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Presentation Abstracts and Conference Guide

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Missouri **Highway 45** sign to Parkville, MO
K: The ASB Bridge, Kansas City, MO
C: ABC Storage Company Building, Kansas City, MO
M: Boulevard Brewery Company Building, Kansas City, MO
O: Union Station, Kansas City, MO
2: Kemper Arena, Kansas City, MO
0: Veolia Energy, Kansas City, MO
1: Veolia Energy, Kansas City, MO
6: The High Line Bridge, Kansas City, MO—Kansas City, KS

Abstracts

Session 1A: Kansas City

Michael D. Hamilton

Technology Transfer from 35mm to 16mm Film at the Calvin Company, Kansas City, Missouri

Founded in 1931, The Calvin Company of Kansas City, Missouri developed some essential technologies for the practical use of 16 millimeter (mm) film for sound-on-film industrial movies. At the time, "industrials," a generic name covering business, education, religious, training and other non-theatrical films, were produced and exhibited in 35mm film. Sixteen millimeter was the "home movie" format. Forrest O. Calvin and Lloyd Thompson believed that 16mm was a practical, and far cheaper, format for industrials and it did not have to be shown in large theaters with carbon arc projectors using dangerous cellulose nitrate film. Little or no professional production or release printing equipment existed for 16mm. With photographs, artifacts and oral histories, this presentation follows Calvin's early history as it adapted 35mm technology to 16mm.

While an off-the-shelf 16mm camera such as the spring-wound Kodak Cine Special is likely to have been the basis of Calvin's camera department in the early years, a specialized motor artifact shows that the company modified the basic camera with special-purpose motors so that they could be held accurately at sound speed, assure consistent frame-by-frame exposure and accomplish time-lapse photography.

The Moviola, a staple in 35mm editing that allowed editors to view sound and picture together and in sync, was not yet available for 16mm. Calvin devised an alternative 16mm editing system to keep sound and picture frame-accurate. An extant synchronizer made in the Calvin machine shop shows that Calvin manufactured peripheral equipment that was only commercially available for the 35mm world. This "across the table" editing method also involved considerably less capital investment.

This same antique synchronizer raises another question about early 16mm film processing in Calvin's lab. Sixteen millimeter, still evolving from an amateur format, was not originally intended for the mass production of copies. So to meet the demand of its industrial movie market, Calvin had to devise a film printer that could economically meet the demand for release prints in quantity. Editors typically used synchronizers that accommodated four strips of film. But this Calvin synchronizer accommodates six. Oral history interviews verify that these synchronizers were made to prepare camera originals for mass printing on the Calvin-Thompson Multimatic printer. This 16mm printer used traveling mattes to achieve optical effects like wipes and dissolves. Thirty-five millimeter editing involved sending even the simplest effects out to an optical house, which added and extra day to the schedule and was a cost, not a profit, center.

Calvin-built processing machines were essential to Calvin's competitiveness. While small processors existed, Calvin machines processed the film faster and thus more economically. Calvin was the sole laboratory that Eastman Kodak licensed for processing 16mm Kodachrome motion picture stock. By the beginning of World War II, 16mm was edging out 35 mm as the accepted format for "industrials." During the war, Calvin studios and lab ran 24 hours a day to meet the war demand, mostly on machinery Calvin adapted from standard 35mm technology.

The original partners sold their interest in the company in the mid-1960s. Their company had become one of, if not the, largest producer and processer of 16mm films in the U.S.

Mike Hamilton is retired from a 40-year career in film and video production. His entry-level job was as a conformer at Calvin Productions, Inc., the successor company to the subject of this paper. At Calvin, he became familiar with 16mm film laboratory practice and, as well as the antecedents to the technology he was using in the 1960s. He supervised the production of many 16mm films before the "non-theatrical" industry switched almost entirely to video. He has been a member of SIA since 1988.

Charles Hyde and Cydney Millstein

The Kansas City Pratt and Whitney Aircraft Engine Plant: Innovative Architecture for War Production

Abstract: The Pratt & Whitney Plant, Kansas City, MO, documented in a Historic American Engineering Record (HAER) report and listed in the National Register of Historic Places, is the focus of this presentation. This talk will examine the design and construction of the Kansas City Pratt & Whitney aircraft engine plant built between July 1942 and June 1943. The Main Manufacturing Plant, which provided three million square feet of manufacturing space, incorporated an innovative design developed by architect Albert Kahn, the last design breakthrough of his illustrious career. The building featured reinforced concrete exterior walls, load-bearing concrete arches to support the roof, and a poured concrete roof. The combination of these design elements sped up the construction of the building, brought cost savings, and perhaps more important, saved tons of precious steel for the war effort. Kahn's innovative design elements made possible his "Warspeed" construction system.

Albert Kahn's lifetime of innovations in factory design will be recounted in order to place his work on the Kansas City plant in historical perspective. His pioneering use of reinforced concrete for factory construction beginning with Packard Motor Car Company Building 10 (1905) in Detroit was followed by Kahn's creation of massive steel-framed factory buildings starting with Building B (1918) at the Ford Motor Company's River Rouge complex in Dearborn, Michigan. Kahn's architectural firm engineered a prodigious volume of war production plants during World War II, with virtually all of them using his well-established steel-framed designs. Kahn innovated yet again in designing the Pratt & Whitney aircraft engine plant in Kansas City and a second enormous engine plant in Chicago.

The Kansas City Pratt & Whitney aircraft engine plant illustrates the ability of Kahn's architectural firm to innovate in response to wartime conditions. Even when using steel-framed designs, Kahn was able to design and build enormous defense plants in record time, typically requiring less than a year from groundbreaking to the start of production. With the Kansas City plant, he faced (and met) the additional challenge of drastically reducing the volume of steel used in construction. Albert Kahn died before this plant was completed, but it remains a monument to this remarkable architect.

CHARLES HYDE earned his Bachelor's degree from the University of Massachusetts in 1966 and his Ph.D. in Economic History from the University of Wisconsin in 1971. He came to Wayne State University in 1974, retiring from the History Department in 2010. He has published ten books, including five books on automotive history topics. His most recent books are *Arsenal of Democracy: The American Automobile Industry in World War II* (2013) and *Images From the Arsenal of Democracy* (2014). He has prepared documentation for scores of automobile plants in Michigan, including many designed by Albert Kahn. He has also published several articles on Kahn.

CYDNEY E. MILLSTEIN (ahr-kc.com) is a preservation consultant, architectural historian, and principal/owner of Architectural & Historical Research, LLC, in Kansas City, Missouri, with nationwide experience in the field for 32 years. Her work includes the examination and documentation of buildings and industrial typologies for a variety of clients, both public and private. Ms. Millstein's honors include the Osmond Overby Award, two National Trust for Historic Preservation Honor Awards, two George Ehrlich Achievement in Preservation Awards, the U.S. GSA Design Award and the State Historical Society of Missouri Brownlee Fund Award. Her book, *Houses of Missouri: 1870-1940*, co-authored with Dr. Carol Grove, with a forward by Richard Longstreth, was published by Acanthus Press, NY, in October 2008. She is currently working with Dr. Grove on a book about the landscape architecture firm of Hare and Hare to be published by the Library of American Landscape History (LALH) in 2017. This project was awarded the David R. Coffin Publication Grant through LALH in 2015.

Andrew Ferdon, Clark Vance, and Dennis Randolph

U.S. 40 Bridge Relocation

Abstract: The "U.S. 40 Bridge Relocation" is an ongoing project to preserve and repurpose an iconic Kansas City structure. This historic tied-arch bridge carried old United States Highway (U.S.) 40 over the Blue River in Northeast Jackson County, just across Interstate 70 from Kauffman and Arrowhead Stadiums. The structure was designed by the Missouri State Highway Department (now MoDOT) and built in 1932. The bridge is 140 feet long and 30 feet tall.

Deterioration of the structure resulted in its closure to traffic in 2014, and MoDOT replaced the bridge as part of the Manchester Trafficway Project, completed in September 2015. Under MAP-21 Act funding, MoDOT is required to offer historic structures to municipalities, counties, or private citizens for reuse or relocation. If a structure is claimed, the claimant is responsible for the removal and transportation costs, and must agree to maintain the features that make the structure historic.

The U.S. 40 Bridge was requested by the City of Grandview, a community within the Kansas City metropolitan area, for use as a pedestrian bridge in a new park complex along the Little Blue River. The city saw an opportunity both to provide a new life for this historic structure and to connect the park with the network of bike trails that span the metro area.

