SOCIETY FOR INDUSTRIAL ARCHEOLOGY

48th ANNUAL CONFERENCE
JUNE 6 - 9, 2019
CHICAGO, ILLINOIS

CONFERENCE PROGRAM

SIA

CHICAGO 2019

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SOCIETY FOR INDUSTRIAL ARCHEOLOGY
MICHIGAN TECHNOLOGICAL UNIVERSITY
1400 TOWNSEND DRIVE
HOUGHTON, MI 49931-1295

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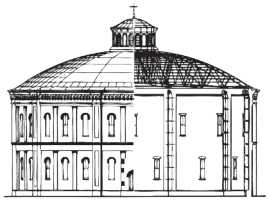

COVER IMAGE

The Baltimore & Ohio Railroad's bascule bridge over the Chicago River at the Chicago Terminal. Photo Credit: Historic American Engineering Record

SIA 48TH ANNUAL CONFERENCE, CHICAGO ILLINOIS

Updates and Corrections to the Saturday Presentations Program

Please note the following changes to the Conference Program which are also reflected in the updated schedule grid on the reverse side of this insert, which supersedes the grid on the back cover of the program.

Page 9: Marlise Fratinardo's paper title is "The Northwestern Elevated Railway: its History and Transformative Effects."

Page 10: Scott Utter's paper title is "John Alexander Low Waddell and the Construction of the Northwestern Elevated."

Page 10: Graham Garfield's paper title is "Rapid Transit Station Design in the context of Chicago's Northwestern Elevated Railway"

Page 13: Matt Kierstead's paper "'Large and Lofty': HAER Documentation of the Erie Railroad's 1875 Portage Viaduct" has been moved from the session "Railroads and Cotton" (8:00 AM – 9:45 AM in Burnham A & B) to the session "Fifty Years of HAER I" (10:15 AM – 11:45 AM in Burnham A & B). Matt Kierstead's paper presentation will follow Christopher Marston's.

Page 20: Tim Davis's paper "The View from the Road: HAER's National Park Roads & Bridges Recording Program" will not be presented.

Page 28: Robert Gordon's paper "Welded Iron Cannon made with Continuous Tidal Power on the Mill Dam" will be presented by Patrick Malone.

Page 37: Zachary Liollio and Gary North's poster "Phoenix Dare: The Restoration of Nevada Northern Railway No. 81" will not be presented.

Page 37: Emine Yavuz's poster "Investigation of Reused Olive Oil Factories in Ayvalik Region" will not be presented.

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ACKNOWLEDGEMENTS

PRESENTATION COMMITTEE
Saul Tannenbaum (Chair)
Mark Brown
Christopher Marston
Daniel Pogorzelski
Rebecca Burrow
David Simmons
T. Arron Kotlensky

GUIDEBOOK CONTRIBUTORS / TOUR LEADERS
Serhii Chrucky
Matthew Jacques
Jacob Kaplan
Matthew Kaplan
Christopher Marston
Patrick McBriarty
Ward Miller
Courtney Murtaugh
Paul Myers
Daniel O'Rourke
Daniel Pogorzelski
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Austin Weber

SIA TOUR HOSTS
ArcelorMittal Burns Harbor: Caroline Martin, Mark Dutler
Illinois Railway Museum: Fred Ash, Dave Diamond
The Plant: John Edel
CTA Skokie Shops: Daniel Tinsley
S&C Electric Company: Don Dumich
Life Fitness: Tom Howe
Vienna Beef: Tom McGlade
Wheatland Tube: Ray Falk, Camille Grayson
Ace Industries: Mary Holewinski and Jeff Holewinski
ArcelorMittal Riverdale: Anthony Pacilio
MWRD Calumet Plant: Commissioner Frank Avila and staff, Shelia Porter
Fermilab/Argonne National Laboratory: Daniel O'Rourke

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Preservation Chicago
Eli's Cheesecake
Vienna Beef

OTHERS
Mark Bouman
Dominic Pacyga

SIA EVENTS COORDINATOR
Courtney B. Murtaugh

WELCOME

On behalf of the SIA Chicago 2019 Planning Committee, welcome to Chicago, Illinois for the 48th Annual Conference of the Society for Industrial Archeology.

As the transportation hub of the country, the city early on became a magnet for manufacturing concerns of all types. Following the 1871 fire and the city's rebirth, it grew at a tremendous pace, driven by the industrial prosperity and growth of the country as a whole. Practically everything was once made in Chicago – from raw materials such as steel, to finished products like bicycles and radios. While the famous Union Stock Yard and packinghouses became the icon of Chicago's industrial might, the city also became the center of the nation's printing, candy and electronics industry in the early 20th century.

At the same time, Chicago became a world center for architecture, with the birth of the skyscraper and the Chicago School of Architecture. Industrial architecture in Chicago was also often at the forefront of modern design and technology. The city became a laboratory for new ideas, such as planned industrial parks, of which Chicago has the oldest examples in the country.

During the conference, we'll get to explore just some of the aspects of Chicago's industrial past and present. While the city and region have seen industrial decline and plant closings, manufacturing still thrives in places. From the ArcelorMittal steel mills in northwest Indiana to Wheatland Tube on the city's southwest side, steel remains a major industry, and the area is now the nation's capitol of steel production. Small manufacturers thrive as well, as we will see when we explore plants like Ace Industries and Life Fitness.

The Chicago region remains a center of energy research, as exemplified by Fermilab and Argonne National Laboratory. Transportation continues to be a major centerpiece of Chicagoland – the conference will examine its past and present, whether at the Chicago Transit Authority's heavy maintenance shops in Skokie, or the Illinois Railway Museum's massive collection of transportation vehicles and artifacts in Union.

We will explore the archeological remains of long-gone industries too, from the Stock Yard gate to the ore walls remaining from the former U.S. Steel South Works. Our boat tour on Sunday will be packed with views of both active industrial sites and remnants of the steel industry. Historic bridges will be a centerpiece of many tours as well.

No matter what tours you are on, or which part of the conference you participate in, we are confident you will be fascinated by the vast industrial metropolis of Chicagoland. We hope to see you back in the city exploring our industrial heritage again soon!

Yours in IA,

Jacob Kaplan
SIA Chicago Conference Committee Chair

CONFERENCE HOTEL INFORMATION

CONFERENCE HEADQUARTERS

Hyatt Regency McCormick Place
2233 S. Martin L. King Drive
Chicago, IL
Phone: (312) 567-1234

The Hyatt Regency McCormick Place is perfect for business or leisure. Close to nearby Chicago including the Field Museum, John G. Shedd Aquarium, The Art Institute of Chicago, Navy Pier, and shopping on the Magnificent Mile. From this contemporary landmark hotel, guests enjoy magnificent views of the city skyline and Lake Michigan.

TRANSIT OPTIONS
The hotel is easily accessed by public transit, including the Metra Electric (former Illinois Central) commuter trains which stop right in adjacent McCormick Place, the #3 King Drive bus from the Loop, and the CTA Green Line Cermak-McCormick Place stop, just four blocks west of the hotel.

HOTEL RESTAURANTS
- Third Star: Featuring an array of international cuisines in a sophisticated atmosphere for breakfast, lunch, and dinner
- Sixes & Eights: Discover the bold flavors of Southeast Asian street food in this fast-casual dining experience; dine-in or carryout
- Arc Bar: Offers a high-voltage, modern vibe to connect over hand-crafted cocktails, premium wine and beer, and a full dining menu
- Market: Grab your specialty coffee, fresh baked breads, pastries, a quick lunch or snacks before heading out for the day

CONFERENCE ROOMS *(See maps on inside back cover)*

SIA CHICAGO 2019

PAPER ABSTRACTS

MY KIND OF TOWN ADLER

8:00 - 9:45 AM

Ellen Stoner

The History of Chicago's Union Station

As the main railroad hub of North American, Chicago not only transported goods, but people spawning intercity passenger rail service. Six independently owned and operated terminals were built as early as the 1850s and each serviced a different region. Union Station was the only terminal headhouse to survive and fulfilled Daniel Burnham's vision outlined in the 1909 Plan of Chicago to consolidate rail service west of the river. Designed by Burnham's successor firm Graham, Anderson, Probst and White in 1915, the station's construction was interrupted by World War I and the unique double stub-end station design did not open until 1925. The monumental Beaux Arts design was a direct reflection of the World's Columbian Exposition 1893's influence and the optimism for the new century.This paper is a history of Chicago's Union Station and the development of passenger rail in the Chicago area. It focuses on the architectural design of the station, its service and physical changes over time, and its place in the greater context of transportation development from intercity rail to air travel.

Research for this presentation was completed as part of the development of the Historic Preservation Plan for Chicago's Union Station.

Ellen Stoner, Principal at AltusWorks, has been practicing architecture in Chicago since the early 1990s. She is a graduate of the University of Illinois architecture program having earned her bachelor's and her master's degree in Architecture, the latter with an emphasis in historic preservation. She has international architectural experience, is LEED AP certified, and her work and that of her company has won numerous awards, including Urban Land Institute's Vision Award, the City of Evanston's Preservation and Design Award, and the Richard H. Driehaus Foundation and Landmark Illinois Awards. Ellen's passion for historic building design and technology has led her to focus her practice on building preservation, restoration and adaptive reuse. Touching all market sectors, Ellen provides expertise to restore and renovate existing facilities to meet today's programmatic requirements without compromising their historic-defining features. These efforts ensure that properties remain viable assets for their owners and the communities they serve.

Marlise Fratinardo

Technological and Cultural Impacts of the Northwestern Elevated Railway

The 1890s were a remarkable decade for Chicago. During this period, the city dramatically increased its population by 600,000, reaching 1.7 million people by 1900 and making Chicago, briefly, one of the largest cities in the world. Rapid growth led to corresponding impacts on the city's transportation and infrastructure resources; however, during this decade Chicago adopted emerging technologies that eased its transportation pressures and facilitated the development of new routes and modes of travel.

The presentation will provide a brief historical context for the decade that brought many of the city's most enduring technological and cultural advancements. In 1893, for example, the World's Columbian Exposition's Intramural Railway successfully demonstrated that "third rail" electric traction technology could be applied safely on a large scale for public transportation purposes. The third rail would soon revolutionize Chicago's streets by influencing the development of the city's first elevated railroads (still in operation within today's 'L' system) and contributing to residents' demands for rapid transit improvements.

Public transportation options on Chicago's North Side during the 1890s were relatively limited. The arrival in 1900 of the Northwestern Elevated Railway's main line provided a fast and convenient transit alternative to street-level travel modes. It would soon become a popular mode of travel that helped to unify the dispersed collection of North Side communities in this era.

The Northwestern Elevated's contribution to the North Side will be examined primarily through the example of the line's terminus at Wilson Avenue. In the years following the arrival of the elevated, the Wilson area's improved con-

nectivity to downtown helped to unlock its abundant natural assets. The 'L' brought an influx of new residents seeking relief from the congestion and pollution of downtown. The line's terminus at Wilson, solidly suburban in character prior to the 'L', would quickly become one of Chicago's most vibrant shopping and entertainment destinations.

Marlise Fratinardo is an urban planner in the Chicago Transit Authority's Strategic Planning Department where she supports a wide range of capital construction projects. Her interdisciplinary career has focused on enhancing quality of life, connecting people and communities, and the stewardship of high-profile public resources. A lifelong 'L' rider, Marlise specializes in National Environmental Policy Act compliance, grant writing, community engagement, and the Section 106 process.

Scott Utter

John Alexander Low Waddell and the Construction of the Northwestern Elevated Railway

The Northwestern Elevated Railway, completed in 1900, was the last of four privately owned rail lines constructed in Chicago. The railway is composed of four lines: the Ravenswood Loop Connector, the North Mainline, the Ravenswood Branch, and the Evanston Branch and was constructed over a 25-year period. The Northwestern Elevated Railway transformed the north side from sparsely populated farm land and small villages to a connected metropolis just as prior lines had transformed the south and west sides. Multiple structural systems were utilized on the four lines and upgrades have been undertaken, however, the iconic element of the Chicago "L" remains the riveted steel technology. The consulting engineer, John Alexander Low Waddell and the chief engineer, Charles V. Weston made extensive study of the specific loading, system use, construction techniques, and materials. The riveted steel design focused on cost efficiency and long-term system durability to propose an innovative system which advanced the understanding of elevated railways. The presentation will provide an overview of the system and discuss how the design approach of the steel structure differed from elevated railroads constructed during the same period. The Northwestern Elevated franchise agreement with the City of Chicago and Laws and Ordinances Governing the City of Chicago provide additional insight into the decisions made in the system design.

As an Architect at AltusWorks, **Scott Utter** strives to provide innovative, technically sound resolutions to problems inherent in existing buildings. Scott brings knowledge of building materials, rehabilitation techniques, and adaptive reuse to each project. His understanding of building pathologies and renovation methods as well as the complexities of integrating new building systems, provides clients a comprehensive approach to their various project needs. He has experience leading research projects including Section 106, Tax Credit, HABS/HAER documentation, and National Register Nominations.

Graham Garfield

Rapid Transit Station Design in the context of Chicago's Northwestern Elevated Railway

Rapid transit stations are challenging facilities to design. Needing to accommodate the circulation and presence of large numbers of passengers, they are also often subject to space and budgetary constraints. Community or government demands for amenities or aesthetic enhancements can add additional pressure to usual engineering and architectural challenges.

The presentation will provide a companion to the exploration of the engineering and structural design of the Northwestern Elevated's steel elevated structure, exploring how the company designed its stations. Most stations fall into two types – local station and express/local station – and the differences and approach to each will be examined. The original design for the stations was undertaken by consulting engineer J.A.L. Waddell, who also designed the elevated structure, and Waddell's approach and philosophy to overall design and arrangement of the facilities, as well as his architectural styling, will be discussed.

Before construction of the stations began, the designs were modified – "value-engineered", by today's parlance – by another architect, William Gibb, with some elements modified and others removed; what these changes were, and why they were likely pursued, will be investigated.

Finally, what lessons were learned from the design of the initial Northwestern Elevated's stations' designs will be studied by examining the design of the next wave of NWERR stations – the Ravenswood branch stations built in 1907, and the stations built for the south Evanston track elevation in 1908-10 – noting what elements were kept, which were changed, and if any were resurrected and implemented from Waddell's original designs .

Graham Garfield is a transit professional, with background in planning, operations, design and history. He is the General Manager of Customer Information for the Chicago Transit Authority, overseeing the agency's bus and rail signage, branding, publications and graphics, and digital and social media since 2007. Working for CTA since 1999, Graham has previously held management positions in CTA's Construction and Rail Operations departments. He has published several articles in print, conducted historical tours, and lectured on Chicago transit history, architecture and design. Since 1997, he has written and maintained Chicago-L.org, a comprehensive historical website about Chicago's rapid transit system.

