# SIA RVA

# SOCIETY FOR INDUSTRIAL ARCHEOLOGY

## 47th ANNUAL CONFERENCE
## MAY 31 - JUNE 3, 2018
## RICHMOND, VIRGINIA

# CONFERENCE PROGRAM

# SCHEDULE AT A GLANCE

***All locations are within the Omni Richmond Hotel except where noted (*)***

***All tours (►) depart from the lobby of the Omni Richmond Hotel***

### WEDNESDAY, MAY 30, 2018

| | | |
|---|---|---|
| **5:00 PM - 7:00 PM** | **Onsite Registration** | **Omni Richmond Lobby** |
| **6:00 PM - 8:00 PM** | **SIA Board Meeting** | **Rappahannock Room** |

### THURSDAY, MAY 31, 2018

| | | |
|---|---|---|
| **7:00 AM - 9:00 AM** | **Onsite Registration** | **Omni Richmond Lobby** |
| **7:30 AM - 5:00 PM** | **► T1 - The University of Virginia** | |
| **1:00 PM - 4:30 PM** | **► T2 - Richmond Historic Waterfront Walking Tour** | |
| **2:00 PM - 4:00 PM** | **► T3 - Treasures from the Collections of the Library of Virginia** | |
| **4:00 PM - 6:00 PM** | **Onsite Registration** | **Omni Richmond Lobby** |
| **5:00 PM–6:00 PM** | **New Members' Welcome Reception** | **Magnolia Room and Wine Bar** |
| **6:00 PM–8:00 PM** | **Opening Reception** | **Magnolia Room and Wine Bar** |

### FRIDAY, JUNE 1, 2018

| | | |
|---|---|---|
| **6:30 AM - 8:00 AM** | **Continental Breakfast Available** | **James River Foyer** |
| **7:00 AM - 9:00 AM** | **Onsite Registration** | **James River Foyer** |
| **8:00 AM - 5:00 PM** | **► F1 – Machine and Foundry Work in Richmond** | |
| **7:30 AM - 5:30 PM** | **► F2 – Petersburg & South** | |
| **8:00 AM - 5:00 PM** | **► F3 – Virginia Maritime & Peninsula Tour** | |
| **8:30 AM - 4:30 PM** | **► F4 – James River & Kanawha Canal** | |
| **7:30 PM - 9:30 PM** | **Eighth Annual SIA Film Festival** | **Potomac Room** |

### SATURDAY, JUNE 2, 2018

| | | |
|---|---|---|
| **7:00 AM - 8:00 AM** | **Continental Breakfast Available** | **James River Foyer** |
| **7:00 AM - 10:00 AM** | **Onsite Registration** | **James River Foyer** |
| **ALL DAY** | **Exhibits, Posters & Book Sales** | **James River Foyer** |
| **8:00 AM - NOON** | **Morning Presentation Sessions** | **James River Salons A,B,D, Potomac** |
| **NOON - 2:00 PM** | **Luncheon & Annual Business Meeting** | **James River Salon C** |
| **2:00 PM - 5:30 PM** | **Afternoon Presentation Sessions** | **James River Salons A,B,D, Potomac** |
| **6:30 PM - 9:30 PM** | **Saturday Banquet** | **Stone Brewing*** |

### SUNDAY, JUNE 3, 2018

| | |
|---|---|
| **9:30 AM - 12:30 PM** | **► S1 – Tredegar Iron Works** |
| **8:30 AM - 1:00 PM** | **► S2 – James River & Kanawha Canal** |
| **1:00 PM - 4:00 PM** | **► S3 – Richmond Railroad Museum** |

► *Buses load on the north side of hotel (Cary Street). Please arrive at least 15 minutes early for tour departures. Departure times are firm. Return times may vary.*

* *A shuttle will run from the Omni to Stone Brewing Company from 5:45 until 6:45 PM. It is a 1.5 mile walk along Tobacco Row and the Virginia Capital Trail.*

# SIA▶RVA

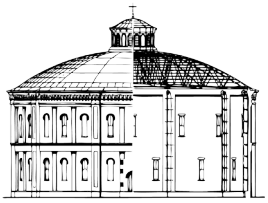
## SOCIETY FOR INDUSTRIAL ARCHEOLOGY 47th ANNUAL CONFERENCE

### MAY 31 - JUNE 3, 2018
### RICHMOND, VIRGINIA
### OMNI RICHMOND HOTEL

## CONFERENCE PROGRAM

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

www.sia-web.org



GUIDEBOOK EDITORS
Christopher H. Marston
Nathan Vernon Madison

LAYOUT
Daniel Schneider

COVER IMAGE
*Philip Morris Leaf Storage Warehouse*
*on Richmond's Tobacco Row.*
*HABS VA-849-31 Edward F. Heite, photographer, 1969.*

# CONTENTS

# ACKNOWLEDGEMENTS


### PRESENTATION COMMITTEE
Paul White (Chair)
Mark M. Brown
Christopher H. Marston
Steven Walton

### GUIDEBOOK CONTRIBUTORS / TOUR LEADERS
Lyle Browning
Joseph Costello
Jesse Harris
Gregg Kimball
T. Arron Kotlensky
Joshua LeHuray
H. Edward Mann
Julia Peirce Marston
Ann L. Miller
Antony Opperman
William E. Trout, III
Tyler Turpin
Dulaney Ward

### SIA TOUR HOSTS
UVA: Stephen Thompson
Blue Ridge Tunnel: Ask Ann Miller
Library of Virginia: Catherine Fitzgerald Wyatt, John Metz, others
Strickland Machine: Matt McGee
OK Foundry: James O'Neil IV
Philip Morris USA: Myrna Banaszak
Richmond ASME: Jeffrey Wiese
Petersburg: Dean McCray, Lisa Bergstrom, Bob Ogle, Walt Patrick
Trapezium: Dave McCormack, James Frazer
Fort Monroe: Denise Dooley, David Stroud, Sam Henderson
Mariners' Museum: Tina Gutshall, Will Hoffman
Jamestown: Mark Summers, David Givens
Friends of Pump House
Richmond RR Museum: Ned Krack

### SIA EVENTS COORDINATOR
Courtney B. Murtaugh

# WELCOME

On behalf of the SIA-RVA 2018 Planning Committee, welcome to Richmond, Virginia for the 47th Annual Conference of the Society for Industrial Archeology.

Richmond provides a unique backdrop for the Society for Industrial Archeology conference's events this year. Strategically located on the falls of the James River, Richmond grew as a major center for tobacco trade and production, flour milling, iron production, and transportation by the eve of the Civil War. The most industrialized city in the antebellum South, Richmond connected to more than 200 miles of canals and five railroads. No wonder the city became the capital of the Confederacy when Virginia seceded; the Tredegar Iron Works produced half of all artillery tubes manufactured for the Southern war effort. Although devastated by Confederate evacuation fires when retreating in April 1865, Richmond rebounded. The Golden Leaf became king with Tobacco Row hosting four of the largest manufacturers in the country. Support industries such as box making, paper making, lithography, and machine shops flourished.

Though Richmond suffered in the post-industrial age, a remarkable legacy of its earlier heyday remains. Several sections and artifacts of the James River and Kanawha Canal are preserved and integrated into Richmond's vibrant riverfront. Walking trails parallel and cross the James alongside antebellum railroad bridge piers and mill ruins, creating scenic, historic vistas of the city. Many of Tobacco Row and Manchester's nineteenth and twentieth century factories have been transformed into modern loft apartments, reinvigorating the city.

The SIA conference's offerings go well beyond Richmond's city limits. Tours will travel west to Charlottesville to explore Thomas Jefferson's legacy at the University of Virginia, and Claudius Crozet's landmark Blue Ridge Tunnel. We're going south to Petersburg, with its own impressive heritage as a major tobacco trading center, with its own related industries, and whose architecture survives as a unique time capsule. A tour east to Hampton Roads looks at the region's military legacy at Fort Monroe, conservation of the USS Monitor, and archaeology at the nation's first permanent settlement at Jamestown.

From the Canal Walk to Tobacco Row, the James Riverwalk to Historic Tredegar, Richmond's rich industrial heritage has shaped the modern southern city you see today. We hope you enjoy your visit to Richmond, and we look forward to seeing you at future SIA events.

Yours in IA,

Christopher H. Marston
SIA-RVA 2018 Conference Chair

# CONFERENCE HOTEL INFORMATION


## CONFERENCE HEADQUARTERS

Omni Richmond Hotel
100 South 12th Street
Richmond, Virginia 23219
Phone: (804) 344-7000

The Omni Richmond Hotel is where refined Southern hospitality meets contemporary amenities. With elegant accommodations inside, historic Richmond outside, and the magnificent Blue Ridge mountains just an hour away, this is the ultimate Virginia ex¬perience. The James Center YMCA, a 30,000-square-foot state-of-the-art health and fitness athletic facility, offers complimentary access to Omni Richmond Hotel guests. Guest services includes: 24-hour dining, onsite ATM, 24 hour business center, Starbucks Coffee shop, complimentary safes in each guest room, full-service restaurant, valet parking ($25 per day), and WiFi Internet ser¬vice.

**PARKING OPTIONS**
- Valet parking $25 per day with unlimited in/out privileges
- Bus and van parking located off-site nearby (fee)
- Two electric vehicle charging stations

Secured parking for hotel guests is beneath the hotel and can be accessed via entrances on Canal Street or Cary Street. Please note that nearby decks offer “hotel” parking but are not secured or monitored by the hotel. Hotel will not be responsible for any damage or claims resulting from parking in these unauthorized locations.

**HOTEL RESTAURANTS – FIRST FLOOR**
- Trevi’s Grille, Lounge and Market
- Starbuck’s

**CONFERENCE ROOMS** *(See maps on inside back cover)*
- Rappahannock Room
- Magnolia Room and Wine Bar
- Potomac Room
- James River Salons AB
- James River Salon D
- James River Salon C
- James River Foyer

# GETTING AROUND RICHMOND

**PUBLIC TRANSPORT INFORMATION**
http://ridegrtc.com
*(Use the trip planner to determine route and mode of transportation )*

**GROUND TRANSPORTATION**
- Amtrak Main Station – 6 blocks
- Amtrak Staples Mill Station – 8 miles
- Taxi: Approximately $25 per cab (airport)
- James River Transportation: (804) 249-1052
- Groome Transportation: (804) 222-7222
- Limo Service: Contact the concierge desk at (804) 344-7000

**HOTEL SHUTTLE OPERATIONS**
- 5 mile radius
- Hours of Operation
- Monday - Thursday: 6:30 a.m. - 9:00 p.m.
- Friday: 6:30 a.m. - 10:00 p.m.
- Saturday: 8:00 a.m. - 10:00 p.m.
- Sunday: 8:00 a.m. - 9:00 p.m.
- Weekend Shuttle Availability - Our shuttle service is designated for our individual travelers and families on a first come basis. We do not service off-site group functions, to the Convention Center, coliseum, other hotels/venues, etc.

**TOURISM INFORMATION**
www.visitrichmondva.com

SIARVA

# ABSTRACTS

# 1A: SALT, CLAY, STONE

## 8:00 AM - 9:30 AM

### Robert C. Whisonant and Cliff Boyd

***18th and 19th Century Salt Production in Saltville, Virginia***

The geology of the Saltville Valley in Southwest Virginia creates a brine with an exceptionally high concentration of sodium chloride (98.7 percent). Because of this resource, the town of Saltville, Virginia became the major producer of salt for the Confederacy during the latter half of the Civil War. The wood-fired salt furnaces (as the production facilities were called) produced a maximum of four million bushels of salt from this naturally occurring brine in 1864. However, these massive 19th century furnaces are no longer standing. Industrial archaeology, with its goal of preserving the history of industrial development, is used to document two of these salt furnaces—one (44SM280) in operation in the late 18th century when salt production was beginning, and the other (44SM139) in operation during the Civil War. The size and sophistication of the exposed foundations of these structures illustrate a shift from predominantly stone-walled furnaces to later, larger structures with stacked brick walls (the Syracuse Style furnace). The size of the iron kettles used to cook the brine also increased to a 100-gallon capacity. These excavations corroborate contemporary descriptions of salt manufacture and provide important physical evidence of 19th century industrial development.

