover. (The option of "Queensborough Tan" drew groans.) On the other side of the battle, old documents and hand-colored lithographs supported the argument that the icon's original color was "Rawlins Red," a hue derived from the iron-oxide from the eponymous mountain town of southern Wyoming. In the end, Brooklyn Bridge Tan won out.

14. THE BROOKLYN BRIDGE STANDS WHERE GEORGE WASHINGTON SLEPT.

The Manhattan anchorage of the Brooklyn Bridge features a bronze plaque commemorating the land below as the former location of the country's first presidential mansion. Known alternatively as the Samuel Osgood House and the Walter Franklin House, the Lower Manhattan mansion served as the home of George Washington during his first ten months as America's Commander-in-Chief. The residence stood at the intersection of Cherry Street and Pearl Street for 85 years before its demolition in 1856.

15. THE BROOKLYN BRIDGE WAS THE LONGEST IN THE WORLD FOR 20 YEARS.

Just two years before starting work on his New York project, John Augustus Roebling made a bit of suspension bridge history with the humbly named John A. Roebling Suspension Bridge, which spanned 1057 feet over the Ohio River between Covington, Ky. and Cincinnati. Roebling put that endeavor to shame with the Brooklyn Bridge, which bested its predecessor's principal span by about 50 percent. Boasting a main span of 1595 feet and a total measurement of 5,989 feet, the Brooklyn Bridge held the superlative of longest suspension bridge in the world for two decades. When it finally lost the title in 1903, its successor was none other than its fellow East River crossing the Williamsburg Bridge. The latter's main span bested the Brooklyn Bridge's by only four and a half feet, though its total length reached 7308 feet.

https://www.mentalfloss.com/article/624999/mask-bundles-on-sale?utm_source=infinitescroll

The New York Times

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May 24, 1883 | Brooklyn Bridge Opens

BY THE LEARNING NETWORK/ *MAY 24, 2012 4:01 AM/May 24, 2012 4:01 am*

Strohmeyer & Wyman/Library of Congress Pedestrians walk across the Brooklyn Bridge's promenade in 1899, 16 years after the bridge opened.

On May 24, 1883, the Brooklyn Bridge, linking Brooklyn with Manhattan, was opened to traffic with a celebration attended by President Chester A. Arthur, Gov. Grover Cleveland of New York, and Emily Roebling, the wife of the bridge's main engineer, Washington Roebling.

The May 25 New York Times reported, "The pleasant weather brought visitors by the thousands from all around. ... It is estimated that over 50,000 people came in by the railroads alone, and swarms by the sound boats and by the ferry-boats helped to swell the crowds in both cities. ... The opening of the bridge was decidedly Brooklyn's celebration. New York's participation in it was meager, save as to the crowd which thronged her streets."

The bridge took 13 years to construct at a cost of $15 million. German immigrant John A. Roebling drafted original plans for the bridge, but he died in an accident a year before construction began. His son, Washington, took over the project and worked alongside laborers in underwater chambers known as caissons. He, like many of the workers, became ill with "caissons disease," a disease now known as decompression sickness or "the bends," which occurs when one returns to the surface after spending time underwater. The disease forced Roebling to take leave from the project in 1872 and oversee the remainder of the construction from his home, with his wife serving as a liaison between him and the construction crew.

When it opened, the Brooklyn Bridge, also referred to as the Great East River Bridge, was the largest suspension bridge in the world, with a span of 1,595 feet. It had two carriageways and two railway lines, with a raised middle platform for pedestrians, who could cross the bridge for the price of one cent. It was the first land connection between New York and Brooklyn, which previously was linked only by ferry or boat.

Six days after the bridge's opening, a stampede caused at least 12 people to die when thousands of pedestrians became panicked. A year later, circus promoter P.T. Barnum displayed the strength of the bridge by leading 21 elephants across it.

Connect to Today:

In a February 2012 letter to the editor, Joan Marans Dim and Antonio Masi, authors of "New York's Golden Age of Bridges," wrote that, unlike the past, much of the steel used to build today's bridges in the United States — like the new decks on the San Francisco-Oakland Bay Bridge — is produced in foreign countries like China. They wrote: "Once upon a time, America built big things. There existed a golden age of bridge construction … All were engineering marvels. Many were built during difficult economic times. All were built with American-made steel and other American-made products. America is no longer capable of building (or rebuilding) American-made large-scale bridges."

In your opinion has the decline of heavy industry in the United States negatively affected American engineering? Why or why not? How do you think modern projects will measure up to those created during the "golden age," like the Brooklyn Bridge or the Golden Gate Bridge, which celebrates its 75th anniversary in 2012? Why?

https://learning.blogs.nytimes.com/2012/05/24/may-24-1883-brooklyn-bridge-opens/?searchResultPosition=1

TWO GREAT CITIES UNITED

THE BRIDGE FORMALLY OPENED.

IMMENSE CROWDS ATTRACTED BY THE CEREMONIES.

PROCESSIONS AND DECORATIONS IN BOTH CITIES, THE FORMAL TRANSFER OF THE STRUCTURE, ADDRESSES BY ABRAM S. HEWITT AND THE REV. DR. STORRS, AND FIRE-WORKS AND ILLUMINATIONS.

The Brooklyn bridge was successfully opened yesterday. A fairer day for the ceremony could not have been chosen. The sky was cloudless, and the heat from the brightly shining sun was tempered by a cool breeze. The pleasant weather brought visitors by the thousands from all around. Special trains were run from Philadelphia and Easton, Penn., and from Long Island points. Extra cars were attached to regular trains, and then there was barely standing room. It is estimated that over 50,000 people came in by the railroads alone, and swarms by the Sound boats and by the ferry-boats helped to swell the crowds in both cities.

The opening of the bridge was decidedly Brooklyn's celebration. New-York's participation in it was meagre, save as to the crowd which thronged her streets. Some of the Exchanges and business houses down town were closed; others stopped business about noon, but as a rule the stores were open as usual, and as a rule, too, patrons were as numerous as on the other days of the year, when no Brooklyn bridges are opened. The crowd from outside, with curious New-Yorkers, combined to give to the vicinity of Madison-square, to Broadway, and to City Hall Park, the customary gala-day crowds. Thousands of people crowded each one of the places named. The windows, the balconies, and the roofs of Broadway buildings had their throngs. There was no general decoration beyond the display of the American flags. These were flown wherever there was a staff surmounting a building, and in themselves gave the City a holiday appearance. Aside from this display there were not more than a score of buildings that were decorated. Of these the most noticeable were in the vicinity of the New-York approach at the publication offices of the *Sun* and the *Staats-Zeitung*. Festoons of bunting graced a half-dozen Broadway fronts. While the crowd of strangers were gathering along the line of march Superintendent Walling was personally superintending the police arrangements up town and Inspector Murray doing a like service with the large force detailed from the various precincts down town. The arrangements were well executed, and as a result there was no delay caused by the blocking of the streets. At about 9 o'clock a gang of workmen removed the unsightly fence which has been in front of the New-York approach and an equally impassable fence of about 50 policemen took its place.

Promptly at 11:15 A. M. the assembly was sounded at the armory of the Seventh Regiment, the escort to the President, the Governor, the Mayor and the other more or less distinguished guests. A half-hour later the regiment had been equalized by Adjt. Rand into 14 platoons of 20 files, or 4(men, each. A guard was detailed, and at 11:45 the regiment, Col. Clark commanding, left its armory and, headed by Cappa's band of 70 pieces and a drum corps of 32, started on its march. The men were dressed in Summer uniform, gray coats, white trousers, and white helmets. From Sixty-seventh-street and Fourth avenue, through Sixty-sixth-street and down Madison-avenue, the regiment moved to Fifty-seventh-street. Passing through that street to Fifth-avenue, the regiment marched down the avenue with the perfect fronts and the long swinging steps which have always marked it, to the Fifth-Avenue Hotel. At Twenty-third-street and Fifth-avenue the regiment halted. Two companies marched into Twenty-third-street, presented arms, and received the guests of the day. These occupied 24 carriages. In the first of these were seated President Arthur and Mayor Edson. These gentlemen were cheered as they appeared, and the President lifted his hat in acknowledgment of the compliment. In the second carriage were Secretary of State Frelinghuysen, Secretary of the Treasury Folger, and Trustee John T. Agnew. Postmaster-General Gresham, Secretary of the Navy Chandler, and Trustee John G. Davis occupied carriage No. 3. In the fourth carriage were Attorney-General Brewster, Marshal McMichael, of the District of Columbia; Mr. Allan Arthur, and Trustee J. Adriance Bush. The fifth had F. J. Phillips, the President's private secretary; Surrogate Rollins, M. W. Cooper, and Charles E. Miller as occupants. The sixth carriage was occupied by Gov. Grover Cleveland and Trustee Gen. Slocum. Seated in the seventh carriage were the Hon. Abram S. Hewitt, Controller Campbell, and Trustee Charles McDonald. Gov. Ludlow, of New-Jersey; ex-Gov. Fairbanks, of Vermont; Gen. W. S. Stryker, and Trustee Jenkins Van Schaick rode in the eighth carriage. Gov. Littlefield, of Rhode Island, and a member of his staff accompanied Trustee Henry Clausen in the ninth carriage. The remaining carriages were occupied by Gov. Cleveland's staff, Gen. Carr and staff, Gen. Shaler and staff, Gen. Ward and staff, Gen. Christensen and staff, and Gen. Fitzgerald and staff, all in full uniform. Among the gentlemen in citizen's dress who rode as guests were Collector of the Port William H. Robertson, ex-Secretary of the Treasury Windom, ex-Speaker of the House of Representa-

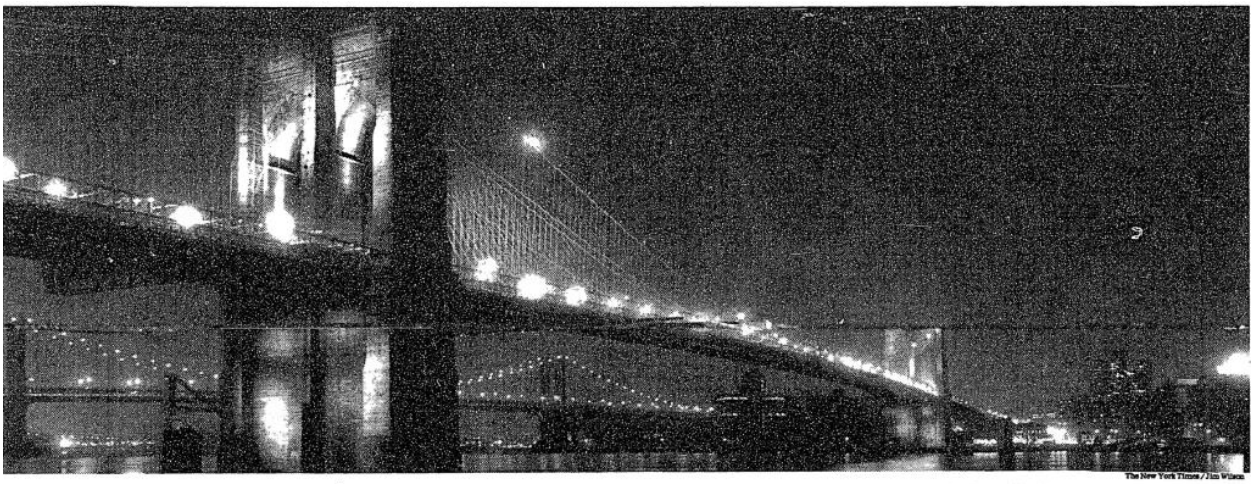
and Grace, the Hon. S. S. Cox, the Hon. Orlando B. Potter, Joseph Lydecker, William H. Guion, Gen. Lloyd Aspinwall, W. A. Palmer, C. J. Hill, of New-Jersey; Senators Titus,

have been consistent to attend the ceremonies. Then, too, he said, at the hour the bridge was opened he attended the funeral of an old and intimate friend, so that even had he desired to be on the bridge he would not have gone. The band struck up a lively march, the regiment broke into columns of fours, and the procession, like a huge gray and black serpent, wound its way to the entrance to the bridge. The regiment, or the greater part of it, marched upon the bridge at 1:50 o'clock. Preceding the President and Mayor Edson, who walked arm-in-arm, was a colored man carrying a yellow water-pail in one hand and a rack of glasses in the other. The President had to step carefully to avoid the water-carrier's heels. The crowd cheered the President. The darky took it as a salute to him, and smiled, unaware of his proximity to greatness. The procession disappeared through the entrance, and then the undistinguished guests followed. That is, those who had tickets followed. Those who hadn't tickets, and who were very curious, paid $2 to ticket speculators for the pieces of pasteboard which permitted them to pass over the span. During the rush white business cards of the requisite shape admitted a number shrewd enough to take advantage of the trick, but it was soon discovered and each card was thereafter carefully scrutinized.

When the President and Governor had walked about half the distance to the New-York pier, there was a commotion down the line, and Orator Abram S. Hewitt came struggling through the ranks trying to get somewhere near the head of the procession. The house-tops and upper windows of buildings almost as far as the eye could reach were black with eager sightseers, many of whom made use of opera-glasses and small telescopes to aid in getting a good view of the parade. The view from the bridge as the procession passed across was fine. All of the vessels in the harbor were gayly decorated with flags and bunting. The ferry-boats, tugs, and small craft on the rivers displayed flags. The pier-heads from which a view of the bridge was to be had were crowded with spectators. The vessels at the docks were packed with people, who took possession of them hours before the first gun was fired. The war vessels were anchored in a line below the bridge in the following order: Tennessee, Kearsarge, Yantic Vandalia, Minnesota, and Saratoga. The first named was just above the Wall-street ferry, while the Saratoga was close to Governor's Island. Each man-of-war had a string of flags and bunting which reached from stem to stern and above the tops of the masts.

