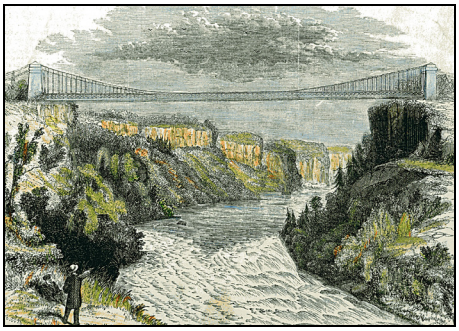
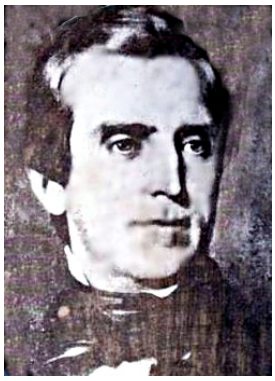
History and Heritage Newsletter

November 2012, Volume VI, No. 6

Banner Images for November



What bridge am I and who built me?

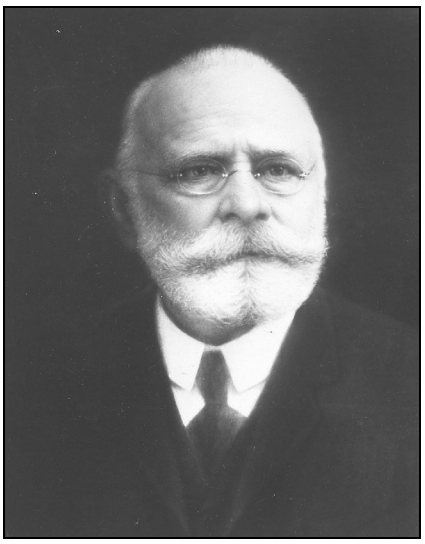


Who am I?

Banner Images from September Issue

The bridge was the Fraser River Bridge designed by C. Conrad Schneider, President of the ASCE in 1905. It was designed prior to the Niagara Cantilever Bridge by Schneider but the Niagara Bridge was built first due to the late delivery of the iron that had to be shipped from England for the Fraser River Bridge. The two bridges were the first cantilever bridges with a suspended span between the two river piers. A cantilever was chosen, as it was impossible to place falsework in the river upon which to build a simple span truss bridge. The Fraser River Bridge finally opened in 1884. It was removed in 1910 and rebuilt over the Niagara Creek and is now called the Frisco Bridge.

Fraser River Cantilever, 1884 to 1910



Charles C. Schneider, President ASCE 1905

The engineer was George S. Morison, President ASCE 1895. He was born in New Bedford, Massachusetts in 1842 and attended Phillips Exeter and Harvard University. He trained to be a lawyer and was admitted to the Bar but chose to pursue a career in civil engineering. His first position was with Octave Chanute on the construction of the Missouri River Bridge. He followed Chanute to the Erie Railroad, which was upgrading its track and bridges. After a fire destroyed the Portage Bridge across the Genesee Gorge near Rochester, he replaced it with an iron bridge within 86 days. He left the Erie after five years and went into partnership with George S. Fields and served as a consultant to the Barring Company that was investing in American Bridges and wanted their man on the ground to advise them. This was followed by many bridges across the Missouri, Snake, St. Johns, Columbia and finally the Mississippi Rivers. His cantilever bridge at Memphis across the Mississippi opened in 1893 with the longest suspended span in the country. He served on many boards of engineers in the 1890s, but it was his service on the Isthmian Canal Commission, appointed by President McKinley, that earned him perhaps his greatest fame. The Commission looked at all of the routes that had been proposed over the last half of the 19th century to build a canal and chose the Nicaragua Route with all but Morison supporting the recommendation. He lobbied President Roosevelt for the Panama Route and spoke in favor of it to the various House and Senate Committees. After the New Panama Canal Company agreed to sell their concession and works at Panama for $40,000,000, the Commission reversed itself and supported the Panama Route. It is thought by many that Roosevelt would have appointed Morison to lead the construction of the canal but he died abruptly in 1903.

Morison's Memphis, Frisco, Bridge 1893 to Present.