**Dr. Robert Whisonant** received a PhD in Geology from Florida State University in 1967. From 1967-1971, he worked as a petroleum geologist for Exxon, Inc. From 1971–2002, he taught geology at Radford University and is currently Professor Emeritus of Geology. In 2002, he was given the Outstanding Faculty Award by the State Council of Higher Education in Virginia. His current research includes developing the connections between geology and the American Civil War campaigns and battles.

**Dr. Cliff Boyd** is Professor of Anthropological Sciences and Co-Director of the Forensic Science Institute at Radford University, where he has taught since 1986. Dr. Boyd received his BS degree at East Tennessee State University in 1974 and, after two years of Peace Corps service, completed an MA (1982) and PhD (1986) in Anthropology at the University of Tennessee-Knoxville, with a concentration in Archaeology. He has excavated and analyzed artifacts and human remains from numerous sites in Tennessee and Virginia spanning the prehistoric and historic periods. In 1998, he received the Professional Archeologist of the Year award from the Archeological Society of Virginia. In 2008, he received the Outstanding Faculty Award from the State Council of Higher Education in Virginia. His current research interests include the archaeology of the Southeastern U.S., and archaeological and forensic anthropological theory.

### Andrea Stahman Burden

***Nineteenth-century Folk Stoneware Potteries: Preliminary Results of National Register of Historic Places Eligibility Testing at 41LT441, Limestone County, Texas***

Small-scale folk or traditional stoneware potteries, colloquially known as jug factories, played a significant role in the culture and economy of nineteenth-century America. Producing jugs, jars, churns, bowls, and pitchers, such factories offered seasonal supplemental income for the farmer/owner/operators, as well as supplemental income and some degree of artistic expression for the potters they employed. Originating in South Carolina, commercial stoneware production expanded into new markets with early nineteenth-century westward migration, and among those areas with suitable clay resources was Texas. Such sites are underrepresented in the archeological literature in Texas. Thanks to the work of Georgeanna Greer and James Malone, dozens of potteries have been recorded across the state, but fewer than 10 have been subjected to archeological excavation, however limited in scope. This paper examines the archeological remains of site 41LT441, a folk stoneware pottery in Limestone County, Texas, which was investigated in 2017 at the request of Luminant Mining to determine the site's eligibility for inclusion in the National Register of Historic Places. Excavations at the site focused on mechanical scraping, mechanical trenching, and hand excavation. During the fieldwork, eight cultural features, including the groundhog-style brick kiln, were identified, and 590 artifacts, including 288 ceramics, were collected for further analysis. Preliminary results of this investigation indicate that wares produced at 41LT441 featured a variety of vessel forms and glazes suggesting experimentation in the use of local ingredients, response to market demand, or both. Also, volume calculations based on the dimensions of the loading shelf within the exposed groundhog kiln suggest the pottery at 41LT441 was likely capable of producing up to

3,000 gallons of stoneware annually. Although these wares were likely sold within a 15-mile radius, access to nearby railroad hubs could have distributed the wares as far as Austin or Dallas.

**Andrea Stahman Burden** is a consulting archeologist with the environmental firm of Blanton & Associates, Inc. in Austin, Texas. She is a 2004 graduate of Texas A&M University with a Master's degree in Anthropology and a Certificate in Historic Preservation from the Historic Resources Imaging Laboratory at Texas A&M's College of Architecture. Mrs. Burden's career experience has included Historic American Building Survey documentation at Fort Pulaski in South Carolina, and archeological excavations at the Camp Ford Civil War prisoner-of-war camp in northeast Texas, historic city cemeteries in central and southeastern Texas, Hohokam village and farmstead sites in Arizona, and the 13,000-year-old Gault Site in central Texas.

### Henry Ward and Susan Bupp

***Identification of Historic Paving Materials from the Virginia Avenue Tunnel Replacement Project***

Archeologists from WSP and Clark/Parsons, working on the CSX project to replace the 1872–1906 Virginia Avenue Tunnel in Southeast Washington, DC, were tasked with salvaging areas of intact nineteenth century cut-stone paving along the original alignment of Virginia Avenue. To identify the raw materials and possible sources of these paving materials, the archeologists coordinated with the geological faculty of Northern Virginia Community College (Annandale Campus). Not only did the geologists agree to section the paving samples using the department's rock saw, they also produced photographic images of the sectioned samples using the ultra-high resolution GigaPan photographic process. These images can be viewed at a high level of magnification while maintaining excellent resolution. This advanced photographic technology was instrumental in revealing mineralogical details of the historic paving materials, including some unusual imported man-made pavers manufactured from iron furnace slag. Additional research into the slag, or "scoria" pavers, uncovered information on their manufacture in the Cleveland Iron District in County Durham, England during the late nineteenth/early twentieth century. The presentation will present details on the patented industrial manufacturing process, international export of the final product, and their use in early streetcar/trolley track systems in the U.S. The presentation also will explore the potential of the GigaPan photographic technology to assist in a wide range of other archeological and historic architectural investigations.

**Henry Ward, RPA** is a Senior Supervising Archaeologist and Cultural Resources Manager with WSP USA (previously WSP|Parsons Brinckerhoff), based in Baltimore City. He has 38 years of professional experience (28 with WSP USA), conducting and managing archaeological investigations throughout the Middle Atlantic Region and Eastern U.S. He has gained specialized experience in public/educational, industrial, underwater, urban, military, and landscape archaeology. In addition to archaeological projects, Henry has also been responsible for coordinating a variety of architectural preservation projects associated with transportation facilities, historic buildings, cultural landscapes, and engineering structures. He has been an active member of the TRB ADC50 Committee since 1998, previously serving as a committee member, and chair of the Subcommittee on Aviation, Rail and Transit.

## 2A: IA IN RICHMOND

**10:00 AM - NOON**

### Ellen Chapman

***Industrial Heritage as Community Amenity: The Integration of Industrial Fabric within the James River Park System in Richmond, Virginia***

The James River Park System sees approximately 2 million visitors annually to a variety of islands and riverside park areas along the length of the James River in the City of Richmond. Since 1972, this series of urban parks has acquired and preserved many vital historic resources associated with Richmond's industry, including the James River & Kanawha Canal; the Byrd Pumphouse; the Dominion Iron Works and hydroelectric power plant on Belle Isle; the Trigg shipyard; the site of Confederate ordnance factory on Brown's Island; and numerous other prehistoric and historic resources. Because of its recreational uses, the park system is a major venue for industrial history education

and interpretation in the region. While there have been several projects during low water level periods to identify and record archaeological sites within the river, the park system as a whole has never been systematically archaeologically surveyed. Recent research using archaeological modeling and policy study has indicated that the James River Park System is highly archaeologically sensitive, and that several pragmatic avenues exist for funding survey. This presentation will review the industrial resources of the park system and discuss archaeological approaches to further developing its historic interpretation.

**Ellen Chapman** recently defended her dissertation on the archaeological sensitivity and community value of archaeology in Richmond, Virginia at the College of William & Mary. She works on archaeological policy and legal matters at Cultural Heritage Partners. Her background and research interests include urban archaeological stewardship, cultural resource management archaeology, bioarchaeology, and public archaeology advocacy. She graduated from Washington University in St Louis in 2005 with a BA in Archaeology and received her MSc in Palaeopathology from Durham University in 2010.

## Joseph Costello

### *Pump House Park Revitalization Plan*

The purpose of this plan is to increase use of the Pump House and surrounding park while protecting the park's conservation, historic, and multi-use values. The largest deficiencies inhibiting revitalization efforts include city organizational infrastructure, funding, and permissions. The plan's priorities are threefold. First and most importantly, the plan describes the process for obtaining a certificate of occupancy (COA) for the Pump House. Currently, the New Pump House is closed to the public as it does not qualify for a COA. To obtain a COA, a variety of archaeological, anthropological, and architectural resources must be managed according to best practice and legal requirements. The "big ticket" items needed for a COA include retrofitting to ADA laws, roof repairs, and sewer/water hookups while complying with the conservation easement, DPU and DPW restrictions and DHR guidelines. The plan recommends the City of Richmond (owner) partner with The Friends of Pump House organization (TFOPH). TFOPH is a 501(c)3 non-profit organization that began working on restoration as an outgrowth of this plan. The group fundraises, applies for restoration focused grants, completes hands-on restoration projects, as well as promotes the New Pump House. The group also engages community and stakeholder groups in restoration efforts. The second priority of the plan is to enhance the park's design. The park's historic values, possible and historic connections to the river, conservation ethos, and Richmond idiosyncrasies provide a framework for park redesign. ArcGIS and Sketch-Up were used to create maps and a 3-D interactive model of the Pump House as it exists today, and an animation showing what it could be once restoration is complete. The third priority of the plan is to enhance connectivity to the James River and adjacent lands. This plan proposes enhancing connectivity to adjacent and historic road, trail, mass transit and Blueway networks. https://www.friendsofpumphouse.org/

My name is **Joseph Patrick Costello**. I grew up in a combination of Clinton, New Jersey, Huntsville, Alabama and Yorktown, Virginia. I attended Christopher Newport University from 2008–2012 and received my bachelor's in political science and history with a minor in philosophy. I also played club soccer and was the first chair tubist in the Wind Ensemble. I then attended George Mason University and received my paralegal certificate. I worked for multiple law firms in the Richmond area until deciding to go back to school. I received the Wilder Fellowship at VCU for the 2015–16 and 2016–17 academic years. I studied Urban and Regional Planning with a concentration in environmental planning. I focused on ArcGIS and design related projects. After graduation, I was hired as a regional planner with the Rappahannock-Rapidan Regional Planning Commission. The Commission is responsible for planning five counties and eight independent towns and is located in Culpeper. I also founded a non-profit, The Friends of Pump House, in May 2017. I enjoy traveling, running, hiking, playing with my dog, hanging out with friends, GIS and technology, and historic tours and sites.

## Douglas Peter Sefton

### *Richmond's Fulton Gas Works*

One of Richmond's richest industrial sites is a brownfield with a few ruinous buildings on the bank of the James River at the foot of Chimborazo Hill. My presentation will present a history of the Fulton Gas Works, which for one hundred years powered Richmond's industries, heated and illuminated its homes, and lit its streets. Until shortly before the Civil War, Richmond's streets were dark and dangerous in the flickering light of lanterns; and factory work ended

with daylight on even the shortest days of winter. In 1852, the city installed its first gas street lamps and constructed a multi-building plant that distilled gas from coke. The City Gas Works relocated to the 3200 block of Williamsburg Avenue in 1856 and enjoyed immediate success, doubling its output in just six years. Although Richmond was devastated during the Civil War, gas production grew even more rapidly as the city recovered and expanded. Just ten years after the war, gas consumption had risen by 50 percent. Increased safety, warmth, and productivity came with a price. Almost from the beginning, the Gas Works' neighbors complained of smoke and foul odors so intense that a city report admitted that "some of the strongest men connected with the works... have been overpowered by the stench." Until the 1890s, the gas works produced coal gas by heating coal in ovens called "retorts." In the 1890s, production began shifting to water gas, produced by passing steam through superheated coal to produce a mixture of hydrogen and carbon monoxide. Coal tar, a by-product of the gas distillation process, was reprocessed as roofing tar by a pioneering recycling operation on the site. The years between 1900 and 1920 saw Richmond's population double. Although streets, houses, and factories were increasingly illuminated by electricity, gas became popular for home heating and cooking, as well as industrial power. In 1907-1909, the Gas Works were expanded and modernized by constructing new buildings, some of which stand derelict on the site. By 1920, over four times as much gas was produced as in 1900, and Richmond's consumption per person had more than doubled. During the 1930s, flood waters from the James shut down the Gas Works and deprived customers of gas. In 1937, an expensive project raised the boiler house and other facilities above the high-water level. Gas production increased dramatically during World War II and continued to grow through the late 1940s. However, transcontinental pipelines soon made natural gas from the southwest a more economical fuel, and in 1951 gas production ceased. Today the Fulton Gas Works site is a monument to a technological epoch that is barely remembered.