In September 2015, the disassembled pieces of the structure were transported to their new home in Grandview. Design work will be completed by Burns & McDonnell to develop plans for reassembly. When the structure was removed (as part of the Manchester Trafficway Project) the main arches were torch cut by the contractor in several locations for ease of removal. Therefore, the challenge at the present time is to develop an efficient means for splicing the structure back together in a way that is safe, affordable, and preserves the historical character of the bridge.

As with many preservation projects, one major challenge of this endeavor is funding. The City of Grandview has sought and received grants from several different State and Federal sources. However, the costs involved in moving and reassembling a structure of this size are significant. Several different strategies have been utilized to decrease the overall cost, including splitting the project into multiple contracts to attract specialty contractors.

It is anticipated that the repurposed bridge will become a signature landmark for the citizens of Grandview, and steps are being taken to include the community in the planning process. Grandview High School has a pre-engineering program geared towards preparing students for degrees in engineering and the sciences. Students from these classes are being included in the design process to give them a "hands on" opportunity to help develop a future icon of their community.

This presentation will highlight the background of the project, the challenges of transporting and reassembling the bridge, and the strategies being implemented to make the project an affordable venture for the citizens of Grandview.

ANDREW FERDON is a Staff Structural Engineer in the Bridge Department at Burns & McDonnell. His experience includes design and construction inspection of over a dozen bridges across the Midwest, both On- and Off-System. He holds a Bachelors and Masters of Science in Civil Engineering from Purdue University.

CLARK VANCE has served as a teacher with Grandview Public Schools for 22 years, the last eight of which at the high school as the Engineering Instructor for Project Lead the Way – a nationally acclaimed engineering curriculum. His courses are geared towards introducing students to real-world science and technology applications, with an emphasis on practical techniques taught in collegiate curriculums – including such skills as drafting, truss analysis, and computer programming. Mr. Vance has had an affinity for old bridges and infrastructure since he was a boy, and is excited by the opportunity for his students to take part in preserving a piece of it. He holds a Bachelor of Science in Vocational Education from Bemidji State University in Minnesota.

DENNIS RANDOLPH, P.E., has served as Director of Public Works for the City of Grandview since 2009. He came to Grandview from Marshall, Michigan, where he served as Director of Public Works for the Calhoun County Road Commission and Community Development Department for over 15 years. Previously, he served as Chief of Highway Operations for Fairfax County, Virginia, and City Engineer for the City of Lansing, Michigan. Mr. Randolph has also spent time as Adjunct Faculty at the University of Missouri-Kansas City, Western Michigan University, and Wayne State University. While in Calhoun County, Mr. Randolph was instrumental in the development of that community's "Historic Bridge Park" – a first-of-its-kind facility that showcases historic bridges relocated from around Michigan. Mr. Randolph holds a Masters of Public Administration from Western Michigan University, in addition to a Bachelors and Masters of Science in Civil Engineering from Wayne State University.

Session 2A: Documenting

Marc Belanger

M.M. Rhodes and Sons Company, Taunton, Massachusetts – Part II

Abstract: The M.M. Rhodes & Sons Company located in Taunton, Massachusetts closed in 2014 after more than 150 years in business by the Rhodes family. The small factory complex is a rare survivor, containing an array of belt-driven machinery operated by antique electric motors. Some of the newer machinery dates from the 1930s and 1940s. The company's office appears much like it did a century ago, with its original tin ceiling and woodwork, along with an extensive collection of product samples and company records. Together, these elements provide great insight on how the company grew and adapted over the years.

Founded by Marcus Morton Rhodes in 1861, the company initially produced small metal items such as carriage lining nails, carpet tacks, hoop skirt trimmings and tufting buttons. Around 1872, Rhodes developed a process to manufacture papier-mâché shoe buttons after the domestic shoe industry experienced a severe shortage of buttons from France during the Franco-Prussian War. In early 1876, the company sold its tack business, and focused solely on shoe buttons for the next two decades. By the late 1880s, they produced over 2,000,000 buttons per day, with annual sales exceeding $100,000. However, by the late 1890s, faced with increased competition and a national economic depression, button sales plummeted dramatically. In 1897, Rhodes developed a process for finishing shoe hooks, sold under the Rhodite trademark. This product saved the company, with strong sales during the first decade of the twentieth century, requiring a significant plant expansion in 1906 and 1907. The company later diversified into other products, including a short-lived venture to manufacture shoe laces. In 1922, the family began producing insulated nails, staples and other types of fasteners for the wiring and furniture industries. These products would carry the company for more than ninety years until it ceased in 2014.

Utilizing new information obtained from the company's extensive archives, this presentation will expand upon the talk given at the 2015 SIA Conference in Albany, and will provide new details on button production methods and business connections, along with an update on efforts to preserve the site and its unique history.

MARC N. BELANGER is a licensed civil engineer from Taunton, Massachusetts with a longtime interest in the history and geography of New England. Since 2001, he has photographed and studied dozens of industrial sites through the region, with particular focus on the textile industry in his hometown of Fall River. He wrote and published *A Guide to Fall River's Mills and other Industrial Sites* (2013), and presented a related paper as part of the Fall River Historical Society's 2013 summer lecture series. He is the current president of the SIA Southern New England Chapter.

Tim Tumberg

Documenting the Pillsbury 'A' Mill Tunnel System

At the time of its completion in 1881, the Pillsbury 'A' Mill, located on the east bank of the Mississippi River in the heart of Minneapolis' famed milling district, was the largest and most technologically advanced flour mill in the world. It was designated a National Historic Landmark in 1966, and is also a contributing element to the St. Anthony Falls Historic District, listed on the National Register of Historic Places in 1971. Less than 10 years after production ceased in 2003, the National Trust for Historic Preservation cited the Pillsbury 'A' Mill one of 'America's 11 Most Endangered Historic Places,' but twenty-first century adaptive reuse saved it from the wrecking ball. Redevelopment efforts began with the above-ground stories converted to residential artist lofts. More recently, the City of Minneapolis solicited proposals for a plan to assess the feasibility of preserving and interpreting the 'A' Mill Tunnel System and using it for hydrothermal heating and cooling. A team of consultants completed the feasibility study in the winter of 2014. This presentation details both the benefits and challenges of working as part of a collaborative team on a project that included more than its fair share of idiosyncrasies, and it concludes by emphasizing the importance of including an explicitly industrial archaeology perspective on a project of this type.

TIM TUMBERG has an M.S. in Industrial Archaeology from Michigan Technological University (1997) and a Ph.D. in Anthropology with a major in Historical Archaeology and a minor in Technology and Disciplinarity from the University of Arizona (2012). He is employed as a Cultural Resource Program Manager for the Minnesota Department of Natural Resources Division of Parks and Trails and is also a Principal Investigator for 10,000 Lakes Archaeology, Inc., a privately owned cultural resource management firm located in South St. Paul, MN. His main research interests are the nineteenth and early twentieth century mining, milling, and logging industries of the Upper Midwest and the Western Great Lakes.

Session 2A: Documenting

Mark Dice and John Arnold

Structure From Motion (SFM) Photogrammetric Methods vs. Hand Measurement and the Documentation of Historic Industrial Structures

Photogrammetry and Structure From Motion (SFM) technologies are making it possible to create dimensionally accurate three-dimensional (3D) models from a series of uncalibrated images taken with consumer-grade digital cameras. In contrast to high resolution survey (i.e. laser scanning) conducted by third-party specialists, SFM offers a low-cost photogrammetric technique heritage organizations can use to document their assets and visualize the results in 3D. This presentation will compare and contrast SFM with traditional photography and hand-measurement using a building slated for demolition as a case study.

The building chosen for this study was one of four historic structures remaining on the campus of Michigan Technological University. In the summer of 2015, the removal of the power house prompted Dr. Sarah Scarlett to assemble a team of faculty and students of Industrial Archeology to document the building within a two-week time frame. Using a combination of measuring tape and hand sketches, a first group recorded the building footprint and details of windows from the ground level. A second team member conducted a SFM mission alone to simulate what would be accomplished by a non-professional using a variety of cameras.

The goals of this study are to assess the accuracy (reliability) of measurements generated with SFM, the deliverables that can be obtained, and identify problems and limitations associated with both techniques. Approaching the mission as an example of “rescue archaeology,” the project presented an opportunity for team members to experiment with evolving techniques that boost the potential for the analysis and interpretation work conducted by archeologists. The results of the study show that when the goals of the project are understood in advance, SFM represents an inexpensive, reliable, and flexible approach that can integrate seamlessly within the traditional archeological documentation work flow.