HISTORIC BRIDGES I BURNHAM C

8:00 - 9:45 AM

Katie Ohland & Greg Mathis

Repairing Concrete on Minnesota's Historic Bridges

The Minnesota Department of Transportation (MnDOT) is committed to preserving historic bridges statewide. To achieve this goal, historic bridge repair and rehabilitation projects must comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties (SOIS).

The repair of original cast-in-place historic concrete has proven to be one of the more challenging aspects of these projects. Over the last decade, MnDOT, in partnership with engineering firms, historic preservation consultants, and construction contractors, has tried several different techniques for matching historic concrete with new concrete, some more effective than others.

Using a series of case studies, this presentation will highlight some of the different techniques MnDOT has tried for matching and repairing historic concrete, as well as presenting current practices and some lessons learned. Example projects, involving work on both the substructure and superstructure, will include a 1912 cast-in-place slab span, 1927 deck truss, 1931 Pennsylvania through-truss, 1949 continuous/cantilevered steel beam bridge, and 1931 vertical lift bridge with concrete concourse approach.

Many of the techniques MnDOT is now using for matching historic concrete, while reasonably successful in meeting the SOIS, are flawed as the final aesthetics are heavily reliant on post-repair surface finishing. MnDOT is currently developing an alternative approach that is based on a scientific analysis of the existing concrete, including petrography and mix design. The alternative approach also shifts specific decision points from on-site construction to the planning and design phase. MnDOT expects this new approach will not only reduce construction and maintenance costs, but also minimize the risk of delays during construction. The new approach will be described through the recent rehabilitation of a 1931 concrete tee-beam bridge.

Greg Mathis is a historian with the Minnesota Department of Transportation's Cultural Resources Unit. He has a Master's Degree in Community and Regional Planning from the University of Nebraska-Lincoln and more than two decades of public and private sector experience in the field of historic preservation planning. Throughout his career, Greg has overseen numerous large-scale historic property surveys throughout the Midwest and documented a wide array of industrial- and engineering-related resources, ranging from bridges and water towers to railroads and rolling stock. He has also been involved with the successful rehabilitation of many challenging historic properties, from bridges to historic mills. As the Cultural Resource Unit's historic concrete expert, Greg regularly provides technical assistance to projects across Minnesota.

Katie Ohland is an architectural historian in the Minneapolis office of Mead & Hunt, Inc., a nationwide professional engineering and architecture firm. Katie received an M.S. in historic preservation from the University of Minnesota. She has experience conducting reconnaissance- and intensive-level surveys, which includes field surveys, photographic documentation, historical research, and report preparation. Katie is also responsible for completing Section 106 compliance, including the identification and evaluation of historic resources while applying the National Register Criteria for Evaluation. She has evaluated numerous bridges for historic significance and collaborates with engineers on historic restorations.

Steve Walton

Lasagna Bridges? The Joliet Bridge & Iron Co., Its History, and Questions About a Signature Bridge Detail

This paper investigates in particular style bridge manufactured by the Joliet Bridge and iron company from Joliet, Illinois, in the late 19th and early 20th century: truss bridges of various designs, whose main chords are typical, built-up riveted construction (two C-channels and a flat plate), but whose top plates are fluted at the edges like lasagna noodles. A few of the JBIC Iron truss bridges have been documented by HAER, but their documenters did not even note the fluting. The investigations have tried to determine whether this was a structural feature or merely an ornamental feature. Investigation then led to the history of the company in general, and to try to determine its owners engineering background to understand where such a feature would come from. This paper is also a contribution to the history of "modest" bridge companies and their strategies for marketing and production in the age of rapid bridge building—and the rapid consolidation of bridge companies—across the country. Because the majority of bridge history literature either focuses on noted bridges and bridge builders, on bridge type regardless of manufacturer (with some notable exceptions, such as an excellent history of the Phoenix Bridge Co.), or on regional assemblages of all types of bridges, there is relatively little literature on these sorts of companies, even if their products have been investigated either individually or within statewide inventories.

Steven Walton is an Associate Professor for the History of Technology at Michigan Tech, teaching in the IHA program there. His intellectual centre of gravity is machines and production, and his work is diverse chronologically (from the Middle Ages to the Military-Industrial Complex), geographically (European and North American), and topically (machine construction, industrial production, military history and production, and social networks), and yet he still find a center in the history of technology. He serves as SIA Executive Secretary and editor of IA.

Paul King

Roebling Before The Bridge

A follow-up to a series of presentations at previous SIA Annual Conferences "Roebling: Before the Bridge" takes a look at the current state of the book manuscript as it is prepared for publication. Thanks to time provided by a fellowship leave from teaching for the spring of 2019, this presentation will exhibit a substantially complete manuscript which will include in depth research and writing accompanied by detailed drawings laid out in book format. To put Roebling's work and ingenuity in context it is interesting to note that his work paralleled the evolution of transportation in America from horse drawn carriages, to the heyday of commercial barges pulled along canals, to the introduction of railway systems with steam locomotives powered by coal, to the of evolution of the electrified public transportation systems which were integrated into the design of the cross section of the Brooklyn Bridge for the Brooklyn Metropolitan Transit (BMT) subway system.

"Roebling: Before the Bridge", looks closely at the evolution of all of Roebling's built work from his first bridge in Pittsburgh, to his suspension aqueducts for the Delaware and Hudson Canal System, to the first Railroad Bridge to span the Niagara Gorge, to the Cincinnati-Covington Bridge – his first bridge to use large masonry towers a direct predecessor to his final work the Brooklyn Bridge. Along the way, Roebling refined techniques in the manufacture of wire rope, conducted experiments in materials science and patented bridge building methods that changed how bridges were built.

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. He is a past president of the NY chapter of the Society of American Registered Architects and a member of the Society of Industrial Archeology. His research focus is the early work of John A. Roebling for which he is writing a manuscript for a book titled "Roebling: Before the Bridge" which focuses on the innovations of his early work which are embodied in the design of the Brooklyn Bridge. A resident of Sullivan County in upstate New York he became keenly interested in the history of the Delaware & Hudson Canal which featured four of Roebling's early suspension aqueducts when he learned that the lake he lived on was built as a reservoir pond to provide water for the canal system.

Michael Cuddy

Frankford Avenue Bridge: Rehabilitation of the Oldest Bridge in the United States

The Frankford Avenue Bridge, built in 1697, is the oldest continuously-used roadway bridge in the United States. It is a three-span stone masonry arch bridge over Pennypack Creek in Philadelphia, Pennsylvania. The bridge remains true to its original form, even after undergoing many construction and repair campaigns during the last three centuries. The bridge is significant for its engineering and transportation history and was listed on the National Register of Historic Places in 1988.

PennDOT, Engineering District 6-0 and TranSystems developed a rehabilitation program to address continued deterioration and recent collision damage. The intent of the program was to sensitively address the bridge's structural deficiencies while maintaining its historic character and integrity.

The scope of the rehabilitation program included in-kind reconstruction of the spandrel walls and wingwalls; cleaning, repairing and repointing of the stone masonry; and removal of the earth fill between the spandrel walls and beneath the roadway and replacing it with lightweight concrete fill. The sidewalks were reconstructed in-kind and a new crashworthy roadway barrier was installed between the sidewalk and the roadway. The existing decorative pedestrian railing was salvaged, repaired, painted and reinstalled on the new sidewalks. The concrete arch liners were repaired and scour protection measures were placed around the abutments and piers. A utility bay was created in the center of the bridge to accommodate the numerous buried utilities.

The presentation will discuss the bridge history, the design process, the sympathetic construction techniques utilized for the bridge rehabilitation, and the Section 106 coordination efforts that occurred both during design and construction ensuring a successful project from all perspectives. Undocumented construction details uncovered during the construction activities will be presented and discussed.

Michael J. Cuddy, P.E. is a Principal/Senior Vice President with TranSystems and Area Manager responsible for the firm's transportation work throughout Pennsylvania. He has been with the firm for 33 years and is responsible for many of its major bridge design, rehabilitation and inspection programs, particularly those involving historic bridges and complex structural systems. A graduate of The University of Pennsylvania, he is a registered professional engineer and is noted for his innovative and practical approach to the evaluation and rehabilitation of historic bridges.

RAILROADS AND COTTON BURNHAM A&B

8:00 - 9:45 AM

Matthew Kierstead

"Large and Lofty:" HAER Documentation of the Erie Railroad's 1875 Portage Viaduct

In 2018, Milestone Heritage Consulting completed Historic American Engineering Record documentation of Norfolk Southern Railway's 1875 Erie Railroad Portage Viaduct over the Genesee River Gorge in Letchworth State Park in western New York. This paper presents the history of this massive wrought-iron Viaduct from its 1852 timber trestle predecessor's destruction by fire to its 2017 Genesee Arch Bridge replacement. This paper encompasses initial construction, subsequent strengthening projects, design attribution, role in bridge specifications development, and place in railway bridge design. Portage Viaduct was rapidly erected by the Watson Machine Company of Paterson, NJ, although conflicting accounts credit additional suppliers. Work included notable early use of concrete. The structure was strengthened in two major campaigns: A 1903 "Era of Improvements" project replaced spans to accommodate heavier traffic and new "Consolidation" steam locomotives. In 1944, the towers were stiffened to carry "Berkshire" locomotives bumped from other Erie routes by new diesel locomotives. This paper includes discussion of the Viaduct's design attribution, popularly assigned to Octave Chanute, but more accurately credited to noted nineteenth-century American bridge engineer George S. Morison. Engineers involved in the Portage design were early

developers of bridge specification systems that influenced the Cooper bridge rating system. Although not technologically innovative, the Portage Viaduct occupies a precedent-setting place in the evolution of what George Morison called "large and lofty" American metal railroad viaducts. Bridge engineers including Henry Grattan Tyrrell and John Greiner considered Portage Viaduct the mature example of this railway bridge type with "towers of two bents only for the different length of spans." This paper concludes with a brief look at how early twentieth-century railroad viaducts evolved into more streamlined structures. The presentation is illustrated with historic photographs and engineering plans, images from the 2015-2018 fieldwork and examples of the HAER large-format photographs taken by Michael Froio Photography.

Matt Kierstead owns Milestone Heritage Consulting, a New York small business providing cultural resource survey, documentation, and interpretation services for historic engineering, industrial, and transportation resources for government agencies, private developers, and the heritage tourism industry. Milestone's focus areas include bridges, mining and quarrying, metallurgy, power generation, rail transportation, and public utilities. Services include Historic American Engineering Record documentations, consultation on historic "Superfund" sites, National Register of Historic Places nominations, tax credit rehabilitations for historic commercial properties, and public history interpretation projects including exhibits, parks, and museums. His HAER projects include "Vulcan," America's largest cast iron statue, in Birmingham, Alabama; and the East Broad Top Railroad in Huntingdon County, Pennsylvania. Kierstead received his Public History MA from West Virginia University in 1994. He is a past president of the SIA Southern New England Chapter, and led the granite quarry and copper mine tours for the SIA 2010 Vermont Fall Tour.

Robert A. Booth Jr. & Amy Kellett

Salem's Naumkeag Steam Cotton Company

In 1847, in the faltering seaport of Salem, Mass., a Salem-Boston investment group completed construction of the largest steam-powered textile plant in the world. Entering a four-story building 400' long, the 600 workers operated 1,700 iron looms and hundreds of spinners running 31,000 spindles. Thanks to the preservation of nearly all records relating to planning, construction, technology, production, personnel, management, and socio-economic impacts, we have a unique opportunity to study in-depth the many issues bearing on the history of an urban industrial village from the 1840s forward.

Salem, formerly a shipping port trading with Asia and South America, had no history of industrial manufacturing. The huge Naumkeag Mill stood on the harborfront shore of a large peninsula, alongside a dozen newly laid-out streets and more than a hundred new wood-frame duplex houses and multi-unit brick boarding houses. The brand-new village of 3,000 people arose on the edge of an established city, to which it brought culture shock as well as the infrastructure and technological talent for rapid development of other lines of manufacturing—shoes, leather, varnish—that restored prosperity to Salem and provided industrial jobs for thousands of famine-refugees from Ireland, and later, for thousands of immigrants from Canada and Europe.

The entire project at The Point—the Naumkeag factories and their products, the in-migrant and immigrant workforce, and the creation of a community within a city—was a model of urban industrial development; and it has been entirely forgotten, due to a catastrophe. In 1914, a massive conflagration destroyed one-third of Salem's built environment, including all of the housing and factories of The Point. Rebuilding began at once, on a different scale, with tall brick tenements and electricity-powered mill buildings. The history of The Point began anew in 1915. Today The Point's residents are mainly immigrants from the Caribbean; and the former factory buildings of 1915-1916 have been adapted for mixed-use storage and offices.

We two researchers have begun digging into events from 1845 to 1865, using a microhistorical theoretical lens to explore socio-economic developments from the street level and to understand human impacts and changes in civic culture. We are looking at labor, capital formation, neighborhood development, integration into the larger community, architectural history, cotton and the perpetuation of slavery, and the continuing development of Salem's manufacturing.

Robert A. Booth Jr. is an independent historian and author with specialty in architectural history and culture (art, architecture, sociology, politics, economy) of Massachusetts seaports and in American maritime history of colonial and Early Republic periods. He gives frequent public presentations on history and architecture in connection with book tours and special topics and is the Curator emeritusof the Pickering House (1664), Salem, Mass., developing educational programs in local history. He was also a reviewer for Smithsonian's National Museum of American History "Within These Walls" exhibition re 1760 Choate House (originally in

Ipswich, Mass.). . He is author of a number of books, including Death of an Empire: The Rise and Murderous Fall of Salem, Mass., America's Richest City (St. Martin's Press, Thomas Dunne Books, New York, 2011), a Boston Globe best-seller for several weeks and winner, "Best Book of New England History" prize for 2012, New England Society of the City of New York. Simultaneously, he's the long-time administrator of national organization for profession of clinical social work (mental healthcare)

Amy Kellett is a public historian with a specialty in digital research and synthesis and interpretation of primary-source data. She is a principal in Public History Services, an organization providing a wide array of technical, interpretive, and writing services to clients. Educated at Salem State University (Public History, Management) and as a restoration carpenter at North Bennet Street School (Boston), she is a graphic designer and digital image enhancer who provides house histories for preservation advocacy groups, manages the online resource YouArchive, and consults in public history programming strategy, development, scheduling and management.

Fred Ash

Smoke on the Water: The Illinois Central Railroad Along Chicago's Lake Front

The city of Chicago forced the nation's first land grant railroad to build into the city by constructing a mile-long trestle into the lake. This allowed the IC to occupy some of the most expensive land on the planet for its terminal, but decades of litigation followed. Resolution of this dispute had a happy ending. Because the company had a monopoly on the shoreline, the Chicago park system only had to work with one landholder to acquire and fill the city's famous lake parks. Once, however, the point where the railroad met lake and canal shipping was an industrial, warehousing and trans-shipment dynamo.