**Douglas Peter Sefton** is a long-time employee of the United States Census who received a Masters Degree in Architectural History and Certificate in Historic Preservation from the University of Virginia in 2012. While at the University of Virginia, he participated in a class project to devise an adaptive reuse strategy for the Fulton Gas Works site. He has extensive experience in preparing National Register nominations for historic sites and is the author of several published articles. Since 2007, he has served as chair of the DC Preservation League's Landmarks Committee in Washington. In 2014, he presented a paper on the Stephen Sanford Sons' Carpet Mill in Amsterdam, New York at the SIA Conference in Albany, New York.

## Lyle E. Browning

### *Anatomical Investigation of Two James River Canal Freighters*

Virginia Canal Boats are of 3 types: batteaux, which are river craft; packet boats, that carried packets and passengers on a slack water canal; and freight boats, that carried cargo on a slack water canal. Two freight boats were abandoned on the margins of the James River & Kanawha Canal at Maymont Park west of Richmond in 1882 when the canal ceased operations. One was a covered boat while the other was open, apart from the cabin. Investigation of these two by the Archeological Society of Virginia led to the recovery of the covered boat and to a full set of plans for both, including hull diagrams. The covered boat has damage consistent with that of the Clinton, which resulted in the Frank Padgett memorial on the canal at Glasgow. This paper deals with the methodologies of construction, repair, and the deterioration of both.

**Lyle E. Browning, RPA**, is President of Browning & Associates, Ltd. He has a BA in History; Post-Graduate Diploma in Scientific Methods in Archaeology, Bradford, UK, emphasis on geophysical survey. Lyle set up and ran the VDOT Cultural Resources Department from 1980-1988, and has been a consultant since 1988. He is known to take on projects other professionals have more sense than to try. This is one.

# 3A: ZINC MINING IN 19TH CENTURY LEHIGH VALLEY

## 2:00 PM - 3:30 PM

### L. Michael Kaas

***19th Century Zinc Mining in the Friedensville Mining District and the Birth of the U.S. Zinc Industry***

In 1853, the small mining town of Friedensville, Pennsylvania, and Bethlehem, located four miles to the north, became the centers of zinc oxide production in the U.S. In the early 1860s, a new zinc smelter in Bethlehem, using Friedensville ore, produced the first commercial zinc metal in the U.S. Under the leadership of such notable figures as Samuel Wetherill, Joseph Wharton, and others, the mines operated until 1893.

The purity and richness of the ores from Friedensville made it possible to produce top quality zinc oxide and zinc metal. The first and largest of the mines was the Ueberroth, named for the farm owner on whose land the ore was discovered. Early mining of the surface ore was relatively easy; however, deeper mining was fraught with dangerous conditions and an immense inflow of water. Dealing with these challenges required a unique mix of practical Cornish mining skills and American engineering and manufacturing expertise.

The high cost of pumping water from the mines eventually caused them to close in 1893. There was plenty of ore still in the ground at Friedensville. Exploration by the New Jersey Zinc Company eventually led to the rebirth of the mining district in 1958 with the opening of the Friedensville Mine. Using bulk mining and modern milling technology, the mine operated until 1983. Since mine closure, the property has been redeveloped for non-mining uses but significant traces of the mining history remain. The most notable example is the huge Cornish engine house that once held The President, the largest stationary steam pumping engine in the world at the time.

**L. Michael "Mike" Kaas** is a retired mining engineer with a lifelong interest in mining history. His career included employment with the U.S. Bureau of Mines, Office of the Secretary of Interior, IBM Corporation, and several mining companies. He received a BS degree in mineral engineering from the University of Minnesota. He is a member and past director of the Society for Mining, Metallurgy and Exploration (SME). He is the author of numerous technical and historical papers, and serves as a volunteer docent at the Smithsonian Institution's National History Museum.

### Mark Connar

***The President Pumping Engine and Engine House***

This presentation will discuss the President Pumping Engine, which operated to remove water from the Friedensville Mines from 1872 until 1891. The engine was christened "The President" in honor of the sitting President at the time of its commissioning, Ulysses S. Grant. The President was the largest single cylinder stationary steam engine ever constructed in the United States and, arguably, the largest and most powerful single cylinder steam engine ever built anywhere in the world. The boiler, engine, and pump components were mostly manufactured in Philadelphia foundries. The engineer, John West, who designed the engine was from a well-known family of Cornish engineers and he greatly contributed to the broader use of Cornish style pumping engines throughout the United States. The design John West employed at the Friedensville mines was not a basic Cornish design as it included a number of innovative features. Like most traditional Cornish engines, The President was a "house-built" machine and its sturdy engine house still stands in a deteriorated condition; it is the only surviving example of a Cornish style pumping engine house in the United States and one of just a few examples in the Western Hemisphere. We will discuss the President Pumping Engine's design features, manufacturing, operating, and post-operational history. Following this, we will "tour" the existing remains of this remarkable machine.

**Mark W. Connar** is a retired businessman with an AB degree in anthropology from Brown University, and post graduate study in archeology at the University Museum, University of Pennsylvania. He has participated in archeological surveys in the United States and the United Kingdom. He holds an MBA degree from Lehigh University. He is on the Board of Trustees, Historic Bethlehem Partnership, and is a Founding Member of the National Museum of Industrial History. A Lehigh Valley native, he has a lifelong interest in the Friedensville mining area and, in particular, the engine house ruins. Consequently, he has extensively researched the subject and is currently working with Lehigh University, the property owner, and Upper Saucon Township officials to undertake steps to preserve this unique location as a heritage park or other suitable protective environment.

### Gerard P. Lennon

***Heritage Park to Preserve the President Pumping Engine & House, Friedensvile Mine Site, PA***

On an attractive site in Friedensville, PA near Bethlehem stands the only surviving example of a Cornish-style pumping engine in the USA, once the location of the largest stationary steam pumping engine in the world at the time it was built in the 19th century to dewater the Ueberroth and adjoining mines. In 2012, Lehigh University received a Stabler Foundation gift of 755 acres, including the site in Upper Saucon Township. A cooperative effort with the Township includes a proposal to convert the site into a public recreation and heritage park. Lehigh's Real Estate Office continues to lead the campus vision of developing or selectively selling tracts by applying for a PA Historical and Museum Commission preservation grant to carry out a structural/stabilization analysis of the engine house, a cultural resource assessment, and other property survey work which would support future development. Although staff, faculty, alumni and students are all involved in the project, of particular interest is a seven-member student team in the innovative, award winning Technical Entrepreneurship (TE) undergraduate program, a two-course interdisciplinary capstone design program, incorporating innovative teaching concepts learned from the KEEN network of universities and colleges. With Lehigh as their client and funding from the Office of Sustainability's Green Fund and the TE Program, the students are developing heritage park concepts, with a focus on the creation of an animated virtual reality model of the as-built President pumping engine as it would appear in the still existing engine house. They will process a 3-D scan of the existing structure and are continuing to analyze and assimilate the extensive but scattered information from locations that include Lehigh University Special Collections, Lafayette College, Moravian Archives, and National Museum of Industrial History.

**Dr. Gerard "Jerry" P. Lennon** is a faculty member of Lehigh University's Civil and Environmental Engineering department. He has published more than 70 papers in journals and conference proceedings. Dr. Lennon's work includes field and laboratory studies as well as modeling ground and surface water flow, subsurface contaminant migration, effectiveness of containment and remediation alternatives including barrier walls, and estimation of fluid expulsion from geothermal vents in the Oregon Accretionary Prism in the Pacific Ocean. Dr. Lennon has also served as Lehigh's Deputy Provost for Academic Affairs. Dr. Lennon has a BS degree in Civil Engineering from Drexel University and an MS and PhD from Cornell University.

# 4A: THE IRON, COPPER, AND COAL INDUSTRIES: ORIGINS, EVOLUTION, DECLINE

## 3:45 PM - 5:30 PM

### Sean Gohman

***Unalloyed Potential: Envisioning Mass Copper Workscapes under an Organic Energy System***

This paper adopts the concept of workscape, here defined as a three dimensional "constellation of unruly and ever-unfolding relationships" between animate and inanimate actors, to illuminate the unique activities associated with the extraction of mass native copper in Michigan's Keweenaw peninsula, 1845-ca.1880. These activities, while

occurring over the course of several decades, in effect mark the formative stage of what would become the Lake copper district. The Lake copper industry continued well into the mid-twentieth century, but by the late nineteenth century copper mined from conglomerate lodes had replaced fissure-bound mass copper. The technologies, fuel, and practice of mining lode copper was far removed from those of mining mass copper, and in many cases the former erased or built over the physical traces of the latter. Mass mining workscapes were the earliest manifestations of potential for the Keweenaw, and while they were replaced, they set the stage for lode mining's long and fruitful success. Uncovering these earlier workscapes of mass mining, defined by isolation and local organic energy sources, relies on the use of two dimensional maps of the period to recreate not only the envisioned potential for the Keweenaw, but how that envisioned potential became reality. This paper uses the Cliff mine, the most successful and thoroughly documented mining enterprise of the mass mining period, as a case study to focus the narrative and provide illustrative examples.

**Sean M. Gohman** recently completed his PhD in Industrial Heritage and Archeology at Michigan Technological University. Gohman has been researching Michigan's Copper Country for nearly a decade, focusing primarily on the earliest phases of activity during the mid-eighteenth century, and his dissertation utilizes the archaeological and documentary evidence of the Cliff mine to offer new perspectives on Copper Country history. Gohman's other research interests include landscape perspectives of extraction, historical mapping, the appreciation of waste linked to industrial practice, and the historic connection between industry and sport, (primarily soccer). As a recent graduate, Gohman is looking for work in consulting/CRM, preferably with a Midwestern/Northern focus … but beggars can't be choosers.

## Charlie Yuill

### *Integrating Spatial, History, and 3-D Documentation for Documenting 19th Century Mining Operations and Towns*

This presentation will present project results and ongoing efforts focused on documentation and subsequent planning and management of some of the earliest underground coal mines and associated towns in the Appalachians. The research is ongoing in a three county area of West Virginia which is the region proposed for an aspiring Geopark—The Appalachian Geopark. Geoparks are internationally designated areas that are under the purview of UNESCO/United Nations. The Appalachian Geopark is one of two proposed for the United States. We are currently documenting features, sites, and landscapes utilizing airborne and terrestrial laser scanning, remote sensing using satellites to drones, and traditional methods of fieldwork and documentary research. The region includes three units managed by the USDI National Park Service—including The New River Gorge. However, most of the region is privately held land dominated by mature dense forested mountains and open limestone agricultural valleys with numerous small communities. The area also includes numerous caves in addition to over seventy early coal mining communities that were abandoned by the early 20th century.

**Charles B. Yuill** is an Associate Professor in the School of Design and Community Development at West Virginia University and a researcher with the Natural Resource Analysis Center where his research is focused on remote sensing in support of archaeological surveys and historic/cultural studies. He has worked in a number of areas in the United States as well as internationally.