West of the New-York pier the Seventh Regiment halted and the men quickly formed in two ranks at the right of the promenade, presented arms, and the civilians passed by. The band halted under the pier arches and played "Hail to the Chief." At 2 o'clock the head of the column reached the pier, where several of the bridge Trustees, headed by Acting President William C. Kingsley, welcomed the chief magistrate and the Governor. As the party started forward after a temporary halt, a Signal Corps officer dipped a signal flag, and in 10 seconds a puff of smoke shot upward from one of the port-holes of the man-of-war Tennessee, followed instantly by a loud report. This was the first gun of the salute of 21 guns, and a moment later the guns of the Vandalia, the Kearsarge, the Yantic, and the Minnesota, and those at the Navy-yard and at Castle William, on Governor's Island, joined in the salute. The members of the Fifth United States Artillery presented arms on the river side of the pier, and then the head of the column reached the centre of the great bridge. When the procession reached the pier on the Brooklyn side, Mayor Low and the Brooklyn authorities stepped forward, the two Mayors locked arms, and the President was joined by Mr. Kingsley. A detachment of marines from the navy-yard stood guard at the Brooklyn pier, and east of the pier the Twenty-third Regiment was drawn up. The men presented arms as the guests passed by, the band greeted the party with "Hail to the Chief," and the immense crowd gathered on the Brooklyn approach cheered. The President and those near him took their seats in the building at the Brooklyn approach, but the great mass of those who had crossed from New-York were unable to get within hearing or seeing distance of the interior of the building. The jam was terrible, and it extended back half-way to the pier.

The New York Times



The New York Times / Jim Wilson

At night, the cables of the Brooklyn Bridge glimmer in the lights illuminating the roadway and twin Gothic towers. The lighting was installed especially for today's pageant in honor of the 100th anniversary of the bridge.

BROOKLYN BRIDGE, 'THE ONLY BRIDGE OF POWER, LIFE AND JOY,' TURNS 100; TODAY

By Deirdre Carmody/ May 24, 1983

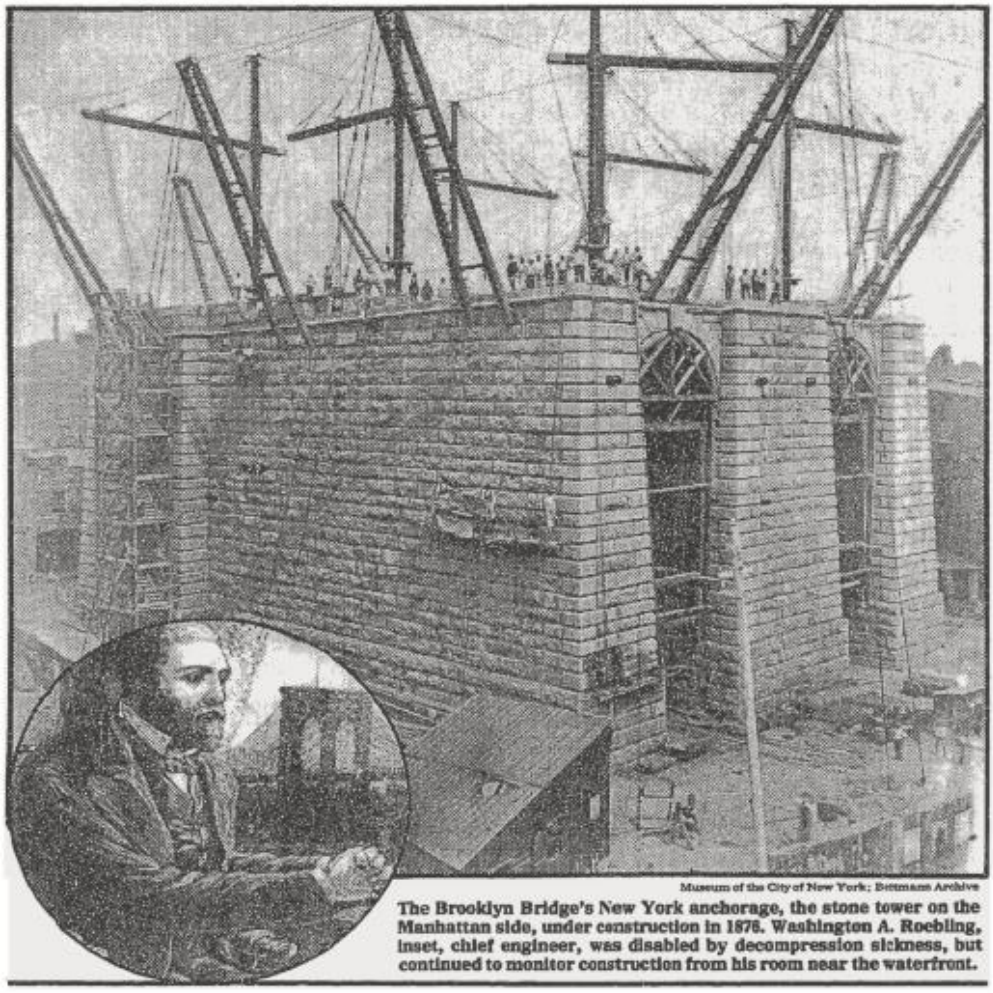
Tens of thousands of New York City residents and out-of-town New York City buffs will flock into lower Manhattan and Brooklyn this morning and onto the banks of the East River tonight to pay joyful homage to the Brooklyn Bridge, which is 100 years old today.

Tributes and visitors poured in all day yesterday in preparation for the ceremonies. The Lord Mayor of London sent a message. The Mayor of Cincinnati prepared to watch the ceremonies from the reviewing stand to commemorate the fact that John A. Roebling, the designer of the Brooklyn Bridge, built a bridge - still used today - in Cincinnati 16 years before he built the Brooklyn Bridge.

A 60- by 90-foot American flag was being prepared to be hung today from the George Washington Bridge, the Hudson River arriviste that is a mere half-century old.

To the rest of the world, the Brooklyn Bridge has been a symbol of New York for all of its 100 years. It has been written about, sung about and filmed. It has developed a lore of its own, including silly stories about people in bars who sold the Brooklyn Bridge to other people in bars. At no time, however, has the selling of the Brooklyn Bridge been raised to such an art as it has for its centennial.

The bridge has appeared on T-shirts, posters, silver spoons from Tiffany's, paperweights and ashtrays. Sherry-Lehmann is selling a popular "Great Bridge White Wine." The Postal Service has struck a commemorative stamp. Andy Warhol has done a poster. A million kits on the



Museum of the City of New York; Bettmann Archive

The Brooklyn Bridge's New York anchorage, the stone tower on the Manhattan side, under construction in 1876. Washington A. Roebling, inset, chief engineer, was disabled by decompression sickness, but continued to monitor construction from his room near the waterfront.

history of the bridge are being given to children in New York City's public, parochial and private schools.

All year, preparations for the centennial have dominated the scene, and there cannot be many people in New York unaware of the importance that is being put on this day. 'A Span, a Cry, an Ecstasy.' "What bridge?" wrote Thomas Wolfe. "Great God, the only bridge of power, life and joy, the bridge that was a span, a cry, an ecstasy - that was America."

As New York prepared its celebration, the police warned of the possibility of enormous traffic jams and urged people coming into the area to leave their cars at home and use public transportation.

"Don't even think of driving," said Samuel I. Schwartz, the deputy transportation commissioner, at a news conference called to announce a "gridlock prevention plan."

The bridge itself, having served the public so valiantly for its hundred-year existence, is being given a rest and will be closed to vehicular traffic all day. Eighteen thousand marchers, many of them in period costume, are expected to parade across it in the morning.

In the evening there will be street fairs and formal ceremonies; a harbor craft parade on the East River; a Sound and Light Spectacle on the bridge's south face, and a half-hour of fireworks billed as one of the biggest pyrotechnic displays in American history.

New Yorkers have a reputation for being cynical about many aspects of the daily life of their city. But when it comes to the celebration of their history and of their monuments, they are as softhearted and as corny as any small-town resident in the rest of the country.

New Yorkers stunned out-of-towners with their old-fashioned good humor and outpourings of enthusiasm on the day of the Bicentennial, and all indications yesterday were that they were eager to do the same again for their beloved Brooklyn Bridge.

The weather forecast was for partly sunny skies and temperatures in the 70's - a day reminiscent of that warm and glorious day exactly 100 years ago when the bridge was opened. That day every house in the area was draped with red, white and blue bunting. Flags flew in the breeze and crowds packed the rooftops and jammed the waterfront.

President Chester A. Arthur, in black frock coat, white tie and a flat-brimmed black beaver hat, led the marchers across the bridge from Manhattan to Brooklyn. He was accompanied by Grover Cleveland, the portly new Governor and future President.

Today, the parade will go the other way, starting from Cadman Plaza West in Brooklyn at 9:30 A.M., continuing over the bridge to Manhattan and proceeding behind City Hall and down Broadway to the Battery, where dispersal is expected around 12:30 P.M.

Neither the President nor the Governor will be in attendance this time, although they were both invited. Governor Cuomo said his wife, Matilda, would stand in for him at the formal ceremonies at Fulton Ferry Landing tonight. Koch to Speak at Ceremony

The Governor said that he had appointments today and tomorrow in Buffalo that had been scheduled for some time and that he intended no slight to Brooklyn. He spoke while wearing a Brooklyn Bridge Centennial tie.

Mayor Koch will speak at the formal rededication ceremony, which begins at 8 P.M., as will the Manhattan and Brooklyn Borough Presidents, Andrew J. Stein and Howard Golden, and the president of the Brooklyn Bridge Centennial, Richard G. Perry. The ceremony, the sound and ight show and the fireworks will all be carried live on WPIX-TV, Channel 11, from 8 to 10 P.M. WNEW-AM radio will carry a simulcast of the ceremonies and the sound and light show.

The Franklin D. Roosevelt Drive will be closed from Houston Street south from 5 P.M. on. At 7 P.M. the northbound lane will be opened to spectators from Jackson Street south to the Battery. The southbound lane will be kept free for emergency vehicles. Pedestrians can get on the drive from Jackson Street on the north end and from the South Ferry area on the south end. Those who wish to come by subway can take the F train to the East Broadway stop, which is at Canal Street, and walk to Jackson Street, or take any subway that goes to the South Ferry area.

The Brooklyn Bridge Centennial Commission says that the Franklin D. Roosevelt Drive is the best place to view the sound and light show, which begins at 9 P.M., and the fireworks, which are scheduled for 9:25 P.M.

Some bridge and tunnel lanes will be reversed this afternoon to let cars leave Manhattan more easily and to make up for the closing of the Brooklyn Bridge. Large areas of lower Manhattan and some areas in Brooklyn will be closed to traffic in the morning and again in the evening. The Staten Island Ferry will stop operating at 7:30 P.M. and not resume again until 10:15 P.M. from the Manhattan side and 11 P.M. from Staten Island.

Ferry service is being suspended because many boats are expected to mass in the river to toot their horns and set off jets of spray. That, too, will be reminiscent of opening day 100 years ago, when at least 50,000 people came into the city by train and probably an additional 50,000 arrived by boat to see the world's longest suspension bridge.

"Our most durable monument," wrote Montgomery Schuyler in the Harper's Weekly dated May 24, 1883. It is that very durability that is being celebrated today.

https://www.nytimes.com/1983/05/24/nyregion/brooklyn-bridge-the-only-bridge-of-power-life-and-joy-turns-100-today.html

AN OLD BRIDGE'S BIRTHDAY IS A HOMETOWN CARNIVAL

By Deirdre Carmody/ May 25, 1983

With an unabashed outpouring of affection, New York celebrated the 100th anniversary of the Brooklyn Bridge yesterday. It had been billed as a great day in the history of the city, and that is exactly what it turned out to be. In the morning, thousands of pedestrians, horse-drawn carriages and marching bands - filling the air with martial music - paraded across the stately bridge under summerlike skies.

Later there were street fairs, speeches, roof parties, boat rides and a harbor-craft parade. Evening fell gently over the bridge. As darkness came, a luminescent full moon filled the sky while a dramatic sound and light show was played on the bridge and recreated its history.

Then the sky simply exploded with fireworks. Red, white and blue shells, golden comets changing to silver, crackling stars in red and green, appeared to fill the entire sky, while hundreds of thousands of people gasped at the sheer dazzle of it all.

At times both towers were bathed in a golden glitter as a barrage of meteors showered down on the bridge. It was the biggest show ever put on by the Grucci family of Bellport, L.I., and included a total of 9,600 rockets, comets, aerial shell bursts and other pyrotechnics. Ebullience and Humor

Many of the spectators rode a flotilla of fireboats, tugboats, military craft, private yachts and fishing boats that had moved up river under the bridge earlier in the evening. Some of the fireboats shot plumes of water into the air.

It was not the events, however, that made the day. It was the crowds. All day, it was abundantly clear that people were there by the thousands for no other reason except that they wanted to be there. They were there not so much to see as to participate. Enthusiasm and good humor burst from behind the barricades along the parade route.

The police estimated that 2.1 million people watched the evening festivities - 1.5 million along the Manhattan waterfront and 650,000 in Brooklyn. They were everywhere, jamming streets leading to the bridge, sitting in windows, crowding roofs and even lining the fire escapes of apartment buildings and warehouses.

All day, people massed along the streets of Brooklyn ready to cheer just about everything that came along. It was a hometown crowd - Brooklynites gathered to honor their beloved bridge, which had made Brooklyn a household name around the world. Main Street, U.S.A.

Cadman Plaza West, with its graceful trees and with flags flying from every lamppost, became Main Street, U.S.A., as friends called out to one another and children sat on curbstones and an enormous cluster of orange and blue balloons bobbed in the air in front of Borough Hall.

In Manhattan, the crowd was entirely different. This was a crowd that roared its pleasure - as was evident to marchers as soon as they made the turn off the Manhattan side of the bridge onto Centre Street near City Hall.