MARK DICE has over 35 years experience in video media production and is pursuing a M.S. in Industrial History and Archeology degree at Michigan Technical University in Houghton, Michigan. He earned a B.M.E. in Music Education from Kansas State Teachers College Emporia, Kansas and launched a video production company in 1976. In 1982, Mark designed and built the first portable multi-camera production system for projecting live concerts and has participated in over 400 live events. Mark is researching ways digital documentation technologies can be used to preserve and interpret industrial heritage sites and landscapes.

JOHN ARNOLD is a Ph.D. candidate in Industrial Heritage and Archeology at Michigan Technological University. He holds both an M.S. in Historic Preservation and an M.Arch. from the University of Oregon, and is a licensed architect with recent experience in several residential firms in California, Oregon, and Washington. His design interests in creating a sustainable and meaningful built environment led to the study of the use and reuse of the living postindustrial landscape.

Session 3A: From the past to the future

Rick Minor

Industrial Archaeology at Willamette Falls: Exploratory Investigations at the North Woolen Mill, Oregon City, Oregon

Willamette Falls, situated 27 river miles upstream from the confluence of the Willamette and Columbia Rivers at Portland, Oregon, was a major fishery for Native Americans, as well as the setting for some of the earliest industrial developments in the Pacific Northwest. Closure of the Blue Heron Paper Company in 2011 provided an opportunity to conduct exploratory archaeological investigations in the dense industrial district on the east side of the Willamette River below the falls. Initial efforts focused on the site of the Oregon City Woolen Mills, where the original mill was constructed on the west side of Main Street in 1865, with an addition on the north constructed in 1890. Demolished in 1980, the basalt masonry foundations of these buildings are the oldest architectural remains of industry still standing in Oregon City. Limited investigations over a two-week period in August 2015 were conducted on the north side of the original mill, where several wood frame buildings stood before the North Mill addition was constructed in 1890.

A ground-penetrating radar (GPR) survey confirmed that construction of the mill buildings involved importation of fill material to create a level surface over the sloping bedrock of the river terrace. Removal of a section of the concrete surface within the North Mill foundation enabled manual excavations in a trench that extended across the former locations of a saloon, undeveloped lot, waste wool storage building, and the Barlow House (hotel). The sediments immediately below the concrete surface are fill that was probably deposited at the time the original mill was constructed in 1865. This fill contained the expected late nineteenth century cultural materials associated with use of the wood frame buildings. Surprisingly, prehistoric lithic artifacts were present as well, indicating that the fill material used to level the landform for construction originated from a Native American archaeological site! As excavations proceeded along the trench, a deep test at the south end encountered a fragipan (compact silt) layer from 147–170cm below surface. Coring through the fragipan established the presence of intact native soil from 170–235cm at bedrock. Lithic artifacts were recovered in these native sediments, as well as charcoal from 190–200cm which produced an AMS radiocarbon date of 1490±30 years before present. No historical materials were found below the fragipan, which provides a firm boundary between the overlying fill and underlying native soil.

In addition to the usual fragmentary ceramic, glass, and metal artifacts characteristic of the late nineteenth century, mill-related artifacts recovered from the fill include possible teeth from carding machines, straight pins, and probable wool fragments. Although limited in scope and duration, this project established the presence of archaeological remains associated with both prehistoric Native Americans and early industrial developments on the lower terrace in the old industrial core of Oregon City.

RICK MINOR is a co-founder and Senior Archaeologist at Heritage Research Associates, Inc., a small business consulting firm specializing in prehistoric and historical archaeology, history, and historic preservation in the Pacific Northwest since 1980. He received his Ph.D. in Anthropology from the University of Oregon in 1983, and for the last ten years has served as an Instructor in the Historic Preservation Program at the University of Oregon.

Session 3A: From the past to the future

John Arnold

Persistent Infrastructure: Vernacular Preservation of the Postindustrial Landscape

Professional historic preservation is a formal and legislated approach to the conservation, maintenance, and conscientious rehabilitation of our historically significant built cultural heritage. Curiously, a great number of historical buildings, structures, and pathways populating the Keweenaw Peninsula have not been subjected to this kind of official, primary, preservation—yet they persevere, often as living, working components of the contemporary postindustrial landscape. Given the prevalence of such properties and their demonstrable service to historical legibility, it must be asked: what, if not historic preservation proper, drives their persistence?

Primary preservation can take place anywhere, if a given historic resource is deemed capable of materially communicating its historical significance to the present—that is, of demonstrating its heritage value. Conversely, the unofficial, secondary preservation of historical buildings, structures, and pathways takes place not because of any formally perceived heritage value, but for their spatiotemporal attributes—in particular, those that are especially conducive to continued use. This presentation discusses that the definitional limbo that many postindustrial properties linger in is not simply a temporary condition preceding a fall to ruin or resurrection by primary preservation, but is in fact a quasi-stable state that is maintained through informal, vernacular, reuse.

In this presentation introduces the speaker's work with the growing Copper Country Historical Spatial Data Infrastructure (CC-HSDI), a longitudinal GIS model currently in development at Michigan Technological University. Comprised of geo-referenced historical maps and digitized cultural features, the CC-HSDI offers an unprecedented opportunity to explore regional spatiotemporal change, including this current examination of mechanisms actuating secondary preservation. Using GIS-based analytical tools, the presenter is investigating the role of spatial variables influencing the functional trajectory of postindustrial properties, and examining in particular the part that common, ongoing usage plays in driving their material perseverance.

The spatiotemporal methodology employed in this research will illuminate the importance of ongoing functional utility, or vernacular reuse, to the informal, secondary preservation of the postindustrial landscape, a legitimate conservation strategy that contributes consequentially to cultural landscape conservation. Furthermore, the analytical methods in this work will serve as a useful tool for heritage planners and historic preservationists to understand critical spatiotemporal variables driving use-state, so that limited resources may be allocated to the greatest benefit of a diversity of endangered industrial heritage sites.

John Arnold is a Ph.D. candidate in Industrial Heritage and Archaeology at Michigan Technological University. He holds both an M.S. in Historic Preservation and an M.Arch. from the University of Oregon, and is a licensed architect with recent experience in several residential firms in California, Oregon, and Washington. His design interests in creating a sustainable and meaningful built environment led to the study of the use and reuse of the living postindustrial landscape.

Session 3A: From the past to the future

Maria Franceschino

Adaptive reuse of industrial heritage in Istanbul: a comparison between Tuzambarı and Feshane

The city of Istanbul presents different examples of industrial archaeology, including the processes of restoration and preservation as witnesses of the industry of the past. The process of industrialization in the Ottoman Empire was at its high point in the nineteenth century, when both the government and the private sectors constructed numerous industrial buildings in different areas of the city. This heritage plays an important part in the physical development of the city and is also an important component of the technological history of the country.

Unfortunately, not all the architectural conservation projects have the same good results, in accordance with the main principles of the ICOMOS charters. This presentation will highlight this concept presenting two opposite examples of architectural conservation in the city.

The first case study is the Tuzambari (salt cellar) in the Kasimpasa industrial district near the riverfront of the Golden Horn. Formerly owned by Turkish State Liquor and Tobacco Monopoly as an alcohol and tobacco warehouse, it later became a salt repository, to which its name of Tuzambari refers. Recently, the building was derelict and in 2008 Medina Turgul DDB Group undertook the renovation and commissioned Erginoğlu & Çalışlar Architects to architecturally transform this resource. The result is a good example of conservation and adaptive reuse of an industrial building, where the visual elements of the old building are emphasized by the correct use of the language of architecture.

The second example is Feshane, located along the Golden Horn in the Eyüp district. It is one of the first textile factory built in Turkey and one of the first examples of steel construction. The building was erected in 1835 by Ottoman Sultan Mahmud II to produce woolen cloth and fez (the headgear introduced to replace the turban) for his new army. The building was renovated different times, the most negative of which dates back to the 1980s when the factories and workshops were relocated along the opposite shore, in the area of Haliç in order to clean-up the banks of the Golden Horn from industrial establishments. As a result, the factory was demolished except for its large weaving hall that was restored to its original appearance.

In 1991, the Istanbul Foundation of Culture and Art and the Foundation of industrialist Nejat Eczacibasi proposed to the Metropolitan Municipality to convert the Feshane into a multi-functional museum for exhibitions, fairs, concerts and other type of cultural events. In this second adaptive reuse project, the basic themes of restoration were not taken in consideration or even partially considered. In addition, new elements that have been introduced are not clearly distinguishable from the original structure.