## Brian Schmult

### *Evolution of the Hopewell Furnace Blast Machinery*

This talk describes the results of and methods used for work to better estimate the evolution of the blast machinery at Hopewell Furnace (a cold-blast charcoal iron furnace near Elverson, Pennsylvania) over its smelting lifetime (ca. 1771 to 1883). Only the final blast design is known with certainty (by its survival into the modern period) and all prior designs are conjectures with no known certain evidence. An improved understanding of the blast evolution is desired to support better interpretation for the public and due to Hopewell's general importance as a National Historic Site. This work was done mainly through a new analysis of existing furnace account books and archeological records. A particularly important part is a crude statistical analysis of "bellows dressing" work, which helps delineate significant changes in the blast design. Another is an analysis of period spring terminology that establishes the meaning of the phrase "elastic piston spring," and establishes a cylinder blast by a certain time. A survey of account book entries for blast-related expenses and of archeological records provides correlating evidence. A survey of general and regional

blast development provides a plausibility check on the conclusions. The original blast is likely to have been ground or platform mounted, not over the wheel as with the current design. There is insufficient evidence to tell whether it was a wood cylinder or leather accordion type. This was likely converted to an over-wheel single-acting wood cylinder blast prior to 1800. Finally, this was likely to have been converted to a double-acting wood cylinder blast ca. 1838, and was approximately in its final form.

**Brian Schmult** is a former computer researcher with a long-time interest in the history of technology. His past work includes research at the former AT&T Bell Laboratories in autonomous robotics, virtual reality and force-feedback interfaces. He volunteers at Hopewell Furnace National Historic Site, explaining blast furnace and cast house operations to visitors, demonstrating sand flask molding and casting, and researching the history of the site to support interpretation.

## David J. Knapp

### *Beneath the Smokestacks: Heydays of Iron Founding on Canvas*

Over 5,000 years old and fundamentally little change in process… the metal casting industry in North America has undergone a continuous deflation since the early 1900s, peaking briefly during WWII, but by 1962 accounting for only 5,000 individual foundries and today only 1,800 remain. The trend may never bottom out for at least several decades. Contrast this to China with 25,000 foundries and India with 12,000 foundries. What then has caused and is causing this ongoing collapse? From first-hand observation over 56 years, the presenter offers a number of discrete factors influencing the attrition from 1962 to 2000, and how it now differs under globalization and offshore sourcing. While still a billion-dollar industry, 20 percent of the demand now comes from foreign shores. Recovery in North America is highly unlikely even under the most optimistic government policies. The typical U.S. foundry remains family owned and employs fewer than 40 people with turnover from $5 to $10 mm annually. Major metals cast are gray and ductile iron, steel, and aluminum. Sand castings are affected more so than other processes, such as investment casting, as they support high tech applications like aerospace and medical. This paper confirms industry trends by investigating the life cycles of specific heavy casting foundries from “Heyday” to “Extinction.” As a foundryman/artist, the presenter makes a full-bore project of each foundry and captures its essence on canvas, so to document the workers, products, and processes eventually to be forgotten. The common thread is that the product cast by these giants is no longer needed or now cast on foreign shores. After 17 three-month painting/study projects, the presenter concludes that the downward industry spiral may curiously be avoided by placing change for sustainability (survival) above all company goals. There is a small body of evidence that shows some of the oldest (mid-1800s) foundries are still operating today where many life spans were less than 50 years.

**David Knapp** is a 1959 graduate BSME from Lehigh University who initially worked for the B&O Railroad and then served as a US Army Ordnance Officer—supplying nuclear weapons to the field artillery during the escalation of the Cold War. In 1962, David began his foundry career in Pittsburgh, mastering the mechanics of making some of the largest steel castings in the world. After decades in shop operations, staying ahead of a wave of foundry closings, Knapp settled into business development and now has 15 years with a family owned iron foundry in Calera, Alabama. Well beyond traditional retirement, David travels much of North America on company business, and combines his passions for foundry history and large industrial paintings. So far Knapp has completed 17 works preserving “seldom seen” images of what may eventually be a vanishing industry.

# 1B: TAINTED LEGACIES

## 8:00 AM - 9:30 AM

### Simon Litten

***Industrial History of Chemicals: PCBs***

Just as there is the industrial archaeology of bricks and iron, there can also be an archaeology of industrial chemicals. The rise and fall of certain chemicals tells us about technological change and how the wider society views technology. Polychlorinated biphenyls (PCBs) are a family of chemicals consisting of a biphenyl skeleton with one or more attached chlorines. The least chlorinated are light oily substances and the most chlorinated is a wax. PCBs came out of a cluster of businesses in Anniston, Mississippi owned by Theodore Swann in 1929. Monsanto took over the Swann empire after its collapse in 1935. PCBs were initially developed for roofing materials as a replacement for polychlorinated naphthalenes. PCBs met electrical industry needs for safe, stable, non-reactive, non-conducting, and non-flammable fluids for transformers, capacitors, and other applications. Monsanto sold PCBs for aircraft hydraulics, concrete sealers, plasticizers, building caulks, microcapsules for carbonless copy paper, flame retardants, cutting oils, lost-wax casting, immersion oil for microscopy, natural gas compressors, and heat transfer fluids. In 1966 Swedish chemist Søren Jensen found widespread environmental PCB presence. The beginning of the end of PCBs came about from accidents in Japan (1968) and Taiwan (1972) where scorched PCBs from heat transfer devices leaked into edible rice oil causing human poisoning. PCBs had been the subject of industrial hygiene concerns as early as 1930 but the response then was to attempt to identify persons of particular sensitivity and restrict them from contact with economically "essential" substances. In the 1960s and 1970s, broader environmental concerns arose as population failures in mink, eagles, and poultry were linked to PCBs. EPA banned the manufacture of PCBs in 1979 but Reagan era exemptions partially tolerate inadvertent PCB synthesis in the manufacture of certain organic pigments, caulks, and organic peroxides.

**Simon Litten** holds a PhD from the Syracuse University Department of Civil Engineering, a MS in Pharmacology from Upstate Medical Center in Syracuse, and a BA in History from the University of Oregon. He has spent over 30 years as a forensic chemist developing field techniques for the NYS Department of Environmental Conservation to track down and quantify ultra-trace chemicals like mercury, dioxins, and PCBs. He is currently working with a team of investigators on issues related to PCBs and dioxins in New York Harbor.

### Fred Quivik

***Mill Tailings Used for Railroad Ballast in the Coeur d'Alene Mining District: Physical Data from ICC Valuation Reports***

At the turn of the twentieth century, railroad companies found that mill tailings from mining districts could be used as an inexpensive material for ballast. Tailings were not as ideal as coarse crushed rock, but tailings' price (often free, requiring only that the railroads pay transportation costs) made them an attractive alternative to the ideal. This paper will describe the uses of tailings as ballast in the Coeur d'Alene mining district, with special attention to the information about the practice that is available in the Valuation Reports on railroads' property that the Interstate Commerce Commission created in the 1910s. The paper will also summarize what has become of the rail lines in the Coeur d'Alene district. Tailings contain hazardous materials, so the railroads have had to remediate their rail lines as part of the Bunker Hill Superfund cleanup, resulting in an exemplary rails-to-trails project.

**Fred Quivik** recently retired from teaching in the Department of Social Sciences at Michigan Tech, where he was affiliated with the graduate 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.

## Thomas Speight and Allen Hatheway

***An Overview of the Historic Manufactured Gas Industry in Massachusetts, 1826-1970***

The manufactured gas industry played a crucial role in the development of urban areas and industries during the 19th and early 20th centuries, including a major role in the development of the modern concept of a public utility, and helping start the worldwide chemical industry. Massachusetts historically had the second largest manufactured gas plant (MGP) industry in the U.S., surpassed only by New York. This part of our industrial heritage unfortunately left a troublesome legacy. Due to the toxicity of many gas-making byproducts such as coal tar, sites contaminated as a result of gasworks operations pose a threat to public health. The assessment, remediation, and redevelopment of MGP sites poses a significant technical and financial challenge to successor property owners, including municipalities and other public entities pursuing revitalization, and to their consulting engineers. The presenters are coauthors of *Manufactured Gas Plant Remediation: A Case Study*, which presents the history of the manufactured gas industry in Massachusetts in the first detailed statewide study of the industry and its modern environmental legacy. Using contemporary primary sources, this research documented the manufactured gas industry's extensive historical footprint in Massachusetts, and then used MassDEP's database of Disposal Sites to identify the current regulatory status of relevant sites. This research identified a "core population" of over 190 confirmed locations in Massachusetts, including 95 former town gasworks, one byproduct coke plant, 18 private fuel gas plants at industrial facilities, and numerous district gasholder stations, off-plant dump sites, and other facilities. This book is intended to be a technical and historical guide for assessment and remediation of gasworks, waste dumps, and other coal-tar sites that threaten public health. There has previously been no "middle ground" in the professional literature on this topic between individual site assessment reports and macroscopic historical reviews such as USEPA's 1985 "Radian Report."

**Thomas B. Speight** has practiced as an environmental consultant in Massachusetts and neighboring states for the past eleven years, with extensive experience in site assessment, remediation and redevelopment, including former manufacturing facilities and brownfields. Mr. Speight is a Certified Hazardous Materials Manager and also provides business, industrial, and institutional clients with consulting services for wastewater, air emissions, hazardous materials storage, and waste management.

**Dr. Allen Hatheway** is a geological engineer operating exclusively in the field of remediation and redevelopment of former manufactured gas plants and other coal-tar sites. Educated at UCLA and the University of Arizona, he has served as adjunct faculty at the University of Southern California and Northeastern University (Boston), and was with prominent consulting engineering firms (Los Angeles, San Francisco and Boston), until 1981, when he began service as full Professor of Geological Engineering (University of Missouri) for 19 years. He has practiced for 54 years and holds American licensure as a Civil and Geological Engineer, Geologist, and Engineering Geologist. Allen has held command leadership in the Association of Environmental and Engineering Geologists (AEG) and the Engineering Geology Division of GSA and is a Fellow and Life Member of ASCE, a Fellow of the Geological Society (London) and is retired as Colonel of Engineers (United States Army).

# 2B: INDUSTRIAL COMMUNITIES

### 10:00 AM - NOON

## Erin Schwartz and Nick Belluzzo

***Seeing and Being Seen: Analyzing Spaces of Industrial Slavery through 3-D Photogrammetric Modeling of Drone-Acquired Aerial Imagery***

With the increasing popularity of 3-D photogrammetric modeling throughout anthropology, numerous use cases demonstrate the power potential to analyze space. While many of these efforts provide compelling visuals and virtual access to archaeological sites, it is also important to foreground methodological considerations on photogrammetric methods with anthropological research questions. In exploring historic practices within industrial spaces using photogrammetric methods, this paper establishes a working model for quantitatively analyzing spatial relationships using low-cost acquisition.

The subject of this research, the Buffalo Forge iron plantation in Virginia's Shenandoah Valley, occupies a unique place within the physical, economic, and cultural landscape of the antebellum South. As an "industrial plantation" or "industrial enclave," Buffalo Forge was anchored spatially and economically by its iron forge and manned by a diverse, largely enslaved workforce across its discrete, yet interconnected, spaces. Intervisibility and invisibility shape and structure practice, particularly in an enslaved context reliant upon observation and coercion. In order to properly understand enslaved practice at Buffalo Forge, it is necessary to delineate the visible and invisible areas of the ironmasters' viewshed, especially around ironmasters' and enslaved individuals' residences.

While viewshed analysis frequently relies upon existing 10-meter digital elevation models (DEM), the scale of the Buffalo Forge plantation, of approximately 200 square meters, requires a finer-grained unit of analysis. This study deploys 3-D photogrammetric modelling developed through aerial imagery collected by drone. The result is a sub-meter accurate DEM collected at minimal cost. Through this dataset, geospatial analysis provides grounded, quantitative delineation of intervisible and invisible areas of practice to guide both subsequent sampling strategies and elicit interpretations into the spatial variation of acquiescence and resistance of enslaved life.