Massed five and six deep along Chambers Street, filling lower Broadway with ticker tape and printouts, this was a crowd that had come for a major occasion. It turned the day from a hometown celebration into a historical event.

"We interrupted plans for our daughter's wedding in Washington to come up here," said Rhoda Zerkin, who came from Florida with her husband, Max, a former Brooklynite. "We weren't going to come. And then I said, no, we have to be here for the parade."

Swarming With Crowds

By 7 P.M., the Brooklyn Heights Promenade, much of lower Manhattan and the Franklin D. Roosevelt Drive were swarming with crowds. There was a carnival atmosphere, much like a giant sports events or a mammoth street fair, which is really what it was.

The elevated, traffic-free drive was turned into a huge paved picnic site with a grand view of the proceedings. Wine and cheese, sandwiches and salad were served amid hooting fireboats and the dazzling fireworks.

"I came to see the fireworks," said 6-year-old Zachary Smith. "I've only seen them one time before." As dusk fell over the vast Alfred E. Smith Houses on the Manhattan side, spectators with sparklers and "I Love New York" buttons jammed into Wagner Place, just north of the bridge, to watch the spectacle. Little Vito Montalto Jr. had been there all day with his parents and a collection of props that included a camera, a tripod and cotton candy.

"It's 100," said Vito, looking up at the bridge, "and I'm 4." The police, who reported a few minor injuries throughout the day despite the crowds, said traffic into the city was very light. People apparently heeded warnings and left their cars at home, and there was none of the congestion that had been feared.

"It has been suggested that if you want to evacuate the lower part of Manhattan, this is a great way to do it," said Alice T. McGillion, deputy police commissioner for public information.

Dominating the Shores

The bridge itself, object of all this celebration, was bedecked with American flags, which flew gently in the breeze. But there were moments yesterday when its roadway shuddered ever so delicately, as thousands of feet pounded across it.

The two great towers, each 276 feet above high water, were New York's first skyscrapers, dominating the New York and Brooklyn shores. Yesterday, the Manhattan tower looked like a giant gateway beyond which could be seen a whole new city of skyscrapers that has arisen since

the building of the bridge. To the right were the tiny, slender spires of the Empire State and Chrysler Buildings. To the left were the large rectangular towers of the World Trade Center. Far down river stood Liberty, her arm raised in salute.

The day was perfect for a parade and very much like the day exactly 100 years ago when the 5,989-foot bridge was opened. Temperatures were in the 70's, and fluffy white clouds blew across a bright blue sky.

Many of the marchers were dressed in period costume, and some rode over the bridge in surreys, landaus and other open carriages. The New York Times wagon was a copy of the horse-drawn carriages that delivered The Times in 1883. 'Tribute to America'

Mary Roebling, widow of a grandson of Washington Roebling, the engineer who built the bridge, rode in a black landau with red wheels carrying a lavender parasol and an armful of flowers.

"This is a tribute to America," Mrs. Roebling said of the ceremonies. After the open carriages, the Budweiser Clydesdale Horses, the small elephant from the Big Apple Circus and a number of others had begun to march, Mayor Koch appeared in a bright blue Brooklyn Dodgers baseball cap. The Huntington (L.I.) High School Blue Devil Band struck up "America the Beautiful," the crowd let out a cheer, and the parade was officially under way.

Mr. Koch was joined by Senator Alfonse M. D'Amato and Governor Cuomo's wife, Matilda. City Council President Carol Bellamy and a number of other city leaders also marched.

"When you look at that bridge, it looks like a cathedral, and when you walk across it you feel you are treading holy ground," said Mayor Koch.

"The bridge is the unification of the city," he said. "With the bridge, we became a single city." Broadway Ankle Deep in Paper

There were floats, high school bands, Boy Scout and Girl Scout troops, fife and drum corps, the Prospect Park mounted rangers, Emerald Society pipe bands and various others. The headless horseman in a black velvet cape with a pink lace jabot around his headless neck was a particular success.

The crowds were particularly thick in the Wall Street area. People hung out windows, waved from roofs and dropped a deluge of ticker tape and printouts onto the parade. By the time it was all over, there were spots along Broadway that were ankle deep in paper.

All along the route people called out to the marchers. "Hey, Tottenville!" yelled a police officer on the bridge to the Tottenville High School band. "I graduated Tottenville." There were times when the horse-drawn carriages, the Victorian costumes and, of course, the bridge itself, made it feel more like 1883 than 1983. Then, invariably, something would break the mood. One Victorian lady in a splendid silk gown and long white gloves sat on the Cadman Plaza grandstand taking long drags from a cigarette. Another woman in a costume complete with bustle and broad-brimmed hat wheeled her child in a stroller.

Many people watched the festivities from their windows on Brooklyn Heights, although not all realized the poignant historical precedent. Washington A. Roebling, the engineer who built the bridge, had caisson disease, or decompression sickness, and was unable to attend the opening-day ceremonies. He lived on Columbia Heights and watched the festivities through a spyglass from his window

That day, May 24, 1883, Brooklyn had been like a carnival. Every public building was ablaze with gaslight. Houses were draped with bunting and Chinese lanterns. Fourteen tons of fireworks were set off from the bridge. It was the beginning of a love affair between Brooklyn and its new bridge that was to last more than 100 years.

https://www.nytimes.com/1983/05/25/nyregion/an-old-bridge-s-birthday-is-a-hometown-carnival.html


United Press International

AFTER 100 YEARS, BROOKLYN IS STILL SOLD ON ITS BRIDGE

May 29, 1983

THERE are bridges that are longer and taller and maybe even more beautiful - though surely not many are more beautiful - but if the Brooklyn Bridge has relinquished its records over the years, time has failed to diminish its stature. When it turned 100 last week, more than two million New Yorkers turned out. Only the Dodgers were missing.

Mayor Koch was literally speechless, having thrown away his text to extoll the span's "character and strength" during a day of parades, flotillas, street fairs, roof parties, picnics, concerts and fireworks. Unlike the opening gala in 1883, the festivities lacked a President and a Governor - they sent regrets - but featured 150 Roeblings, descendants of the bridge's designer, John, who gave his life to start it, and his son, Washington, who sacrificed his health to finish it. Brooklyn still had its independence back then, and some may have thought the structure's $16 million pricetag (though twice the original estimate) a bargain for the supremacy over Manhattan it was

expected to bring. Then again, that it stood at all, much less lasted a century, surprised more than a few. P.T. Barnum walked 21 elephants across it before he declared himself satisfied.

For the record, its length - 5,989 feet, end to end -was unrivaled, as were the four 15 3/4-inch cables, with their 3,515 miles of wire, that held it up. The two 276-foot towers, graced by Gothic arches, were the city's first skyscrapers. In a Harper's Weekly review the week of the opening, an architecture critic named Montgomery Schuyler found aspects of the design overly Romantic and retrogressive. Poets, playwrights and painters from Hart Crane to Arthur Miller to Andy Warhol have thought differently.

Like the city, it is a little the worse for wear these days. Two years ago, a diagonal stay snapped, killing a Japanese photographer and prompting the Transportation Department to begin a 10-year, $100 million overhaul. But for at least a day last week, the great bridge ceased to be part of the city's crumbling infrastructure and was instead a symbol of its endurance.

https://www.nytimes.com/1983/05/29/weekinreview/after-100-years-brooklyn-is-still-sold-on-its-bridge.html

The New York Times

Celebrating an Engineering Marvel, Born in Tragedy

BY JENNIFER 8. LEE/ MAY 22, 2008 10:56 PM-May 22, 2008 10:56 pm

The 125th anniversary of the Brooklyn Bridge is being marked with a series of celebrations, starting with a concert and lighting ceremony Thursday night. (Photo: Chang W. Lee/The New York Times)

The Brooklyn Bridge: a marvel of engineering, or a death trap? Both, within the first week of its opening.

The opening of the Brooklyn Bridge [pdf] on May 24, 1883, was a joyous occasion with "two great cities united." That 125th anniversary is being marked with a series of celebrations over the holiday weekend. But few remember that the bridge's public debut was marred days later by a stampede [pdf] in which a dozen people were crushed to death, and 35 others injured. The May 30 mayhem was exacerbated by a false rumor that the bridge was going to collapse.

The traffic that surged onto the Brooklyn bridge as soon as it opened was overwhelming and dominated by pedestrians who were charged one cent to pass. There was room for 15,000 people on the footpaths at any one time (though overcrowding sometimes drove it to as high as 20,000).

On the second day, there was "a crush of foot passengers from 11 o'clock in the morning to 7 o'clock at night." The pedestrians "collected at the entrance, compressed themselves into a funnel about 15 feet in width and then ran the gantlet, one by one, of the tolltakers."

Until then, to cross the river, people had to take the ferry.

With subways now, it is rare to see such vast crowds on foot on the bridge, except in emergencies like Sept. 11 and blackouts.

The dense flow of people over the bridge made it fertile ground for pickpockets (newspaper accounts talk about a lot of men discovering that they were missing watches) and other hazards. Six days after the opening, the deadly stampede occurred.

According to the most commonly accepted account, one cited by The New-York Times, the stampede started when a woman fell down the wooden steps on the Manhattan side, and another woman screamed (perhaps because she saw the woman being dragged by a police office officer who had sprung to her aid)

But another version of the events, cited by The New York Tribune, and considered more credible by The Brooklyn Daily Eagle, starts with a German man descending the steps when a pickpocket tried to steal his watch. His wife screamed, and the thief's accomplices started yelling that the bridge was going to collapse, leading to a rumor-induced panic.

"Agonizing!" read the lead headine from The Eagle, which devoted an extra to the panic. It also highlighted "The Stairway that Led to Death."

As The Times described at the time [pdf]:

Those on the promenade above the stairway,knowing nothing of the fearful crush on the steps, surged ahead with irresistible force, and in a moment the whole stairway was packed with dead and dying men, women and children, piled upon another in a writhing, struggling mass. Cries, shrieks, yells, and groans filled the air at the stairway, while those on the promenade above yelled and shouted as they were pushed forward and rolled and tumbled over the poor unfortunates who were being crushed and trampled to death beneath them.

The situation was made worse by "a gang of New York toughs" who formed a dense line by putting their arms on each other's shoulders and charged.

The police officers on duty didn't have the ability to shut off the bridge on the other side. So for some time, the crowd kept pouring onto the bridge even as people were getting crushed on the other end. Officers were eventually stationed in the middle of the bridge to turn people back.

To relieve the strain of people, a bridge employee found a chisel and a hammer nearby and hammered at iron bolts and nuts until he broke away a section of the iron fence to relieve the crush. Also wood planks were laid so people could walk over the fence.

The Times reported the injuries in graphic detail [pdf]:

The first rescuers to reach the spot found the dead and dying wedged together in the narrow space as if they had fastened in a vise. So tightly were they packed and squeezed that from dozens of persons blood was oozing from ears and noses. The bodies were piled four or five deep at the foot of the stairway and most of those at the bottom were women.

The Brooklyn Daily Eagle wrote, “The sight was one that was never equaled for horror.” The dead were laid in a row, their faces covered with hats or another article of clothing.

After the bodies and the crowds were cleared, all that was left was bloodstains on the steps, mens and women’s hats, umbrellas and parasols, and a thousand steel pens lost by a peddler. But the clean-up was relatively speedy. As the Times described at the time [pdf]:

An hour after the disaster the only evidence that anything unusual had occurred at the stairway was the opening in the iron railing where a section of the latter was torn away in order that bodies might be more quickly taken from the mass in the stairway.

Among the proposals to advert future disasters: tripling the police force on the bridge, accelerating the plans for a telephone connection from one end of the bridge to another, and removing the stairs in favor of an inclined plane.

And of course, lawsuits were filed against the bridge trustees.

A bird’s-eye view of fireworks at the opening of the Brooklyn Bridge in 1883. (The Metropolitan Museum of Art)

Anniversary Events

The Brooklyn Bridge lights will be turned on from 9 to 11 p.m. each night through Memorial Day. The celebrations and observances include lectures, dances, performances, a film series presented at the foot of the bridge, information tents, guided tours, and more. [Complete Schedule, NYCVisit.com.]

https://cityroom.blogs.nytimes.com/2008/05/22/an-engineering-marvel-born-in-tragedy/

NYC The Official Guide

Guide to the Brooklyn Bridge

Andrew Rosenberg/Updated 11/06/2019

Celebrated in song, glamorized on celluloid and immortalized in poetry, the postcard-perfect Brooklyn Bridge stands as one of New York City's most recognizable symbols—not to mention a magnificent feat of engineering. Upon its completion in 1883 it became the first roadway to connect Manhattan and Brooklyn, which were then separate cities (Brooklyn became part of New York City in 1898). Back then, with a central span of 1,595 feet, the Brooklyn Bridge was also the world's longest suspension bridge.

The bridge's appearance sets it apart: its Gothic towers with double arches, crisscrossing steel cables and graceful, gentle curvature make walking or biking across the span (or at least catching a glimpse of it) sought-after experiences for visitors. On either end are cool neighborhoods to explore: stately Brooklyn Heights and once-industrial Dumbo on the Brooklyn side; Lower Manhattan, Tribeca and Chinatown all within easy reach on the Manhattan side.

Below, our guide includes everything you need to know to take full advantage of a trip to what may be the most famous bridge in the world.

Brooklyn Bridge. Photo: Julienne Schaer

History

John A. Roebling, an immigrant from Prussia, designed the bridge—though he died due to complications from a freak accident in 1869, just before construction commenced. His son Washington took on the job of chief engineer, but a case of the bends sidelined him. Washington Roebling's wife, Emily, ultimately oversaw the construction, which was completed in 1883; the bridge's dedication and opening took place that May 24.

Numerous changes have taken place over the years, including structural repair work, a widening of the ramps on both ends and a fresh paint job (which took about six years to complete) with a new official color, Brooklyn Bridge Tan.