Maria Franceschino is a Ph.D. student at the Mimar Sinan Fine Arts University located in Istanbul, Turkey. She received her B.S. in Architecture with a Restoration concentration and her M.S. degree in Architecture from the University of Udine in Italy. The focus of her graduate work has been in architecture and memory. She holds a Certification of Expert designer of CasaClima® for the sustainable design. Her interests include the conservation of historical buildings and industrial archeology.

Session 3B: Environment

Marco Meniketti

The Loma Prieta Mill Project: Timber, Labor and West Coast Industrial Landscape

Abstract: The Loma Prieta Mill project is an investigation of industry, ethnic diversity, and environmental change in early California. Between the 1850s and 1920s, the region encompassed by the Forest at Nisene Marks State Park, near the town of Aptos, California (Santa Cruz County), was the scene of intensive logging operations that profoundly transformed the natural environment. Over 1.5 million board feet of lumber was harvested to build regional communities and to fuel local industries. The loggers, railroad workers, sawyers, and ship captains involved were immigrants from various ethnic groups, each seeking a share of the west coast dream and each contributing to the cosmopolitan character of modern California. The mill was located on the Loma Prieta creek—the epicenter of a major earthquake in 1989 that caused severe damage to San Francisco.

Quickly following the arrival of fortune seekers during the Gold Rush, landscapes were radically altered, not simply by sheer population growth, but through such dynamic process as hydraulic mining, farming, ranching, timber cutting, salt manufacture, lime production, shipping, rail development, and dozens of other intersecting industries. In the process of meeting the timber requirements and increasing demand of the growing cities and towns of California in the 1880s, railroads and steam engines running on narrow gauge lines were introduced to the rugged terrain to support the extraction of timber resources.

San Jose State University, in association with California State Parks, is undertaking a multi-year research project investigating the industrial landscape, environmental change, and the ethnic character of the labor groups. During the first field season the mill site was mapped and the foundations of the boiler for the steam engine that powered the five-foot circular saw at the mill was discovered. Nearly a dozen different maker's marks are evident on the bricks, some from local kilns, with others from as far away as England; illustrating the character of industrial relationships. Worker's housing was also located during survey and will be the focus of the 2016 field season.

Marco Meniketti is a professor of archaeology at San Jose State University focusing on the intersections of labor, industry, and environmental transformation. He earned a BA in Anthropology from UC Berkeley, an MS in Industrial Archaeology at Michigan Tech, and his Ph.D. in Historical Archaeology from Michigan State University. He is a past Vogel Prize recipient for research on the sugar industry in the Caribbean. Dr. Meniketti is director of the Loma Prieta Mill Project. He was recently elected to the Executive Board of the Advisory Council for Underwater Archaeology.

Session 3B: Environment

Fred Quivik

Managing Underground Development from Afar: Anaconda's Walker Mine in California

Underground mine workings are landscapes – and industrial artifacts – seldom seen by most people. While industrial archeologists typically cannot directly investigate underground mine workings, we can investigate artifacts, such as drawings, associated with the design and development of mine workings. Through those drawings, we can gain an understanding of the roles of distant managers, geologists, and engineers in the construction of a particular mine's workings. The drawings are part of the collection, Records of the Geological Department of the Anaconda Copper Mining Company (ACM), held by the American Heritage Research Center, Laramie, Wyoming, This presentation analyzes the significance of such drawings in the context of large-scale technological systems.

This talk grows out of the presenter's recent work as a testifying expert for the Central Valley Regional Water Quality Control Board in California, which sought to issue a Cleanup and Abatement Order to ARCO, the oil company, for acid mine drainage emanating from the Walker mine, a copper mine in Plumas County. ARCO is the legal successor to the ACM, of which the Walker Mining Company was a subsidiary. Drawing on historian Eric Nystrom's article, "Underground Mine Maps and the Development of the Butte Underground" (winner of last year's Vogel Prize), which is about representations of underground mine workings in the form of geological drawings, this presentation will show how the ACM was able to manage the development of the Walker mine, in California, from the offices of Anaconda's Geological Department in Butte, Montana.

Fred Quivik retired this past year as professor of history at Michigan Tech, where he taught for six years. He has done consulting work as an industrial archeologist since the early 1980s, and since the early 1990s, he has also worked as an expert witness in Superfund litigation. Many of those cases have pertained to historic mining and metallurgical operations.

Session 3B: Environment

Kelly A. Woestman

From Strip Pits to Sinkholes: The Remains of the Day in the Tri-State Mining Region (MO, KS, and OK)

Today, strip pits and sinkholes dominate the landscape of the once prosperous Tri-State mining region that overlaps the shared borders of Southeast Kansas, Southwest Missouri, and Northeast Oklahoma. Despite the hazardous potential of acidic residues in the coal mining strip pits now filled with water, local residents continue to swim, fish, and boat in these nearby waters and young adults are even known to participate in parties at the "pits." In addition to these strip pits, one of the machines that helped create them remains, standing over 160 feet tall. As the tallest landmark remaining from this coal-mining area, "Big Brutus" is a large shovel that was used to uncover the coal that was close to the surface, primarily in southeast Kansas.

Throughout these former mining regions of Kansas, as well as Oklahoma and Missouri, sinkholes continue to pop up and cause not only potential dangers for both motorists and landowners, but also headaches for local city and area transportation officials. Because they were often worked by individuals and not always by organized commercial enterprises, many of the zinc and lead mines in northeast Oklahoma and southwest Missouri are not clearly identified on any official maps. As a result, potential sinkholes can sometimes be fixed but cannot always be prevented. Most notably, a newly built interstate interchange near Webb City, Missouri, continues to need reinforcement due to the unanticipated settling and even occasional sinkholes hidden underneath the surface.

Most notably, lead contamination in northeast Oklahoma led to an investigation by the Environmental Protection Agency (EPA) and the ultimate removal of the mining town of Picher, Oklahoma. A tornado soon after destroyed most of what remained standing of the small town a few people still attempted to call home. Now, the area strikes people as desolate and deserted. Furthermore, because it was originally identified as "Indian Territory," Oklahoma continues to witness court struggles between numerous Native American tribal representatives and local government agencies over the proceeds of the once prosperous region.

Additionally, chat piles filled with lead and zinc tailings still cover several spots, especially in northeast Oklahoma and southwest Missouri. This same contaminated chat was once used to build roads and their shoulders throughout the area, as well as beyond the Tri-States. Cyclists and four-wheelers of all kinds continue to race around the chat piles for recreation.

This presentation pieces together these divergent mining landscapes and resources that have surrounded the presenter since her childhood. Too often, historians and other professionals have overlooked the expertise and experiences and memories of the residents of these once prosperous areas that now are seen only as the scarred remains of days gone by. The project lays the foundation for articles and eventually a book-length study of the Tri-States that was last presented in 1972 in Arrell M. Gibson's ground-breaking work, *Wilderness Bonanza: The Tri-State District of Missouri, Kansas and Oklahoma*.

Kelly A. Woestman is University Professor at Pittsburg State University [Pittsburg, KS] in the Tri-State mining region overlapping the borders of Kansas, Missouri, and Oklahoma. She earned her Ph.D. from the University of North Texas and has been a faculty member at Pittsburg State University since 1993. She grew up among the chat piles of southwest Missouri and has been actively investigating the region's mining history for over a decade. She also teaches twentieth century and family history to undergraduate and graduate students. Besides studying the vast mining resources available in the Axe Library Special Collections at her university, Dr. Woestman enjoys the challenges of exploring the vast resources available outside the institution's walls to inform her research and her teaching. She has incorporated the wide-ranging work of the Kansas Department of Health and Environment, the Jasper County (MO) Records Center, and the Ottawa County, Oklahoma, Genealogical Society in her work.

Session 3B: Environment

John Baeten

Ghost Plants, Tailings and Low-Grade Ores: The Hidden Landscape of the Lake Superior Iron District

This presentation examines the effects on industrial water use and waste production in the Lake Superior region that resulted from the shift from mining direct-shipped ore (that is, ore that needed no on-site processing beyond perhaps crushing) to mining the new low-grade iron ores (which required considerable concentration before shipping). Beginning in 1910, the focus of iron mining in the Mesabi Range of Minnesota shifted towards low-grade iron ore, resulting in new demands and impacts on the environment. The technologies used for processing low-grade ores consumed water and produced waste at a scale that was unprecedented for the iron mines of the Lake Superior region. As low-grade iron mining developed, these impacts became more intense and were concentrated next to a shrinking number of processing plants.