**Erin S. Schwartz** is a PhD student in Anthropology at the College of William & Mary. After obtaining her undergraduate degree at Washington & Lee University in Archaeology/Anthropology, she completed her master's work at William & Mary, where she used machine-assisted flotation to process and analyze artifacts from a 19th century college dormitory site. Her current interests in the southeastern United States, historical archaeology, industrialization, and practice have inspired her dissertation research on the enslaved community at the Buffalo Forge iron plantation in the Shenandoah Valley of Virginia. Additional research interests include architectural history, gender and identity, spatial analysis, agency and autonomy, and community engagement.

**Nick Belluzzo** is a PhD student in Anthropology at the College of William & Mary. He holds a BA in History from Boise State University and an MA in Archaeology from University College London. His research primarily focuses on Oceania, though he also has academic and professional experience elsewhere, including the western United States, Virginia, and England. He specializes in survey, geospatial, and geostatistical methods with research interests in dryland agriculture and arboriculture, landscape analysis, and social organization. His dissertation research focuses on notions of authority and community in environmentally marginal hinterlands on Hawai'i Island.

## John R. Mullin

### *The Estey Organ Company: Making Music in Brattleboro, Vermont*

This paper is an historic analysis of the impact of the Estey Organ Company on the evolution of the town of Brattleboro, Vermont between 1850 and 1890. It is based upon field research undertaken in Brattleboro and a review of archival material located in the Estey Museum, the Brattleboro Public Library, and the University of Massachusetts Library. The Estey Organ Company, founded in 1846 by Jacob Estey, rose to become the largest organ manufacturer in the United States by the 1880s. Moreover, it played a significant role in creating an organ manufacturing cluster in Brattleboro. Through the social capital of Estey and his family, they made major contributions to the development of Brattleboro as a significant cultural center. Through their corporate policies, the company was one the most progressive manufacturers in New England. And, through the design of their iconic factory buildings, church, homes and mill village, they placed an indelible stamp on the physical character of Brattleboro. The paper, following the introduction, is divided into five parts. Part One describes the emergence of Brattleboro as a center for the manufacturing of organs and melodeons in the 1840s and how Jacob Estey became involved in organ making. Part Two examines the evolution of the company and how it impacted the physical character of Brattleboro between 1850 and 1890. Part Three explores the progressive workplace policies of the Estey Organ Company. Particular attention is given to the place of women in the workforce and the development of the Estey Mill Village. Part Four is an assessment of the Estey family's contribution to Brattleboro. Part Five concludes with a concise commentary on the state of the complex today. Now placed on the National Register, it awaits the arrival of the next Jacob Estey.

**John R. Mullin** is Professor Emeritus of Urban Planning in the Department of Landscape Architecture and Regional Planning at the University of Massachusetts, Amherst and former Director of the university's Center for Economic Development. Between 2002 and 2012 he served as the university's Dean of the Graduate School. He is the recipient of the university's Chancellor's Award for Academic Achievement, a former Fulbright Scholar (Portugal) and a retired Brigadier General in the Army National Guard. Over the past thirty years, his academic research, writing, and consulting have focused on the evolution of New England mill communities. His academic teaching includes graduate courses on planning history, economic development, and planning theory.

## James Schwaderer

### *A Call for Nuance in Logging Camp Interpretation*

A logging camp is a logging camp is a logging camp—or is it? Historians and archaeologists have clearly demonstrated that there is no such thing as a typical lumber camp, and distinct variations include their size, complexity, layout, and how they were provisioned. Most of this variability has been explained by time period or idiosyncratic aspects of the company that ran the camp. To more clearly define the conditions that led to logging camp variability, I will compare camp organization and materiality of camps in the Coalwood and Rumley districts in what is today the Hiawatha National Forest. Both camps were owned and operated by Cleveland-Cliffs Iron Company (CCI) between 1900 and 1915 to supply cordwood for CCI charcoal furnaces. Since these camps were both operated by the same company at the same time, we would expect the two districts to be virtually identical in their layout and materiality. Evidence from archival company records and archaeological material recovered from the Coalwood District suggests that this was not the case, providing the data for a more nuanced approach to logging camps.

**James B. Schwaderer** is a PhD 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 is examining the foodways of workers in three logging camps located within the Coalwood district which was operated by Cleveland-Cliffs Iron Company and reside just south of Munising, Michigan. He hopes to understand how forces like industrial provisioning and company behavior impact the foodways of workers, and how workers reacted in turn through hunting and preserving.

## Matthew Lawrence Daley

### *An Island in the "Furniture City": The Black Hills Neighborhood, Godfrey Avenue's "Furniture Row," and Homeownership in Grand Rapids, Michigan, 1890–1930*

This paper examines the intersection of worker housing and homeownership, private home developers, and the actions of a powerful trade association in a neighborhood's formation in the "Furniture City" of Grand Rapids, Michigan from 1890 to 1930. This combination fostered homeownership within an isolated area with limited amenities that shaped both the working lives of its inhabitants and their families. The focus is on an area separated from the rest of the city by geography. Within the area along Godfrey Avenue, furniture manufacturers including Luce, Michigan Chair, and Stickley Brothers Furniture contributed to Grand Rapids' centrality to household furniture production along with the array of designers and the twice-yearly Furniture Expositions. Coupled with nearby suppliers and the railroad yards, the area's industrial base grew quickly but was hampered by a lack of housing. Beginning in the late 1890s, developer Charles Coit began to construct housing situated between the railroad yards and factories on the highest land in the area called the Black Hills. To aid workers in obtaining homes, the developers drew on the array of financial institutions controlled by the powerful Furniture Manufacturers Association, who encouraged homeownership as a means to deter unionization. With only two streets for access sandwiched within this industrial landscape, the community developed its own identity and was tied unlike any other within the city to the fortunes of these firms. Despite the collapse of the household furniture industry during the Great Depression and the shift away from railroads, the neighborhood and nearby factories remain intact. Though not a traditional company town, the design, location, and financing of the Black Hills neighborhood provides a complete industrial landscape crafted by an industry at its peak in combination with private developers.

**Matthew Lawrence Daley's** research focuses on urban development in Detroit and Grand Rapids, Michigan, primarily on worker housing and company towns. This long-term project focuses on the rise of the household furniture industry and its physical landscape in Grand Rapids. Additional work is in Great Lakes maritime labor culture and technology, notably the growth and operation of the trade group the Lake Carriers' Association. My work in public history ranges from archival administration to historic preservation and interpretation, and teaching industrial archaeology within Grand Valley State's archaeology program. I have published my work in the International Journal of Maritime History and Minnesota History.

# 3B: INFRASTRUCTURE SYSTEMS

## 2:00 PM - 3:30 PM

### Peter Hutchinson

***Unraveling Tesla's Wardenclyffe Site***

Before the turn of the twentieth century, Nikola Tesla experimented with inducing a frequency into the earth to project electric current wirelessly to distant receivers. Tesla built a tower in now Shoreham, New York called Wardenclyffe. The nature and extent of the underground tunnels to the 57-meter tall tower remain a mystery. Electrical imaging and microgravity measurements provide the evidence for the location of four orthogonally placed tunnels and two support tunnels. Electromagnetic terrain conductivity measurements, however, provided no information as to the presence of the tunnels leading from the shaft and only imaged the cement grout used to seal the shaft. The tower footing, imaged with a proton precession magnetometer, consists of an extensive ferrous infrastructure within the concrete footing, and possibly a landing to the stairway that reportedly extended to the base of the shaft.

**Peter J. Hutchinson, PhD, PG** is the principal scientist of the Hutchinson Group, Ltd., a near-surface geophysical consulting company. Dr. Hutchinson received a BS from Syracuse University, an MS from the University of New Mexico, and a PhD from the University of Pittsburgh. Registered in six states, he is an Adjunct Professor at the University of Pittsburgh and has taught Environmental Geology at Chatham College and the University of Pittsburgh and Environmental Geophysics at St. Vincent College through an EPA grant. Dr. Hutchinson has published 60 peer reviewed papers on Environmental Geophysics, Petroleum Geology, and Environmental Geology and has performed thousands of environmental geophysical investigations using electrical imaging, time- and frequency-domain electromagnetic energy, gravity, magnetic, seismic, temperature, ground penetrating radar, radioactive and very low frequency methods.

### Stephen Thompson

***Watering "The Lawn": The Evolution of Water Supply Systems at the University of Virginia During the Nineteenth Century***

Envisioned by its founder as an "Academical Village," Thomas Jefferson designed the University of Virginia as a deliberate and integrated quasi-urban landscape devoted to the production of knowledgeable citizens. From its inception, the University was to be supplied by a centralized water supply system—for consumption, cleaning, and fire suppression. Limitations in technology and funding were perennial problems however and contributed to cycles of shortage and innovation. Combining documentary evidence with findings and insights gained over nearly two decades of archaeological investigations, this paper discusses the development of the University's water supply system from spring-fed wooden supply lines through the capture of roof run-off, the integration of steam power, and the construction of a series of expanding and sometimes novel reservoirs.

**Steve Thompson** is a principal and managing partner of Rivanna Archaeological Services, a consulting firm in Charlottesville, Virginia. He holds a BA and PhD in Anthropology from the University of Virginia and an MA in Archaeology from the University of Sheffield, UK. He has more than 30 years of archaeological field experience encompassing a wide range of project types, including archaeological survey, testing, and data recovery projects focused on both historic and prehistoric contexts throughout Virginia. He also has considerable field and research experience abroad as well as over 20 years of experience in the use of GIS technology in archaeological and historical research and mapping. Since joining RAS in 2005, he has contributed to numerous archaeological projects within the historic grounds of the University of Virginia.

### Robert Kapsch

***Building the Infrastructure for the New Federal City on the Potomac, 1790–1840***

The Residence Act of 1790 authorized the construction of a new Federal city along the banks of the Potomac River. The site selected by President George Washington was a semi-inhabited, triangular shaped peninsula bounded on the west by the Potomac River and on the southeast by the Eastern Branch (Anacostia River). The principal settle-

ment in the peninsula was Georgetown, a village of 5,000. Infrastructure was almost totally lacking. The only existing bridge in the area was a small wooden structure that connected Georgetown with the remainder of the new Federal city. Roads were rudimentary and the only canal in the area was the imperfect Potomac Canal, not to be completed for another twelve years.

Planner Pierre L'Enfant intended that the commissioners of the new city build the necessary bridges, roads, and canals. They attempted that by hiring builder Leonard Harbaugh to build a bridge across Rock Creek to connect Georgetown with the new construction sites at the President's House and the Capitol. It was a disaster. It was not properly sized to pass flood and tidal surges and promptly developed a three-foot sag requiring rebuilding. After that experience, the public building commissioners left bridge, road, and canal building to the public sector.

Bridging the Potomac was difficult. Above Georgetown it would require only a relatively small single span but was susceptible to flood waters that were as high as forty feet above normal flow. This site, now called Chain Bridge, was the site of four flood-destroyed bridges between 1790 and 1840. Below Georgetown, near the present site of the Pentagon, crossing the river would require a bridge almost a mile long. Roads to these bridge sites needed to be constructed and the siting of them are still used today by major highways. Bridging the Eastern Branch was easier. On the eve of the British attack on Washington, August 24, 1814, the Eastern Branch was crossed by three bridges—two were destroyed by American forces after which the British forces crossed the third, at Bladensburg.

Canals were also needed. Before Washington became president of the United States, he was president of the Potomac Canal Company, which intended to open the shortest route from coastal cities to the Northwest Territory. Under construction since 1785, it was not completed until 1802. Benjamin Latrobe, then the chief engineer of the Chesapeake and Delaware Canal, became chief engineer of the Washington City canal—considered by Latrobe as his most important project. This was followed by the Chesapeake and Ohio Canal (begun 1828) and the Alexandria Canal with its crossing of the Potomac (begun 1833).

All of these projects were a struggle for a new Federal city with an authorization from Congress but no appropriation. This presentation is based on Dr. Kapsch's newly published book, Building Washington: Engineering and Construction of a New Federal City, 1790-1840 (Johns Hopkins University Press).