The bridge is one of New York City's most recognizable symbols.

Where can I get the best views of the bridge itself?

A walk or ride on the bridge is going to position you for some excellent river vistas and changing perspectives—but to take in the whole of the bridge itself, you'll need to go somewhere nearby. A few ideas:

Go down to Main Street or Pier 1 at Brooklyn Bridge Park, on the Brooklyn side, and gaze up or out. The Brooklyn Heights Promenade also provides some excellent looks.

In Manhattan, head to Pier 15 (or one of the neighboring piers) down by the Seaport District for a good view.

Brooklyn Bridge Park. Photo: Julienne Schaer

What should I do when I get to the other side?

Manhattan: See the African Burial Ground National Monument. Tour City Hall (for details, visit nyc.gov) or check out Tweed Courthouse. Sip a glass of wine at Racines NY. Wander up to Chinatown.

Brooklyn: Take a spin on Jane's Carousel. Have pizza and ice cream in Dumbo. Check out some street murals and gallery art. Walk the gaslit blocks of Brooklyn Heights.

Where to Eat on Both Sides of the Brooklyn Bridge

Jane's Carousel. Photo: Julienne Schaer

Where to enter

The pedestrian stairs on the Brooklyn side are located at Washington Street and Prospect Street, right at the northeast corner of Cadman Plaza. You can also just walk straight onto the bridge from Adams Street. On the Manhattan side, cross Centre Street near the Brooklyn Bridge-City Hall subway station for the 4, 5 and 6 lines to the Brooklyn Bridge Promenade.

Does it matter which way I cross?

That depends on which skyline you would rather approach on your journey: the towers and canyons of Lower Manhattan or the converted warehouses and green-lined waterfront of Dumbo. Whichever way you go, make sure to take a bit of time to look up and around as you're crossing—the cables spiderwebbing in front of the arches make for a classic picture.

Photo: Julienne Schaer

Does it cost anything to cross?

No. When it first opened, though, pedestrians had to pay a penny for the privilege.

Fast facts

• The Brooklyn Bridge was the first suspension bridge to use steel rather than iron for its cables.
• Cable cars ran in NYC from 1883 to 1908, with the first line opening on the bridge. Elevated trains ran on the bridge until 1944; trolleys until 1954.
• In December 2018, the US Department of Transportation awarded a $25 million infrastructure grant toward a $337 million project to rehabilitate the bridge's approaches and towers. This would be the first work on the towers since the bridge's construction.
• According to the Department of Transportation, more than 100,000 cars, 4,000 cyclists and 10,000 pedestrians cross the bridge daily.
• The full length of the bridge is 6,016 feet.
• *Splash*, *Hudson Hawk* and *On the Town* are just a few of the movies that have shown off the bridge on film.

• In 2006, City workers discovered a Cold War–era stash of emergency supplies hidden inside a room in the structural foundations of the bridge.
• Check out the John A. Roebling Suspension Bridge (1866), which links Cincinnati, Ohio, and Covington, Kentucky. It was Roebling's dry run for the Brooklyn Bridge.
• A plaque honoring Emily, Washington and John A. Roebling can be found on the tower on the Brooklyn side of the bridge. During his illness, Washington positioned himself in their apartment at 110 Columbia Heights (later destroyed for the construction of the Brooklyn-Queens Expressway) to monitor the bridge's progress from afar.
• This is not really a fact, but it is a fun commercial for Brooklyn Bridge's 100th anniversary.

Brooklyn Bridge. Photo: Julienne Schaer

https://www.nycgo.com/articles/guide-to-the-brooklyn-bridge

New York City

HISTORY.COM EDITORS--UPDATED: MAR 15, 2019/ORIGINAL: JAN 12, 2010

The first native New Yorkers were the Lenape, an Algonquin people who hunted, fished and farmed in the area between the Delaware and Hudson rivers. Europeans began to explore the region at the beginning of the 16th century–among the first was Giovanni da Verrazzano, an Italian who sailed up and down the Atlantic coast in search of a route to Asia–but none settled there until 1624. That year, the Dutch West India Company sent some 30 families to live and work in a tiny settlement on "Nutten Island" (today's Governors Island) that they called New Amsterdam. In 1626, the settlement's governor general, Peter Minuit, purchased the much larger Manhattan Island from the natives for 60 guilders in trade goods such as tools, farming equipment, cloth and wampum (shell beads). Fewer than 300 people lived in New Amsterdam when the settlement moved to Manhattan. But it grew quickly, and in 1760 the city (now called New York City; population 18,000) surpassed Boston to become the second-largest city in the American colonies. Fifty years later, with a population 202,589, it became the largest city in the Western hemisphere. Today, more than 8 million people live in the city's five boroughs.

New York City in the 18th Century

In 1664, the British seized New Amsterdam from the Dutch and gave it a new name: New York City. For the next century, the population of New York City grew larger and more diverse: It included immigrants from the Netherlands, England, France and Germany; indentured servants; and African slaves.

Did you know? New York City served as the capital of the United States from 1785 to 1790.

During the 1760s and 1770s, the city was a center of anti-British activity–for instance, after the British Parliament passed the Stamp Act in 1765, New Yorkers closed their businesses in protest and burned the royal governor in effigy. However, the city was also strategically important, and the British tried to seize it almost as soon as the Revolutionary War began. In August 1776, despite the best efforts of George Washington's Continental Army in Brooklyn and Harlem Heights, New York City fell to the British. It served as a British military base until 1783.

New York City in the 19th Century

The city recovered quickly from the war, and by 1810 it was one of the nation's most important ports. It played a particularly significant role in the cotton economy: Southern planters sent their crop to the East River docks, where it was shipped to the mills of Manchester and other English industrial cities. Then, textile manufacturers shipped their finished goods back to New York.

But there was no easy way to carry goods back and forth from the growing agricultural hinterlands to the north and west until 1817, when work began on a 363-mile canal from the Hudson River to Lake Erie. The Erie Canal was completed in 1825. At last, New York City was the trading capital of the nation.

As the city grew, it made other infrastructural improvements. In 1811, the “Commissioner’s Plan” established an orderly grid of streets and avenues for the undeveloped parts of Manhattan north of Houston Street. In 1837, construction began on the Croton Aqueduct, which provided clean water for the city’s growing population. Eight years after that, the city established its first municipal agency: the New York City Police Department.

Meanwhile, increasing number of immigrants, first from Germany and Ireland during the 1840s and 50s and then from Southern and Eastern Europe, changed the face of the city. They settled in distinct ethnic neighborhoods, started businesses, joined trade unions and political organizations and built churches and social clubs. For example, the predominantly Irish-American Democratic club known as Tammany Hall became the city’s most powerful political machine by trading favors such as jobs, services and other kinds of aid for votes.

New York City in the 20th Century

At the turn of the 20th century, New York City became the city we know today. In 1895, residents of Queens, the Bronx, Staten Island and Brooklyn–all independent cities at that time–voted to “consolidate” with Manhattan to form a five-borough “Greater New York.” As a result, on December 31, 1897, New York City had an area of 60 square miles and a population of a little more than 2 million people; on January 1, 1898, when the consolidation plan took effect, New York City had an area of 360 square miles and a population of about 3,350,000 people.

The 20th century was an era of great struggle for American cities, and New York was no exception. The construction of interstate highways and suburbs after World War II encouraged affluent people to leave the city, which combined with deindustrialization and other economic changes to lower the tax base and diminish public services. This, in turn, led to more out-migration and “white flight.” However, the Hart-Cellar Immigration and Nationality Act of 1965 made it possible for immigrants from Asia, Africa, the Caribbean and Latin America to come to the United States. Many of these newcomers settled in New York City, revitalizing many neighborhoods.

New York City in the New Millennium

On September 11, 2001, New York City suffered the deadliest terrorist attack in the history of the United States when a group of terrorists crashed two hijacked jets into the city’s tallest buildings: the twin towers of the World Trade Center. The buildings were destroyed and nearly 3,000 people were killed. In the wake of the disaster, the city remained a major financial capital and tourist magnet, with over 40 million tourists visiting the city each year.

Today, more than 8 million New Yorkers live in the five boroughs–more than one-third of whom were born outside the United States. Thanks to the city’s diversity and vibrant intellectual life, it remains the cultural capital of the United States.

https://www.history.com/topics/us-states/new-york-city

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BROOKLYN

Brooklyn's Evolution From Small Town to Big City to Borough

By Keith Williams | Jul 24, 2014, 3:30pm EDT

*Some neighborhood names appear to be jokes. Some have stuck around for centuries, despite changing connotations. Some shift with the winds of gentrification. Welcome to **Blurred Lines**, in which writer Keith Williams studies New York City's changing neighborhood boundaries.*

Why does "South Brooklyn" refer to Red Hook, and not to Coney Island? It's a question that's crossed the mind of almost every New Yorker at some point or another.

The answer is simple: as late as **1894**, that area *was* the southern extreme of the **City of Brooklyn**. What we know today as Brooklyn is better described, historically, by its synonymous designation, **Kings County**. For centuries, Kings County was composed of numerous towns and, briefly, one other city and the progression from the original **six towns** to one unified City of Brooklyn can be charted through **350 years of maps**.

Before we begin this journey through the history of Kings County, a bit of background is needed. First: just as with Manhattan, there's been **a lot of land-filling** over the years, so the geographic extremities of these maps won't be true to what they were in the 19th century. For practical purposes, changing water boundaries have been left out.

Second: several borders in Kings County were based on **rivers, streams, and creeks that no longer exist**—above ground, anyway. Over the past 200 years, most of the waterways in Kings County have been rerouted into subterranean pipes, but they're no longer apparent on the surface. For both of these reasons, a few of the boundaries on these maps are **rough approximations**.

Now, let's get down to business.

By the time the British took over Dutch Nieuw Nederland in **1664**, six towns existed in what would become Kings County. The oldest, **Gravesend**, was founded by an Englishwoman, Lady Deborah Moody, in 1645. The other five were Dutch:

Boswijck (1661), "heavy woods" or "town in the woods"
Breuckelen (1646), for a town in the Netherlands
Midwout (1652), "middle woods"

Nieuw Amersfoort (1647), also for a town
Nieuw Utrecht (1657), same deal

Luckily for us, the Dutch didn't append "Nieuw" to all of their holdings in the New World, or else today 2.6 million people might live in New Brooklyn.

In 1677, the colony chartered "The New Lotts of Midwout," the last part of Kings County to offer virgin land.

Our English-speaking forebears had little interest in some of the freaky-deaky names left behind by the Oranje, so they made some cosmetic changes. ("Nieuw Amsterdam" was probably the first to go.) By **1683**, when Kings County was formally established by the Colony of New York, Midwout had changed to **Flatbush** (from the Dutch *vlacke bos*, "flat woods"), Nieuw Amersfoort had become **Flatlands** (aiming for geographical accuracy, perhaps), and the other three names had been anglicized. Don't worry about Midwout; its legacy continues today as **Midwood**.

Each of the towns would set up its **own grid system** with proprietary naming conventions, which is why the streets and avenues in Brooklyn are so out of whack in many places. Gravesend, for example, **ran its avenues east-west** instead of north-south. As for the borders, they stayed in an equilibrium for nearly 150 years—until a notable invention made Brooklyn a hot spot for the first time.

Starting in **1814**, Robert Fulton's **steamship** *Nassau* helped transform Brooklyn Heights into America's first suburb. In 1816, that area **became its own village within the Town of Brooklyn**. It was bounded by Atlantic Avenue, Red Hook Lane (a small remnant of which still exists near the New York Transit Museum), and the U.S. Navy Yard.

A major reason for the incorporation: Brooklyn didn't have a fire department. When a fire broke out—a frequent occurrence in the days of wood-frame homes—Brooklynites would often have to **wait for a boat** to come over from New York City, propelled by 50 men using oars.

You might have noticed that not all of the territory of Kings County was originally covered. On April 14, 1827 **Williamsburgh** ('h' and all) was granted a **village charter** within Bushwick—the start of an ascension that would last a single generation. It was bounded by Brooklyn to the south (at Division Avenue, an appropriate name), and was separated from the rest of Bushwick by Union Avenue (less appropriate) and the Bushwick Creek, which was much longer than today's Bushwick Inlet.

As the great Brooklyn historian Henry Stiles wrote, the forgotten area came about "not from any oversight, but from the fact that the site of Williamsburgh was originally surveyed and owned by the Dutch West India Company." In other words, it didn't have landholders advocating for formal recognition as a municipality.

That had changed in 1802, when Richard M. Woodhull bought 15 acres of land in the area and named it after his friend, Colonel Jonathan Williams, who had surveyed the land—and who was the Chief Engineer of the Army Corps of Engineers. Some people called the area Yorkton, but that name soon fell out of favor.

Brooklyn was growing by leaps and bounds; in the **1830** census, it had **12,406 people**, three times its total from 20 years prior, before the introduction of rapid trans-river transport. In **1834**, it upgraded itself to a City.

Further north, the Village of Williamsburgh continued its Icarian ascent, gobbling up even more of Bushwick's territory. It now extended over to Bushwick Avenue.

In 1840, Williamsburgh went rogue.

This legislation **gave Williamsburgh independence from Bushwick**, complete with control over its own affairs. For the first time, there were seven municipalities in Kings County.

Williamsburgh just couldn't be contained. On **April 7, 1851**, eleven years after becoming its own town, it declared itself the City of Williamsburgh. Including New York City, there were now **three cities** within a stone's throw of each other.

The change made sense: Williamsburgh was a boomtown, growing to **30,000 inhabitants** in the 1850 census—six times its population in 1840.

Less than a year later, on February 12, 1852, the **eastern half of Flatbush seceded**, calling itself the Town of **New Lots**, a throwback to the area's charter.

The breakaway was driven in large part by the area's huge population, thanks to an industrial-tenement area called East New York. It was a hub of German-immigrant activity in Kings County, with breweries, *biergartens*, newspapers, and other trappings of Deutschland.