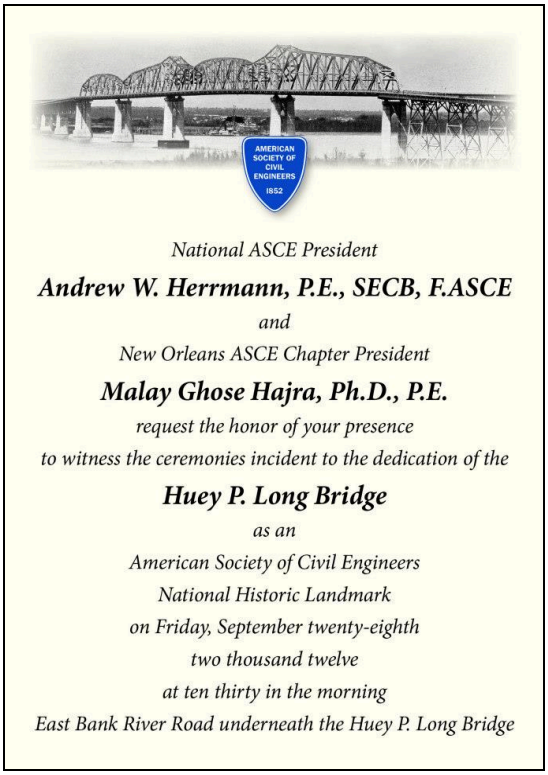
Dedication of Huey P. Long Bridge as a NHCEL

On September 28, 2012, the New Orleans Branch of the Louisiana Section hosted the dedication ceremony of the Huey P. Long Bridge as an ASCE National Historic Civil Engineering Landmark. National ASCE President Andrew Hermann presented the commemorative plaque to John Morrow, the general manager of the New Orleans Public Belt Railroad, owner of the bridge, in a ceremony attended by Secretary Sherri LeBas of the Louisiana Department of Transportation and

Development, Jefferson Parish President John Young, and other local dignitaries. Local radio personality, "Spud" McConnell, emceed the ceremony in character as Huey P. Long with several Long family members in attendance. Approximately 75 people attended the ceremony held under the bridge.

The program for the ceremony with many construction photographs can be found at http://www.timedla.com/upload/files/news/HPL%20ASCE%20book%202nd%20edition.pdf

Malay G. Hajra, President New Orleans Branch ASCE, President Andy Herrmann, Ronald Schumann, President Louisiana Section ASCE



National ASCE President

Andrew W. Herrmann, P.E., SECB, F.ASCE

and

New Orleans ASCE Chapter President

Malay Ghose Hajra, Ph.D., P.E.

request the honor of your presence
to witness the ceremonies incident to the dedication of the

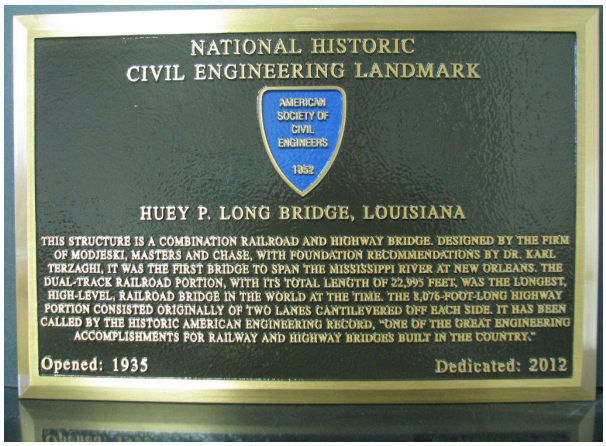
Huey P. Long Bridge

as an
American Society of Civil Engineers
National Historic Landmark
on Friday, September twenty-eighth
two thousand twelve
at ten thirty in the morning
East Bank River Road underneath the Huey P. Long Bridge

Invitation to Ceremony

Dignitaries, Pres. Herrmann second from right, Secretary Sherri LeBas, Louisiana Department of Transportation and Development, fourth from left, and members of the Long family.

Huey P. Long Bridge, roadway portion on far side of the bridge. Note: the simple span truss on the left was also constructed by cantilever methods.