Fred Ash is a retired Senior Vice President of J.P.Morgan Chase for Government and Non-Profit Banking. He is the author of Chicago Union Station published by the University of Indiana Press and over forty articles on railroads, the built environment, and local history. Mr. Ash is a founding member of the Illinois Central Historical Society. An active member at the Illinois Railway Museum, his recent projects there include the salvage and preservation of terracotta building ornament.

TICCIH AND WORLD HERITAGE CLARK

8:00 - 9:45 AM

Patrick Martin

TICCIH and World Heritage on the Global Stage

Opening Remarks

Patrick Martin is a retired professor of Industrial Archaeology, Michigan Technological University, former editor of IA, former Executive Secretary, SIA. Life President, The International Committee for the Conservation of the Industrial Heritage.

Miles Oglethorpe

Demonstrating the Value of Industrial Heritage on the World Stage

Dr. Miles Oglethorpe is Head of Industrial Heritage at Historic Environment Scotland. After completing his PhD at Glasgow University, he joined the Royal Commission on the Ancient and Historical Monuments of Scotland in 1985, moving on to Historic Scotland in 2007 where he fulfilled a number of key roles including Head of Education, Outreach and Publications, Deputy Chief Inspector, and Head of Policy. More recently, he led the team responsible for preparing the successful World Heritage nomination for the Forth Bridge, and in September 2018 was elected president of the International Committee on the Conservation of the Industrial Heritage (TICCIH). Recent publications and research interests have included the Scottish coal industry.

Mark Watson

Abutments to Outstanding Universal Value: Delony and Waddell's Comparisons of Steel Cantilever Bridges

The paper reviews the writings of J.A.L. Waddell (Bridge Engineering, 1916) and of Eric DeLony (Context for World Heritage Bridges, 1996, among others) as launch points for comparative studies of bridges by type and by span. They were fundamental to the justification of Outstanding Universal Value that the UK government submitted to UNESCO and resulted in the addition of the Forth Bridge as the fourth individual bridge on the World Heritage List in 2015.

Bridges came relatively late to the world heritage list, other than those already in rural, linear or urban landscapes, inscribed for many reasons besides the bridges they contain. In part this is because engineers don't often fit their specialised work onto pedestals alongside other building types. Eric DeLony helped to change that, as an architect who had a rare passion for bridges, their documentation and preservation. He was the ideal author for the second of the thematic studies published jointly by ICOMOS and TICCIH (http://ticcih.org/ticcih-thematic-studies-and-published-reports/). It does not pretend to be comprehensive, but gives the context that UNESCO sensed it lacked in facing industrial era nominations.

Waddell did not hesitate to speak his mind. He stirred controversy in Japan early in his career, when he castigated British bridge-building as wasteful compared to American. His later accounts of bridges by type and then ordered by span are enlivened by judgements on their economy and aesthetics, and show that he was alert to bridge developments the world-over that is hard to match as a resource in comparative work on other building types.

The paper examines the fates of the cantilever bridges in Waddell's tables, and confirms the utility suggested by Vermes quoting Waddell (SIA, Kansas City 2016) of work that "for many years to come, should… prove a great value to the engineering profession."

Mark Watson is in the Conservation Directorate, Industrial Heritage team within Historic Environment Scotland. He is UK national representative for TICCIH: The International Committee for the Conservation of the Industrial Heritage, convenor of IHBC Scotland, and is a historian interested in place, regeneration, world heritage, European and Scottish industrial heritage

Phyllis Ellin

The U.S. World Heritage Tentative List and Industrial Heritage

The U.S. Department of the Interior updated its World Heritage Tentative List in 2017, adding nine properties to the official list from which future World Heritage nominations can be drawn. Among the new properties are two notable engineering additions, the Brooklyn Bridge in New York and a group of the first-generation "skyscrapers" with internal metal structural systems in Chicago's Loop, built in the late 19th century. This presentation will review the process used to identify and select properties for the Tentative List, which included U.S. advisors with specialized expertise, input from both the U.S. national committee of the International Council of Monuments and Sites (US/ICOMOS) and an "upstream" evaluation by the ICOMOS international body. The presentation will discuss the reasons for choosing these two properties, note others of interest that were looked at, and will examine some of the issues that would have to be considered in any future effort to nominate them to the World Heritage List.

Phyllis Ellin is an independent historian and architectural historian who provides expertise to the U.S. National Park Service's Office of International Affairs, focusing on the World Heritage program. She has served on U.S. delegations to the UNESCO World Heritage Committee since 2008, has contributed to revisions of the U.S. World Heritage Tentative List, and has guided the preparation of several U.S. nominations. Prior to her retirement from the agency, she worked on a variety of history and partnership projects, including serving as the national coordinator for the Abraham Lincoln Bicentennial, and was Executive Director of the federal commission for the Illinois & Michigan Canal National Heritage Corridor. She served as an appointed member of the Commission on Chicago Landmarks from 2001-2011. Ms. Ellin has an M.S. in historic preservation from the University of Pennsylvania and a B.A. in history from Princeton University.

CHICAGO IS . . . ADLER

10:15 - 11:45 AM

Richard Lanyon

History Shows the Way for a Sustainable Future for Stormwater and Wastewater in Metropolitan Chicago

Since its creation in 1889, the Sanitary District of Chicago, presently known as the Metropolitan Water Reclamation District of Greater Chicago (MWRD), has engineered drainage and water processing infrastructure that has met the needs of the time and provided for modernization to accommodate state-of-the-art technology development. This presentation will show via vivid historic and contemporary photographic images from the archives of the MWRD how the MWRD has dynamically progressed over its 130-year history and prepares for the future. Technologies include bascule bridges, hydroelectric power generation, navigable waterways, sewage treatment, sewage sludge utilization, sewer construction and stormwater management.

Sewage treatment separates water and the carried solids into recoverable resources, water for reuse in area waterways and beneficial utilization of processed solids as fertilizer and an organic soil amendment. An engineered waterway system to drain the metropolitan area provides sustainable renewable energy at a hydroelectric generating station. Replacing outdated center-pier swing bridges with bascule bridges improved navigation and reduced rail and road traffic delays. A navigable waterways system built with local tax dollars before there was a federal interest in waterway navigation, has become a vital link in the federal inland waterway system connecting the Great Lakes with the Mississippi River. Once constructed in hand-dug tunnels in Chicago's blue clay, sewers are now constructed with contemporary construction equipment in the clay or via rock tunnel mined with tunnel boring machines in Chicago's thick limestone bedrock. Chicago pioneered the use of rock tunnels to reduce combined sewer overflows, an environmental problem common in older US cities.

Dick Lanyon retired from his position as Executive Director of the Metropolitan Water Reclamation District of Greater Chicago (MWRD) at the close of 2010, a position held for 4½ years to top a 48-year career at MWRD. The MWRD serves five million people in Cook County and the industrial waste load equivalent of another four million people providing wastewater, stormwater management and other related services to protect public health and the environment. Since "retiring," Dick has published three books and one periodical article about the MWRD and is working on a fourth book, collectively describing the engineered drainage system in metropolitan Chicago and history of the engineered MWRD infrastructure. His BS and MS in Civil Engineering was received from the University of Illinois in Urbana-Champaign. In hometown Evanston, Illinois, Dick has been an alderman and is currently a member of the Utilities Commission.

Lisa Schrenk

A Lake Palimpsest: Chicago's Northerly Island

In March 2003, under the cover of darkness and with the consent of Chicago Mayor Richard M. Daley's government, workmen dug massive "X"s into the runways of Meigs Field rendering the downtown airport nonfunctional. In doing so, they closed one of the many chapters of a strip of man-made land located just south of the Chicago Loop known as Northerly Island, which today includes a nature preserve and forms part of the city's museum campus. The 91-acre peninsula was initially envisioned as part of Daniel Burnham's comprehensive 1909 Plan for Chicago. Realized in the early 1920s, the fill of the new land was reportedly to have included everything from rubble from Chicago's Great Fire of 1871 to a truckload of Kewpie dolls. The first and grandest use of the site was as part of the fairgrounds for the 1933-34 Century of Progress International Exposition. During the event, the land hosted grand, colorful pavilions, including the spectacular Electrical Building designed by Raymond Hood. Also on the island was one of the two 628-foot-tall towers of the iconic Skyride—a massive bridge that allowed visitors to take in a bird's-eye view of the fairgrounds and beyond while traveling to Northerly Island in streamlined rocket cars 215 feet above Lake Michigan. Reflecting upon the fair designers' desire to use modern, man-made materials for the exposition, millions of feet of Masonite were used in the construction of buildings and signs throughout the fairgrounds, as well as to line the artificial bay created between the island and the shoreline during the event. This paper will explore the history of

Northerly Island, including why it was built and how it has evolved over time. It will focus on engineering and other design issues that took place during the construction of A Century of Progress, especially in the realization of the Skyride and the large exhibition pavilions that resulted in the development of experimental forms of foundation and other building systems.

Lisa D. Schrenk is Associate Professor of Architectural History at the University of Arizona. Her work focuses on Chicago, international expositions, and the early work of Frank Lloyd Wright. She is the author of Building a Century of Progress: The Architecture of Chicago's 1933-34 World's Fair (U Minnesota), and other exposition-related publications. She is currently completing a book on Wright's Oak Park studio. Other areas of interest include world architecture, Art Deco designs, Radio Flyer wagons, and the work of the Architect's Small House Service Bureau. She has traveled to over 75 countries and taught on two around-the-world Semester at Sea voyages.

Carrie Christman & Rob Watson

Recent Archaeological Investigations at the Pullman National Monument Main Factory Complex

In 2017 and 2018, Chicago Neighborhood Initiatives contracted with Commonwealth Heritage Group, Inc. to monitor the removal of potential sources of environmental contamination and conduct limited mechanical archaeological excavations at the historic Main Factory complex of the Pullman National Monument in Chicago, Illinois. Environmental removal and testing were conducted in preparation for site development at the recently designated Pullman National Monument under the oversight of the Illinois Environmental Protection Agency, in coordination with the Illinois State Historic Preservation Office and the National Park Service. Archaeological monitoring of environmental removal was requested to assess potential impacts of these activities on archaeological resources. Additionally, mechanical excavations were conducted to identify potential intact buried structural remnants of the Pullman factory's transfer pit and northeast quadrant of the historic Main Factory complex. Investigations focused on archaeological features and cultural material related to the Pullman period (1880–1897). No features or cultural materials dating to the Pullman period use of the site or earlier cultural occupations were observed during environmental monitoring. Several limestone footers, I-beams, and former utility ducts were documented during mechanical excavations, but Commonwealth did not encounter any features or archaeological deposits that would contribute to the significance of the site. As demand grew with mass production and technological advances, the continued use of the factory post-Pullman period led to the discontinuation of late-nineteenth production methods. Further, the demolition of the factory structures in the 1950s has impacted the integrity of the archaeological deposits. The lack of Pullman period features, along with no longer discernible interior workspaces leads to several questions about presentation as site development continues with an emphasis on the Pullman period at the Main Factory complex.

Carrie Christman is a Principal Archaeologist at Commonwealth Heritage Group (Commonwealth), a consulting firm in Milwaukee, Wisconsin. She has a Bachelor of Arts degree, majoring in Anthropology and History, from the University of Wisconsin-Madison and a Master's degree in Applied Anthropology within Historical Archaeology from the University of Maryland, College Park. Ms. Christman specializes in historical archaeology and has over 15 years of experience in field survey, testing, and mitigation projects in the Midwest, Upper Great Lakes and Mid-Atlantic. Before joining Commonwealth, she worked for the Office of the State Archaeologist of Iowa where she led investigations focused on urban archaeology in downtown Des Moines. Her interests include community-based archaeology, African-American Diaspora, and public outreach.

Robert Watson is the Regional Director of Commonwealth's Milwaukee office. He has a Bachelor of Arts degree, majoring in Anthropology and History, from the University of Wisconsin-Madison and Masters and Doctorate degrees in Anthropology from the University of Wisconsin-Milwaukee. Dr. Watson has over 25 years' experience directing both prehistoric and historic archaeological projects in the Midwest and Upper Great Lakes regions. In addition to his work at Pullman, Dr. Watson was co-director of University of Wisconsin-Milwaukee College for Kids excavations at Trimborn Farm, an early nineteenth century lime production facility in Milwaukee County, and directed archaeological evaluations of the Menominee Bayshore Camp 10, an early twentieth century logging camp in the Chequamegon Nicolet National Forest.

HISTORIC BRIDGES II BURNHAM C

10:15 - 11:45 AM

Robert Dermody

The Mackinac Bridge, Long-span Suspension Bridge Design

The Mackinac Bridge was the first major suspension bridge to open after the Tacoma Narrows disaster in 1940. The designer of the Mackinac Bridge, David B. Steinman, was one of the central figures in the post-Tacoma era of bridge research and design. Steinman devoted a significant portion of his professional career to thoroughly researching the effects of wind on bridges, and developing improved bridge design methods. These efforts would ultimately result in the design and construction of the "Mighty Mac", the most significant bridge span to be built since the Tacoma disaster, and the crowning achievement of Steinman's long career. This paper will focus on the story of the design and construction of the Mackinac Bridge, in the context of David Steinman's prior bridges, and his extensive efforts after Tacoma to research and fully understand the behavior of long-span suspension bridges under wind loads. In fact, two of Steinman's own bridges had issues with wind-induced oscillations; Thousand Islands Bridge in New York in 1937, and Deer Isle Bridge in Maine in 1939. Steinman successfully designed retrofits for both of these bridges to reduce or eliminate the oscillations. During this period of his long professional career, he studied historic bridge designs (including notable collapses), conducted experiments with small-scale models, wrote journal articles, lectured widely, and published books on the topic of bridge design, especially as it related to designing for wind. In 1945-46, Steinman published a series of five articles in Civil Engineering titled, "Design of Bridges Against Wind", wherein he carefully explained his theories on aerodynamic stability for bridges. Through his own bridge designs, and his extensive research on the topic, Steinman culminated his career with the 3800-ft span at Mackinac.

Robert J. Dermody is a Professor in the School of Architecture, Art and Historic Preservation, where he teaches architectural design studios and the structures courses. Mr. Dermody has a B.S. in Civil Engineering from the University of Massachusetts at Amherst, and a Master of Architecture with a concentration in Structures from the University of Illinois at Urbana Champaign. He is a founding member of the Building Technology Educators Society, and is a licensed architect in Massachusetts.

Paul King

Roebling's Cincinnati-Covington Bridge

Of Roebling's ten built works only three remain, the Brooklyn Bridge, the Delaware Aqueduct built for the Delaware and Hudson Canal and the Cincinnati-Covington Bridge. Originally completed in 1866 Roebling's Cincinnati-Covington Bridge would likely not have survived for us to visit today if it had not been for a creative solution to improve the bridges load bearing capacity proposed and implemented by Wilhelm Hildenbrand in 1896. Hildenbrand who had worked as an assistant engineer to Washington Roebling on the Brooklyn Bridge, proposed the addition of two extra cables, modifications to the deck and roadway and replacement of the stiffening trusses that ran along the sides, all to be supported by the existing masonry towers which were originally designed to carry heavier loads. Featured in this presentation are recent photographs from the top of the Covington tower taken during the 2018 SIA fall tour of Roebling's bridge which shows clearly the remaining original components as well as the modifications implemented by Hildenbrand.