With that, Kings County arrived at Peak Municipality: **six towns and two cities**. And just as quickly, an exploding population would force some mergers and acquisitions.

The first victims: the three-year-old City of Williamsburgh and its parent, the Town of Bushwick. The City of Brooklyn **annexed** them on April 17, 1854. The two former municipalities became known as the **Eastern District of Brooklyn**, and that excess 'h' fell for good from Williamsburg's name.

Stiles cites **political corruption** as the main driver for the merger. In Williamsburgh, the **ruling Whigs** saw the fire department as their chief political ally, and showered it with gifts: new engines and gear, and probably cash, straight-up. The Whigs, Stiles wrote, "repelled public inquiry into their actions, brow-beat the tax-payers when they complained, and broke down that high sense of propriety in public officee and trusts, which had been the glory of the party since the days of John Quincy Adams." Many residents thought they **could do no worse by joining Brooklyn**.

There was apparently some **rivalry** between Brooklyn and its neighbors to the north, and it came at the expense of our understanding of Bushwick's early days. According to contemporary historian T.W. Field:

"The Town of Bushwick, having been swallowed up in the great city [of Brooklyn], a nice functionary of the City Hall, on assuming charge of its Old Dutch Records, contemptuously **thrust them into his waste-paper sacks** and sent them to the paper-mill."

The next consolidation came 32 years later, in **1886**, when New Lots, just a generation old, fell to the hungry monster on May 13. In her poem The New Colossus, inscribed on the base of the Statue of Liberty, Emma Lazarus confirmed Brooklyn's stature as a major city: "... her mild eyes command / The air-bridged harbor **that twin cities frame**." Sometime between, Brooklyn also gained control of the land within the southern reaches of **Green-Wood Cemetery and Prospect Park**, shrinking Flatbush just a bit.

Brooklyn had **unsuccessfully** attempted to annex the rest of the county in **1873**. The high-density city wanted control of suburban expansion, but the farmers in control of the towns—many descendants of original Dutch families—weren't having it.

According to an account of a hearing in the *Times*, a Mr. Bergen of **New Utrecht** was firmly against the idea. "The government of New-Utrecht, he said, was the least expensive; it was only an agricultural village, a long way from Brooklyn, and not in need of being included in the expenses of municipal government, at least not for the present." (For more on the failed consolidation, check out the book *Of Cabbages and Kings County*.)

The dominos came toppling in the span of a few days in **1894**, as the **state legislature forced consolidation** on Kings County. The remaining towns were just blips.

In what the *Times* called the "greatest event in history of Brooklyn," Flatbush, Gravesend, and New Utrecht were absorbed into the city with immediate effect. Flatlands was given 20 months to live.

When the clock ran out, the City of Brooklyn became co-terminus with Kings County. And what a city it was! With **more than a million residents**, it was the third-largest in the nation.

It was not to be, however. In what some today still call **The Great Mistake of 1898**, Brooklyn became a **lowly borough** in the consolidated City of New York. A key contributing factor was the **water supply**: Manhattan had the service of the seemingly limitless liquids from upstate, while Brooklyn had to rely solely on the aquifers beneath Long Island.

There's one last mystery to be untangled: when did the border with Queens change from a straight line to the jagged, grid-friendly boundary we see today? As best I can tell, it was around 1925, but a confirmed answer might require a trip to the New York State legislative library.

(The "why" is obvious: once the grid was set up, the line was cutting through people's homes. Imagine the comebacks a little kid could use: "You can't tell me what to do! You're not even in the same borough!" Not to mention the important things, like public services and voting.)

https://ny.curbed.com/2014/7/24/10069912/brooklyns-evolution-from-small-town-to-big-city-to-borough

Walkabout: "The Great Mistake" — How Brooklyn Lost Its Independence, Part 1

Aug 27, 2015 • 01:00pm by Suzanne Spellen (aka Montrose Morris)

Here's an updated look at the most important thing to happen in Brooklyn since Henry Hudson landed at Coney Island. Many people call it "The Great Mistake." Was it?

With Brooklyn's much-hyped status as the hippest place on Earth comes some nostalgic feelings about "The Great Mistake," as many called the consolidation of New York City. On that fateful day, January 1, 1898, Brooklyn the city disappeared, and Brooklyn the "outer borough" was born. (As were the Bronx, Queens and Staten Island.)

The decision to join all of the counties surrounding Manhattan into one central city was not made easily, quickly or lightly. Politicians, businessmen, city fathers and ordinary citizens argued and lobbied for or against this for almost 20 years.

Consolidating New York City took a tremendous amount of money and power, along with the consideration of business interests, tax revenues, city bureaucracies, social issues and civic identity. Some people thought it was inevitable and progressive — but for others it was the end of the world as they knew it, the Death of Brooklyn.

1909 Postcard via eBay

Brooklyn Was a Successful Independent City

The bill that created the municipality of New York City was signed into law on May 1, 1897, but the talking and the negotiating had been going on for years beforehand, particularly between the cities of Brooklyn and New York.

So many of Brooklyn's transportation advances revolved around its location as a midpoint between the important and productive agrarian regions of eastern Brooklyn and Long Island, and the ports, businesses and financial power of lower Manhattan.

When ferry service was successfully established between Brooklyn and Manhattan in the late 1700s, Brooklyn became New York City's first suburb. The steamship ferry lines of the early 1800s solidified that status.

But the whole of Kings County was a collection of towns, each with its own governing bodies, elected officials and special identities. Being part of the same county was not the same as being part of the city of Brooklyn.

Brooklyn, as we know it today, was originally six separate towns: five Dutch and one English, all settled in the early-to-mid 1600s.

The towns of Brooklyn, Flatbush, New Utrecht, Flatlands, Bushwick and Gravesend were united as Kings County in 1683, 20 years after the British takeover of New Amsterdam. But they were still independent towns, with smaller villages and hamlets within their greater borders.

The cities of Brooklyn and Williamsburg were joined in 1854 and Brooklyn annexed the town of New Lots in 1886. Flatbush, Gravesend and New Utrecht became part of Brooklyn in 1894, and Flatlands — the last holdout — completed the city of Brooklyn in 1896.

Many of these annexations didn't happen without a fight — especially in Flatbush, which voted against becoming a part of the city of Brooklyn, but that's another story for another time.

1900 postcard via eBay

Brooklyn and Manhattan — Codependent Rivals

In the 19th century, Brooklyn became the third-largest city in the nation. Brooklyn had important industries, ports and centers of business, along with its own civic center, cultural institutions and diverse neighborhoods.

Brooklyn had its own transportation centers, rail and streetcar lines, and roads. It also had its own independent parks, police, corrections and fire departments, water and gas companies, and, later, telephone and electric companies, as well as a separate and very progressive public school system.

It had its own government, courts and newspapers, and had Brooklyn been located anywhere else, it would still be an independent and successful city. But it was directly across the river from Manhattan, and the two cities' futures would always be joined.

All this time, Brooklyn competed with Manhattan to see which could be the better city. Many of Brooklyn's Victorian-era city fathers and boosters put a lot of time and money into making Brooklyn a first-class city of its own.

Manhattan got Olmsted and Vaux's Central Park. Brooklyn got Olmstead and Vaux to do one better — Prospect Park. Manhattan's Metropolitan Museum of Art? Ha! Meet the massively larger-in-plan Brooklyn Museum of Arts and Sciences, today's Brooklyn Museum.

Manhattan's wimpy Grand Army Plaza? We got our own Grand Army Plaza, twice as big and much more impressive. It goes on.

Brooklynites — from merchant princes to clerks and bookkeepers — have been commuting to Manhattan to make their fortunes as soon as transportation allowed. They traveled first by ferryboat, then steam ferry, then, in 1883, the Brooklyn Bridge. That would be followed by the other bridges and their roadways, a tunnel and, finally, subway trains.

The Brooklyn Bridge was really the turning point and catalyst for talk of consolidation between Manhattan and Brooklyn.

Brooklyn Bridge, 1905 via eBay

Two Cities Linked by Commerce and a Bridge Should Become One

By 1883, it was a well-known fact that economic success in Manhattan meant economic success in Brooklyn, as the prosperity of Brooklynites working in Manhattan spread the wealth to that city, in terms of real estate, retail opportunities and every other aspect of everyday life. Talk of consolidation began in earnest.

In 1879, the state legislature began debating the issue. Those who were for the consolidation spoke lavishly of the profits that would be made, especially in Brooklyn.

Space-starved Manhattanites swarmed to Brooklyn in search of homes, and businesses flowed across the bridge in search of room for factories and warehouses.

In order to not sound quite so mercenary and to smooth out the crass commercialism, these same people also spoke of how the well-heeled ladies of Brooklyn would be able to claim they were from New York City when they traveled abroad or around the nation — a bragging point as impressive as being from London or Paris.

A larger New York City would have a population, physical size and municipal power as great, or greater, than London or Paris. This would put New York City on a par with Europe's great cities, something Americans have long been obsessed with.

But not everyone in Brooklyn was on board

There were many eloquent voices opposing the merger. During the last three decades of the 19th century, the city of Brooklyn had been doing some consolidating of its own. Always a fiercely independent bunch, Flatbush and the outermost southern and western parts of Kings County had resisted joining the city of Brooklyn.

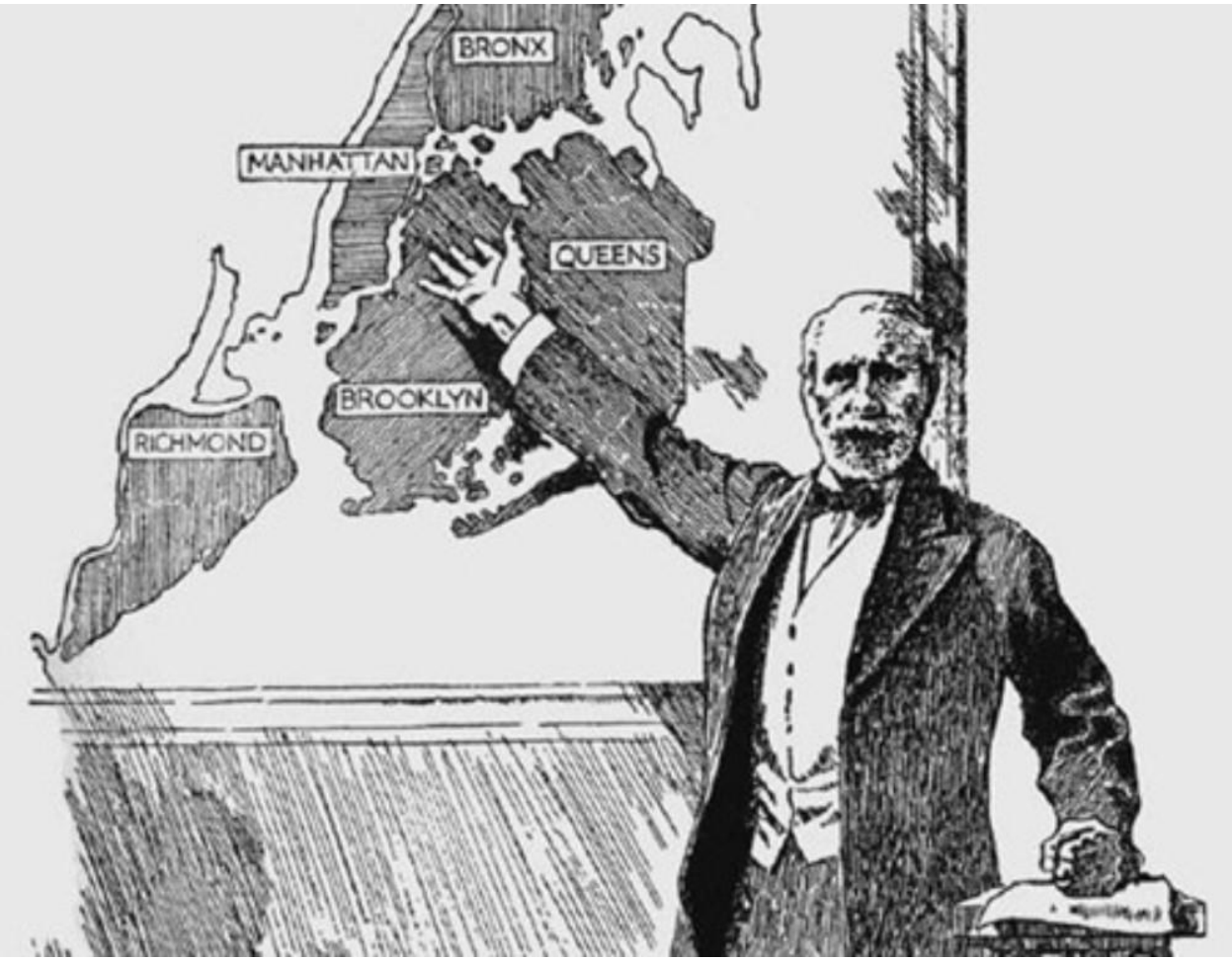
The thought of annexing themselves to Manhattan and the rest of the proposed greater city didn't go down well with a lot of Brooklynites, and their reaction, as well as what happened next, will be the subject of the next chapter of the "Great Mistake."

Top postcard: 1900s Brooklyn Bridge, via eBay. Below: Stereoscopic photo of Brooklyn Bridge Pedestrians, 1890s, via New York Public Library.

https://www.brownstoner.com/history/brooklyn-history-brooklyns-great-mistake/

Walkabout: “The Great Mistake” — How Brooklyn Lost Its Independence, Part 2

Sep 3, 2015 • 01:00pm by Suzanne Spellen (aka Montrose Morris)



On January 1, 1898, the City of New York officially rose from the collection of cities, towns and neighborhoods that made up Manhattan, Brooklyn, Queens, Staten Island and the Bronx.