Plaque as mounted on Bridge Column

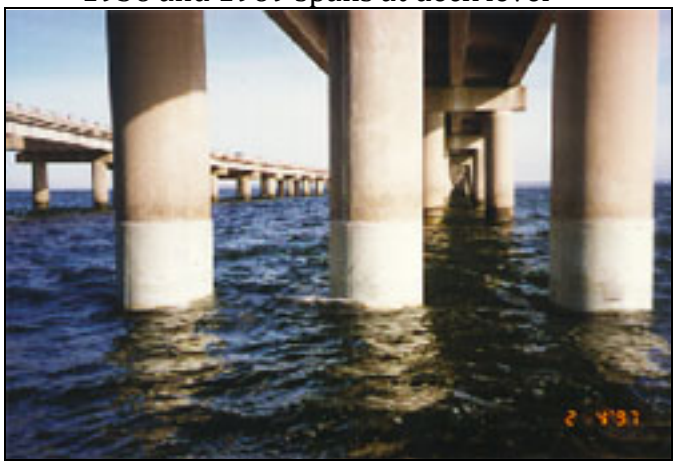
History and Heritage Committee Meeting
Washington, D. C. September 22, 2012

The committee met face to face for the first time in two years at ASCE Headquarters in Reston, Virginia. Among the HCEL nominations considered were the Slow Sand filtration Plant in Kolkata, India, the Lake Pontchartrain Bridge in Louisiana, and the Waterford Bridges in New York State.

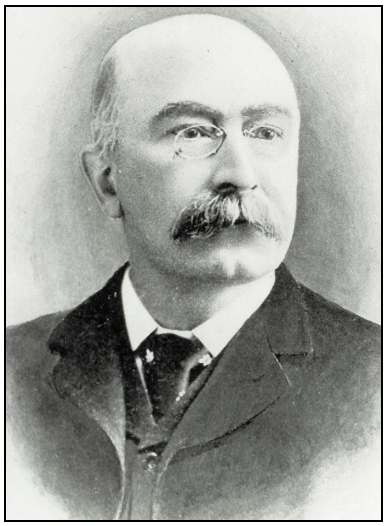
The **Lake Pontchartrain Bridge in Louisiana** was nominated by the Louisiana Section. Frank Griggs was the presenter. He mentioned that both he and his father had worked for the Raymond Concrete Pile Company during the period of construction of the bridge. After giving a brief history of pile driving he described the poor soil conditions existing across the 20+ mile long lake and how all structures had to be supported by friction piles which up to that time had been of 24 inch square reinforced concrete. Maxwell Upson designed and patented a 54-inch diameter cylinder pile made up of 16 ft. long precast segments which were pre-stressed together by steel wires. In addition, Upson suggested that all of the pile caps be precast and the entire deck section be built as a single unit with pre-stressed concrete. A factory was set up to precast and pre-stress all of the elements which were standardized and shipped to the bridge site on barges. The cylinder piles were positioned and driven, two piles to a bent and a precast pile cap was placed on the top of the piles and concreted into place at the design grade. The precast, prestressed deck section was placed on the pile caps and the process repeated and repeated in much the same way as Caesar's bridge across the Rhine in 55 BC and the early wooden New England Bridges such as across the Charles River. It can be claimed that it was the first manufactured bridge using industrial plant methods.

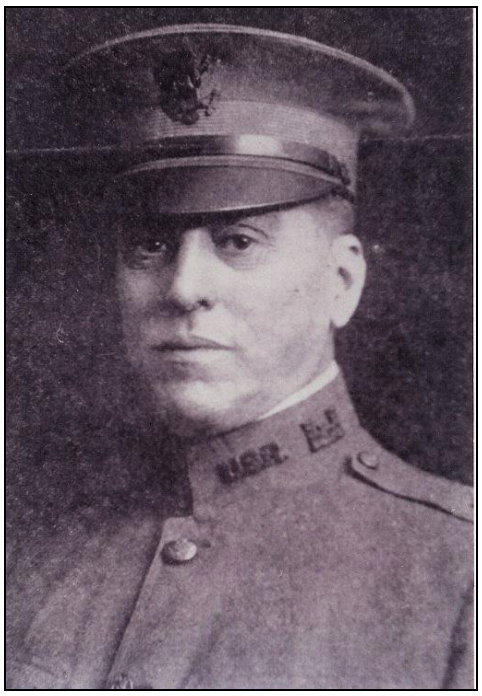
It addition, it was the longest bridge in America and is still the longest continuous bridge over water in the world. It is 23.8 - miles long from end to end and was opened in 1956, with a parallel span opening in 1969. The 1969 bridge was built on the same plan with the exception that the piers consisted of three cylinder piles. Griggs recommended it be approved as a NHCEL and the motion was seconded. After discussion the nomination was approved unanimously.