**Robert J. Kapsch** is former chief of the Historic American Buildings Survey/Historic American Engineering Record (1980-1995) and National Park Service Senior Scholar in Historic Engineering and Architecture (2000-2005). Since retiring in 2005, he has published six books on historic engineering. He holds PhDs from Catholic University and the University of Maryland. He has been a member of SIA since 1980 and is a former director.

# 4B: INDUSTRIAL HERITAGE: CHALLENGES AND PROSPECTS

## 3:45 PM - 5:30 PM

### Erik Nordberg

***Archives as Material Culture: Who Controls What is Collected?***

Manuscript records are critical material culture items used to inform industrial archeology, business history, and the history of technology, particularly in those cases when they are the only remaining evidence of factories, mines, power plants, railway yards, and other industries which have been removed (or largely removed) from the physical landscape. Unfortunately, the quantity and quality of preserved records has been inconsistent across institutions and geographic regions since the early 20th century. This paper compares and contrasts the founding and early man-

uscript collecting activities of four American repositories known for their extensive holdings in business, industrial, and technological history: the Baker Library at Harvard University, the Hagley Library and Museum, Smithsonian's National Museum of American History, and the Benson Ford Research Center at The Henry Ford Museum. The research considers how institutional contexts influenced appraisal and selection activities at these repositories during their formative years, 1905-1983. The study reveals the idiosyncratic nature of manuscript collecting at the four repositories. Acquisition was not guided by pre-established policies or guidelines at any of these institutions, nor did the repositories have a standardized approach. Instead, key individuals at each institution determined the direction of manuscript acquisition, usually in an ad hoc manner. Personality took primacy over written policy. The separate and often disparate approaches that resulted, however, led to the preservation of a much broader range of record formats, business types, and industrial sectors than might otherwise have survived. This study also reveals the dearth of historical studies about the creation and acquisitions policies of archives and the challenges historians face gaining access to repositories' administrative records. The results underline the critical material evidence provided by manuscript sources about industrial history topics, encouraging more research about past acquisitions practice and greater transparency in future practice.

**Erik Nordberg** is Director of the Walter P. Reuther Library, Archives of Labor and Urban Affairs at Wayne State University in Detroit, Michigan. From 1994 to 2013, he directed the historical archives program at Michigan Technological University which preserved and interpreted materials documenting the history of Michigan's historic copper mining district. He holds degrees from the University of Ulster, Trinity College Dublin, Wayne State University, and he recently completed his PhD in Industrial Heritage and Archaeology at Michigan Tech. Nordberg is a past president of the Mining History Association and also recipient of that group's John Townley and Rodman Paul awards.

## Aurora Donoso-Sequeiros and Narciso Vazquez-Carretero

### *The Structural Rehabilitation of Tharsis Pier (Huelva, Spain), Monument of the Spanish Industrial Heritage*

During Great Britain's Industrial Revolution, foreign capital settled in Huelva, Spain, attracted to its rich copper deposits. This circumstance unleashed substantial economic and sociocultural changes, paving the way for the industrialization of the Andalucía region. The iron piers of the Tharsis Sulphur & Copper Company Ltd. (1871-1921) and the Rio Tinto Company Ltd. (1876) at the Port of Huelva form part of this context, providing excellent examples of the transfer of cutting-edge technology to Europe. As milestones of Spanish Industrial Heritage, in 1997 and 2003 these structures were declared to be "Cultural Interest Goods." Despite their significance as industrial monuments, both piers have suffered noticeable deterioration since their abandonment in the late 20th century. The aim of the research is to develop procedures for stabilizing the Tharsis Pier that can maintain the broader integrity it shares with the Rio Tinto Pier. Structural rehabilitation involved an initial phase of characterization and documentation followed by structural analysis. The structural analysis is based on a 3-D model of the pier, which includes the previous characterization, and using software capable of analyzing the linear elements of three-dimensional structures. Conclusions center on the capacity and structural need of the different elements, the characteristics of disused materials like cast and wrought iron, and the validity of current regulations to deal with rehabilitation, among others. This research also opens possibilities for moving from a specific intervention to standardizing a methodology of intervention applicable to the whole set of British (or inspired by British) piers.

**Aurora Donoso-Sequeiros** is currently in her second year of the PhD Programme in Architecture at the University of Seville. She received her degree in Architecture (QF-EHEA Second Cycle) with First Class Honours from the Superior Technical School of Architecture of the University of Seville in 2016. Since then, she has been working in the renowned architectural firm NO.MAD Arquitectos, by Dr. Eduardo Arroyo, and collaborates with the research group in charge of the Diagnostic Study of the Tharsis Company's Pier in the Port of Huelva, led by the former Director of the Superior Technical School of Architecture of Seville, Dr Narciso Vázquez-Carretero. Her research focuses on the development of new procedures of intervention in industrial heritage, specifically in British railway piers.

**Dr. Narciso Vázquez-Carretero** is the former Director of the Superior Technical School of Architecture of Seville (2009-2017) and previous President of the Conference of Directors of the Architecture Schools of Spain (2010-2017). He currently works as a full-time Associate Professor at the Building Structures and Geotechnical Engineering Department of the Superior Technical School of Architecture of Seville. He has published numerous articles in scientific journals, books and minutes for national and international congresses; and he has an internationally extended patent on rectangular and square covering systems. He also collaborates with

many research groups, for example: Structures and Geotechnics PAIDI TP-107 for the Government of Andalucía; the Andalusian Industrial Research and Cooperation Association (AICIA); the University Institute of Architecture and Construction Sciences (IUACC); and the research group in charge of the Diagnostic Study of the Tharsis Company's Pier in the Port of Huelva, of which he is the main director.

## Oscar L. Rodríguez Cavielles, Paz Benito-del Pozo, and Carlos J. Pardo Abad

### *Industrial Heritage in Spain: Current Situation and Potential as a Tourist Resource*

The old industrial spaces recovered for tourism in Spain have become one of the most visible facets of the new tourist trends. This local dimension has been able to boost the economy in areas previously characterized by deindustrialization, unemployment, and environmental deterioration. Industrial heritage tourism is based on novel intervention projects that often integrate the territorial framework and the participation of the local population with models of sustainable resource management. In this research we pursue a purely geographical conception of industrial heritage, framed in the so-called "Culture of the Territory." The legacy of industrialization is interpreted as a basic element of landscapes and as a singular social product, practically unrepeatable, due to the combination, specific and punctual, of aspects of a very different nature. We link the new tourist use of the industrial elements with the preservation of signs of identity of local communities. This consideration, under the most recent epistemological context of geographic science, makes it possible to claim the importance of the local versus the global, not as a counter-position, but as an interrelation between the two spatial scales. The most representative industrial heritage elements—both for their architectural and technical characteristics as well as for the uniqueness of the geographical spaces in which they are located—have been selected for this research. At the same time, we studied the legal framework, the new projects of tourism and cultural use, the cases of abandonment, pending projects of reuse, and the inexcusable relations between industrial heritage and cultural landscape.

**Oscar L. Rodríguez Cavielles**: Degree in Geography and History (University of Oviedo, Spain), Senior Technician in Tourism Information and Marketing, Master in Methods and Advanced Techniques of Artistic, Historical and Geographical Research (National University of Distance Education of Spain—UNED). I have published some articles about industrial heritage and I am the author of a book about mining landscape. I have participated in workshops and international congresses, and I belong to the organizing committee of the Industrial Historic Heritage Congress of Asturias (Spain). Currently I am a Fulbright Scholar at the Michigan Technological University, as a PhD student, preparing a thesis on the recent transformations of the mining and industrial areas of Asturias (Spain).

**Dr. Paz Benito-del Pozo**: Accredited Professor of Human Geography at the University of León (Spain). Expert in the analysis of industrial and urban spaces and in industrial heritage. Visiting professor at the Universities of Turin and Southern California (2000, 2009, and 2011). Training and teaching stays at the Universidad do Minho (Portugal, 2013 and 2014), at the Goldsmiths University of London (UK, 2012) and at the London School of Economic (UK, 2013). President of the Industrial Geography Working Group of the Association of Spanish Geographers (1994-1998). Deputy Director of the Department of Geography of the University of León (2004-2007); Director of the INVESTER Research Group of the ULE since 2005. Member of the Board of Directors of TICCIH-Spain since 2008. Member of the Board of Experts on Industrial Heritage of the Government of Castilla y León since 2005 and member of the Board of Directors of the Association of Spanish Geographers since 2011. Member of the Royal Geographical Society and Secretary of the Humanism Research Institute of the ULE.

**Dr. Carlos Pardo Abad**: PhD in Geography and Extraordinary Doctorate Award from the Autonomous University of Madrid. He is an Associate Professor at the National University of Distance Education of Spain (UNED) and External Professor at the Open University of Portugal (UAb). His work has focused on the industrial dynamics of urban areas, particularly deindustrialization. His main line of research currently is analysis of industrial heritage as a tourism resource and its possibilities for reuse. This area of research is the focus of his latest publications, both books and national and international journals, the presentation of communications and papers in different scientific conferences, and the management of several university courses.

## Andréa Livi Smith

### *Industry, Preservation & Renewal in Fredericksburg, VA*

Fredericksburg, VA was established in 1728, and flourished through the nineteenth and early twentieth century as an industrial center. The Virginia Central Railroad and Rappahannock River allowed for varied and extensive industries in cotton weaving, pants production, flour milling, cellophane manufacturing, and coffee roasting. While industry in

Fredericksburg is now gone, the infrastructure and buildings left over from past eras are being put to use in supporting the city's primary economic engine: tourism. This has generally been mutually beneficial. For instance, both recreation trails in the city are named after these industrial pasts—the VCR Trail and Canal Trail—and include interpretation panels exploring the city's manufacturing history. Similarly, the industrial heritage has been embraced in branding certain parts of the city: the Mill District is currently being redeveloped, with a hydroelectric plant becoming a restaurant; across town, the industrial buildings close to the railroad are being reused as offices and condominiums. However, economic resurgence has not come without risks for the industrial fabric of the city. Uncontrolled gentrification is a concern, particularly as housing costs in this Washington, D.C. bedroom community have skyrocketed. Fredericksburg is far from unique is facing these challenges, but it is an interesting case study: small southern cities rarely have such a rich industrial past. This paper will discuss Fredericksburg's industrial fabric and the challenges in preserving it, particularly in the context of economic success.

**Andréa Livi Smith** is Chair of the Department of Historic Preservation at the University of Mary Washington. She previously served as Director of the Center for Historic Preservation (2009-2014), focusing on preservation pedagogy and curriculum development. Dr. Smith has worked on multiple grants relating to transportation in the Washington, D.C. metropolitan area. Trained as an urban planner as well as preservationist and architectural historian, Dr. Smith has focused her research on the intersection of urban design, transportation, and preservation. Her other interests include environmental psychology, and the history and reuse of industrial resources.

# 1C: ENGINEERING HISTORY, LARGE AND SMALL

## 8:00 AM - 9:30 AM

### Bruce Greenberg

***The History of Lionel Trains: The Revolution of 1923***

My paper will show and describe pre-1923 Lionel toy train production compared with post-1923 Lionel toy train production. It will explain why these changes likely occurred. Lionel began manufacturing toy trains in 1901. From 1901 through 1922, its trains were modeled on actual railroad locomotives and rolling stock. Locomotives and rolling stock were painted in realistic colors and were rubber stamped with logos and lettering that copied railroad markings. The names of the railroad lines were conspicuous and the Lionel name was usually present but inconspicuous. Locomotives were designed to operate on battery power. Because battery operation was very expensive, locomotives and rolling stock had light weight bodies and the motors were optimized for direct current. In 1923, Lionel changed the designs of its new locomotives. Lionel no longer sought to model specific actual locomotives. Lionel designers built models inspired by the general appearance of real world locomotives but not easily recognized as specific models. The names of U.S. railroads no longer appeared on locomotives; they were replaced by the name LIONEL. Lionel soon had more locomotives in operation then all of the U.S. railroads. By 1923, most American buyers of Lionel trains had homes powered by utility-generated electricity rather than batteries. The constraints on equipment weight disappeared and Lionel built much heavier equipment with much more powerful motors which consumed much more current.