This paper presentation is in fact a look at two bridges, the first as originally designed and built by John Roebling and the second, the modified bridge we visit today engineered by Hildenbrand. We will take a close look at the construction of Roebling's original, reviewing the short cuts that were taken due to the economics of the civil war, the modifications implemented by Hildenbrand including the techniques used to keep the bridge open and functioning through construction as well as a comparison to the Brooklyn Bridge. Roebling's Cincinnati-Covington Bridge is the most direct predecessor to the Brooklyn Bridge, his first bridge with large monumental masonry towers, which can be viewed as a proof of concept that a great bridge could be built to connect the cities of New York and Brooklyn.

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. He is a past president of the NY chapter of the Society of American Registered Architects and a member of the Society of Industrial Archeology. His research focus is the early work of John A. Roe-

bling for which he is writing a manuscript for a book titled "Roebling: Before the Bridge" which focuses on the innovations of his early work which are embodied in the design of the Brooklyn Bridge. A resident of Sullivan County in upstate New York he became keenly interested in the history of the Delaware & Hudson Canal which featured four of Roebling's early suspension aqueducts when he learned that the lake he lived on was built as a reservoir pond to provide water for the canal system.

William Vermes

Opening Details of Two Manually-Operated Swing Bridges

Among Ohio's deep bridge heritage are two differing and yet similar examples of manually-operated swing bridges: one nearly forgotten and recently lost, the other repurposed and beloved. Though built over 200 miles apart, these distant sister bridges illustrate design practices found in period bridge engineering references and reveal forgotten construction details not recorded by their builders.

First, the 1888 Swan Creek Bridge in Toledo was a bobtail deck girder manually-operated swing bridge that carried a single track of rail, though it may never had opened for marine traffic. In 2012, the Swan Creek Bridge was one of three abandoned railroad bridges included in a HAER document written prior to their removal. Though only the pivot pier and portions of the center pivot, rack and gears remain, these components continue to tell tales of their construction.

The 1913 Harmar Bridge (Marietta, Ohio) is a manually-operated through truss swing bridge that carried a single line of B&O rail traffic until 1962. It was then donated to the non-profit Harmar Bridge Company and converted to pedestrian traffic. Each summer, the Harmar Days Street Festival is held featuring the swing span opening as a fundraiser for the bridge's rehabilitation needs and current maintenance purposes.

Bridge engineers of the late 1800s conducted tests and discussions regarding how to overcome static and rolling friction when opening swing bridges and the time and manpower required to complete opening or closing. This presentation will discuss step-by-step the equations used to estimate these values. The performance of the fair's "Harmar Bridge Crew" and the geometry of the manual gears will correlate these equations and estimate how many men were needed to open and close the Harmar Bridge when owned by the railroad. Further use of the design equations and field data from the Harmar Swing Bridge will be applied to the Swan Creek Swing Bridge to recreate the probable manual operation of this bridge had it ever swung open.

Inspection of both swing bridges also uncovered undocumented drainage details inside the rack on top of pivot pier hidden by decades of dirt accumulation and lack of maintenance and the mechanisms to lock both swing spans in place.

Bill Vermes is a senior bridge engineer with Pennoni's Akron, Ohio office. He graduated from Cleveland State University with Bachelors and Master degree in Civil Engineering. Bill has over 30 years of bridge inspection experience of both major and minor bridge inspections in thirteen states, and he specializes in bridge rehabilitation. Bill has authored several papers discussing past bridge construction practices covering concrete, steel and stone bridge construction, and he is co-author of Cleveland's Historic Bridges: Architectural and Engineering Masterpieces.

FIFTY YEARS OF HAER I BURNHAM A&B

10:15 - 11:45 AM

Tim Davis

The View from the Road: HAER's National Park Roads & Bridges Recording Program

America's national park roads and parkways exemplify the harmonious integration of engineering and landscape architecture. By constructing roadways to showcase scenery with minimal impact on their surroundings, the National

Park Service created an internationally renowned road system that provides access to iconic American landscapes while standing as a remarkable social, artistic and technological achievements in its own right. In recognition of their significance, the Historic American Engineering Recording conducted one of its most ambitious documentation projected between 1988-2001, producing dozens of historical reports, hundreds of measured and interpretive drawings, thousands of large-format photographs, two books, and a major exhibit at the National Building Museum. This presentation will showcase these achievements and trace the evolution of the program from strict technological focus to more expansive consideration of cultural landscapes, natural settings, and social concerns.

Tim Davis is a National Park Service historian currently conducting a Historic American Landscapes Survey project on California's John Muir Trail. From 1991-2001 he served as a historian for HAER's National Park Roads & Parkways recording project. He is the author of National Park Roads: A Legacy in the American Landscape (University of Virginia Press, 2016) and co-editor of National Park Roads and Parkways: Drawings from the Historic American Engineering Record (Johns Hopkins University Press, 2002).

David Simmons

Buckeye Reflections on HAER's Legacy

Only a few years after its inception in 1969, HAER began an active historic preservation program in Ohio. It has been a tool for documenting structures shortly before their demolition, but it has also been a positive force in bringing public attention to important industrial and engineering landmarks in the state. The passage of a half century provides an appropriate time to reflect on this program. Where has the HAER program and its leadership had successes and failures in preserving Ohio's historic properties and in shaping its preservation initiatives?

David A. Simmons, senior editor of *Echoes Magazine*, has over forty years of experience evaluating and documenting historic structures. He worked with the National Register of Historic Places and 106 review processes for the SHPO. Beginning in 1983, he contributed to four statewide historic bridge inventories with the Ohio DOT and authored a "Historically Speaking" column in the County Engineer's Association of Ohio's magazine. He assembled eight historic bridge conference programs in Ohio 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. Active with SIA since 1977, he has presented papers at conferences, organized two fall tours, served three terms on the board, received two awards for articles published in IA, and was a member of multiple committees.

Christopher Marston

HAER at 50: The Legacy of the Monongahela Valley and AIHP surveys

Two of the most ambitious multi-year projects undertaken by the Historic American Engineering Record occurred in western Pennsylvania in the late 1980s and early 1990s. Authorized by Congress in 1988, the Steel Industry Heritage Task Force focused on a six-county area along the Monongahela Valley (Allegheny, Beaver, Greene, Fayette, Washington, and Westmoreland counties) from 1989-1994. America's Industrial Heritage Project was active from 1988-1993 in a nine-county area centered around Johnstown (Bedford, Blair, Cambria, Fayette, Fulton, Huntingdon, Indiana, Somerset, and Westmoreland counties). Both programs promoted concept plans for "conserving, interpreting, promoting, and managing the historic, cultural, natural, and recreational resources" associated with western Pennsylvania's industrial heritage of steel making, coal mining, and related industries.

HAER and its sister program HABS were an integral part of the multi-disciplinary background research for both projects, by providing field teams to produce multiple HAER inventories, site recording projects, and publications from 1988-1994. HAER's drawings, photographs, and histories of hundreds of sites provided inventories and detailed documentation of historic industrial complexes and structures, for future development planning and public-private partnerships in the region. The HAER surveys had several positive effects and influence on the planning process. Results included preservation of several structures on industrial sites, designation of industrial-themed National Historic Landmarks, transformation of former rail corridors into active rail-trails and recreation corridors, and ultimately the establishment of the eight-county Rivers of Steel National Heritage Area. This presentation will review HAER's accomplishments and assess the current state of industrial heritage tourism and redevelopment in the Monongahela Valley and western Pennsylvania.

Christopher H. Marston has been an architect with the U.S. National Park Service's Historic American Engineering Record since 1989, where he began by documenting steel mills in the Monongahela Valley. He most recently served as the project leader of the HAER National Covered Bridge Recording Project. He was co-executive editor of Covered Bridges and the Birth of American Engineering (Historic American Engineering Record, 2015). He also served as co-editor of the award-winning America's National Park Roads and Parkways: Drawings from the Historic American Engineering Record (Johns Hopkins University Press, 2004). Christopher serves as an active member of several preservation organizations, including the Society for Industrial Archeology (President, 2018-2020), Preserving the Historic Road, and Transportation Research Board's Committee on Historic and Archaeological Preservation in Transportation (ADC50).

WORLD HERITAGE II CLARK

10:15 - 11:45 AM

Miles Oglethorpe

Bridging the Gap in World Heritage - the Forth Bridge experience

The Forth Bridge became Scotland's sixth World Heritage Site in July 2015, and is one of only a handful of bridges to have been inscribed onto UNESCO's World Heritage list in their own right (i.e. not as part of wider nominations). The nomination process would have been extremely difficult without the comparative study of bridges completed for TICCIH by the late Eric Delony, which continues to be a hugely valuable document.

This paper will discuss the importance of this and other comparative studies to the work of TICCIH in promoting industrial heritage on the World Heritage stage both to UNESCO itself, and to the organisations that advise it, including ICOMOS. It will also consider the extent to which bridges are currently under-represented on the World Heritage list, and refer to future nominations that are potentially in preparation.

Finally, the opportunity will be taken to outline the ways in which World Heritage has been used to promote not only the Bridge itself, but also industrial heritage more generally. Since inscription, funding has been attracted which has permitted extensive digital documentation projects, and the associated development of education projects which feed into the Scottish national curriculum. The aspiration is to use our iconic engineering heritage to inspire new generations of young scientists and engineers at a time when technical skills shortages are becoming a major problem in many industries.

Dr Miles Oglethorpe is Head of Industrial Heritage at Historic Environment Scotland, the equivalent of the National Parks Service in Scotland. After gaining his PhD at Glasgow University, he joined the Royal Commission on the Ancient and Historical Monuments of Scotland in 1985, moving on to Historic Scotland in 2007 where he fulfilled a number of key roles including Head of Education, Outreach and Publications, Deputy Chief Inspector, and Head of Policy. More recently, he led the team responsible for preparing the successful World Heritage nomination for the Forth Bridge, and in September 2018 was elected president of the International Committee on the Conservation of the Industrial Heritage (TICCIH).

Siobhan Osgood

Industrial Archaeology of Irish Railway Architecture: The Great Northern Railway Ireland

The Great Northern Railway (Ireland) was founded in 1876 and was an amalgamation of four earlier railway companies, the earliest dating from 1836. A myriad of architectural styles were inherited by the new company. Ireland's second largest railway company with over 560 miles of track, 140 railway stations, and a myriad of associated buildings and bridges, the GNRI's first chief engineer William Hemingway Mills streamlined the design of the company's infrastructure. Mills used polychromatic yellow, red and black brickwork to create a company identity incorporating influences from his early career in England, Scotland, Spain and Mexico. This study has termed this 'brick-branding'.

This presentation takes the data collected from the site visits and interprets the aesthetics of railway architectural design in Ireland and its impact including implications for communication connectivity, trade, emigration, employ-

ment and gender equality. Key questions include how did the 'GNRI style' develop? How did an engineer merge into the role of architect? What impact did the railways have on Irish society? Starting with a brief history of the GNRI, this presentation provides illuminating visuals from site visits, photographic collections and beautifully illustrated original architectural drawings, alongside literary excerpts to deliver an engaging session. This research is the only comprehensive study of Irish railway architecture to be conducted and therefore showcases previously unseen findings and interpretations.

Siobhan Osgood is a PhD candidate at Trinity College Dublin, researching the architecture of the Great Northern Railway Ireland across its original network. She accomplished a master's with distinction in Irish Art History at Trinity College Dublin and her thesis was awarded the UK's Industrial Archaeology Association's Dissertation Prize in 2017. Siobhan has presented her research for guest lectures, seminars and conferences including the Theoretical Archaeology Conference UK, and Irish History Students' Association Conference, Ireland. Published articles include the Irish Railway Record Society Journal, Architecture Ireland, the Industrial Archaeology Review, and Public History Queen's University Belfast. Siobhan has created a social media platform for her research, Irish Railway Architecture: www.irishrailwayarchitecture.blogspot.com, Instagram (@irishrailarch) and Twitter (@IrishRailArch)

Maria Giminez Prades

Sparks From A Temple Of Energy: Designing Adaptive Reuse of the Aliago Therman Power Plant, Teruel Spain

The Aliaga Thermal Power Plant was built as a "Temple of Energy", the biggest and most modern plant of its kind in Spain. Adaptive reuse of the building as a heritage asset will help generate a new creative economy while promoting the natural landscape as attraction for cultural and rural tourism. Located in Aliaga, a small village in Teruel's rural area of north Spain, "Electricas Reunidas de Zaragoza" built the Thermal Power Plant in the early 1950s. Its remarkable architecture is characterized by the grandeur of its scale, the use of classical decorative elements like triangle pediments, pilasters, large paned vertical windows in the main facades, and entablatures decorated with round windows. The Aliaga plant is a magnificent example of the monumental architecture built in Spain during this period. Shortly after its decommission in 1982, the power plant and the town disappeared into obscurity.

The archive contains little textual record of the plant's construction, but holds a wealth of graphic information such as pictures and maps that document the main building, the dam, and the cable car used to transport the coal from the mines into the power plant. These documents can show the transformation of a traditional agricultural area into a very modern industrial site, evidenced in the growing population and new social facilities.

The decline of the power plant in the early 1980s had a negative impact on the local community, resulting in a lack of sustainable economic opportunities, depopulation, and environmental pollution. The community also lost that part of their local identity associated with the power plant itself. These consequences are still visible today, and the building and its history are forgotten by the local government.

However, due to its exceptional architectural and historical features, the power plant could become a valuable Industrial Heritage asset, as a case study in new possibilities of adaptive reuse. The power plant's buildings and cultural landscape can become a new asset in the community, sparking redevelopment around industrial heritage.

Maria Gimenez Prades received a B.A in Fine Arts and a M.A in Conservation from the Universidad Complutense of Madrid. Currently is a Fulbright Scholar conducting her Ph.D research at Michigan Technological University on the preservation and the adaptive re-use of Industrial Heritage and its role in the development of a new creative economy in post-industrial communities. Her expertise includes conservation and restoration of objects, having worked in Spain, Italy, Germany, and the UK. She is also certified art teacher and has been working with high school students during the past year. Her research interests include also public engagement in the conservation process in relation to heritage, as communities strive to create sustainable and competitive economies.

DEBRIEFING THE FRIDAY PROCESS TOURS
ADLER

1:45 - 3:15 PM

Patrick Harshbarger, Fred Quivik
Debriefing the Friday Process Tours

One of the hallmarks of the SIA is the set of process tours we arrange for the Annual Meeting and the Fall Tour. These experiences are more than merely interesting; they are useful contributions to our professional and scholarly development. Each year, members informally exchange responses to tours in the hotel, at the bar, and over meals, but we haven't provided a formal venue for such exchanges. This year, Patrick Harshbarger, past editor of the Society for Industrial Archeology Newsletter, and Fred Quivik, past editor of IA: The Journal of the Society for Industrial Archeology, will moderate a discussion by the audience of the previous day's process tours, asking interested audience to help each other analyze what we have learned about several of the enterprises we have just visited.