1956 and 1969 spans at deck level


Cylinder Piles, Three per pier (1969) on right, two per pier (1956) on left.

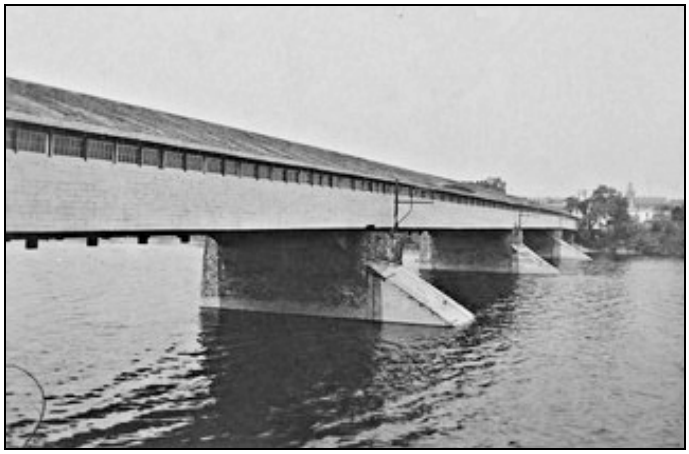
The Waterford Bridges were nominated by the Mohawk Hudson Section. Frank Griggs was the presenter. He began the presentation by giving a brief history of early wood truss/arch bridges in the United States starting with the bridge of Timothy Palmer across the Merrimack, Kennebec, Piscataqua, Delaware and Potomac Rivers in the late 18th and early 19th Centuries. It was in the early 1800's that Theodore Burr began to build his bridges consisting of arch supported wooden trusses. He was called to Waterford, New York in 1804 to build the first bridge across the Lower Hudson River. It had three masonry piers in the river along with two masonry abutments. Late in 1804 the toll bridge was opened to traffic as a double-barreled bridge with three lines of trusses. It was repaired and covered in 1814 and survived, with reinforcing to permit the passage of trolley cars, until 1909 when it was destroyed in a fire. It was replaced with a new steel bridge on the same piers, with some increase in pier height to permit the Champlain Canal boats to pass underneath when the canal was shifted to the river channel. The engineers were A. P. Boller and Henry Hodge, two of the leading bridge engineers of the period. The steel was fabricated and erected by the Phoenix Bridge Company, one of the leading bridge companies of the period. For the past 208 years only two bridges have served this site and they both rest upon the piers placed in 1804. This makes the site and its bridges one of the most unique bridge sites in the country. Griggs recommended that the nomination be approved as a NHCEL. The motion was seconded and, after discussion, the nomination was approved unanimously.


Alfred P. Boller



Henry Hodge

New and Old Waterford Bridges from postcard



Waterford Bridge 1804, Covered 1814

In other business the new committee re-organization was discussed to determine the impact it may have on the H & H committee processes. Staff indicated that a lot has yet to be determined and as soon as the details have been worked out the committee will be notified. The Newsletter on the History and Heritage of American Civil Engineering was discussed with several suggested formats made by the Web Development department. It is anticipated that the first newsletter in the new Web format to be made available to all members of the society will be the November issue.

The Committee for 2012 is shown below.

H & H Committee, Front row Henry Petroski, Chair, Anni Autio, Back row, Carol Reese, staff contact, Richard Wiltshire, Frank Griggs, Reuben Hull, Lawrence Lee, HAER Liaison

Civil Engineering Almanac - Reuben Hull
November / December 2012

November marks the anniversary of the completion of the **Goodyear Airdock**, an airship hangar in Akron, Ohio. The Goodyear Airdock, constructed from April 20, 1929 to November 25, 1929, was built at a cost of $2.25 million by the Goodyear-Zepplin Corporation from plans created by the Wilbur Watson Engineering Company of Cleveland, Ohio. With the construction of the Airdock, Akron became one of the centers for development and construction of lighter-than-air ships. The U.S. Navy airships, *USS Akron* and *USS Macon*, were built in the Airdock and launched in 1931 and 1933, respectively.