For those who had worked for close to 20 years to make this happen, it was a glorious day. For the common folk of New York, business probably just went on as usual.

In 1873, talk of a Greater New York City began in earnest. The leading citizens and politicians of both New York and Brooklyn began talking about joining the two cities. The opening of the Brooklyn Bridge in 1883 gave the idea wings.

Simon Chittenden, one of Brooklyn's leading citizens, was one of the first serious proponents of this annexation, and he held meetings in his Brooklyn Heights home, successfully getting the proposal to the 1874 State Legislature. The measure did not pass.

The chief mover of the Consolidation Movement was Andrew Haswell Green, a Manhattan lawyer, city planner and visionary. Some historians refer to him as the 19th century's Robert Moses for his vision and determination in changing the face of New York.

Appointed chairman of the New York City Parks Commission, he worked tirelessly on city planning projects. His name is associated with the creation of Central Park, as well as Riverside, Morningside and Fort Washington parks.

He widened Broadway, created the circle at Columbus Circle, and sponsored the creation of the Metropolitan Museum of Art and the Museum of Natural History. He also joined the Tilden, Astor and Lenox funds to finance the creation of the New York Public Library system.

Green was appointed by the state legislature to be the head of the consolidation commission called the Greater New York Committee.

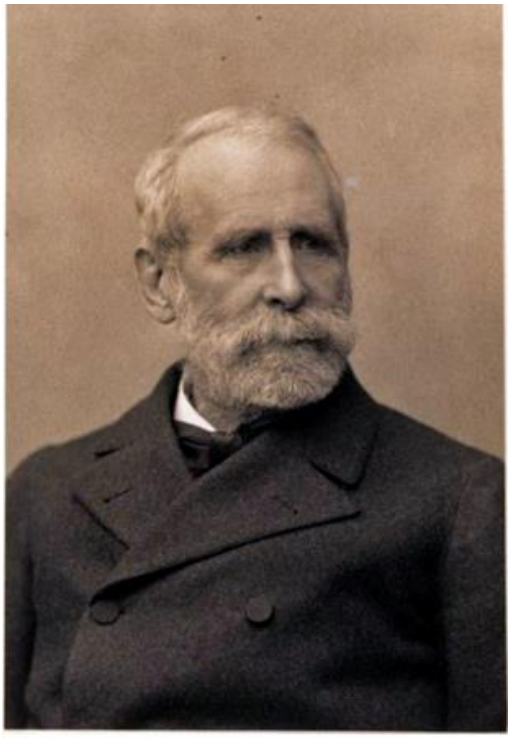


Photo of Andrew Haswell Green via Museum of the City of New York

Meanwhile, Manhattan was doing some consolidation of its own. In 1874 it annexed the parts of the Bronx just across the Harlem River. This tied the Bronx to New York City, separating it from Westchester County. More territory was added in 1895, creating the Bronx as we know it today.

Greater New York City, as it was conceived in the 1870s, would have been Manhattan, parts of the Bronx and the city of Brooklyn. After much evidence and debate, the legislature came to the conclusion that this wasn't enough. The new city would have to be bigger.

Green was a "big picture" planner. He wanted New York's greatest treasure — its harbors — to consolidate, creating new port facilities, improved rail lines and commerce. But the fractured power of different municipal governments — along with their graft, petty politics and jealousies — was helping to keep progress away from New York.

And then there was Chicago.

The Windy City loomed large over the talk of consolidation because Chicago was on the rise. In 1893, Chicago was chosen over NYC as the site of the World's Exhibition, the 1893 World's Fair. This was a tremendous coup and New Yorkers were not happy.

The Chicago World's Exhibition, 1893. Photo via Library of Congress

When that exposition turned out to be a huge success, not to mention herald a huge change in America's architecture, technology and society in general, Chicago was the most lauded city in the country.

It was also growing in size. Chicago was annexing its former suburbs to grow in population and importance. Chicago had its railroads and Great Lakes traffic, making it the premiere city of the Midwest.

It was as much a hub for business and industry as New York. The city was also the other preferred destination for new immigrants from Europe, making its population and potential workforce rise.

Chicago was a major threat to New York's dominance in the U.S. If ever there was a reason for a consolidated New York, one need only look west. It was time for New York to step up.

Green drew up the lines for consolidation, adding two new potential boroughs to the mix. His choices were based on two major considerations: bringing together all of the major port facilities in the Metropolitan New York area, and the sharing of resources, such as fresh water.

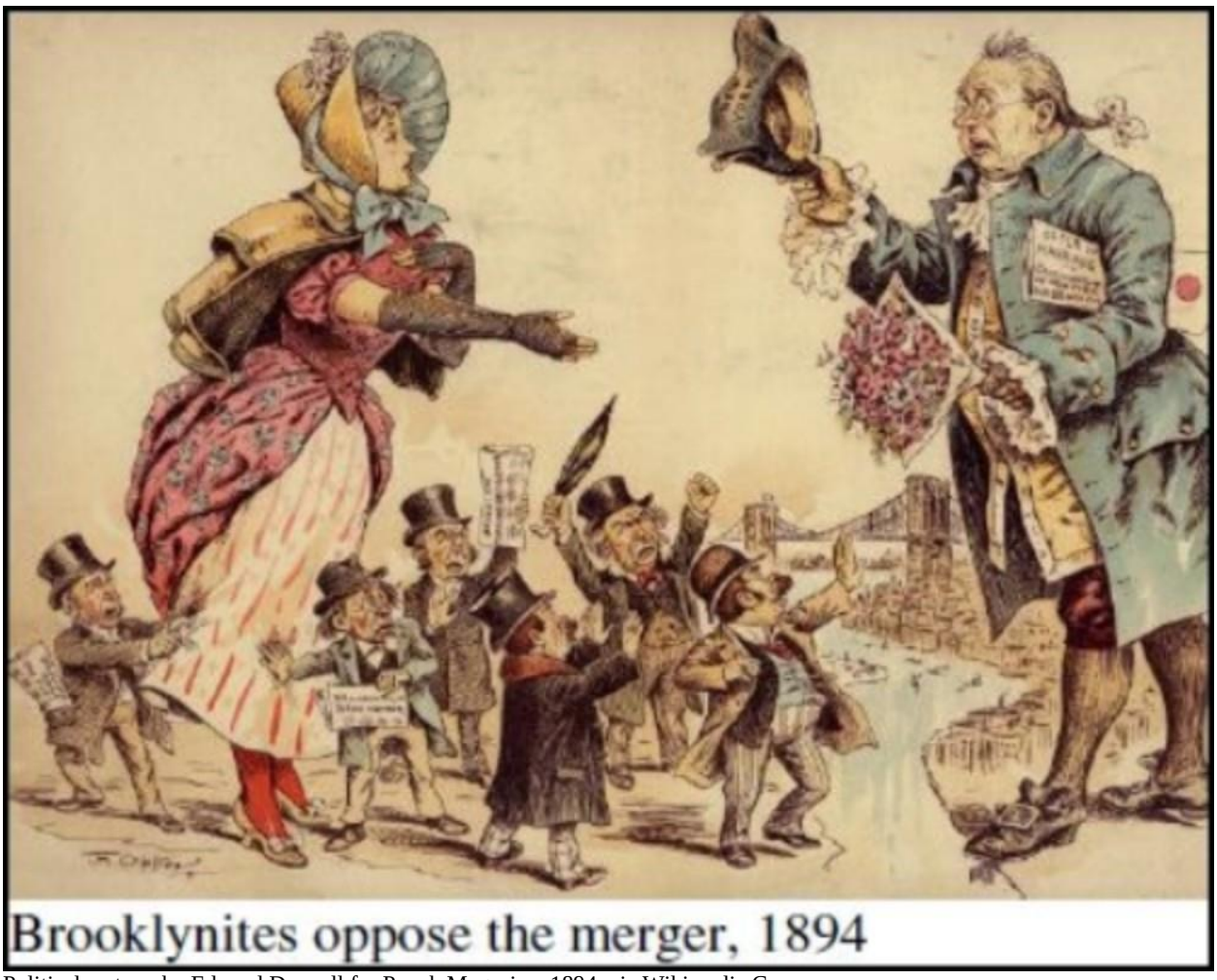
Brooklyn and Manhattan were obvious, and parts of the Bronx were already tied to Manhattan. The Bronx had access to the East River and the Long Island Sound.

In Queens, Long Island City had been an independent city as well. Its shoreline and port facilities were important to the plan, as was Queens' vast Jamaica Bay. Queens needed to be cut from neighboring Nassau County.

Staten Island offered the waterfront and bays that surrounded it. Green didn't want to lose them to New Jersey.

Beating Chicago was icing on the cake, but the real issue in consolidating the city was consolidating the vast resources of the area's harbors, the efficiency of shared municipal facilities, agencies and tax revenues and, of course, big money and power.

The business interests and politicians, both honest and corrupt, soon jumped aboard with great enthusiasm.



Political cartoon by Edward Donnell for Punch Magazine, 1894, via Wikimedia Commons

In 1894, a non-binding referendum was passed with a majority voting for consolidation, even in Brooklyn, where it passed by only 300 votes. This had two opposing results. The pro-consolidation forces considered the vote a victory and thought consolidation was now a done deal. They were wrong.

The anti-consolidation opposition kicked into high gear, ratcheting up the anti-consolidation sentiment so much that, by 1895, it was able to block any further legislation. Green was roadblocked. Staten Island and parts of Queens had issues with the merger, but the big opposition came from Brooklyn.

For many of Brooklyn's elite, consolidation was a matter of Brooklyn getting taxed for Manhattan's problems. Brooklynites saw their taxes rising. They also saw Brooklyn losing its identity and civic pride, an identity many had worked hard to create.

They were also afraid of Manhattan's Tammany Hall. An advertisement in the Brooklyn Eagle, run several times in October of 1894, stated:

Every voter can vote "for" or "against" the consolidation of Brooklyn with New York. He should vote against it this year, for now is not the time for it. Brooklyn is a City of Homes and Churches. New York is a city of Tammany Hall and Crime government. Rents are twice as cheap in Brooklyn as in New York, and homes are to be bought for a quarter of the money. The price of rule here is barely more than a third of what it is in New York. Government here is by public opinion and for the public interest. If tied to New York, Brooklyn would be a Tammany suburb, to be kicked, looted and bossed as such. Vote against consolidation now and let the speculators wait till a better time, when New York will offer something like fair terms.

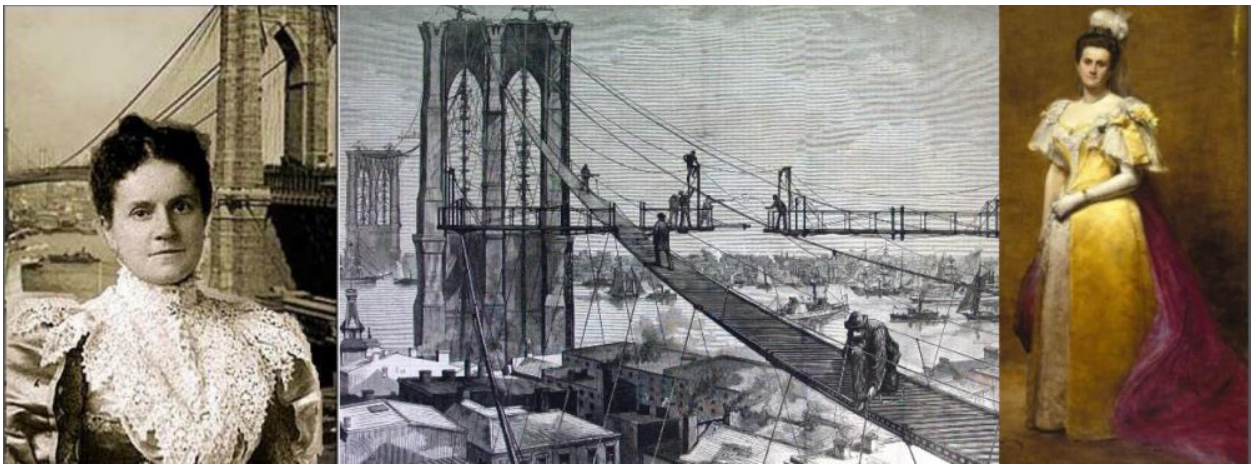
Green had appealed to New Yorkers' sense of Manifest Destiny and shared resources. He failed. It would take Republican politician Thomas Platt to wrest the movement away from him.

Platt got down and dirty; he called in his political favors and muscle and the measure was pushed through the state legislature in 1896. The charter was passed in 1897 and, on January 1, 1898, Greater New York City was born.

https://www.brownstoner.com/history/brooklyn-history-consolidation-of-new-york-great-mistake/

A Presentation by Carol Simon Levin

BRIDGE BUILDER IN PETTICOATS: EMILY WARREN ROEBLING



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- Further Reading for Adults & Teens

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The Great Bridge: The Epic Story of the Building of the Brooklyn Bridge by David McCullough (Simon and Schuster, 1972, reprinted 1983.) The definitive book on the bridge. Emily's role is updated in his Brave Companions: Portraits In History (Simon and Schuster, 1992.) which has a chapter describing Washington & Emily's partnership as well as mini-biographies of other exceptional, often little-known, men and women.

Chief Engineer Washington Roebling: The Man Who Built the Brooklyn Bridge by Erica Wagner (Bloomsbury, 2017) A new, authoritative and well-written biography that makes the case that Washington was far more than the executor of his father's plans. Makes use of Washington's manuscript biography of his father, thought to be lost until the 1980s when Donald Sayenga found it in the Rutgers University Archives and also articulates the frustration of not knowing exactly what Emily did since we have so few surviving documents by or about her (pp.xvi-xvii).

Art of the Brooklyn Bridge: A Visual History by Richard Haw (Routledge, 2008.) is a beautiful and exceptionally researched and well-written history of the bridge. His The Brooklyn Bridge: A Cultural History (Rutgers, 2005.) examines literary and social legacy of the bridge — positive and negative.