The built environment of the Mesabi Range has undergone dramatic changes over the past half-century. More than half of the open-pit mines that made the Range famous, now exist as lakes; recreational areas that are stocked with fish and managed by the Department of Natural Resources. Additionally, of the nearly 90 processing plants that once dotted the Range's nearly 100-mile stretch, only a handful remain. The absence of industrial facilities, such as concentrating plants, makes it difficult to articulate where the tailings basins came from. Tailings, as they appear in the Mesabi Range today, seemingly exist as islands because the technological systems that created them have been scrapped and removed from the landscape altogether.

Harnessing an historical Geographic Information Systems (GIS) approach, this presentation explores the shifts in iron ore extraction, water consumption, and waste production that occurred with the transition to low-grade ore mining in the Lake Superior District. This presentation illuminates how the transition to low-grade iron mining and processing transformed the Lake Superior District from a widespread mining landscape to one dominated by concentrated pockets of intense industrial activity. Additionally, this presentation illuminates the latent waste and processing plants that helped shape the industrial landscape of the Mesabi Range, but remain absent from the contemporary heritage discourse.

John Baeten is a doctoral candidate in the Industrial Heritage and Archaeology Program at Michigan Technological University. His dissertation explores the intersection between mining technology, industrial heritage, and environmental history, using iron mining in the Lake Superior District as its core case study. He is interested in exploring industrial heritage through the lens of environmental history in order to meaningfully address contemporary concerns related to the relationship between industrial decline and environmental degradation; concerns that are evident in mining landscapes, where the remains of industry continue to interact with the environment long after the mines close.

Session 4A/B: Lessons learned

Donna Carmichael

Re-branding of Post-Industrial Cities - Lessons Learned

The corporate world has long embraced the concept of branding to help differentiate and communicate unique and compelling aspects of products and services. The application of branding in the public sector realm is evident in the branding of places – cities, regions, and nations – and is typically broadly referred to as place branding. Place branding has emerged as an important policy component to help to transform the negative imagery of cities and regions, and it has figured prominently in regeneration initiatives in many de-industrialized European cities such as Sheffield, Glasgow, and Dundee. Increasing globalization has resulted in intensified competition between cities around the world – as the traditional economic base has eroded, many cities are now competing with each other for survival, and it is no longer a question of whether to brand, but how to brand. Mid-sized post-industrial cities struggle to address years of economic decline due to massive de-industrialization, usually with limited financial and human resources. These cities often look to culture-led re-branding as a life-raft of sorts, which often contains an element of culture in the new 'creative city' brand, which may not reflect the reality of their citizens' experiences.

Urban regeneration initiatives, especially the culture-led initiatives evident in the economic development strategies of many post-industrial cities, are often created in response to the need to address entrenched, and often seemingly intractable, social, economic and environmental issues. These regeneration strategies often include major investments in flagship cultural institutions (*e.g.*, Guggenheim Museum in Bilbao, V&A Museum of Design in Dundee, and new sports stadium in Detroit), infrastructure (road and bridge lanes re-routing), sectoral clusters (Media, Cultural, and Renewables), neighborhood renewal projects, and many other elements. These investments could fail to generate the expected new jobs and economic benefits if these cities cannot overcome their historically negative image as declining, post-industrial places. By the 1980s, the physical environment in many of these deindustrialized cities had decayed dramatically, leaving behind derelict and abandoned factories, vandalized buildings, and a demoralized citizenry. The visible decline in the built environment of many deindustrialized cities has resulted in an unflattering external 'image', including perceptions of a place filled with overcrowded slums, multiple deprivation, crime and vandalism, labor unrest, and widespread urban decay. For the citizenry, the decrepit factories and mills represent a painful reminder of long-lost employment and prosperity, and often the question about what to do with these industrial artifacts is fraught with controversy and strong opinions.

DONNA CARMICHAEL is a Doctoral student at the Ironbridge International Institute of Cultural Heritage at the University of Birmingham (UK). Born in Dundee, Scotland and residing in Toronto, Canada, Ms. Carmichael obtained her B.Sc. at the University of Toronto, an MBA at York University in Toronto, and a Post-Graduate Certificate in Local & Regional Economic Development from Dundee University in 2015. Ms. Carmichael enjoyed a very successful 25 year career in business with several large and mid-sized global corporations, including senior roles in marketing, branding, advertising, business development and strategic planning, and has returned to university to pursue a doctorate in cultural heritage with a focus on industrial heritage. Her doctoral work is focused on the re-branding of mid-sized post-industrial cities in the UK, US and Canada with an emphasis on the role of industrial heritage assets in the re-branding process.

Session 4A/B: Lessons learned

Michaell Allen and Larry Giles

Historic Preservation and Industrial Heritage in the American Bottom

This session explores the fates of two abandoned industrial facilities in the "Metro East" area of East St. Louis, the belt of suburbs on the Illinois side of the Mississippi River. The Sterling Steel Casting Company plant, built in sections between 1921 and 1953, closed in 2001 after the plant relocated to Mexico in the NAFTA era. The complex of steel casting and pattern storage sheds sat vacant in the industrial village of Sauget, IL until the National Building Arts Center (NBAC) purchased the facility for conversion to an architectural study center in 2005.

NBAC founder Larry Giles will present the method behind conserving and interpreting the foundry, which has become as much the NBAC's work as handling its own massive collection of architectural artifacts and literature. In contrast to an unlikely and quirky industrial preservation project, the recent demolition of the Armour and Company Packing Plant in the former National City Stockyards north of East St. Louis raises questions about stewardship of industrial resources under the National Historic Preservation Act (NHPA).

Architectural historian Michael R. Allen, who authored a National Register of Historic Places determination of eligibility for the plant this year, will explain how the National Register standards interact with a ruinous, partially demolished industrial heritage site. Allen also will explain how the process that ultimately identified at least a historic refrigeration and power plant was eligible for the National Register failed to prevent demolition that included the destruction of historic De La Vergne compressor engines.

The contrast between outcomes in these two endeavors to preserve Metro East industrial heritage locate the politics of private ownership, the limitations of NHPA standards toward industrial facilities that experience change and abandonment, and the need for greater identification of industrial heritage sites in the region.

MICHAEL R. ALLEN founded the Preservation Research Office in 2009. Additionally, he holds an appointment as Lecturer in Landscape Architecture and American Culture Studies at Washington University in St. Louis, where he teaches courses on historic preservation, architectural history and the politics of place. Through the Preservation Research Office, Allen had led architectural surveys, historic district nominations, and rehabilitation planning efforts across the city of St. Louis, East St. Louis and other cities in Missouri and Illinois. Allen's work emphasizes the social, economic and political dimensions of preservation planning in legacy cities, and his research examines the impact of deindustrialization on historic urban landscapes. Allen is a frequent speaker on preservation and regional architectural history, and has appeared in settings ranging from the 2014 National Preservation Conference to the St. Louis Art Museum. Allen is the author or co-author of nearly 50 National Register of Historic Places nominations. Allen's writing on architectural history includes chapters in *The Making of An All-America City: East St. Louis at 150* (2011) and Osmund Overby (ed.), *Buildings of Missouri* (forthcoming, 2017) as well as numerous scholarly and popular articles on topics ranging from the Pruitt-Igoe housing project to the evolution of industrial architecture in St. Louis.

LARRY GILES is the president and director of the National Building Arts Center, the Midwest's largest study center on architectural heritage, allied arts, the trades and labor. Giles founded the Center's predecessor in 2002, during a nearly 40-year career as St. Louis' foremost expert on architectural salvage. Throughout his career, Giles recovered ornament, architectural elements, structural elements, primary documents and much more from condemned buildings, bridges and factories in St. Louis, Chicago, Brooklyn and other places. Giles is a noted authority on the material history of St. Louis' architecture, and has been a contributor to several major exhibitions on the terra cotta and brick industries in the region.

Session 1B: Bridge Symposium I

Rebecca Burrow

A Bridge on the Edge: 50 Years of the Astoria-Megler Bridge

In August 1966, the governors of Oregon and Washington came together to dedicate a massive new bridge across the mouth of the Columbia River. Widely derided as a 'Bridge to Nowhere' at the time of its construction, the Astoria-Megler Bridge connected the town of Astoria, Oregon with the relatively unsettled southern coast of Washington, completing US route 101 from Canada to Mexico. At the time, it was hoped that the $25 million expenditure would bring new industry to the coastal area, as well as increasing tourism in both states. While the effect of the bridge on development is debatable, what cannot be denied is its technological significance.