In 1928 the U.S. Navy awarded the Goodyear-Zeppelin Corporation a contract to construct two large (6,500,000 cubic feet volume) rigid airships to be used for scouting and fleet operations. To construct these rigid airships, engineer Karl Arnstein (1887-1974) and his team of German engineers designed the Airdock at the Akron municipal airport. The dimensions of the Airdock are 325 feet wide, 1,175 feet long and 211 feet high, large enough to accommodate an airship of 10,000,000 cubic feet capacity. The Airdock is supported by parabolic structural steel arches, with nine acres of unobstructed floor space and an enclosed volume of 55 million cubic feet. When the dock was completed, it was the world's largest freestanding structure without interior supports.

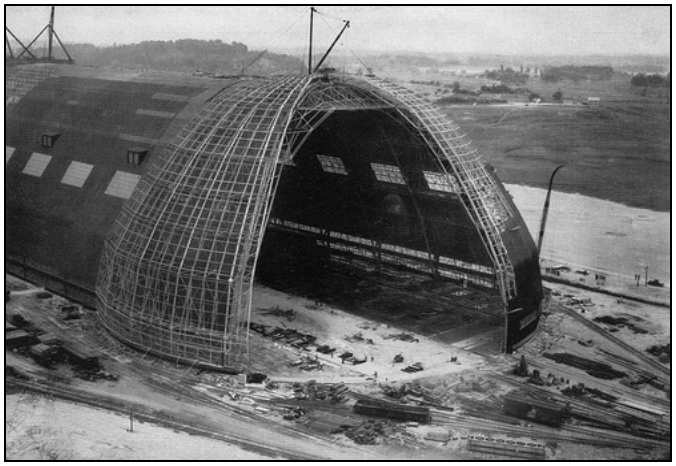
The building has a unique shape which has been described as "half a silkworm's cocoon, cut in half the long way." Wind dynamics were a major consideration in building such a large structure. Arnstein had extensive tests conducted on a model of the building in the wind tunnel of the Daniel Guggenheim School of Aeronautics of New York University. Wind tunnel testing on a model helped designers decide that a semi-parabolic shape would best resolve air current concerns.

At each end of the building are two semi-spherical doors that each weigh 600 tons and rest on 40 wheels, set radially on curved, standard gauge railroad tracks. Each set of doors has an individual power plant that can open and close its door in five minutes.

The Airdock is so large that temperature changes within the structure could be notably different from that on the outside of the structure. To accommodate these fluctuations, which could potentially cause structural damage, a row of 12 windows were installed 100 feet off the ground and the entire structure is mounted on rollers to compensate for thermal expansion and contraction.

The last airship built in the Airdock was completed in 1960. The building later housed the photographic division of the Goodyear Aerospace Corporation. The Goodyear Airdock remains among the largest buildings ever designed in terms of obstruction-free interior square footage. It covers an area larger than eight football fields set side-by-side and is roughly as tall as a 22-story building. In 1980, the Goodyear Airdock was designated a National Historic Civil Engineering

Landmark by the American Society of Civil Engineers.



Goodyear Airdock

December marks the anniversary of the death of **Karl Arnstein** (March 24, 1887 - December 12, 1974), civil and structural engineer, designer of the Goodyear Airdock, and one of the world's authorities on lighter-than-air aircraft. Born in Prague, Bohemia, Arnstein attended the German Institute of Technology and the University of Prague, graduating Summa Cum Laude (Engineering) in 1910. He was awarded the degree Doctor of Technical Sciences in 1912.

Appointed an assistant professor of bridge design at the University, Arnstein earned a reputation throughout Europe for his expert knowledge of stress analysis and he won a competition for the design of the Lorraine Bridge in Bern, Switzerland. From 1911-1914, he was employed as Chief Engineer for the firm Ed. Züblin & Cie., in Strasbourg, where he calculated the design and helped build the reinforced concrete Langwieser Viaduct of the Chur-Arosa electric railroad in Switzerland. This long-span arched bridge served as a prototype for other large, reinforced concrete bridges. While employed with Züblin, Arnstein also was responsible for engineering reinforcements to the weakened pillars supporting the tower of the Strasbourg Cathedral.