Industrial systems are foreign to many of us, and the process tours help us to conceptualize the many facets of industrialization: the skills workers need to engage with machines and technical systems; working conditions; management and labor/management relations; the machines and building spaces themselves; the ways that changing markets shape changes in industrial systems; environmental impacts of industrial operations; and engineering considerations in designing industrial systems. Of particular interest are examples of older processes and machines, providing valuable insights into facets of industrial archeology. Harshbarger and Quivik will photograph as many of the sites they visit as possible, so that PowerPoint slides of those experiences may help foster the discussion.

Patrick Harshbarger is Vice President and Principal Historian at Hunter Research, Inc., a cultural resources consulting firm based in Trenton, New Jersey. Patrick's recent IA project highlights are a statewide historic bridge inventory for New Hampshire, archeology of the tidewater terminal of the Camden & Amboy Railroad in South Amboy, New Jersey, and planning for the restoration of the three-tiered raceway system of Alexander Hamilton's Society for Establishing Useful Manufactures in Paterson, New Jersey.

Fred Quivik recently retired from teaching in the Department of Social Sciences at Michigan Tech, where he was affiliated with the grad program in Industrial Heritage and Archaeology. He recently completed a six-year stint as editor of IA: The Journal of the Society for Industrial Archeology. He continues working as an expert witness in environmental litigation.

WATER POWER, VALVES, CONTROL, AND RENOVATION BURNHAM C

1:45 - 3:15 PM

Kevin Coffee
Lowell Waterpower and the Dawn of the Anthropocene

This paper is an initial examination of the waterpower infrastructure at Lowell, considering various inputs required to build and maintain it, and exploring its impact within the Merrimack River watershed.

An emerging trend in contemporary historical archaeology explores the decisive and global effects of human settlement. Research has adopted the term 'anthropocene' to describe that distinct epoch of global history and, in many

uses, aligns that epoch with the Euro-American industrial revolution. An important driver of industrialization in America and Europe was mechanized textile manufacturing centered in New England.

Established in 1823, the planned city of Lowell, Massachusetts was described by a network of canals that diverted waterpower to each of the mills. The qualitative advances in engineering and the physical sciences, which concurrently propelled and were impelled by the productive consumption of industrialization, were particularly manifest in the mechanical engineering – especially fluid dynamics and machine building – of Lowell's multi-stage cotton mills. Industrialization requires and exponentially increases the amounts and types of material inputs to production processes, including the means of production in all its various forms. This exponential increase in productive consumption is definitional of the Anthropocene epoch.

Beyond the most obvious input of concentrated and regimented human labor, a variety of material inputs have driven industrial production, each responsible for a cascade of effects outside and/or at a distance from the point of production. The impact of Lowell as a manufacturing center has been explored to some extent in regard to its effect on human labor in factories and on plantations. Less explored is how that productive consumption also remade social and ecological environments at a distance.

This paper is an initial examination of the use of waterpower at Lowell in relation to the entire Merrimack Valley and watershed, including under-theorized and, in several instances, unintended consequences of that use.

Kevin Coffee is a historical archaeologist whose work explores 19th and 20th century industrialization and urbanism, especially the intersections of class, gender, ethnicity, and social practices that engender functional or dysfunctional social relationships. He is currently Chief of Interpretation and Education for Lowell National Historical Park. He received his MA in historical archaeology from the University of Leicester (UK).

Greg Johnson

The Greatest - Crane Valve Company and its Chicago Plant

The Crane Valve Company was considered the greatest valve company in the world. At its zenith, the company's main factory, known as "The Great Works", was located on 160 acres in south Chicago on Kinzie Avenue. This paper will discuss the company and its history, with most of the focus on the period dominated by its presence on Kinzie Ave. Descriptions of the plant itself, including numerous photographs, will be shown.

The massive Crane Chicago plant was built in 1914 and produced valves and fittings for over 50 years. The facility was vertically integrated. It poured its own, steel, iron & bronze castings onsite, followed by product machining, assembly & testing.

Anecdotes gleaned from a long working relationship with former Crane VP of Engineering, Bill Maclean, will be presented. These include the role that Crane played as an important player in Admiral Rickover's nuclear navy. Crane was noted for its engineering expertise and the company was able to glean one of the great engineering minds from the Operation Paperclip conveyor, Kurt Bredtschneider. Some of Mr. Bredtschneider's contributions to the industry will be noted.

In addition to the discussion of Mr. Bredtschneider's work at Crane, the company also was at the forefront in many areas of valve design. There are interesting back-stories that accompany these designs & revelations.

A very short silent film, "Open & Shut" produced by Crane in 1928, will be a part of the presentation. The film includes some assembly-line views of the Chicago plant, as well as a campy, quick story of industrial valves.The material in this presentation is part of a nearly completed book I am writing on the history of the valve industry in the United States.

Mr. Johnson is considered the leading historian on the United States Valve industry. He has written numerous articles for industry publications and is a contributing editor of Valve Magazine. He has been active in the valve industry as a member of the American Petroleum Institute's (API) sub-committee on piping and valves and has served as the president of The Manufacturer's Standardization Society (MSS), the oldest valve standards organization in the United States.He is also current chairman of the Valve Man-

ufacturer's Association (VMA) Communications Committee and has served as an instructor for the VMA valve education program for 10 years.Mr. Johnson has been in the valve industry since 1978 and is a 1974 graduate of the University of Houston, with a degree in Journalism. He is president of United Valve, a 58-year-old valve service company in Houston, Texas.

Steve Muller

The Burden Iron Co. Office Building: 40 Years of Renovation

The Burden Iron Works office building in Troy, NY, is the only significant structure remaining from the Burden Iron Works complex which once included blast furnaces, rolling mills, horseshoe machines, etc. The building was acquired by the Hudson Mohawk Industrial Gateway in the 1970s. Over the years the Gateway first preserved the building, then engaged in a long-term process of restoration. in 2017 the Gateway won a New York State grant for $500,000 which should enable the Gateway to complete the exterior renovation.

Steve Muller lives in Troy, NY, and was a board member of the Hudson Mohawk industrial Gateway for 12 years. He has written two local history books. He was an international economist with the US Department of State for nearly 30 years.

FIFTY YEARS OF HAER II BURNHAM A&B

1:45 - 3:15 PM

Todd Croteau

Saving the Lines: A Reflection on HAER's Maritime Documentation Program

The HAER Maritime Program was established in 1985 as part of a broader Congressional mandate to document and preserve historic maritime resources like ships, small craft, lighthouses, and other land-based marine resources. The program expands on documentation previously developed by the Works Progress Administration-era Historic American Merchant Marine Survey (HAMMS) from 1936-1937, which is curated by the Smithsonian Institution's National Museum of American History. After the development of the Guidelines for Recording Historic Ships and testing the standards and methods during several pilot projects, the program has continued to employ the latest technological advances in surveying and drafting. This portion of the session will present the history of both HAMMS and the HAER Maritime Program and discuss recent endeavors in maritime documentation.

Todd Croteau is a Project Manager for the Historic American Engineering Record (HAER), a division of Heritage Documentation Programs, National Park Service. He has been working with HAER since 1989 and has served as the Maritime Program Coordinator since 1992. A graduate of the Rhode Island School of Design's Industrial Design Program, Mr. Croteau brings a unique perspective to the HAER architectural staff.

Dana Lockett

HAER Metrology: Embracing 3D Data Acquisition and Object Reconstruction

The U.S. National Park Service tasks Heritage Documentation Programs (HDP) with creating comprehensive archival documentation, guidelines, and standards for the preservation of America's architectural, engineering, and landscape heritage. The Historic American Engineering Record has been documenting historic engineering sites for 50 years now while utilizing contemporary and proven techniques of metrology (the science of measurement) as well as the experimentation and implementation of cutting-edge technologies. With a mission that places emphasis on creating an archival record, HAER still persistently strives to improve the speed and quality of digital data capture using terrestrial laser scanning, digital photogrammetry, robotic total stations, and GPS to aid in the creation of its archived materials at the Library of Congress. These tools are not only useful in producing HAER's typical physical record, but also in the production of digital entities that can be developed into online interpretive tools such as virtual tours, fly-through videos, solid and mesh models, and animations that creatively engage the public with historic resources. This presentation will highlight how we use these tools to produce interpretive drawings as well as create content that reaches beyond the normal HAER documentation.

Dana Lockett is a Project Manager for the Historic American Engineering Record. He holds a Bachelor of Architecture from Texas Tech University and has 27 years of preservation experience with Heritage Documentation Programs. While producing archival hard copies is the primary mission of his work, Dana emphasizes digital surveying and the interpretive digitalization of engineering and industrial sites using measuring techniques such as Terrestrial Laser Scanning (TLS) and photogrammetry combined with Computer Aided Drafting (CAD) and other 3D rendering tools.

Justine Christianson

Recording an "Intolerable Nuisance": The Tidal Basin Documentation Project

In 2017, staff with Heritage Documentation Programs undertook a comprehensive documentation project of the world-renowned Tidal Basin in Washington, D.C., for the National Park Service. The Tidal Basin and surrounding landscape were entirely manmade, the result of an extensive Potomac River reclamation project completed by the Army Corps of Engineers in the late nineteenth century. The reclaimed land was then developed as parkland with the Tidal Basin serving both as a recreational body of water and a flushing mechanism. The documentation project required capturing both the iconic landscape and the engineered structures, so a variety of technologies—including a paddleboat and a photogrammetric camera—were employed. The resulting voluminous digital data was distilled into the traditional measured drawings with accompanying large-format photographs and a written historical report. As this particular documentation project shows, the methods of documentation may be new, but the Historic American Engineering Record's commitment to creating accurate, legible, and verifiable documentation remains unchanged.

Justine Christianson is an Historian with the Historic American Engineering Record. She has a Master's degree in History and Historic Preservation from The George Washington University. She started with the HAER program in 2001 and has been involved in a variety of documentation projects, including serving as co-executive editor of the HAER publication Covered Bridges and the Birth of American Engineering.

PERPETUAL POWER CLARK

1:45 - 3:15 PM

Charles Parrott

Perpetual Motion Machine: 24-7 Tidal Power in Early 19th-Century Boston's Back Bay

The lunar attraction of the oceans' water provided the conditions in many locations along the Atlantic coasts of North America and Europe for the tides to be harnessed for the historic production of water power. At these locations, the capture of the high-tide's water behind a dam erected in a tidal estuary or cove provided the power necessary to operate the water wheels of, typically, grain or saw mills. But the small window of time the lunar cycle provided before the motion of these water wheels was hindered by the next rising tide below the dam limited their utility and productivity. However, by the early 19th century the idea emerged of capturing the waters of high tide and low tide in adjacent dammed reservoirs, and keeping them near those maximum and minimum levels to produce power from the resulting head of water between them, while relying on the next high and low tide in the adjacent tidal flow to respectively replenish and drain those reservoirs.

This concept to harness the tidal cycle and provide an around-the-clock power source was developed and put into operation in 1822 in Boston's Back Bay. It is the only known historical instance deployed anywhere of what was deemed "perpetual" tidal power. Within its limitations it operated successfully for a little more than 35 years until Boston's expansion pressure demanded more lucrative use of the Back Bay's marine estate. This presentation will outline the configuration of this power scheme and explain the hydraulic operation that allowed 24-hour operation. It will also examine its use of breast-wheel technology to achieve the highest possible efficiency in power production then available, while minimizing the occasional effect of power-robbing backwater on the wheels.

Until his retirement, **Charles Parrott** was the historical architect at the Lowell National Historical Park, National Park Service, where he was engaged since the early days of the Park in the rehabilitation and restoration of historic buildings and industrial

sites throughout the city, and the development of the greenway system along the Lowell canals called the Canalway. Before his engagement in Lowell he worked for a time in the National Park Service's preservation programs in Washington, on several early Historic American Engineering Record field teams, and in a private restoration architectural practice. He is the author of Lowell Then and Now: Restoring the Legacy of a Mill City.

Patrick Malone

The Back Bay Mill Dams of Boston: IA When You Can't See or Excavate the Features

The largest and most important features of the tidal power system in Boston's Back Bay were a main dam across the entrance to that estuary and a cross dam that divided it into two basins. Both of those dams are now buried beneath the city's streets. We cannot easily get permission or funding to excavate any part of them. However, the investigative methods of industrial archaeology can help us understand their construction and the innovative way they made use of energy from tidal cycles. We have large collections of historical documents, even a diary from Laommi Baldwin, Jr., the engineer who built the dams. City engineers in later years sometimes uncovered features of the dams while working on other projects. Two of them recorded their findings in written descriptions or photographs. A modern researcher can even visit the quarry ledges that supplied Roxbury conglomerate stone for the walls of the main dam.

This illustrated presentation will use a wide variety of evidence to explain how the Back Bay dams were designed and built. It will also demonstrate how the process of trying to draw historical structures and mechanisms can provide new insights about their likely form. When completed in 1822, Boston's perpetual power system was the second most impressive engineering project in New England. Only the Middlesex Canal exceeded it in cost, scale, and technical complexity. The main dam of the system was also an important toll road providing direct connections to the west and south. Today that hidden mill dam carries Beacon Street, Boston's most prestigious address. The connecting cross dam also had a roadway and was the base for several water-powered industries. This entire system, now largely forgotten even in Boston, deserves more respect and historical study. It was a unique application of renewable energy for industrial development.

Patrick Malone is an industrial archaeologist and a historian of technology. He is a former president of the Society for Industrial Archeology (SIA) and is now Professor Emeritus of American Studies and Urban Studies at Brown University. The SIA has given him its Norton, Vogel, and General Tools prizes. He is the author of Waterpower in Lowell and co-author, with Professor Robert Gordon, of The Texture of Industry. His primary interests are the urban built environment and industrial development. Malone has also done a great deal of work in public humanities, focusing on museum interpretation, park development, historical preservation, and the recording of engineering structures. Much of his scholarship examines American rivers and hydraulic engineering. His present research focuses on a unique tidal power system in nineteenth-century Boston.