The 4.1-mile-long bridge, consisting of seven different structure types, reflects the wildly varying and challenging conditions at the crossing. As both the last use of field riveting in Oregon and the first use of prestressed concrete piles, the design of the Astoria-Megler used all of the tools available to bridge engineers of the day. In addition to the bridge's complicated design, construction of the bridge faced huge hurdles, both economic and natural. Today, those same conditions complicate the maintenance and rehabilitation of this massive structure. This presentation will explore the technological changes demonstrated by the design of the Astoria-Megler Bridge, as well as take a deeper look into the condition and maintenance of the bridge 50 years on. Sources include construction records and interviews with members of the community at Astoria.

REBECCA BURROW is a structural preservation engineer with the Oregon Department of Transportation Bridge Preservation Section. As part of her job, she co-authored Oregon's Historic Bridge Field Guide 2013. She also designs bridge rehabilitation and preservation projects on various historic bridges ranging from covered bridges to concrete boxes. Her interests include the use of 3D printing for bridge preservation and bridge tourism.

Session 1B: Bridge Symposium I

Patrick McBriarty

Chicago River Bridges

This presentation takes the audience on an amazing journey through the past and present bridges of Chicago detailing the architecture, innovation, design, and development of modern moveable bridge technology. This talk presents the untold history and development of Chicago's iconic bridges, from the first wood footbridge built by a tavern owner in 1832 to the fantastic marvels of steel, concrete, and machinery of today. It is the story of Chicago as seen through its bridges, for it has been the bridges that proved critical in connecting and reconnecting the people, industry, and neighborhoods of a city that is constantly remaking itself. Generations of Chicagoans built (and rebuilt) the thriving city, trisected by the Chicago River, with bridges linking its citizenry.

New research will be presented into the bridges' architectural designs, engineering innovations, and their impact on Chicagoans' daily lives. The presentation will also describe the structure and mechanics of various kinds of moveable bridges (including vertical-lift, Scherzer rolling lift, and Strauss heel trunnion mechanisms) in a manner that is accessible and still satisfying to the bridge aficionado. In addition, the "Chicago-style" bascule drawbridge has influenced the style and mechanics of bridges worldwide. The presentation will be interspersed with various stories, like the floods of 1849 and 1992, the cattle crossing collapse of the Rush Street Bridge in 1863, or Vincent "The Schemer" Drucci's Michigan Avenue Bridge jump in 1922.

A confluence of Chicago history, engineering lore, and urban design, this presentation will illustrate Chicago's significant contribution to drawbridge innovation and emergence as the drawbridge capital of the world. Chicago has the greatest working drawbridge museum strung across its waterways and is home to the most different moveable bridge designs of any city in the world. More modern drawbridge designs were first invented, designed, or built in Chicago before anywhere else and the city was a crucible for the development and practice of many of the world's premier bridge designers, engineers, and bridge building companies.

This presentation is based on the presenter's comprehensive guidebook of these remarkable features of Chicago's urban landscape, *Chicago River Bridges*, which received the 2015 Ferguson Prize from the Society for the History of Technology (SHOT), the 2013 Henry N. Barkhausen Award for original research by the Association for Great Lakes Maritime History, and an Honorable Mention in the Chicago Writer's Association's 2014 Book Awards in the traditional non-fiction category.

PATRICK MCBRIARTY is author of the PTM Werks Series of children's picture books *Drawbridges Open and Close* (Oct. 2014), *Airplanes Take off and Land* (April 2015), and *City Railways Go Above and Below* (Summer 2016). After earning a M.S. in Economics, McBriarty learned he would have been better suited as an engineer. Decades later he created the books he would have wanted as a child about how things work. His first book was the award-winning history *Chicago River Bridges* (2013), and basis for the documentary *Chicago Drawbridges*, co-produced with Stephen Hatch.

William Vermes

J.A.L. Waddell and Bridge Engineering: A Centennial Book Review

This year, 2016, marks the publishing centennial of Kansas City's J.A.L. Waddell's monumental work, *Bridge Engineering*. While Waddell is remembered for his numerous bridge innovations and as the father of several engineering consulting firms, he was also a very prolific writer of American bridge engineer topics. At nearly 2,200 pages, this two-volume book represents not only a work 18 years in the making, but it also the fulfillment of Waddell's dream.

Bridge Engineering is actually the second book of a trilogy spanning over 20 years: *De Pontibus: A Pocket-book for Bridge Engineer* (1898, 403 pages), *Bridge Engineering* (2,177 pages) and *Economics of Bridgework: A Sequel to Bridge Engineering* (1921, 512 pages). Following the second edition of *De Pontibus* (1904), Waddell greatly wanted to rework the book to not only include additional bridge topics but also to represent the state of the rapidly evolving bridge engineering practice. After 12 years of contributions from his staff and noted bridge engineers, the 1914 dissolution of his firm Waddell and Harrington, the new version of *De Pontibus* (Bridge Engineering) had more than fulfilled Waddell's vision.

However, *Bridge Engineering* is not another how-to book of basic bridge design. Instead, it is an in-depth snapshot of bridge construction in the 1910s, loaded with personal suggestions and insights of Waddell's and other bridge engineers' design methods. Also woven in the lines of this manuscript also are Waddell's biases. The 80 chapters of *Bridge Engineering* are informally divided into several units, beginning with contemporary materials, design loads, and seminal bridge engineering principles. The second unit, steel superstructure design and detailing, covers 19 chapters and nearly 500 pages, giving one an impression that Waddell preferred steel bridge designs over all other designs. The third unit, concrete bridge design, substructure considerations and timber bridge design follow with what appears to be less fanfare.

The book concludes with chapters of mundane topics like Office Practice, Bridge Examination (inspection), Bridge Maintenance and Repair, Specifications, Arbitration, Aesthetics in Design, and Promotion of Bridge Projects. On the contrary, these chapters now give the contemporary bridge engineer and industrial archeologist a rare look to how Waddell and other bridge engineers worked at their profession, and some respects, how this profession has changed little.

When read closely, *Bridge Engineering*, along with its prequel and sequel, take on the form of a technical memoir. In the Preface, Waddell wrote that he "considers this book to be the greatest and most important work of his entire professional career, and most certainly would be bitterly disappointed if, for many years to come, it should fail to prove a great value to the engineering profession." He concluded that the *Bridge Engineering* trilogy was meant to be a guide for the young engineer, which these books continue to do so into the twenty-first century.

William (Bill) Vermes is a senior bridge engineer for Pennoni in Akron, Ohio, specializing in bridge inspection and bridge rehabilitation. Bill has conducted research on the performance of rivets on American bridges, early American high strength steels and past bridge design and construction practices.

Justin Spivey and Karla Kruse

Precast Recast: The Broad Street Bridge in Mason Texas

Abstract: A century after their initial development, reinforced concrete trusses remain a rare and intriguing bridge type in North America. The true reinforced concrete truss form, consisting of rectangular panels subdivided by diagonals with all members constructed of reinforced concrete, appears to have arisen independently in three centers of development during the early twentieth century: Pennsylvania and New Jersey, New Mexico and Texas, and the Pacific Northwest. Although the reinforced concrete "rainbow" arch patented in 1911 by Iowa native James B. Marsh is more of a tied arch than a truss in its structural behavior, it is considered a related form because its vertical suspenders are in axial tension, similar to the tension web members in trusses.

As is the case with concrete construction in general, there is some appeal in the relative ease of transporting bulk materials (cement, sand, and gravel) and smaller steel reinforcing bars, as opposed to larger metal girders or truss components, particularly for remote crossings. On the other hand, while shorter concrete truss spans can be precast and lifted into place, any truss too heavy to be lifted requires temporary falsework on which to assemble reinforcement and formwork for cast-in-place construction. Another limitation of reinforced concrete trusses, perhaps more readily recognized from a modern durability perspective, is the control of cracking in reinforced concrete members subjected to axial tension.

Reinforced concrete trusses appear to have been precast in at least two of the aforementioned regions during the 1910s. The Delaware, Lackawanna & Western Railroad reported using precast concrete girders and trusses for short, narrow overcrossings in New Jersey, where it was critical not to interrupt rail traffic. In rural New Mexico, civil engineer George E. Morrison developed a more ambitious system of separately precasting trusses and floor beams, erecting the trusses, and threading the floor beams through holes cast into the trusses' vertical members. Morrison's system was used for at least two bridges in New Mexico, in 1913 and 1915, both constructed by the Missouri Valley Bridge and Iron Company. Similar precast concrete trusses were used by the Alamo Construction Company in 1918 for the Broad Street Bridge in Mason, Texas, which was documented by the Historic American Engineering Record (HAER) in 1996, with measured drawings completed in 2000.