From 1915 to 1924, Arnstein, on the personal invitation of Count Ferdinand von Zeppelin, accepted a position with Luftschiffbau-Zeppelin Friedrichshafen, Germany and soon became Chief Constructor. While there he developed the theoretical calculations necessary for the design and construction of larger, more efficient airships employing aluminum alloy joints and girders.

Arnstein immigrated to Akron, Ohio, in 1924 to serve as vice-president of engineering at Goodyear-Zeppelin Corporation. At the recommendation of the U.S. Navy Bureau of Aeronautics, the Goodyear Tire and Rubber Company selected Arnstein to head a group of

Karl Arnstein

engineers at the newly formed Goodyear-Zeppelin subsidiary in Akron, Ohio for the design of the innovative airships *USS Akron* and *USS Macon* and the Goodyear Airdock in which they were constructed. Along with the rigid airships, Arnstein also directed the design of free balloons, notably the *Century of*

Progress and *Explorer II*, which captured world altitude records for manned aircraft.

During the 1930s Arnstein developed a streamlined commuter train called the "Comet" for the New York, New Haven, and Hartford Railroad incorporating monocoque construction. Monocoque (from the Greek for single *[mono]* and French for shell *[coque]*) is a construction technique that supports structural load by using an object's external skin, as opposed to using an internal frame or truss.

Other projects undertaken by Goodyear and Arnstein in the post-World War II era included the construction of prefabricated aluminum houses in addition to his many aviation designs. Arnstein retired from the Goodyear Aircraft Corporation in 1957 after 32 years with the company, but continued as a consultant for several years thereafter. Over his career, his innovations in aircraft design were granted more than thirty aviation related patents.

Karl Arnstein became a naturalized American citizen in 1930. Arnstein passed away in Akron on December 12, 1974, at the age of 87.

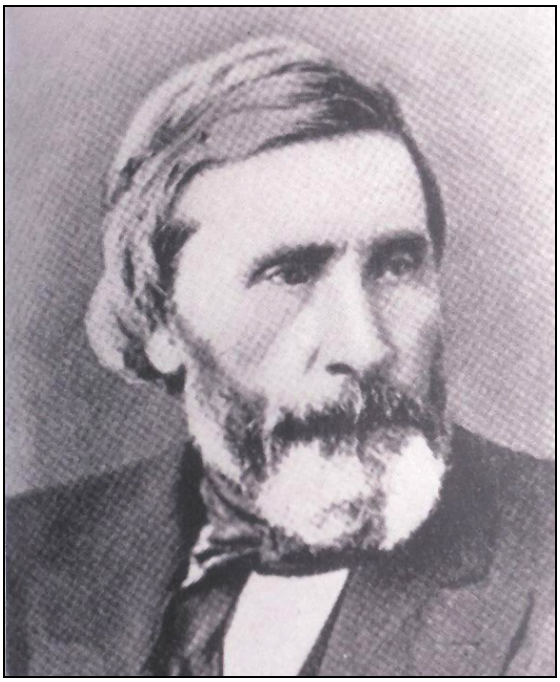
Further information on the Goodyear Airdock and Karl Arnstein can be found in the book *When Giants Roamed the Sky: Karl Arnstein and the Rise of Airships from Zeppelin to Goodyear*.

Cities Named for Civil Engineers: Kirkwood, New York and Kirkwood, Missouri

This issue's city named for an engineer is a two-fer as James Pugh Kirkwood had two cities named after him, one in New York and one in Missouri. Kirkwood, New York is located in Broome County on the Susquehanna River near the border with Pennsylvania and just off I-81. James Kirkwood was an engineer who worked on the layout of the New York and Erie Railroad in the 1840s and early 1850s which ran through the town. He, along with his brother-in-law Julius Adams, also designed and built the Starrucca Viaduct to the southeast.

Kirkwood, Missouri is located southwest of St. Louis near the intersection of I-270 and I-44. It was located on the Pacific Railroad of Missouri, which ran through the area, and for which Kirkwood was the chief engineer in early 1850s.