The Roebling Legacy by Clifford W. Zink (Princeton Landmark Publications, 2011.) The definitive history of the family and the firm.

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The Bridge: How the Roeblings Connected Brooklyn to New York Brooklyn Bridge: Fact and Symbol by Peter J. Tomasi, illustrated by Sara DuVall (Abrams, 2018.) This well-researched, beautifully-illustrated graphic novel effectively conveys the emotion and gravity of this tremendous undertaking. Brooklyn Bridge: Fact and Symbol by Alan Trachtenberg [my addition] (U of Chicago, 1965, 1979) synthesizes research about the Brooklyn Bridge from such diverse fields as history, engineering, and the arts. The work asks the question of why the Brooklyn Bridge had such a great impact on the nineteenth century American imagination and why it has continues to resonate in twentieth century art and literature.

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Other resources: RPI Archives Roebling Family Links. Rutgers University Roebling letters (along with photographs, and her paper "A Wife's Disabilities.")

DVDS:

Brooklyn Bridge — narrated by David McCullough & Ken Burns' first PBS Documentary (PBS Video, 1981)
Modern Marvels: Brooklyn Bridge (A&E Home Video, 2005)
Seven Wonders of the Industrial World (BBC Video, 2008)

- Further Reading for Children:

Secret Engineer: How Emily Roebling Built the Brooklyn Bridge by Rachel Dougherty (Roaring Brook, c2019) 40 p. Author-Illustrator Rachel Dougherty tells the story of Emily Roebling's role in the bridge in this picture book biography.

How Emily Saved the Bridge: The Story of Emily Warren Roebling and the Building of the Brooklyn Bridge by Frieda Wishinsky and Natalie Nelson (Groundwood Books, c2019) 32 p. Whimsical collage illustrations combining contemporary photographs and blocks of color along with imagined dialogue speech bubbles accompany this picture book account of the bridge & the builder.

Brooklyn Bridge by Lynn Curlee. (Atheneum Books for Young Readers, c2001.) 35 p. Describes the planning, construction, and history of the Brooklyn Bridge, celebrated as one of the greatest landmarks of New York City.

The Brooklyn Bridge by Elizabeth Mann. (New York : Mikaya Press, c1996.) 46 p. Attractive & detailed non-fiction description of the construction of the bridge and the many pitfalls encountered.

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Twenty One Elephants and Still Standing by April Jones Prince ; illustrated by François Roca. (Houghton Mifflin, c2005.) 32 p. The true story of how P.T. Barnum and his twenty-one elephants paraded across the bridge to prove to everyone that the bridge was safe. Twenty-One Elephants by Phil Bildner ; illustrated by LeUyen Pham. (Simon & Schuster Books for Young Readers, c2004.) 32 p. Fictionalized but contains lots of fascinating details.

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Marvelous Mattie : how Margaret E. Knight became an inventor by Emily Arnold McCully. (Farrar, Straus, Giroux, c2006.) 32 p. or In the Bag! Margaret Knight Wraps it Up by Monica Kulling,

Illustrated by David Parkins. (Tundra, c2011.) 32 p. The woman who figured out how to make a machine that would make a flat-bottomed paper bag and later became known as "the Lady Edison."

Spic-in-Span: Lillian Gilbreth's Wonder Kitchen by Monica Kulling, Illustrated by David Parkins (Tundra, c2014). A picture book biography of the first woman industrial engineer.

Ada Byron Lovelace and the Thinking Machine by Laurie Wallmark, Illustrated by April Chu (Creston, c2015.) 32 p. Gorgeous picture book biography brings to life the personality and amazing accomplishments of the astonishing 19th century female mathematician who conceived of the idea of computer programming long before there were even computers and is literally the "mother of computer science."

Bridge Building Experiments

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Bridges and Tunnels: Investigate Feats of Engineering with 25 Projects by Donna Latham, Illustrated by Jen Vaughn. (Nomad, c2012) Clear explanations of the physics accompany a variety of hands-on projects.

Build It! Activities for Setting Up Super Structures by Keith Good. (Lerner, c1999) Includes easy-to-build designs for a beam bridge (with spaghetti trusses). drawbridge, arch & suspension bridges.

WEBLINKS:

Emily Warren Roebling: Beyond the Bridge (NY Historical Society Women at the Center article contains links to many other pieces, including Emily's 2018 NY Times obituary) The New York Times did not publish an obituary at the time of her death (though approximately 50 other papers did — these are collected in the papers at Rutgers.) However the Times did publish this May 23, 1883 page 1 article on her role the day before the bridge's grand opening.

Brooklyn Bridge Construction: Overcoming the Odds

How Emily Warren Roebling helped save – and complete – the Brooklyn Bridge

American Society of Civil Engineers: Emily Warren Roebling

Scandalous Women: Emily Warren Roebling

BBC: A Marriage of Equals

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Common Core Connections: Engineering & Bridge Building Ideas

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MERCK MANUAL
Consumer Version
The trusted provider of medical information since 1899

Decompression Sickness (Decompression Illness; Caisson Disease; The Bends)

*By **Richard E. Moon**, MD, Duke University Medical Center*
Last full review/revision Aug 2019| Content last modified Aug 2019

Decompression sickness is a disorder in which nitrogen dissolved in the blood and tissues by high pressure forms bubbles as pressure decreases.

- Symptoms can include fatigue and pain in muscles and joints.
- In the more severe type, symptoms may be similar to those of stroke or can include numbness, tingling, arm or leg weakness, unsteadiness, vertigo (spinning), difficulty breathing, and chest pain.
- People are treated with oxygen and recompression (high-pressure, or hyperbaric, oxygen) therapy.
- Limiting the depth and duration of dives and the speed of ascent can help with prevention.

Air is composed mainly of nitrogen and oxygen. Because air under high pressure is compressed, each breath taken at depth contains many more molecules than a breath taken at the surface. Because oxygen is used continuously by the body, the extra oxygen molecules breathed under high pressure usually do not accumulate. However, the extra nitrogen molecules do accumulate in the blood and tissues.

As outside pressure decreases during ascent from a dive or when leaving a compressed air environment, the accumulated nitrogen that cannot be exhaled immediately forms bubbles in the blood and tissues. These bubbles may expand and

injure tissue, or they may block blood vessels in many organs—either directly or by triggering small blood clots. This blood vessel blockage causes pain and various other symptoms, for example, sometimes similar to those of a stroke (such as sudden weakness on one side of the body, difficulty speaking, or dizziness), or even flu-like symptoms. Nitrogen bubbles also cause inflammation, causing swelling and pain in muscles, joints, and tendons.

The risk of developing decompression sickness increases with many of the following factors:

- Certain heart defects, such as patent foramen ovale or atrial septal defect
- Cold water
- Dehydration
- Flying after diving
- Exertion
- Fatigue
- Increasing pressure (that is, the depth of the dive)
- Length of time spent in a pressurized environment
- Obesity
- Older age
- Rapid ascent

Because excess nitrogen remains dissolved in the body tissues for at least 12 hours after each dive, repeated dives within 1 day are more likely to cause decompression sickness than a single dive. Flying within 12 to 24 hours after diving (such as at the end of a vacation) exposes people to an even lower atmospheric pressure, making decompression sickness slightly more likely.

Nitrogen bubbles may form in small blood vessels or in the tissues themselves. Tissues with a high fat content, such as those in the brain and spinal cord, are particularly likely to be affected, because nitrogen dissolves very readily in fats.

- **Type I decompression sickness** tends to be mild and affects primarily the joints, skin, and lymphatic vessels.
- **Type II decompression sickness**, which may be life-threatening, often affects vital organ systems, including the brain and spinal cord, the respiratory system, and the circulatory system.

Symptoms

Symptoms of decompression sickness usually develop more slowly than do those of air embolism and pulmonary barotrauma. Only half of the people with decompression sickness have symptoms within 1 hour of surfacing, but 90% have symptoms by 6 hours. Symptoms commonly begin gradually and take some time to reach their maximum effect. The first symptoms may be

- Fatigue
- Loss of appetite
- Headache
- Vague feeling of illness

Type I decompression sickness (less severe)

The less severe type (or musculoskeletal form) of decompression sickness, often called the bends, typically causes pain. The pain usually occurs in the joints of the arms or legs, back, or muscles. Sometimes the location is hard to pinpoint. The pain may be mild or intermittent at first but may steadily grow stronger and become severe. The pain may be sharp or may be described as “deep” or “like something boring into bone.” It is worse when moving.

Less common symptoms include itching, skin mottling, swollen lymph nodes, rash, and extreme fatigue. These symptoms do not threaten life but may precede more dangerous problems.

Type II decompression sickness (more severe)

The more severe type of decompression sickness most commonly results in neurologic symptoms, which range from mild numbness to paralysis and death. The spinal cord is especially vulnerable.

Symptoms of spinal cord involvement can include numbness, tingling, weakness, or a combination in the arms, legs, or both. Mild weakness or tingling may progress over hours to irreversible paralysis. Inability to urinate or inability to control urination or defecation may also occur. Pain in the abdomen and back also is common.

Symptoms of brain involvement, most of which are similar to those of air embolism, include

- Headache
- Confusion
- Trouble speaking
- Double vision

Loss of consciousness is rare.

Symptoms of inner ear involvement, such as severe vertigo, ringing in the ears, and hearing loss, occur when the nerves of the inner ear are affected.

Symptoms of lung involvement caused by gas bubbles that travel through the veins to the lungs, produce cough, chest pain, and progressively worsening difficulty breathing (the chokes). Severe cases, which are rare, may result in shock and death.

Late effects of decompression sickness

Dysbaric osteonecrosis (sometimes called avascular bone necrosis) can be a late effect of decompression sickness, or can occur in the absence of decompression sickness. It involves the destruction of bone tissue, especially in the shoulder and hip. Dysbaric osteonecrosis can produce persistent pain and severe disability. These injuries rarely occur among recreational divers but are more common among people who work in a compressed-air environment and divers who work in deep underwater habitats. There is often no specific initiating event the person can identify as the source of symptoms once they do appear.

These workers are exposed to high pressure for prolonged periods and may have an undetected case of the bends. Technical divers, who dive to greater depths than recreational divers, may be at higher risk than recreational divers. Dysbaric osteonecrosis usually produces no symptoms but if it occurs close to a joint it may gradually progress over months or years to severe, disabling arthritis. By the time severe joint damage has occurred, the only treatment may be joint replacement.

Permanent neurologic problems, such as partial paralysis, usually result from delayed or inadequate treatment of spinal cord symptoms. However, sometimes the damage is too severe to correct, even with appropriate treatment. Repeated treatments with oxygen in a high-pressure chamber seem to help some people recover from spinal cord damage.

Diagnosis

- A doctor's evaluation

Doctors recognize decompression sickness by the nature of the symptoms and their onset in relation to diving. Tests such as computed tomography (CT) or magnetic resonance imaging (MRI) sometimes show brain or spinal cord abnormalities but are not reliable. However, recompression therapy is begun before the results of a CT or MRI scan are available, except in cases in which the diagnosis is uncertain or the diver’s condition is stable. MRI is usually diagnostic of dysbaric osteonecrosis.

Prevention

Divers try to prevent decompression sickness by avoiding gas bubble formation. They do this by limiting the depth and duration of dives to a range that does not need decompression stops during ascent (called no-stop limits by divers) or by ascending

with decompression stops as specified in authoritative guidelines, such as the decompression table in *Air Decompression,* a chapter in the *United States Navy Diving Manual.*

The table provides a schedule for ascent that usually allows excess nitrogen to escape without causing harm. Many divers wear a portable dive computer that continually tracks the diver's depth and time at depth. The computer calculates the decompression schedule for a safe return to the surface and indicates when decompression stops are needed.

In addition to following a table or computer guidelines for ascent, many divers make a safety stop of a few minutes at about 15 feet (4.5 meters) below the surface.

Following these procedures, however, does not eliminate the risk of decompression sickness. A small number of cases of decompression sickness develop after no-stop dives. The persistence of decompression sickness may be because the published tables and computer programs do not completely account for the variation in risk factors among different divers or because some people fail to obey the recommendations of the tables or computer.

Other precautions also are necessary:

- After several days of diving, a period of 12 to 24 hours (for example, 15 hours) at the surface is commonly recommended before flying or going to a higher altitude.
- People who have completely recovered from mild decompression sickness should refrain from diving for at least 2 weeks. After serious decompression sickness, it is best to wait longer (at least a month) and be evaluated by a physician before diving again.
- People who have developed decompression sickness despite following dive table or computer recommendations should return to diving only after a thorough medical evaluation for underlying risk factors, such as a heart defect.

Did You Know...

- Flying within 12 to 24 hours after diving (common when vacationing) increases the risk of decompression sickness.

Treatment

- Oxygen
- Sometimes recompression therapy

About 80% of people recover completely.

Divers having only itching, skin mottling, and fatigue usually do not need to undergo recompression, but they should be kept under observation, because more serious

problems may develop. Breathing 100% oxygen from a close-fitting face mask may provide relief.

Recompression therapy

Any other symptoms of decompression sickness indicate the need for treatment in a high-pressure (recompression, or hyperbaric oxygen) chamber, because recompression therapy restores normal blood flow and oxygen to affected tissues. After recompression, pressure is reduced gradually, with designated pauses, allowing time for excess gases to leave the body harmlessly. Because symptoms may reappear or worsen over the first 24 hours, even people with only mild or transient pain or neurologic symptoms are treated.