Robert Gordon

Welded Iron Cannon made with Continuous Tidal Power on the Mill Dam

The high failure rate of cast-iron cannon led the Army Ordnance Department to initiate research at commercial foundries on cannon casting technology. In 1840 it was getting nowhere. Into this breach stepped Daniel Treadwell, the Boston polymath and entrepreneur, with a plan to replace cast iron, a material with poor fracture toughness, with ductile wrought iron in cannon. The iron was oriented to place its greatest strength in the direction of the greatest stress the cannon had to sustain, perpendicular rather than parallel to the bore. He wound wrought iron strips around a hollow steel mandrel that would form the cannon bore, and welded the resulting disc solid. He then welded the necessary number of these discs together to make a 32-pounder cannon that weighed 1,800 lbs., a quarter that of a cast cannon of the same caliber. Since no forge hammer anywhere could make the welds, Treadwell used the continuous tidal power and shop facilities at the Boston Mill Dam to build a double-acting, 1,000 ton-force, 25-foot long hydraulic welding press. Workers heated already-welded discs white hot and threaded them onto a moveable mandrel built into the press piston. This then thrust them into forming dies so that the full force of the press could be applied to make the weld. The press then pushed the joined discs off the mandrel. Adding successive discs built up the full length of the cannon. Treadwell's welded 32-pounder cannon withstood treble the proofing charges used for cast guns of the same caliber. Production facilities were in place on the Mill Dam, but the Army was committed to its casting program and foundry contractors; the welding technique pioneered in Boston was developed instead by the British. Surviving cannon and design calculations that supplement the written record allow us to reconstruct Treadwell's work.

Since 1984 IA has published eleven papers by **Robert Gordon** and colleagues, the most recent in the current issue. His books include The Texture of Industry, an Archaeological View of the Industrialization of North America with Patrick Malone, and Industrial Heritage in Northwest Connecticut, A Guide to History and Archaeology with Michael Raber. His American Iron is now being reissued by the Johns Hopkins University Press. His research in archaeology has included the African Iron Age, Andean metallurgy and Machu Picchu, bloomery smelting in the Adirondack region, and manufacturing technology at the Whitney Armory. As Regents' Fellow at the Smithsonian Institution he did field and experimental work on American manufacturing technology. He is collaborating with Patrick Malone on the Boston Perpetual Tidal Power project. Gordon is Senior Research Scientist at Yale University.

MATERIALS - CONCRETE, CERAMICS, AND ALUMINUM ADLER

3:30 - 5:15 PM

Liying Jiang

Preservation of Historic Concrete Structures - Understanding "Controlling Moments"

The late 19th/early 20th century saw the construction of many historic public and communal concrete structures such as stadiums, railroad structures, and swimming pools. These important structures are vulnerable to multiple types of deterioration due to their long-term usage as well as harsh exposure. The preservation of these historic concrete structures requires intersection of preservation technology, archaeology, materials science, and engineering.

Understanding how these historic concrete structures are reaching their "controlling moment" in time is essential to the preservation of the structures and the extension of their service lives. These "controlling moments" may be materials-related, such as cyclic freezing and thawing, carbonation, chloride-induced deterioration, alkali-silica reaction, or they may be related to the history of manufacture and construction control. Thus, to fully understand these moments, cooperative investigation of historically significant materials and construction is required as part of preservation of the historic structures. Moreover, because maintaining historical significance and original fabric are typically the final goals of the preservation, application of the science and art, including material science, petrography, archaeology, and chemistry may also be required in order to provide the information needed to understand the existing/historic materials, their durability and versatility, and potential alternatives in-kind.

This presentation describes various historic concrete structures encountered and explains how to investigate their "controlling moment" and how to preserve the structure and/or provide an optimized outcome that holds the best interests of all stakeholders at heart. The procedures may include: review of the history of the manufacture and construction, characteristics of existing condition by onsite visual observations with supplemental non-destructive testing, laboratory testing on the extracted existing materials (including material characterization, petrographic examination, and/or chemical testing). Examples with photographs and anecdotes will be used to demonstrate the concepts and procedures.

Liying Jiang is a Senior Staff II- Structure with Simpson Gumpertz & Heger, Inc. of Waltham, Massachusetts and is a registered Professional Engineer in Massachusetts. Ms. Jiang graduated from Tongji University, China, with a Bachelor of Engineering degree and a Master of Engineering degree in Materials Science and Engineering in 1999. She also received a Master of Engineering in Civil Engineering and Applied Mechanics from McGill University in 2003. She specializes in cement and concrete technology, with two years of professional experience in the precast industry and more than eleven years of professional experience in investigating concrete materials and existing structures, designing repair and rehabilitation measures, and developing management plans for structures affected by alkali-silica reaction (ASR), corrosion, and other materials-related distresses. She is also skilled in nondestructive testing techniques for structural evaluations, including Ground-Penetrating Radar (GPR), IE (Impact Echo) and IR (Impulse Response), etc.

She is a professional member of American Concrete Institute (ACI) and International Concrete Repair Institute (ICRI), and currently serving on ACI Committee 228, Nondestructive Testing of Concrete, and Committee 364, Rehabilitation, ICRI 110 Guide Specifications and ICRI 710 Coating and Waterproofing.

Christopher Fennell

Dragons in America: Industry and Innovation in Edgefield, South Carolina

The first innovation of alkaline-glazed stoneware pottery in the Americas occurred in Edgefield, South Carolina, in the early 1800s. These potteries employed enslaved and free African Americans, and stoneware forms also show evidence of likely African cultural influence on stylistic designs. Archaeological investigations in 2011 at the first Edgefield kiln, built circa 1815, were informed by a strong consensus among historians that the facility was an early

form of groundhog kiln for a relatively small-scale craft enterprise. Excavations revealed that the tradition of Southern alkaline glazed stoneware started in Edgefield based on an infrastructure of industrial-scale production and enslaved artisans. Four of the earliest Edgefield kilns in the 1800s proved through archaeology to consist of up-hill, dragon kiln designs utilized successfully for centuries in southeast China. Edgefield thus represents “a crossroads of clay” where the influences of Asia, Africa, and Europe were combined.

Chris Fennell is a historical archaeologist with projects focusing on social group identities, ethnic group dynamics and racialization, diaspora studies, regional systems and commodity chains, stylistic and symbolic elements of material culture, consumption patterns, and analysis of craft and industrial enterprises.

David Weiss

The Wonder Metal Birth of the Aluminum Industry in Manitowoc-Two Rivers, Wisconsin

When a piece of the Russian satellite Sputnik IV hurtled through space in 1962 and landed in the middle of a Manitowoc street, two policemen mistook the hot metal chunk for a foundry slag that had likely fallen from a passing truck. Sputnik heralded the advent of the Space Age. Consumers wanted things shiny and modern, so the same city gave them the aluminum Christmas tree, which evolved into a decade-long holiday craze.These tidbits are telling, as the area’s history is inextricably entwined with the foundry industry and the new “wonder metal” — aluminum.

Manitowoc and its sister city of Two Rivers entered what could be called the Aluminum Age at the turn of the 20th century, about the same time that Milwaukee, some 80 miles south, was becoming known as the Beer Capital of the World.That these two small cities in east-central Wisconsin found such success is surprising. After all, aluminum was a relatively unknown metal with less-expensive substitutes. The area was isolated from its raw material and major markets; its workers were relatively unskilled. In addition, anti-aluminum factions of the day, led by competitors, attacked aluminum as being poisonous, and causing cancer and sterility. The secret to their success was the gumption displayed by the metal workers and foundrymen, men as tough and versatile as the aluminum they produced. Men like Conrad Werra, Joseph Koenig and Henry Vits and later, Abraham Schwartz and G.E. William Eck. All had something in common. They worked hard, weren’t afraid to try something new and, simply put, loved a metal with so much potential for the future. This paper introduces these men and shows how they left their mark on the Manitowoc-Two Rivers area, which continues to support aluminum foundries and manufacturers to this day.

Mr. David Weiss, Vice President of Engineering and R&D for Eck Industries, Inc., is responsible for development and application of high performance alloys and casting concepts for the foundry and their customers. In 2015 he received the John A. Penton Gold Medal from the American Foundry Society for pioneering work in the premium aluminum casting industry.

LOGGING CAMPS AND OTHER INDUSTRIAL COMMUNITIES BURNHAM C

3:30-5:15 PM

James Schwaderer

They Ate More Than Beef

Much of the literature written about lumber camps is geared toward identifying and understanding the “typical’ camp. Types of information used to categorize a camp includes the time period of operation, number of men, physical layout, rail access, and foodstuffs, but all emphasize the role of the company in managing decisions and provide little direct evidence for workers’ experience in logging camps. Foodways provide a corrective lens to understand worker’s lives since the average logger burned between 6,000 to 12,000 calories a day, making food a vital component of working life. The Coalwood lumber district, located in the Hiawatha National Forest just southwest of

Munising in Michigan's Upper Peninsula, provides an interesting counterpoint to typical narratives. Cleveland-Cliffs Iron Company (CCI) owned the Coalwood district, but workers constructed their own houses or lived in camp boarding houses that were not controlled by the company. Working in such a context allows focus to remain on worker experience from their own perspective. To understand worker choices of food I will use faunal data recovered from three camps in the Coalwood lumber district: Coalwood, Zerbal, and Roscoe. This data was collected during three periods of excavations ranging from 2013-2016. This data provides direct information about what workers chose to eat in the context of CCI's production that made workers responsible for their own subsistence, shifting the perspective away from management, toward worker experience.

James B. Schwaderer is a Ph.D. student at Michigan Technological University in the Industrial Heritage and Archaeology program. He holds undergraduate degrees in history and anthropology from Michigan State University and a Masters of Anthropology from Western Michigan University. His research interests include historical and industrial archaeology, the implications of the capitalist mode of production, foodways, the incorporation of digital technology into archaeological methodology, and archaeological public education and outreach. James' current research examines the foodways of workers in three logging camps located within the Coalwood lumber district which was operated by Cleveland-Cliffs Iron Company and resides just south of Munising, Michigan. He hopes to understand the logging experience from a worker's perspective through the lens of foodways.

LouAnn Wurst

Rethinking Labor in the Northern Forest

Much of the archaeology of industrial workers inadvertently adopts the perspective of capital. Whether focusing on single industrial sites or discrete industries, workers are frozen into the social relations of their production at that place and time, leaving our perspectives of labor as already/only reactionary to the dictates of capitalist production. This common approach fails to capture workers actual experience as industrial laborers. Several brief examples of workers' experience from Michigan's Upper Peninsula highlight that from the workers vantage point, movement and mobility are much more ubiquitous than stasis. This perspective changes the pertinent questions about industrial labor from examining class relations at each mill or shop, toward examining the kinds of choices workers had, how they negotiated these choices, and how capitalists competed for the same labor pool. The archaeological site of Coalwood provides a case study to explore these reframed questions. The site was a cordwood lumber camp operated by the Cleveland Cliffs Iron Company (CCI) from 1900-1912 near Munising, Michigan to fuel their charcoal iron furnace in Marquette. CCI paid their choppers by the cord and workers provided their own housing and subsistence. I explore the contradictions of an industry where workers were paid by the piece to extract a finite and diminishing resource, situated in a region where endemic labor shortages were typical. Shifting the vantage point to the perspective of the workers provides the means to understand this contradiction and workers everyday life.

LouAnn Wurst received her PhD from SUNY Binghamton in 1993 and is currently Professor in the Industrial Heritage and Archaeology program at Michigan Technological University. Her research focuses on issues of class, labor, ideology, and gender in the 19th and 20th centuries. Her current research projects include a long term study of the transformations in the agriculture industry based on excavations at eighteen farms in central New York's Finger Lakes National Forest, industrial labor in the lumber industry, and issues of Civilian Conservation Corp and German prisoner of war labor at Camp Au Train in the Hiawatha National Forest.

Sarah Fayen Scarlett

Keweenaw Time Traveler: Geospatial Technologies for Community-Driven Industrial Heritage

The Keweenaw Time Traveler is an interactive online historical GIS for Michigan's Copper Country being developed at Michigan Technological University with support from the National Endowment for the Humanities. It enables users to access hundreds of layered historical maps tethered to census and directory data from 1880–1950 to explore and analyze past lives and environments in one of America's earliest mining landscapes. Known as a "deep map," this tool connects researchers with community-members, invites place-based digital storytelling, and is pioneering the use of geospatial technologies tailored to industrial heritage practice. This paper will overview the collaborative interdisciplinary community-driven approaches used to build the Keweenaw Time Traveler; present its use in current historical research; outline new datasets being prepared including Calumet & Hecla Mining Company employee records, business directories, and historical flu outbreak maps; and preview future plans for improved query and visualization capabilities. Post-industrial landscapes pose known challenges to the economic and cultural health of contemporary communities, whose identities often suffer with population loss, deterioration or erasure of industrial structures, and

environmental waste. The Keweenaw Time Traveler's active public programming models best practices in community-driven heritage research to develop applications that ensure mutual benefit for academic researchers and community stakeholders alike. Explore the Keweenaw Time Traveler at www.KeweenawHistory.com.

Sarah Fayen Scarlett is assistant professor of history at Michigan Technological University where she teaches in the Industrial Heritage and Archaeology graduate program and is affiliated with the Historical Environments Spatial Analytics Lab. Her current book project uses overlapping social landscapes as a framework for place-based examinations of class and gender identities between 1875 and 1920. Scarlett serves as co-director of the Keweenaw Time Traveler and studies digital spatial storytelling and citizen science as applied to heritage research and public interpretation.

Cooper Sheldon

A Year of Heritage: The application of the Stewards Individual Placement Program in the Calumet Region

Every year since 2015 the "Stewards Individual Placement Program supports over 600 AmeriCorps, AmeriCorps VISTA, and non-AmeriCorps service members and interns across the US" (History, Stewards Individual Placement Program). Community and Regional Heritage based service year opportunities with the Stewards Program allow for graduate, undergrad, and heritage professionals to gain valuable field experience and first-hand perspectives on populations they aim to work with. The Calumet Heritage Project is the first to be developed in the heritage field that directly focuses on helping environmental and cultural heritage organizations that are working to federally designate a region where a nationally significant steel industry, biodiversity, and cultural communities combine to create a unique, storied landscape. This paper will discuss the work being done between the Field Museum, Calumet Collaborative, and Calumet Heritage Partnership for the creation of the 50th National Heritage Area; how the Stewards Individual Placement Program has and will help forward their join cause; and how this program can be used as a blueprint for similar programs in the future.

Cooper Sheldon is an Industrial OSM/VISTA Archaeology and Heritage Management Masters Graduate Student from Michigan Technological University. In his undergrad at SUNY Potsdam, he double-majored in archaeology and anthropology, with a minor in history. After graduation in 2016, he did his first year of AmeriCorps VISTA as a STEM Education and Outreach Coordinator in Syracuse, NY. After a year of schooling, he started another year of AmeriCorps as part of his Masters, this time as a Stewards AmeriCorps VISTA member with the Field Museum and Calumet Collaborative. As a second-year graduate student, he's currently working on his thesis, the topic of which will center around industrial ruination and the social memories of de-industrialized places and landscapes in the Calumet Region.