As the Broad Street Bridge may soon be altered by a rehabilitation project, the presenters have examined two aspects of the original bridge fabric that were not addressed by the HAER documentation: the composition of the concrete and the adaptation of Morrison's system to a slightly different configuration that includes cantilevered sidewalks along both sides. Petrographic examination of the concrete reveals coarsely ground residual portland cement particles, consistent with the cement available during the era of construction. The concrete contains an abundant amount of irregularly shaped voids, consistent with a block-like texture. This block-like texture is a result of a deficiency of cement compared to modern standards and likely required an increase in water content to create a flowable consistency into the wood forms.

Formed surfaces on the bridge can also be examined, both visually and petrographically, to draw conclusions about the sequence of concrete placement operations. Although the HAER documentation posits a construction sequence similar to that for the New Mexico bridges, the Broad Street Bridge's cantilevered sidewalks complicate the floor beam geometry in a way that cannot be accommodated in precast components. Examination of formed surfaces confirms that while the Broad Street Bridge's trusses were precast on the ground, its floor beams were cast in place, perhaps using formwork suspended from the trusses. Corrosion of embedded reinforcement has occurred; but overall, the relatively intact concrete elements after 98 years is a function of the local environment and the characteristics of the concrete.

Justin M. Spivey, P.E., is the Secretary of SIA (2010–2016); a Senior Associate at Wiss, Janney, Elstner Associates, Inc. (WJE), in Princeton, New Jersey, and Philadelphia; and a Lecturer at Johns Hopkins University. His professional interests include forensic engineering, adaptive reuse of existing structures, historic bridges, and the history of structural engineering. He has compiled or edited HAER documentation for hundreds of historic bridges and is a licensed professional engineer in eight states.

KARLA KRUSE is an Associate Engineer with WJE, in Cleveland, Ohio. She specializes in the evaluation and characterization of building materials. Her work in WJE's Cleveland materials laboratory focuses on the petrographic examination of concrete, mortars, grouts, stucco/plaster, cast stone, brick, and other construction materials. She conducts field evaluations evaluating distress in concrete slabs and pavements, coating systems, terra cotta facades, and EIFS and stucco systems. She also has special expertise in petrography of early concrete structures for historic preservation.

Michael J. Cuddy

Overcoming Challenges: A Look at Innovative Techniques Used by Early Bridge Builders

Pennsylvania's bridge population includes numerous examples of engineering marvels that when constructed stretched the capabilities of the times. When viewed today, engineers cannot help but appreciate the design advances and ingenuity employed to build these signature bridges. This presentation will focus on the innovative techniques used by early bridge builders in Pennsylvania to construct three structures that represent crowning achievements in the history of bridge construction in the United States. The bridges include:

The Walnut Lane Bridge, Philadelphia. A predominantly unreinforced open spandrel concrete arch that at the time of its construction in 1908 had the longest (232′) and highest (70′) arch span in the world. The uniqueness of the bridge are the concrete arch ribs which were constructed with embedded flat stones and no steel reinforcement. The arch ribs were constructed on an extensive timber falsework system that was saturated with water causing the timber to swell, the final concrete rib segment was placed and the timber then allowed to dry. This technique was instrumental in achieving the long span length of the bridge.

The Mulberry Street Bridge, Harrisburg. A reinforced concrete ribbed arch bridge that was constructed in 1909 over 25 active railroad lines and was the first major highway bridge in Harrisburg. Steel forms were used in lieu of traditional arch centering to construct the arch ribs while maintaining railroad operations. Adjacent spans were designed as continuous beams for deadloads with rods connecting the top portion of the piers. After the concrete in the ribs had cured, the rods were cut, allowing the structure to function as arches rather than the continuous beam.

The Dunlap Creek Bridge, Brownsville. The nation's first cast iron bridge was completed in 1839 and still carries unrestricted vehicular traffic today. The bridge is comprised of five elliptical tubular cast iron arch ribs with cast triangular shaped spandrels. The design and construction of this bridge demonstrated the success of joining scientifically trained engineers with empirically trained craftsmen.

Through a combination of engineering drawings, historic photos of construction and present day images, the technics used to construct each structure will be explained. PennDOT completed or is planning rehabilitation projects for each of these structures and a summary of their strategy to avoid adverse effects will be presented.

MICHAEL CUDDY, PE is a Principal/Senior Vice President with TranSystems and Entity Manager responsible for the firm's transportation work throughout Pennsylvania. He has been with the firm for 30 years and is responsible for many of its bridge design, rehabilitation, and inspection programs, particularly those involving historic bridges. He has been the project manager on such notable projects as the Wheeling Suspension Bridge and the University Avenue Drawbridge, designed by notable Philadelphia architect Philip Cret. A graduate of the University of Pennsylvania, he is a registered engineer and is noted for his innovative and practical approach to the evaluation and rehabilitation of historic bridges.

Session 2B: Bridge Symposium II

Paul King

Before the Bridge: Roebling and the Four Suspension Aqueducts of the D&H Canal

As a follow-up to the presenter's 2015 talk, "Before the Bridge: Roebling and the D&H Canal" this year's presentation looks to expand the historic review to the four suspension aqueducts that Roebling built to facilitate the flow of coal along the Delaware and Hudson (D&H) Canal from the hills of Pennsylvania to the Hudson River and to market in New York. The work of Roebling before the Brooklyn Bridge not only built his reputation it allowed him to develop the technologies he would need to succeed to build the great bridge.

As part of the D&H Canal Roebling build four suspension Aqueducts, two located adjacent to each other crossing the Lackawaxen (1849) and Delaware (1848) rivers where the two met, one at the Neversink (1851) River near Cuddbackville, New York and a fourth one (1851) at High Falls, New York. While there are historical accounts of the construction of the more significant work of Roebling, there is limited publication of archival drawings of these major works that focus on the evolution and innovation of their construction.

To put this work and ingenuity in context, it is helpful to remember that the mid-nineteenth century was a time before the steam locomotive, when people travelled by horse drawn carriage, when the primary means of commercial transportation of goods, was by barges floated down along natural waterways or pulled on man-made canals like the Erie Canal using hemp rope attached to mules and when the idea of Manifest Destiny encouraged settlement to expand west to the Pacific Coast.

Having already constructed a suspension aqueduct over the Alleghany River in Pittsburg (the first cable suspension bridge built in America), Roebling was hired by the Wurts brothers to design and construct four suspension aqueducts for the D&H canal to cross the Delaware River where navigation was hazardous. Over the course of this work, he further refined techniques and invented machinery to facilitate the manufacture of wire rope which eventually led to the founding of Roebling & Sons.

PAUL C. KING, a Professor of Architectural Technology at New York City College of Technology, is a licensed Architect with degrees in Architecture, Landscape Architecture and Urban Design and is past president of the New York chapter of the Society of American Registered Architects. A pioneer in the use of technology, he was instrumental in the transition his profession from traditional hand drawing to computer based methodologies, he provides leadership as an educator and travels to run faculty development workshops on the "Reflective Teaching Portfolio". A resident of Sullivan County, New York, he became keenly interested in the history of the D&H canal and the early work of Roebling when he discovered that the lake he lived on was built to provide water to the canal. He is continues to research the work of Roebling "Before the Bridge" and the innovations that led to the design and construction of the Brooklyn Bridge.

David Simmons

Roberts Covered Bridge: From Arsonist's Kindling to Community Organizer

The Roberts Covered Bridge was completed in 1830 on a private turnpike just south of Eaton, Ohio. By the late twentieth century, it was the only extant double-barreled covered bridge in the state, incorporating three genuine Burr trusses. After the state highway it carried was relocated in the 1950s, the bridge location became extremely isolated. The bridge was frequently vandalized, and occasional attempts were made to burn it. An arsonist finally succeeded in 1986. The roof, rafters, and siding were a total loss but the trusses were only charred, although heavily. Following a promising assessment by West Virginia University's Emory Kemp, county officials proposed a one-time levy to fund the relocation and restoration of the bridge. Unfortunately the levy campaign coincided with George H. W. Bush's presidential bid, a campaign that featured the infamous pledge, "Read my lips, no new taxes." Voters in the conservative, rural county took the Bush message to heart and resoundingly voted the levy down. County officials saw no alternative but to convert a public preservation project into a private one.