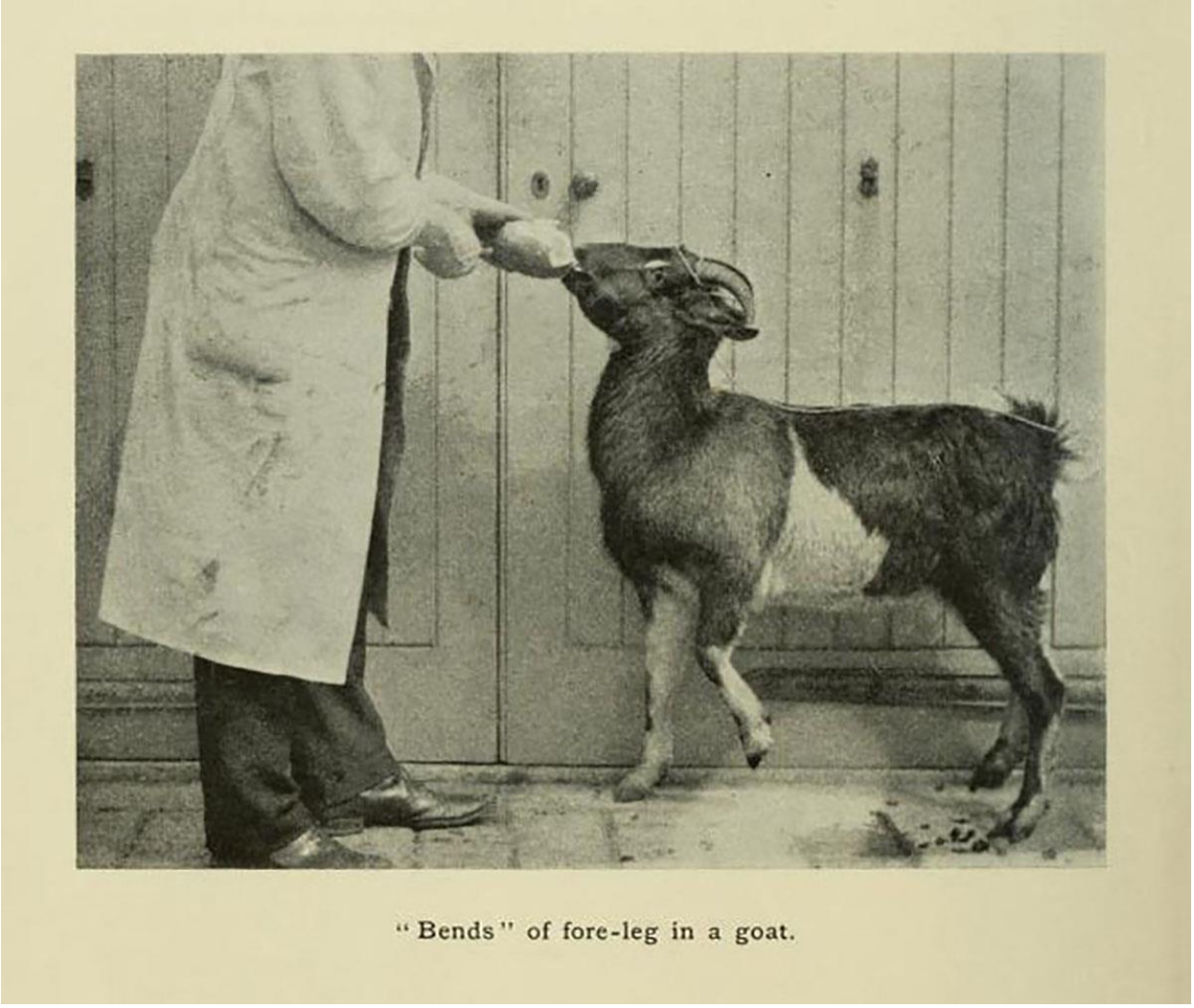
Recompression therapy is beneficial for up to 48 hours after diving and should be given even if reaching the nearest chamber requires significant travel. While awaiting transport and during transport, oxygen is administered with a close-fitting face mask, and fluids are given by mouth or intravenously. Long delays in treatment increase the risk of permanent injury.

https://www.merckmanuals.com/home/injuries-and-poisoning/diving-and-compressed-air-injuries/decompression-sickness

The Dark Story of How Scientists Used Goats to Solve the Bends

In 1905 a Scottish physiologist tested a method to help divers avoid the bends. Some goats were lost in the process.

JOSEPH A. WILLIAMS/Oct. 9, 2018



Bends in the foreleg of a goat after experiments performed by physiologist John S. Haldane, published in the Journal of Hygiene Vol. 8, 1908.

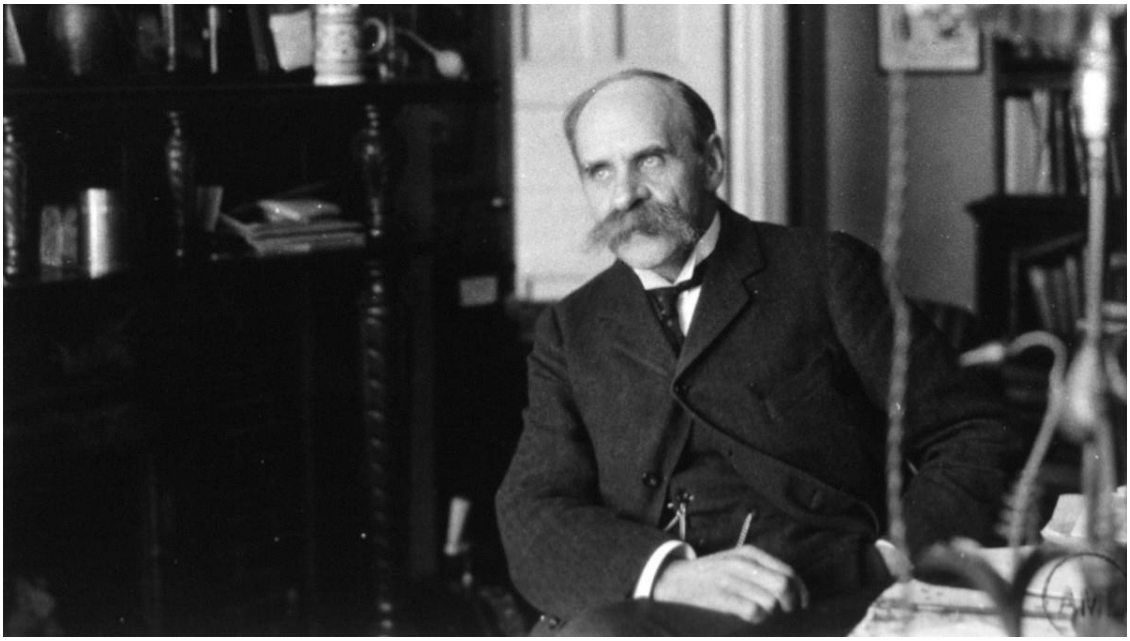
When the autopsy was performed on the diver in 1900, they found bubbles in his brain and heart. There were so many bubbles, in fact, that when examiners lifted the heart, it gurgled with froth. The cause of death was decompression sickness. And while doctors knew the cause of the condition, they desperately needed a way to prevent it. For the Scottish physiologist tasked with finding a solution, it would take multiple tests—and 85 goats—to find a method to avoid the excruciating condition.

Any person working under compressed air is subject to decompression sickness–this is especially true for divers, who in order to dive deep need to breathe higher levels of compressed air in order to overcome ambient sea pressure. As divers on the bottom breath compressed air, they notice nothing–the air seems the same as it would on the surface. However, as a diver surfaces and the water pressure lessens, the gasses of compressed air the diver imbibed come out of solution forming bubbles, much the way a bottle of soda water does when the cap is opened.

Of the various gasses inside the bubbles, oxygen is easily absorbed by the body, carbon dioxide is readily expelled, but bubbles of nitrogen linger. These travel through the body and lodge into joints, the spinal column and organs. Those afflicted with decompression sickness experience a variety of symptoms including dizziness, double vision, severe pains, blindness and paralysis. Death was common. Decompression sickness was also known as diver's palsy and caisson's disease, since it was first diagnosed among workers who were building the Brooklyn Bridge under compressed air. But it is most commonly called the bends, due to the contorted position victims often took.

In the early 20th century there was no known way to prevent the bends. If divers surfaced and showed symptoms, they were often sent back down to the bottom or placed into a recompression chamber, nicknamed a "diver's oven," to breathe compressed air which forced the nitrogen bubbles in their bodies back into solution. Then they were decompressed by trial and error. The most common advice of the day was to gradually raise a diver by one atmosphere of pressure every 20 minutes, which hardly ever worked.

In 1905, the British Admiralty commissioned the Scottish physiologist John Scott Haldane to solve the problem. Haldane at that time was known for his experiments in combating noxious gasses in mines and his studies on respiration. Not one to shy from practical experimentation, he and a colleague sealed themselves in an air-tight box they dubbed the "coffin" and recorded their reactions as they ran out of breathable air. The Haldane family motto, was "Suffer."



John Scott Haldane, circa 1920.-U.S. National Library of Medicine

Haldane coordinated test dives with the Royal Navy, reviewed the medical literature, and interviewed divers. He learned that decompression sickness never occurred when a diver stayed above 33 feet. The compressed air that was delivered to divers at that depth was at a pressure of about two atmospheres, double the air pressure on the surface. Haldane reasoned that if a diver can surface after being exposed to double the air pressure with no ill effects, then any human could withstand an immediate drop in air pressure by half no matter the depth.

For example, if a diver descends to 300 feet, the volume of compressed air necessary to overcome the water pressure is just over 148 pounds per square inch (psi). Instead of coming up gradually, a diver may ascend immediately to 134 feet where the pressure is 74 psi, half. Then after waiting for a time to allow the body to adjust and dissipate bubbles, the diver may ascend to 51 feet, where the pressure is just over 37 psi, wait, and so on until he was able to surface. Haldane dubbed his theory *staged decompression*.

To test his hypothesis, Haldane ordered experiments to be performed at the Lister Institute of Preventative Medicine in London by Lieutenant Guybon Damant of the Royal Navy, an expert diver and amateur scientist, and the physiologist Edwin Arthur Boycott. The researchers first experimented on mice, rats, guinea-pigs and an old hen by placing them in a large experimental air tank, filling it with compressed air, then evacuating the air. The results were inconclusive since these smaller-bodied creatures exchanged gas more rapidly than humans.

The researchers considered alternatives such as monkeys, dogs and pigs. But these were either too small, difficult to obtain or had respiratory exchange rates far different from humans. At last they settled on goats which they calculated had a respiratory exchange rate 1.7 times that of an adult human male.

A herd of 85 goats was assembled at Lister for some grim experiments. The researchers put groups of up to eight goats inside the chamber, delivered compressed air, waited, and then normalized pressure before releasing them into the institute’s yard for observation.

Just as in humans, the goats had different kinds of symptoms indicating the bends. Some refused food. Others bleated in pain. Some became paralyzed (both temporary and permanent). Others showed injury in the knees (a common occurrence of the bends as bubbles would lodge in the joints). Some suffered shortness of breath and labored breathing. Others died. The researchers were not completely devoid of compassion. They attempted to limit experiments to what they deemed would not outright kill the goats, and those that were in great distress were euthanized. At the conclusion of all these experiments there was one surviving goat, which was adopted by Lieutenant Damant as a pet. It was in this way that the researchers confirmed that those goats which were staged decompressed did not suffer from the bends.

A vintage postcard showing deep sea divers from the Royal Navy returning from training, circa 1905.Popperfoto/Getty Images

The next step was human testing. Lieutenant Damant and Warrant Officer Andrew Catto, an expert diver, volunteered for the job. Like the goats, they entered the experimental chamber and subjected themselves to bouts of compressed air of up to just over 94 psi from which they were staged decompressed. After repeated trials, there were no signs of the bends. Now it was time for real world experiments.

In late August 1906, Haldane, Catto, and Damant sailed the torpedo boat HMS *Spanker* to the deep waters of Loch Striven, a finger off the Firth of Clyde. Damant and Catto suited up into the bulky diving dress which in air weighed nearly 200 pounds. The divers were connected physically to the *Spanker* by an air hose and lifeline, the latter of which was threaded with a copper wire that allowed for telephone communication with the surface.

Tests dives were conducted by Catto and Damant who stood knee deep in the muck of the loch for up to an hour. When the time was up, Damant, who descended to 90 feet, was raised to 30 feet which was calculated to be the shallowest depth he could safely decompress. He held a shot line and waved about his limbs vigorously with the idea that this would help disperse nitrogen bubbles faster. Five minutes later, he was hauled to 10 feet. There he waited another 10 minutes before he was raised to the surface. There were no signs of the bends.

Testing continued for over a week, but not all went as planned. On the afternoon of August 28, Catto dove to 180 feet and worked on attaching a weight to a hawser for 12 minutes in order to simulate realistic conditions. As he ascended he found that his lifeline had become entangled. It was not a terrible tangle, but this was at an unprecedented depth and the pumps, which were hand cranked affairs, had trouble delivering the appropriate amount of air. This made Catto particularly sluggish.

Catto ultimately was able to untangle his line. By the time he was untangled, he had been on the bottom for 28 minutes. No human had ever been exposed to such levels of compressed air (over 90 psi) in real-world conditions for so long. When raising Catto, the researchers took great care and stage decompressed him with nine stops. It took Catto 90 minutes to reach the surface. The diver showed no sign of the bends, just exhaustion. Catto dove the next day, and three days later, Damant descended to an unprecedented depth of 210 feet, a world record. He surfaced with no signs of decompression sickness.

Testing was a complete success. Haldane published a series of diving tables which were quickly adopted by Britain and soon after by divers worldwide. These tables formed the basis of the essential rules of how to safely raise deep sea divers.

Staged decompression is still used today. On September 18, 2014, Egyptian diver Ahmed Gabr dove 332.35 meters (1,090 feet) in the Red Sea, setting a world record for deep sea scuba diving. The ambient sea pressure was over 472 psi. While it took Gabr 14 minutes to reach that depth, he spent 13.5 hours decompressing to the surface.

https://www.history.com/news/staged-decompression-bends-diving-goats