**Bruce C. Greenberg**, PhD, has written extensively about American toy trains including 25 books, and is recognized as the leading scholar in the field. His books on Lionel, American Flyer, and Ives toy trains are the standard reference works. In 1975, he founded Greenberg Publishing Company. Greenberg Publishing Company has published over 300 works on American toy trains, toys, as well as several books on German toy trains.

### Gerald M. Kuncio

***Rediscovering an Engineering Marvel: Surveying the Delaware, Lackawanna & Western Railroad's Clarks Summit to Hallstead Cutoff***

Between 1912 and 1915, the Delaware, Lackawanna & Western Railroad spent $14 million ($1.8 billion in today's dollars) to upgrade its main line between Scranton, Pennsylvania and the New York State line, the largest such railroad reconstruction project in the eastern United States. The Lackawanna's 39.6 mile Clarks Summit to Hallstead Cutoff reduced total mileage on the Lackawanna's main line by only 3.6 miles. However, by extensively manipulating the landscape with tremendous cuts, fills, and bridges, the Lackawanna eliminated nearly all grades and curvature. The Cutoff allowed the Lackawanna to employ longer, heavier trains, greatly reducing running times and equipment needs and increasing operating efficiencies and profitability. The engineering marvel became famous for its bold and audacious design and construction and its extensive use of reinforced concrete, which was the construction material not just for bridges, but for signal towers, stations, and tunnels as well. The Cutoff included the two largest reinforced concrete bridges constructed up to that time, the world-famous Tunkhannock Viaduct and its companion span, the Martins Creek Viaduct. The Cutoff's planning and design garnered the Lackawanna national press, attracted visiting delegations from overseas, and won the railroad international acclaim. In 2014 and 2015, the Pennsylvania Department of Transportation (PennDOT), as mitigation for the replacement of one of its bridges, undertook a survey of the entire 39.6-mile Cutoff. The purpose was to document what built resources remained from the Cutoff's construction and operation and to assess the railroad line's eligibility for the National Register of Historic Places. The paper presents a brief history of the Cutoff's design and construction, its importance in engineering and railroad history, and a summary of the resources that remain.

**Gerald M. Kuncio**, the Senior Historian at the cultural resources firm of Skelly and Loy, Inc., was Principal Investigator on the Clarks Summit to Hallstead Cutoff documentation project. He has a Bachelor's Degree from Duquesne University and a Master's Degree from University of Delaware, both in American History. Gerry has worked in Cultural Resource Management for nearly 30

years, both for private consulting firms and the Pennsylvania State Historic Preservation Office. Prior to that, he served as Chief Curator at the B&O Railroad Museum in Baltimore. He has been project manager or principal investigator on projects in Pennsylvania, West Virginia, Maryland, Delaware, and New York, and has researched and assessed nearly every property type for National Register eligibility. Gerry takes a particular interest in transportation corridors and historic bridges; the Clarks Summit to Hallstead Cutoff documentation project addressed both.

### Paul C. King

***Before the Bridge: Roebling's Ropes***

"Roebling's Ropes" looks at the development Roebling's wire ropes, perhaps the greatest innovation of his body of work and one that was not only critical to the development of his own work, but has a legacy in the development of suspension bridges well into the 20th century through the continued manufacture of products for the wire rope industry by John A. Roebling Sons Company. This presentation is a continuation of work presented at annual SIA conferences since 2015. It can be argued that Roebling's career as a bridge engineer began when he returned to his fascination with the manufacture of woven wire ropes in 1841, after he witnessed the death of several men who were killed when a hemp rope used for the Allegheny Portage failed. The Allegheny Portage used a system of inclined planes to pull canal barges up and over mountains too steep for the canal's lock systems to navigate. While Roebling did not invent the use of woven wire rope, he patented several methods of manufacture that innovated new ways to weave cables including a "Method of and Machine for Manufacturing Wire Rope" which looked to wrap cables with a protective outer covering and an "Apparatus for Passing Suspension-Wires for Bridges Across Rivers." This presentation is a follow-up to three previous SIA conference presentations on the topic, two of which focused on Roebling's Aqueducts for the Delaware & Hudson Canal and last year's presentation which reviewed the working outline for a book manuscript entitled *Before the Bridge*. This presentation, "Roebling's Ropes" is an early chapter of this manuscript. While there are historical accounts of the construction of the more significant work of Roebling there is limited publication of archival drawings of these major works that focus on the evolution and innovation of their construction.

**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 New York 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 entitled *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.

# 2C: HISTORIC BRIDGES

## 10:00 AM - NOON

### Todd Wilson

***Using Historic Maps to Discover Pittsburgh's Lost Bridges***

Roads in Pittsburgh, the City of Bridges, are known to be convoluted. Some streets intersect each other three times. Others change names. Giving directions, one often says, "Not that right, the other right" or "go straight" which means angle left. The development of the city's roads and bridges is directly linked to the shifting landscape of the city, as hillsides were leveled and valleys filled in as urban designers and contractors rearranged the landscape in an attempt to create some flat land for development in the dissected Allegheny plateau where Pittsburgh is located. Bridges were built over these ravines, spurring development, only to fall victim to technological changes as well as their own success when the resulting development called for more modern roads and more flat land. In writing the book, Images of America Pittsburgh's Bridges, published in 2015, studying historical maps became a key research

tool in understanding where these lost bridges once were. This research showed that by going back far enough in time, there was an explanation for each irregularity. This presentation tells the story of some of Pittsburgh's long-lost bridges using maps and images past and present, explaining the city's inconsistencies and abnormalities that make it unique along the way.

**Todd M. Wilson, PE**, is a civil engineer whose passion for bridges has spanned his whole life and led him on quests to photograph bridges in all 50 states and 20 countries, visiting thousands. He has given many presentations on bridges, including at the SIA's 2011 Annual Conference in Seattle. Wilson was the lead author of *Pittsburgh's Bridges* (2015), and is working with the Pittsburgh Section of the American Society of Civil Engineers (ASCE) on a book about Pittsburgh's engineering history, due to be released in the fall of 2018. Wilson graduated from Carnegie Mellon University in 2006 with a BS in Civil Engineering and Engineering and Public Policy, and from Point Park University in 2017 with a MBA in Engineering Management. He is a Senior Project Engineer at GAI Consultants, Inc. In 2010, he was named one of the Ten New Faces of Civil Engineering by ASCE. In 2011, Mr. Wilson was chosen as one of Pittsburgh's 40 Under 40, and he received the Carnegie Mellon University Department of Civil Engineering's Recent Alumnus Achievement Award. He currently serves as a Trustee of Pittsburgh History and Landmarks Foundation (PHLF), the History and Heritage Committee Chair of the Pittsburgh Section of ASCE, and a member of Carnegie Mellon University's Civil Engineering Department Alumni Advisory Council.

## Ann L. Miller

### *Historic Bridge Identification and Management in Virginia*

The Virginia Department of Transportation (VDOT) and its research arm, the Virginia Transportation Research Council (VTRC) have undertaken research into transportation history and historic transportation structures for over forty-five years, beginning with a statewide study of early truss bridges in 1972. Subsequent major thematic bridge studies in Virginia included those for later metal truss bridges, non-arched concrete bridges, movable span bridges, and masonry and concrete arch bridges, as well as other bridge investigations. These projects have included not only survey documentation but identification of the historically significant bridges as well. Once historic significance was determined, the next step was the development of a comprehensive historic bridge treatment/management plan. This plan, implemented by VDOT in 2001 and recently updated, has resulted in at least some degree of repair, completed rehabilitation, or in-progress rehabilitation planning for the majority of Virginia's historic bridges now or formerly under state purview. Virginia is home to a variety of interesting, and in some cases rare, bridges. Our extant historic bridges range in age from the early 19th century to several innovative mid-20th-century designs. Nineteenth-century bridges include stone arch bridges, the National Historic Landmark wooden trussed-arch "Humpback" covered bridge (1857), and a variety of metal truss bridges. (These truss configurations include a number of bridges utilizing Phoenix columns, and several bridges that are uncommon or extremely rare: a tubular bowstring truss, a Fink deck truss, a Lane truss, and a Thacher truss.) Twentieth-century structures include additional metal truss bridges, concrete arch bridges, and a concrete through arch bridge; concrete rigid frame, through-girder, deck girder and T-beam bridges, an early steel beam semi-integral bridge, and the first (1960) of only four Fairchild aluminum beam bridges built in the U.S. This paper will discuss the development and results of Virginia's historic bridge research and management initiatives, and will provide an overview of Virginia's historic bridges and the various management options that have been employed for these bridges.

**Ann L. Miller** is currently Historian for the Virginia Transportation Research Council (VTRC, the research arm for the Virginia Department of Transportation) in Charlottesville. She is the principal investigator for the VTRC's history and cultural resources program, including research into historic bridges, early roads, and other aspects of transportation history, as well as related cultural resource management. She is the state chair for the Virginia Historic Structures Task Group, the interagency committee that examines questions of historic significance and management for Virginia's historic transportation structures. Ms. Miller holds the degrees of Bachelor of Architectural History (1979) and Master of Architectural History with Certificate in Historic Preservation (1989), both from the University of Virginia. Her special areas of interest include history, social history, architecture, cultural landscapes, and transportation history. She is the author of numerous reports and publications for VTRC, as well as a variety of other books, reports, conference papers, articles, and National Register nominations on matters relating to Virginia history and structures.

## Anne Peden and Ty Houck

***Piedmont Manufacturing Company Footbridge***

Once the largest cotton mill in the U.S. and possibly the world, Piedmont Manufacturing Company's four mills spanned the Saluda River in upstate South Carolina. Mills #1 and #2 were constructed on the Greenville County side, but when Mill #3 was planned for the Anderson County side of the swift river, a new dam was constructed with a footbridge atop to enable speedy crossing between the mills. The year was 1888. The iron and plank bridge still overlooks the mill pond and dam falls where the first Sheriff of Washington District was assassinated in the 1790s. Called the Great Ford of the Saluda by the Cherokee, this was a major native crossing prior to the Treaty of Dewitt's Corner, which transferred four counties to the state. Later the site for a grist mill and, finally, the mill town of Piedmont, the dam and footbridge still stand marking this historical path. Today, Enel Electric Company utilizes the dam, but the bridge needs care. Closed to foot traffic for over 40 years, weathering has taken a toll. Recently, it has been designated as Greenville County's most endangered historic site.

**Dr. Anne Peden** has been Chairperson of the Greenville County (SC) Historic Preservation Commission for five years. She has lived and worked in Piedmont for over 50 years but never had the opportunity to cross the footbridge. As an educator and public historian, Dr. Peden writes history books, articles, and research on Southern Greenville County as well as working to restore the Piedmont Historical Collection housed in the local mill Community Building. She promotes history and preservation, also, through erecting state historic markers and speaking about the importance of place in our stories whenever possible.

## Rebecca Burrow

***How to Pour Concrete in 1920: The Story of the Dry Canyon Bridge***

The bridge over Dry Canyon on the eastern end of the Historic Columbia River Highway was constructed by state forces in 1920-21. At the time of its construction, no highway yet reached this rocky bluff overlooking the Columbia River. Camping at the exposed site, the construction crew was forced to deal with harsh weather and barely passable materials. Despite that, they turned out a bridge which has survived nearly 100 years and, with its recent rehabilitation, is expected to last 100 more. Due to the use of state forces, the construction furnished a wealth of early bridge construction documentation relative to other bridges of this era. Documents include food orders for the camp, weather reports, weekly telegraph updates on the construction, material information, and personal accounts of the seemingly chaotic construction site. Not only do these documents provide historical background to an already significant bridge, but they also helped inform the rehabilitation. This presentation will examine some of these documents and how they continue to be of use to engineers today.