MONSTER ENERGY BURNHAM A&B

3:30-5:15 PM

Kyle Waldeck

Monster Sized History: Restoring Waterworks Steam Engines: Mt. Pleasant Iowa

The waterworks steam engine that has the longest record of operating in preservation in the USA is a 130 ton engine from Marshalltown, Iowa, now at Midwest Old Threshers in Mt Pleasant, Iowa. The volunteer driven organization was founded in 1950 and originally focused on steam traction engines and threshing machines. The exhibits expanded to showcase artifacts that any small Midwestern community could have had, such as print shop, railway, and town main street to name a few. The waterworks engine at the Old Threshers is a horizontal cross compound engine built by Allis Chalmers in 1922. It was moved to the show grounds and placed onto a new foundation in 1973, then the adjacent steam powerhouse building was extended over top of it. The engine operates for five days annually during the Old Threshers Reunion held during Labor Day weekend. The Steam Powerhouse exhibit in which it is shown highlights industrial steam engines. The operating exhibit explains what the engines were used for, how they work, and where they originally came from. Maintenance is done during the summer to prepare for the annual event and often includes minor repairs to artifacts and equipment. Steam is turned on and the artifacts are operated to makes sure no other

maintenance is needed. After the Reunion, the equipment is winterized to prepare it for the temperature and humidity extremes of the unheated building. A few volunteers check and roll the engines over throughout the year so to prevent them from seizing. Volunteers are educated on site throughout the year on care operation and steam. Most volunteers are not around steam nor industrial equipment in their professional lives so these skills have to be taught.

Kyle Waldeck is a volunteer at Midwest Old Threshers in Mt. Pleasant IA and the Prairieland Heritage Museum in South Jacksonville IL At Midwest Old Threshers he volunteers within the Steam Powerhouse exhibit. There he helps operate, maintain, and teach new volunteers. At Prairieland Heritage museum Waldeck helps with traction steam engines. Waldeck's history interests are broad: everything from circus, agriculture, railway, industrial, highway system, and car culture to name a few. Waldeck has a bachelor's degree from Illinois College. Waldeck is a recent graduate from University of Illinois Springfield, where he received a master's degree in public history. With the degree, Waldeck hopes to start a career with in the museum field. He is currently the caretaker of the Governor Duncan Mansion is Jacksonville, IL.

Michael Piersa

Monster Sized History: Restoring Waterworks Steam Engines: Bethlehem PA

The National Museum of Industrial History relocated and restored what is now the most powerful operating waterworks steam engine in America. The story begins with the construction of the engine in 1914 and its service with the York Water Company in York, PA. The tale then turns to how the engine did what many of its counterparts failed to do: survive to the present day. When the engine was still in service, its historic value was recognized and plans were made to bring it to an antique engine club. The move was made in 1981, but the engine was never made ready for exhibition. By 2009 it had to be removed, either to another museum or destroyed. At that point, the National Museum of Industrial History stepped up to move the engine to safety and eventually restore it. The project was immense: designing and pouring a 78 cubic yard concrete foundation, moving the engine into a historic former Bethlehem Steel mill building that traditional cranes could not fit into, and restoring it cosmetically and mechanically without disturbing Smithsonian owned artifacts only several feet away. An operational restoration was vital not just to impress visitors, but to dispel increasingly common myths that develop as the public becomes disassociated with older technology, and to preserve skills and knowledge that would not otherwise have been passed down. The project also provided the opportunity to solve problems in new ways and involve new community partners, such as utilizing steam pipe couplings so modern that they received their patent during installation. The result is a professional installation in a museum context that connects the past to the present.

Mike Piersa is a Historian at the National Museum of Industrial History in Bethlehem, Pennsylvania. He has been associated with the Museum since 2002. His vast knowledge base and hands-on philosophy has enabled him and his volunteer crews to preserve over 250 tons of historic machinery from mining, transportation, and manufacturing facilities across the northeast. Mike has a bachelor's degree from Moravian College, a master's degree from Lehigh University, and a certificate in nonprofit management from The Nonprofit Center at La Salle University's School of Business.

Philip Beard

Monster Sized History: Restoring Waterworks Steam Engines: Phillipsburgh NJ

The engine in Phillipsburg, New Jersey, of all the potential Grand Waterworks Triples to restore, was far from the optimal choice. However, it was the only in-situ waterworks engine in the Northeast United States that was cared for by a group looking for new blood and willing to nurture progress without delay. Alex Karnes, Philip Beard, and other volunteers faced with the task of reviving and completing a stalled restoration that had begun in the 1990s. This meant repairing and replicating broken and missing pieces, freeing up parts that had seized through thirty years of decay, and cleaning for days on end. Despite poor prior plans to spin the engine electrically, or simply leave it static, work began to restore the engine all the way, to steam. Facing an uphill battle against a severely broken machine, the team did their homework and endeavored to restore the engine to its proper former glory. A year and a half later, the engine once again came to life, becoming not only the first waterworks triple to run in preservation in the US, but the largest operating stationary steam engine in North America.

Philip Beard found an interest in steam technology at an early age. In his early teens he became involved with the restoration of a historic 1873 railway depot in his hometown. Over the next several years, he became participated in several more projects, until he became co-director of the Phillipsburg Triple restoration project. Also at a fairly young age, he picked up an interesting in Digital Modeling and quickly combined interests. In his attempts to accurately recreate these machines and industries, he developed a solid understanding of their construction and operation. Philip is presently studying 3D digital animation at Pratt institute in Brooklyn, NY, where he continues to be known for both his physical work on antique machinery and his accurate digital re-creations.

Alexander Karnes

Monster Sized History: Restoring Waterworks Steam Engines: Woburn, MA

The engine in Woburn, Massachusetts was essentially a case of rumored buried pirate's treasure. After exhaustively chasing a rumor that an intact waterworks engine of some type survived in the water department of the city, permission to access the site was eventually granted after two years. Inside was found not only a wholly intact and undisturbed 1908 vertical compound Corliss engine that had not run since 1933, but a nearly undisturbed facility surrounding it including fittings, clocks, tools, and even original oil lamps affixed to the walls, some of which date to the origin of the waterworks in 1872. With careful bargaining with city officials, Mayoral support was eventually gained from a Mayor that did not until this time know the engine existed at all, and after only four months of careful work, it was brought to live steam and triumphant motion in November 2018, disconnected from its pumps.

Alexander Karnes became infatuated and involved with steam engines at a young age, and began producing detailed technical renderings of them simultaneously. He is almost entirely self-taught and has completed significant work on various machines including steam engines of all types over the years. He is principally an operating engineer on stationary and marine steam power plants, steam locomotives, antique electrical power equipment, and more. The most formative experience of his life was at age 18, when he went to see the surviving waterworks engines at Chestnut Hill in Brookline MA. Frustrated by the stagnant nature of the museum formed there, and by the fact that none of these surviving machines were working in the US, from that time he sought and advocated to bring one of the survivors into operation. Alex has become fluent in both the mechanical and political skills required to bring large projects to life.

THE COLD WAR CLARK

3:30-5:15 PM

Charissa W. Durst

Putting the Cold in the Cold War

Building 1190 was one of four identical hangars constructed along the flightline at Eielson Air Force Base in Alaska. These small nondescript wooden hangars were constructed in 1946-1947 to service B-29 bombers modified to support spy missions over the Soviet Union during the Cold War. These missions included confirmation that the Soviets had exploded an atomic bomb in 1949, subsequent nuclear weapon tests, and aerial photography runs deep into Siberia. The Air Force also had to develop new techniques to service aircraft and associated ground vehicles that were not designed for extreme cold weather. After the arrival of the U-2 spy plane to the base in 1957, the four older hangars fell out of use. Building 1190 entered its second life in 1958 as an Air Terminal Operations Center (ATOC), the all-services air terminal for "the interior" that shipped intermodal containers with weapons, explosives, and even classified material to military bases all over the world. In 2012 shipping activity moved to a newer hangar, and Building 1190 was given to the Alaska Air National Guard, who used it as storage and ultimately demolished it. This is just another example of how a boring old building can be associated with previously unknown and significant aspects of history.

Charissa W. Durst founded Hardlines Design Company in 1990 and is the firm's President and Principal Architect. She earned a B.S. in Architecture from the University of Maryland and a Master of Architecture from The Ohio State University. As a student, she worked on HAER teams to document bridges in Ohio and New York state, and as a business continued the HAER documentation at Wright-Patterson Air Force Base. Charissa has since managed dozens of military HAER projects across the country. As a licensed architect, Charissa focuses on the rehabilitation of historic buildings for the public sector, and works as an architectural historian on the occasional research and documentation project of personal interest.

Daniel J O'Rourke & Erhard Koehler

The Nuclear Ship Savannah: The Flagship of President Eisenhower's Atoms for Peace Initiative

In a 1953 speech, President Dwight Eisenhower initiated his Atoms for Peace initiative, which promoted the peaceful uses of nuclear energy. President Eisenhower later proposed the construction of a nuclear powered passenger/mer-

chant ship that could serve as a unique mobile demonstration of the peaceful uses of nuclear power. The Nuclear Ship (NS) Savannah began its life as a nuclear powered vessel in 1962 after years of development. The NS Savannah would travel some 455,000 miles and visit 96 ports during its career. The ship was decommissioned in 1970. Since its decommissioning, the ship spent many years as a museum ship where the story of the Atoms for Peace program was told. The ship is managed by the Department of Transportation's Maritime Administration (MARAD). The NS Savannah was listed on the National Register of Historic Places in 1981, it became an International Historic Mechanical Engineering Landmark for the American Society of Mechanical Engineers in 1983, a Nuclear Engineering Landmark for the American Nuclear Society in 1991, and a National Historic Landmark in 1991. The NS Savannah is currently docked at the Port of Baltimore, Maryland.

The NS Savannah's reactor retains its license under the Nuclear Regulatory Commission. Planning has begun for the removal of the license with the NRC. A Section 106 review under the National Historic Preservation Act is examining the effects of decommissioning of the reactor on the National Historic Landmark. This paper will briefly describe the history of the NS Savannah and provide an overview of the ship's condition. The paper will discuss the activities which are currently planned during the decommissioning of the NS Savannah's reactor. Finally, the paper will discuss the long term options available for preservation of this surviving piece of the United States' nuclear history.

Dan O'Rourke is a Principal Cultural Resource Specialist, Environmental Science Division, at Argonne National Laboratory. A graduate of the MS program in Industrial Archaeology at Michigan Technological University, he has a bachelor's degree in history and anthropology from Michigan State University. He has practical experience in historic preservation policy and National Environmental Policy Act (NEPA) projects. Past research includes examination of industrial remains in the Pullman neighborhood in south Chicago, investigation of the remains of the Ferris Wheel for the 1893 World's Columbian Exposition at The University of Chicago, as well as several research buildings at The University of Chicago. While at Argonne, he has been involved in NEPA and National Historic Preservation Act projects for the U.S. Department of Energy, Bureau of Land Management, Nuclear Regulatory Agency, and Department of Defense in locations across the continental United States, Alaska, and Japan. He has documented numerous nuclear research facilities for the Department of Energy.

Erhard Koehler is the Manager, Nuclear Ship Savannah Programs, U.S. Department of Transportation, Maritime Administration. as well as Senior Technical Advisor, N.S. Savannah – acting as the agency's designated licensee to the Nuclear Regulatory Commission. Koehler is a graduate of the State University of New York Maritime College, with a BE degree in Naval Architecture. He joined MARAD's Office of Ship Operations in Washington, DC in early 1991. An avid amateur maritime historian, Erhard enthusiastically jumped at the assignment in late 1992 to oversee the Savannah's return to MARAD custody from Patriots Point, and her subsequent drydocking at Sparrows Point. In 2004 he succeeded to the agency's senior Savannah management positions. As Manager, N.S. Savannah Programs, Erhard is responsible for all activities related to the ship; including ship custody and husbanding, routine radiological surveillance and monitoring, the nuclear decommissioning project, and the Savannah historic preservation program. Erhard also serves as the Senior Technical Advisor, N.S. Savannah, a position designated by the Maritime Administrator and responsible for all licensing matters before the Nuclear Regulatory Commission.

POSTERS

Zachary Liollio & Gary North
Phoenix Dare: The Restoration of Nevada Northern Railway No. 81

The Phoenix Dare Challenge is the Nevada Northern Railway Museum's fundraising effort to restore several locomotives. The flagship of this effort is NNRy. No. 81, a 1917 Baldwin-built 2-8-0 steam locomotive. Having sat as a museum display since the early-60's, No. 81 is being restored to operation in the original 1907 machine shop, using some of the original equipment. Spearheading the restoration work is Gary North, who worked as a machinist for Kennecott Copper (the previous owner of the railroad). The author/presenter (Zach Liollio) also worked under Gary North to forge and fabricate components for No. 81. The poster will cover a brief history of the railroad, technical locomotive topics, completed work, and provide project management-related info (schedule, budget, etc.). Challenges to this project include the availability of parts, HAZMAT abatement, and ensuring that the locomotive will meet current state and federal standards. This information will hopefully provide insight to people concerned with similar projects. It will also serve to promote NNRy., and expand their base of volunteers and historians.

Zachary Liollio is graduate student at The Military College of South Carolina. He has worked in the transportation construction industry for four-years, and also values working with his hands. His side business, Z.P. Liollio & Co., tackles welding and mechanical projects with a historic focus. Born and raised in Charleston, SC, he quickly grew found of local history. In college, Zach began writing academically for a state history blog, Roots & Recall. This eventually lead to his first article in TICCIH on the topic of hot riveting. His favorite pastimes include hiking and working on cars. One goal he has set for the future is to volunteer with industrial-focused museums across the country.

Emine Yavuz

Investigation of Reused Olive Oil Factories in Ayvalik Region

After the Industrial Revolution, many industrial structures remained in the background due to the use of computers and the transition to automation. In countries where the Industrial Revolution has lived before, these spaces that made for machines have begun to be transformed for human use. With the emergence of the concept of industrial heritage, the issue has investigated with in a different dimension, and many industrial buildings have registered and protected. Thus, there are not only the structures that are recycled to their original function but also the structures that are loaded different functions. While different functions are being loaded into the building, besides the concept of protection, the construction of the new function must be compatible with the existing space design. Intermediate floors, walls, passages and materials should not damage the original architectural features. Re-functional structures should be considered together with their surroundings and also cultural, economic, social reasons should be considered. In the scope of the study, old olive oil factories and oil houses are investigated. After the tourism-oriented development of Ayvalık region, the olive oil factories located in the city center were moved out of the city and the factories located in the city center were remained in the background. Some of the structures as cultural heritage are protected by re-functioning. In this study; massive, structural and spatial interventions that are applied to the idleness and re-functioning old oil and olive oil factories are investigated in terms of architectural heritage and industrial heritage.