The ultimate success of the private preservation effort for the Roberts Covered Bridge is the focus of this presentation. While the basic engineering remained the same, it was obvious that the financing and process for completing the project had to fundamentally change. Most materials and equipment costs remained the same. A major cost reduction came by substituting volunteers for much of the labor costs. Providing professional supervision for the volunteers, however, became essential, and a willing timber framer, experienced in historic restoration, was enlisted. In addition, as the communal character of the project emerged, commercial firms stepped forward to donate materials, time, equipment, and expertise to the project. In the end, each element proved essential for the bridge to be transformed from arsonist's kindling to a mechanism for establishing a new marriage between the community and its history.

DAVID A. SIMMONS, senior editor of the popular history magazine *Timeline*, has over forty years of experience in the evaluation and documentation of historic structures. Since joining the Ohio History Connection in 1976, he has been active in public and private efforts to preserve historic engineering structures. While employed by the Ohio State Historic Preservation Office, he worked on 106 National Register of Historic Places review processes, eventually overseeing state's historic inventory and National Register nominations. Beginning in 1983, he advised and was a contributing writer in four statewide historic bridge inventories, including evaluation and preservation plans, prepared by and for the Ohio Department of Transportation. Research on the history of Ohio bridges led to a regular column called "Historically Speaking" in the County Engineer's Association of Ohio's quarterly magazine. He has helped assemble the program for eight historic bridge conferences that provided a forum for exchanges between engineers and historic preservationists and was program chair for the Second National Covered Bridge Conference in Dayton, Ohio. Simmons is president of the Ohio Historic Bridge Association, for whom he directed the restoration of an 1876 covered bridge in eastern Ohio. He has been active with SIA since 1977, presenting papers at conferences, organizing a fall tour, serving two terms on the board, received two awards for articles published in *IA*, and as a member of multiple committees.

Poster Session

Timothy Gieringer and Morgan Gieringer

Preserving Historic Texas Bridges: a Model for Cooperative Preservation

with the assistance of Jane Hardman Flynn and Rachel Crowe

Abstract: The Denton County, Texas historic bridge program started in the late 1990s with the efforts of local preservationist and Denton County Historical Commission (DCHC) member Mildred Hawk, who began researching the remaining iron and steel bridges in the county and produced a pamphlet to provide information on the bridge locations and their histories. In 2002, Denton County Judge Mary Horn took office and began searching for new ways to save these historic bridges. This prompted a collaborate effort between the Denton County Commissioner's Court, the Texas Department of Transportation (TxDOT), the federal bridge relocation program, the Denton County Historical Commission, the Denton County Geographic Information Systems (GIS) Division, and various local groups and government agencies.

Under the Denton County program, bridges that have been marked for replacement or that are no longer in use, are put up for "adoption." The adopting agency provides a new location for the bridge and through a cost-sharing program between the county, TxDOT, and the federal program, the bridges are moved to their new homes. The DCHC Historical Research and Marker Committee then conducts in-depth research on the history of the bridge and its original uses. For bridges that have remained in their original locations, a Recorded Texas Historical Landmark designation is applied for to obtain a state historic marker; for the majority of the bridges that have been relocated from their original locations (and thus ineligible for a state marker), a DCHC historic marker is obtained and placed with the bridge in its new location. . In order to promote the historic bridges through heritage tourism, the Denton County GIS Division has created and maintains a virtual tour of the bridges showing their locations, current and historic photographs, and historical information provided by the Historical Research and Marker Committee. All bridges that have obtained historical markers are also listed on the county historic marker webpage. Originally, 17 historic bridges were identified as remaining in Denton County. Upon further research, 3 more bridges were identified. Of these, all 13 that were available for adoption have been successfully adopted and relocated, while due to various circumstances, 7 remain that are not available for adoption.

This unique program has proven to be a successful model for historic bridge preservation in Texas. Bridges continue to be marked with historical markers and promoted online. Enthusiasm for the program has increased as seen in large turnouts at marker dedication events and increased press coverage. This poster will provide an overview of the program, including examples of bridge repurposing, historic recordation, and public marketing of the program. This successful bridge program has lasted for over a decade and gives some examples of solutions to implementing or improving a similar programs for other communities.

TIMOTHY GIERINGER is the Newspaper Program Metadata Coordinator for the Portal to Texas History at the University of North Texas Libraries. He has been a member of the Denton County Historical Commission Historical Research and Marker Committee since 2015. Mr. Gieringer has provided research on two bridges for Denton County Historical Commission historic markers, including for the first bridge that was relocated for repurposing. In addition to researching historic bridges, Mr. Gieringer has researched the histories of numerous homes in Denton to assist homeowners in obtaining local historic landmark designations and is currently involved in providing research for a National Register of Historic Places application.

MORGAN GIERINGER is the Head of Special Collections at the University of North Texas Libraries. She has been a member of the Denton County Historical Commission Historical Research and Marker Committee since 2012. Mrs. Gieringer's historical narrative for the Elm Fork Bridge received a Recorded Texas Historic Landmark designation from the Texas Historical Commission and the marker was dedicated in February 2016. Mrs. Gieringer has written two narratives for Denton County Historical Commission historic markers for bridges, including for the first bridge that was relocated.

JANE HARDMAN FLYNN is chair of the Denton Co. Historical Research and Marker Committee

RACHEL CROWE is manager of Denton County Geographic Information Systems.

Index of Presenters

	Room: Washington 3	***Room:*** Brookside
8:00–10:00AM	1A: **KANSAS CITY** MODERATOR: TBA • Michael D. Hamilton, "**Technology Transfer from 35mm to 16mm Film at the Calvin Company, Kansas City, Missouri**" • Charles Hyde and Cydney Millstein, "**The Kansas City Pratt and Whitney Aircraft Engine Plant: Innovative Architecture for War Production**" • Andrew Ferdon and Clark Vance, "**U.S. 40 Bridge Relocation**"	1B: **BRIDGE SYMPOSIUM I** MODERATOR: JUSTIN SPIVEY • Rebecca Burrow, "**A Bridge on the Edge: 50 Years of the Astoria-Megler Bridge**" • Patrick McBriarty, "**Chicago River Bridges**" • William Vermes, "**J.A.L. Waddell and Bridge Engineering: A Centennial Book Review**"
10:30–NOON	2A: **DOCUMENTING** MODERATOR: TBA • Marc Belanger, "**M.M. Rhodes and Sons Company, Taunton, Massachusetts – Part II**" • Tim Tumberg, "**Documenting the Pillsbury 'A' Mill Tunnel System**" • Mark Dice and John Arnold, "**Structure From Motion (SFM) Photogrammetric Methods vs Hand Measurement and the Documentation of Historic Industrial Structures** "	2B: **BRIDGE SYMPOSIUM II** MODERATOR: NATHAN HOLTH • Justin Spivey and Karla Kruse, "**Precast Recast: The Broad Street Bridge in Mason Texas**" • Michael J. Cuddy, "**Overcoming Challenges: A Look at Innovative Techniques Used by Early Bridge Builders**" • Paul King, "**Before the Bridge: Roebling and the Four Suspension Aqueducts of the D & H Canal**" • David Simmons, "**Roberts Covered Bridge: From Arsonist's Kindling to Community Organizer**"
NOON-1:30PM	*Lunch and Annual Business Meeting* (Washington 1&2)	
1:30-3:30PM	3A: **FROM THE PAST TO THE FUTURE** MODERATOR: STEVEN WALTON • Rick Minor, "**Industrial Archaeology at Willamette Falls: Exploratory Investigations at the North Woolen Mill, Oregon City, Oregon**" • John Arnold, "**Persistent Infrastructure: Vernacular Preservation of the Postindustrial Landscape**" • Maria Franceschino, "**Adaptive reuse of industrial heritage in Istanbul: a comparison between Tuzambarı and Feshane**"	3B: **ENVIRONMENT** MODERATOR: PAT MARTIN • Marco Meniketti, "**The Loma Prieta Mill Project: Timber, Labor and West Coast Industrial Landscape**" • Fred Quivik, "**Managing Underground Development from Afar: Anaconda's Walker Mine in California**" • Kelly A. Woestman, "**From Strip Pits to Sinkholes: The Remains of the Day in the Tri-State Mining Region (MO, KS, and OK)**" • John Baeten, "**Ghost Plants, Tailings and Low-Grade Ores: The Hidden Landscape of the Lake Superior Iron District**"
3:45-5:00PM	4A/B: **LESSONS LEARNED** MODERATOR: TBA • Donna Carmichael, "**Re-branding of Post-Industrial Cities - Lessons Learned**" • Michaell Allen and Larry Giles, "**Historic Preservation and Industrial Heritage in the American Bottom**"	
All Day	**POSTER SESSION** WASHINGTON LOBBY • Timothy Gieringer, **"Preserving Historic Texas Bridges: a Model for Cooperative Preservation"**	