Kirkwood was born in Edinburgh, Scotland in 1807 and served his apprenticeship with Thomas Grainger before entering briefly into practice on his own in Glasgow. He immigrated to the United States in 1832. He, along with James Laurie, another Scot, went to work on the New England railroads with William Gibbs McNeil. Following work on several other railroads, including the New York & Erie, he moved to Missouri in 1850 to work on the Missouri Pacific Railroad. In 1855 he moved to New York City working on many water projects, including the Croton Aqueduct. In the mid 1860s he went to St. Louis and designed a slow sand filtration system based upon European methods which he learned during a trip to the continent in 1865. His last major project was a report to the Massachusetts State Board of Health on river pollution and ways to clean the waterways. He was elected the second President of ASCE in 1867 after its resuscitation following the Civil War. Kirkwood died in Brooklyn in 1877.



James Pugh Kirkwood, 1807-1877

Starrucca Viaduct 1851, NHCEL

Upcoming History Sessions

Jerry Rogers and the EWRI History and Heritage Committee have planned three history sessions for the EWRI Conference to be held in Cincinnati, Ohio in May 2013. The tentative schedule of talks along with their presenters is as follows:

Session #1
A Century of Environmental Research in Cincinnati -James Smith
Building the Canal to Save Chicago – Dick Lanyon
The Past and Future of the Johnson Administration Water Quality Policies- David Eaton

Session #2
Arthur Morgan, The 1913 Dayton Flood and the Miami Conservancy District History – J. David Rogers
One Hundred Years of Leadership: The Miami Conservancy District – Kurt A. Rinehart

Session #3
The Western Australia Goldfields Water Supply Scheme: An International Historical Civil Engineering Landmark – David Gilbert
History of Raw Water Intakes and Water Treatment for Southern Nevada – Laura Jacobsen, Erika Moonin and Robin Rockey

In addition, Jerry Rogers will have a Poster paper entitled: The History of Environmental Research in Cincinnati, Ohio (From the U. S. Public Health Service to the U. S. Environmental Protection Agency)

The History and Heritage Committee (with Bernie Dennis as contact person) is working with other ASCE partners to present a history session at the Annual Meeting of ASCE in Panama in 2014 on the 100th anniversary of the opening of the canal. J. David Rogers is working with ASCE Press on a book on the Panama Canal that will hopefully be published prior to the event.

Articles and books on Civil Engineering History

Griggs, Francis E. "Joseph B. Strauss," *Structure Magazine*, October 2012, 35-37.

Hahn, Alexander, *Mathematical Excursions to the World's Great Buildings*, Princeton University Press, Princeton, New Jersey, 2102.

Hart-Davis, Adam, *Engineers: From the Great Pyramids to the Pioneers of Space Travel*, DK Publishing, New York City, 2012.

Holth, Nathan, *Chicago's Bridges*, Shire Library, London, July 2012.

Masi, Antonio, *New York's Golden Age of Bridges*, Fordham University Press, 2011

Thrall, Ashley P., Bréa, Kyrsten L., Billington, David P., (2012). "The Maria Pia Bridge: A Major Work of Structural Art," *Engineering Structures*, Vol. 40, 479-486

Weingardt, Richard, "Canvas White: Pioneering Canal Engineer and Originator of American Cement," *Leadership and Management in Engineering*, Vol. 12, No. 4, October 2012, 330-337.

Weingardt, Richard, "William LeMessurier, Builder of Elegant Cutting-edge Structures," *Structure Magazine*, September 2012, 35-37.

Thoughts for the Day

"Begin somewhere; you cannot build a reputation on what you intend to do."
James Russell Lowell

"Character is like a tree and reputation like a shadow. The shadow is what we think of it, the tree is the real thing."
Abraham Lincoln

"Be more concerned with your character than your reputation, because your character is what you really are, and your reputation is merely what others think you are."
George Washington

"Leadership to me means duty, honor, country. It means character, and it means listening from time to time."
George W. Bush

"To sit back hoping that someday, someway, someone will make things right is to go on feeding the crocodile, hoping he will eat you last--but eat you he will."
Ronald Reagan

"Our character...is an omen of our destiny, and the more integrity we have and keep, the simpler and nobler that destiny is likely to be."
George Santayana

Newsletter editor: Frank Griggs, Jr., Ph.D, P.E., L.S., Dist.M. ASCE