Emine Yavuz is a research assistant in Mimar Sinan Fine Arts University Architectural Faculty İnterior Architecture Department and Phd Student in Mimar Sinan Fine Arts University

Dr. Hande Zeynep Katan is assistant professor in Mimar Sinan Fine Arts University Architectural Faculty İnterior Architecture Department

Amanda Richey

Archaeological Remains of the Savage Mine Hoist House, Virginia City, Nevada

Wastewater improvements in the historic mining town of Virginia City, Nevada revealed the foundations of the Savage Mine hoist house. The Savage Mine, staked in 1859, was one of the Comstock Mining District's leading producers

during the 1860s. As a leading producer, the mine and hoisting house were selected to be prominently featured in the United States Geological Exploration of the Fortieth Parallel (1867-1881) also known as the King Survey. During wastewater improvements, archaeological monitors identified remains of the foundations of the Savage Mine as depicted in a series of technical illustrations presented in the King Survey. However, the archaeological remains provide more detail about the hoisting engines and associated equipment than the illustrations. Through this project it has become clear that the underlying foundations were more complicated than what was illustrated.

Six machine footings consisting of large andesite blocks secured to the underlying brick foundation by large metal tie bolts and a long narrow brick passageway running through the main hoist house foundations were uncovered as well as an additional brick foundation in the known location of the main boiler with three back-filled arched openings. These features were part of the day-to-day maintenance and operation of the machinery. The passageway leading through the hoisting works foundations and the boiler foundations were important parts of the larger system, but they do not seem to have been considered important enough to be included in the documentation prepared by the King Survey. The archaeological investigation of the Savage Mine documented portions of these auxiliary features giving a more complete picture of the hoisting system used to extract over $18,356,000 of gold and silver ore from one of the leading mines of the Comstock Mining District.

Amanda Richey earned a B.A. in Anthropology from the University of California, Santa Cruz in 2008, and an M.A. in Anthropology from the University of Nevada, Reno in 2016. She has participated in a broad range of prehistoric and historic cultural resource management (CRM) and research projects in the Great Basin and California for over 10 years. She served as Field Director for the Virginia City Wastewater Improvement Project, helped to record the Savage Mine ruins, and co-authored the report detailing the findings of the data recovery and monitoring efforts. She is looking forward to upcoming projects related to the Transcontinental Railway, a Native American boarding school, and the early settlement of Reno, Nevada.

Amanda Ciampolillo

Streamlining Section 106 with the New ACHP Program Comment for Rail Properties

On August 17, 2018, the Advisory Council on Historic Preservation (ACHP) finalized the Program Comment to Exempt Consideration of Effects to Rail Properties Within Rail Rights-of-Way. Development of the Program Comment was a requirement of the Fixing America's Surface Transportation Act and is intended to accelerate the review of rail-related undertakings under Section 106 of the National Historic Preservation Act and ultimately improve the timeliness of project delivery. The Program Comment is available for use by any federal agency that has an undertaking affecting rail properties within existing railroad and rail transit rights-of-way. Two approaches to streamlining Section 106 comprise the Program Comment – an exempted activities list and a property-based approach. The Federal Railroad Administration (FRA) has already demonstrated time savings by applying the list of exempted activities to grant-funded projects, and is highlighting key points of that approach and project examples in this poster.

Amanda Ciampolillo is an Environmental Protection Specialist for the Federal Railroad Administration (FRA). Her project portfolio at the FRA includes project work in the Southwest and Midwest portions of the country. Amanda's role is to help federally-funded rail projects complete the required environmental and historic preservation compliance processes. She joined the FRA in 2017 after more than a decade at the Federal Emergency Management Agency. Amanda's interests include industrial architecture (particularly smokestacks), road trips, dystopian science fiction, and long-haul train travel. She holds a B.A. in History from the State University of New York College at Potsdam and a M.S. in Historic Preservation from the University of Vermont.

Thomas Behrens

HAER at 50

Accurate and efficient measurement of the increasingly complex sites that the Historic American Engineering Record documents has evolved over HAER's 50-year history. Beginning with tape measuring, HAER experimented with a variety of laser distance-measuring tools, and today relies on high-definition laser scanning as the workhorse for the majority of its field documentation.

The proposed poster will pull images from the HAER collection as well as in-process screen captures and illustrations to highlight how HAER has grown from exclusively hand-measuring and hand-drafting to become a leader in the field digital data acquisition, processing and production of archivally-stable hard copies.

Thomas Behrens is a Project Manager for the Historic American Engineering Record (HAER), a division of Heritage Documentation Programs, National Park Service. He earned his Bachelor of Architecture from The Catholic University of America and has been with the Heritage Documentation Programs for 25 years. During his tenure, Tom has led a number of teams documenting large-scale industrial sites that included several Apollo-Era sites for NASA, TVA sites and a number of steel processing plants.

Kyle Parker-McGlyyn

Does Digital Really Make a Difference?

With advancements in technology integrating more and more into everyday life, the ability to digitize an artifact, structure, or landscape has lost the novelty it once had. You can no longer show someone a LIDAR scan of an archaeology site and say isn't this groundbreaking, because the next question you will get is what did you want to show me about it? After all the digital dust has cleared, the question to ask is: does all of this digital assistance really assist a person in learning and retaining information? The concept for this presentation is to have people examine two different formats of similar information about an industrial archaeology site. The first format will use a standard poster to present the information, the second format will use Matterport software to present the information. After each person is done looking at the respected formats, I will then have each willing participant take a brief questionnaire on the information they just reviewed. The questionnaires will be collected, tallied, and reviewed to determine if there is a difference in the amount information people glean from the respected displays.

Kyle Parker-McGlynn is a Ph.D. student in the Industrial Heritage Archaeology program at Michigan Technological University. Before becoming a Ph.D. student in the fall of 2018 Parker-McGlynn graduated from Northern Michigan University in 2005, with a B.S. in geography, and in 2015 graduated from the University of Idaho (UI), with an M.S. in geography. After graduating from the UI, Parker-McGlynn worked as a cultural resource archaeologist and GIS analyst for CH2M Hill. Parker-McGlynn is interested in developing digital education outreach solutions for industrial archaeology heritage sites. By creating digital platforms of industrial archaeology heritage sites that are interesting and accessible to the general public, Parker-McGlynn hopes to expand knowledge and awareness of industrial archaeology in general.

Kelly Wells

Our Evaporating Working Waterfronts

During the 19th through early-to-mid-20th Centuries the working waterfronts servicing U.S. ports were not only bustling centers of commercial activity providing for robust economic support for coastal regions as well as inland commercial hubs, but were also plentiful in that ample coastal space was readily available for commercial maritime development.

Fast forward to the latter part of the 20th Century and it is easy to see the role gentrification has had in severely removing and repurposing waterfront access away from historical, commercial purposes. As we move well into the 21st Century, this fast moving storm of gentrification and "nimbyism," also known as "not in my backyard" syndrome, has increased exponentially to the point that numerous industries such as the commercial fishing industry are finding it far too expensive to access port acreage, even if such acreage does exists. My research effort examines, through physical inspection documented digitally, how these waterfronts have changed and how these changes have affected maritime industries.

Kelly Marie Wells serves as a research assistant for the Eastern Shore Watermen's Museum and Research Center, a subsidiary of the Waterman Heritage Foundation of Virginia's Eastern Shore, Inc., located in Onancock, Virginia. As an undergraduate student, Kelly served as a research intern for the museum over the course of two summers and has remained in her research role with the museum since her graduation from college. Kelly earned a BA in Classical Studies from Virginia Wesleyan College in 2013. Since that time, Kelly has engaged in several research projects on Virginia's Eastern Shore and Coastal North Carolina to discover historical and archaeological data to assist in the museum's public history efforts.

Laura Rouleau

Archaeology, History, and Community at Pullman National Monument

Pullman National Monument was established by presidential proclamation in 2015. The following year, faculty from Michigan Technological University's Industrial Heritage and Archaeology Program and staff from the National Park Service's Midwest Archaeological Center and Pullman National Monument entered into a collaboration to create

recommendations for best practice in researching, interpreting and managing Pullman's cultural resources. Scholars at Michigan Tech have researched, written, and delivered a White Paper that reviews major research themes and interpretive agendas within the discipline of industrial archaeology and heritage and applies these themes to the resources at Pullman National Monument. An Archeological Overview and Assessment has also been completed by faculty and researchers at Michigan Tech. This document provides a historical summary of the factory site and surrounding town, from construction through to decline and post-industrial transformation. The Archaeological O&A offers a detailed geospatial chronology of various activity areas, property types, workflow and processes, including a review of all previously completed archaeological studies.

The faculty team at Michigan Tech is now focused on completing the final portion of the project: an Historic Resources Study of Pullman National Monument. This report will summarize the history of both the company and town of Pullman, as well as offer a detailed examination of what is known about labor at Pullman and the communities of workers. The HRS will review the technological systems and industrial processes implemented at the factory and town, including those deemed innovative and those representative of common or conventional practice, with attention to the sociological implications of the planned community.
This poster will present the research completed on this project so far, as well as call on members of the SIA community to provide feedback and engage in discussions about where this project is headed in the future.

Laura Walikainen Rouleau is a visiting assistant professor in the Social Sciences department at Michigan Technological University. Her research interests include late-19th and early-20th century social and cultural history, gender history, and material culture studies. She holds PhD in the History of American Civilization from the University of Delaware, as well as a master's from the Winterthur Program in American Material Culture. Her research has been funded by a National Endowment for the Humanities fellowship and she has completed the University of Delaware's Public Engagement in Material Culture Institute. She presented her research at conferences including the Material Culture Symposium for Emerging Scholars. In addition, she has also served as book review editor of Winterthur Portfolio

NOTES

TIME	ADLER	BURNHAM C	BURNHAM A & B	CLARK
8:00-9:45 AM	**MY KIND OF TOWN** Ellen Stoner - "The History of Chicago's Union Station" Marlise Fratinardo - "The Northwestern Elevated Railway: Its History and Transformative Effects" Scott Utter - "John Alexander Waddell and the Construction of the Northwestern Elevated" Graham Garfield - "Rapid Transit Station Design in the Context of Chicago's Northwestern Elevated Railway"	**HISTORIC BRIDGES I** Katie Ohland - "Repairing Concrete on Minnesota's Historic Bridges" Steve Walton - "Lasagna Bridges? The Joliet Bridge & Iron Co., Its History, and Questions About a Signature Bridge Detail" Paul King - "Roebling, Before the Bridge" Michael Cuddy - "Frankford Avenue Bridge: Rehabilitation of the Oldest Bridge in the United States"	**RAILROADS AND COTTON** Robert A. Booth Jr. & Amy Kellett - "Salem's Naumkeag Steam Cotton Company" Fred Ash - "Smoke on the Water: The Illinois Central Railroad Along Chicago's Lake Front"	**TICCIH AND WORLD HERITAGE** Patrick Martin - "TICCIH and World Heritage on the Global Stage" Miles Oglethorpe - "Demonstrating The Value Of Industrial Heritage on the World Stage Mark Watson - "Abutments To Outstanding Universal Value. DeLony and Waddell's Comparisons of Steel Cantilever Bridges" Phyllis Ellin - "The U.S. World Heritage Tentative List and Industrial Heritage"
MORNING BREAK & POSTER SESSIONS (See page 37 for poster descriptions)				
10:15-11:45 AM	**CHICAGO IS . . .** Richard Lanyon – "History Shows the Way for a Sustainable Future for Stormwater and Wastewater in Metropolitan Chicago" Lisa Schrenk – "A Lake Palimpsest: Chicago's Northerly Island" Carrie Christman & Rob Watson – "Recent Archaeological Investigations at the Pullman National Monument Main Factory Complex"	**HISTORIC BRIDGES II** Robert Dermody – "The Mackinac Bridge, Long-span Suspension Bridge Design" Paul King – "Roebling's Cincinnati-Covington Bridge" William Vermes – "Opening Details of Two Manually-Operated Swing Bridges"	**FIFTY YEARS OF HAER I** David Simmons – "Buckeye Reflections on HAER's Legacy" Christopher Marston – "HAER at 50: The Legacy of the Monongahela Valley and AIHP Surveys" Matthew Kierstead - "'Large and Lofty': HAER Documentation of the Erie Railroad's 1875 Portage Viaduct"	**WORLD HERITAGE II** Miles Oglethorpe – "Bridging the Gap in World Heritage - the Forth Bridge experience" Siobhan Osgood – "Industrial Archaeology of Irish Railway Architecture: The Great Northern Railway Ireland" Maria Giminez Prades – "Sparks From A Temple Of Energy: Designing Adaptive Reuse of the Aliago Therman Power Plant, Teruel Spain"
BUSINESS LUNCH				
1:45-3:15 PM	**DEBRIEFING THE FRIDAY PROCESS TOURS** Patrick Harshbarger, Fred Quivik – "Debriefing the Friday Process Tours"	**WATER POWER, VALVES, AND RENOVATION** Kevin Coffee – "Lowell Waterpower and the Dawn of the Anthropocene" Greg Johnson – "The Greatest - Crane Company Valve and its Chicago Plant" Steve Muller – "The Burden Iron Co. Office Building: 40 Years of Renovation"	**FIFTY YEARS OF HAER II** Todd Croteau – "Saving the Lines: A Reflection on HAER's Maritime Documentation Program" Dana Lockett – "HAER Metrology: Embracing 3D Data Acquisition and Object Reconstruction" Justine Christianson – "Recording an "Intolerable Nuisance": The Tidal Basin Documentation Project"	**PERPETUAL POWER** Charles Parrott – "Perpetual Motion Machine: 24-7 Tidal Power in Early 19th-Century Boston's Back Bay" Pat Malone – "The Back Bay Mill Dams of Boston: IA When You Can't See or Excavate the Features" Robert Gordon – "Welded Iron Cannon made with Continuous Tidal Power on the Mill Dam"
AFTERNOON BREAK				
3:30-5:15 PM	**MATERIALS - CONCRETE, CERAMICS, AND ALUMINUM** Liying Jiang – "Preservation of Historic Concrete Structures - Understanding 'Controlling Moments'" Christopher Fennell – "Dragons in America: Industry and Innovation in Edgefield, South Carolina" David Weiss – "The Wonder Metal Birth of the Aluminum Industry in Manitowoc-Two Rivers, Wisconsin"	**LOGGING CAMPS AND OTHER INDUSTRIAL COMMUNITIES** James Schwaderer – "They Ate More Than Beef" LouAnn Wurst – "Rethinking Labor in the Northern Forest" Sarah Fayen Scarlett - Keweenaw Time Traveler: Geospatial Technologies for Community-Driven Industrial Heritage" Cooper Sheldon – "A Year of Heritage: The application of the Stewards Individual Placement Program in the Calumet Region"	**MONSTER ENERGY** Kyle Waldeck – "Monster Sized History: Restoring Waterworks Steam Engines: Mt. Pleasant, IA" Michael Piersa – "Monster Sized History: Restoring Waterworks Steam Engines: Bethlehem, PA" Philip Beard – "Monster Sized History: Restoring Waterworks Steam Engines: Phillipsburgh, NJ" Alexander Karnes – "Monster Sized History: Restoring Waterworks Steam Engines: Woburn, MA"	**THE COLD WAR** Charissa W. Durst – "Putting the Cold in the Cold War" Daniel J O'Rourke – "The Nuclear Ship Savannah: The Flagship of President Eisenhower's Atoms for Peace Initiative"