**Rebecca Burrow** is a bridge preservation engineer with the Oregon Department of Transportation, where she has worked for 7 years. In her role as engineer, she designs rehabilitation projects on unique and historic bridges across the state, including concrete arches and girders, and steel trusses. She was also involved in the identification and documentation of Oregon's historic bridge inventory. Her educational background includes an MA in Conservation Studies (Historic Buildings) for the University of York and a BS in Engineering from Swarthmore College.

# 3C: REVIVING MACHINE HISTORY

### 2:00 PM - 3:30 PM

## Zachary Liollio and Steve Howell

***Hot Riveting Technology: Perpetuating an Age-Old Method of Metal Joinery***

Much of the historic infrastructure worldwide has been built by riveters. With the arrival of the 21st century, this highly skilled and multi-disciplinary technique is not only continuing to maintain our history, but also seeing a renaissance as part of new construction projects. Much of this revitalization is driven by artists and sculptors, and represents the

culmination of creativity, engineering, and mechanical aptitude. Technology that was once deemed obsolete, like hydraulic riveters, electric rivet heaters, and rivet guns, are being restored and given new life. Through research and a hands-on approach, a small group of individuals across the U.S. are seeking to use historic information and existing pieces of equipment to make riveting ever more viable and competitive. Zach Liollio, as part of his two summers at the Nevada Northern Railway in Ely, NV, conducted a feasibility study of using existing equipment. This equipment included a No. 2 Hills & Jones Punch and Shear, a Frank C. Cheston Rivet Heater, and various rivets guns, holder-ons, and rivet snaps. An executive summary of the technical information, along with several short video demonstrations, will be included in the presentation. Steve Howell owns Ballard Forge, a renowned metal fabrication shop in Seattle, WA. He has worked to restore a large C-frame riveter. A recon trip to the orchard town of Toppenish, Washington revealed a large press with a Todd shipyard tag on it along with 80 years of grease and oil. His portion will include the story of returning that riveter to service, and its application.

**Zach Liollio** is a graduate student at The Military College of South Carolina (The Citadel) studying Technical Project Management. His undergraduate degree was at The College of Charleston for Historic Preservation & Community Planning. At a young age, Zach and his parents realized that he loved working with his hands, and that he had an eye for detail. He began sketching in kindergarten and never stopped. A blacksmith that he worked under in college told him that the ability to sketch comes before the ability to forge steel. In Ely, Nevada, he spent two consecutive Summers at the Nevada Northern Railway museum as the resident blacksmith and addressed a number of projects related to railroad steel fabrication and riveting. Today, he also volunteers with the Philip Simmons Foundation as a blacksmith helper and draftsman. Zach is a construction inspector with SCDOT.

**Steve Howell** is the owner of Ballard Forge, Seattle, Washington. Mr. Howell holds American Welding Society CWI and ASNT Level III Ultrasonic certifications, in addition to being an International Code Council Special Inspector for welding, structural steel, and high strength bolting. His career path has lead from offshore platforms in the Gulf of Mexico, to B-2 and 777 aircraft in Seattle. He has built, help build, or rehabilitate bridges from Yosemite to Maui and Cambridge to Perth. Steve's work has been featured on the History Channel's Titanic at 100, historic bridge restorations, university studies, and in fine homes and businesses worldwide.

## Daniel Schneider

### *Creativity Within Mechanical Constraint: 1890s Wood Type for the Twenty-First Century*

During the late nineteenth and early twentieth centuries, the Hamilton Manufacturing Company in Two Rivers, Wisconsin was the predominant manufacturer of wood type for the printing trade. In addition to cutting wood type letters using pantograph-mounted routers, workers in Hamilton's type shop used a specialized die-stamping machine to produce decorative wood type borders. The machine was designed to perform a very specific operation in the type-making process, and its mechanics structured the work of the operator strictly toward that purpose. The die-stamping machine and the nature of the operator's engagement with it reflect the influence of the division and mechanization of labor that are defining characteristics of industrialized manufacturing. This presentation explores how the machine's mechanics influenced the design and production, using the machine, of two new wood type border designs in the twenty-first century. It will discuss similar constraints letterpress printing technology of the late nineteenth and early twentieth centuries imposed on the work of printing and draw broader analogies to mechanized industrial work.

**Daniel Schneider** is an industrial archeologist and book artist living in the copper mining district of Michigan's Upper Peninsula. His research explores ways in which industrialization, and mechanization in particular, transformed work. Ideas in the same vein underpin some of his book arts practice. Schneider graduated from the master's program in Industrial Archaeology at Michigan Technological University in 2015.

## David Shields

### *American Wood Type: Planing Patterns and Sleuthing Origins*

Wood type, with its low cost and wide range of styles and sizes, gave tremendous stimulus to mass advertising and job printing and played an integral role in the creation of nineteenth century American visual culture. Determining a type design's origins adds to an evidence-based history of printing and typography—useful to designers, typographers, historians, bibliographers, and antiquarians. Fixing a type's origins is historically complicated by the widespread pirating of type designs during the mid- to late-nineteenth century. The pantograph, while fundamental to the

mass production of wood type, also made it easy to copy a competitor's designs by using the type itself as a pattern, subtly modifying the resultant copies to sell as "originals." While copying created a great proliferation of wood type designs, working through this proliferation creates challenges in fixing a type's exact origins. Each manufacturer by necessity created their own machinery for producing type-high wood blocks. The differences in machine construction from manufacturer to manufacturer is made evident in the unique planing patterns that remain on the back of each of their type blocks. Examining and recording these planing patterns has become a method for identifying the manufacturers and clarifying, as precisely as possible, the origins of the designs of the types—a clarification of their histories through physical and visual research. I intend to develop this particular approach into a generalized method that could be shared with other curators who are attempting to clarify the manufacturer identity of wood types held in other collections, and thus facilitate a better historical understanding of type design.

**David Shields** is an Associate Professor and Chair of the Department of Graphic Design at Virginia Commonwealth University in Richmond. He is currently focused on research of histories of 19th and early 20th century typographic form and visual culture. This research grows from his earlier investigations of Rob Roy Kelly's American Wood Type Collection (http://rrk.finearts.utexas.edu) held at The University of Texas at Austin where he served as the Custodian of the Collection (2005-2012). He is also exploring the visual possibilities inherent in experimental hybrid combinations of historical type production methods with contemporary digital type production practices. He keeps a (slow) blog of current facets of his research at woodtyperesearch.com. Shields holds a BFA from Memphis State University and a MFA from Cranbrook Academy of Art.

# 4C: CONSERVATION OF INDUSTRIAL HERITAGE

## 3:45 PM - 5:30 PM

### Joseph Sembrat

***The Conservation of Industrial Archeology and its Role in Preserving the History of American Technology***

Adaptive reuse of abandoned industrial heritage buildings has become a common part of urban revitalization plans, and previously empty mill buildings often now thrive as restaurants, offices, and homes. The conservation of industrial artifacts and isolated industrial or mining sites offers a different and more challenging opportunity for preservation. Unique moments in time, such as the California Gold rush or the "Space Race" of the 1950s and 1960s, left remnants in those landscapes that, while not readily converted to current uses, retain a community's past and provide a physical record of its contributions to the development of a society. This paper will use several case studies of various industrial and heritage sites and artifacts throughout the U.S. to explain the various roles a conservator plays within a team of heritage architects, planners, engineers, historians, and grass roots advocates. Specific examples will include: the conservation of industrial artifacts from mining communities of the American West, aerospace artifacts from Kennedy and Johnson Space Centers, and agricultural sites from Arkansas.

**Joseph Sembrat** has been immersed in the conservation field for over 25 years. In 1999 he, together with his wife Julya, founded Conservation Solutions, Inc. (CSI), which has since developed into a leading, international heritage preservation firm focusing on the conservation of art, artifacts, and architecture. CSI has been recognized and has won numerous awards for its work over the years. Some high-profile projects include the treatment of three Saturn V rockets and associated Apollo spacecraft for NASA; many industrial and mining sites located throughout the American and Canadian West, some of which include Bodie State Historic Park, CA, Empire Mine State Historic Park in Grass Valley, CA, and Whitehorse, YT; and numerous artifacts from the salvaged R.M.S. Titanic wreck site, such as the 17-ton "Big Piece." Joe is also an accomplished author and presenter of topical industry-relevant issues. He continuously conducts research and publishes papers on topics in the preservation field with special emphasis on technology sharing among various areas of industrial research and its applicability to conservation treatments.

## William Hoffman and Hannah Fleming

### *Two Decades of Progress: An Update on the Conservation of USS* Monitor

Between 1998 and 2002, National Oceanographic and Atmospheric Administration (NOAA) archaeologists and experts from the U.S. Navy recovered approximately 210 tons of artifacts from the wreck site of the Civil War ironclad USS *Monitor* culminating in the raising of the vessel's iconic revolving gun turret. Upon recovery, NOAA transferred all objects to The Mariners' Museum and Park (TMMP) in Newport News, Virginia for conservation, curation, and display.

Over the past 20 years, TMMP staff have made much progress in the conservation and stabilization of *Monitor* artifacts. This paper will provide an overview of the project to date, highlighting some of the challenges and accomplishments that have occurred during the treatment of several high-profile objects. Additionally, the presentation will outline future steps to be undertaken with the conservation effort and provide insight into proposed options for final large artifact display.

**Will Hoffman** received Bachelor's degrees in Anthropology and Fine Art from The State University of New York College at Buffalo. In addition, he holds a Master's degree in Art Conservation specializing in the conservation of objects from Queen's University in Kingston, Ontario. He has worked at the Mariners' Museum and Park since 2009 focusing on the conservation of archaeological metals recovered from the wreck site of the Civil War ironclad USS *Monitor*. During his tenure at the institution, his research interests have encompassed the evaluation of cleaning and stabilization methods for archaeological iron materials, the disassembly of composite artifacts, and the study of 19th-century metal casting and steam engine technologies. Presently, he holds the position of Director of Conservation and Chief Conservator responsible for coordinating all conservation-related activities within the Batten Conservation Complex and museum overall.

**Hannah Fleming** is the Material Culture Specialist of the Conservation Department at The Mariners' Museum and Park. Her role is to conduct archaeological research and compile that data to better tell the stories of The Museum's collections, specifically the USS *Monitor*. She has a Bachelor's Degree in Anthropology, focusing in Archaeology, from the University of North Carolina at Wilmington, and a Master's Degree in Maritime Archaeology from East Carolina University. Her specialty is in artifacts' cultural biographies—crafting comprehensive stories about specific artifacts' manufacture, use-life, loss, burial events, and historical significance. Recently, much of her work has involved photogrammetric modeling and digital reconstruction of the *Monitor*'s structural and mechanical components to assist in current public outreach efforts, spatial understanding of the ship's components, and future exhibition planning.

## Kelly Caldwell and Sophia Zweifel

### *Inside and Out: Conservation Approaches to Preserving Canadian Industrial Heritage*

Industrial heritage artifacts in Canada continue to pose enormous challenges for the institutions, communities, and governments that wish to preserve them. While there is a strong recognition of the historical and technological heritage value that these artifacts hold, the high costs of restoration, limited funding resources, and a gradually retiring work force of conservators with specialized knowledge in industrial artifacts, have led to increasing numbers of industrial heritage objects left untreated and inaccessible to the public. Canada's heritage community has had to seek out new and innovative approaches to preserve the physical, historical and technological record of these artifacts. Conservation Solutions has been involved in a number of projects assessing, treating, and evaluating preservation options for artifacts of Canada's industrial history. This paper will present examples of CSI's work that highlight a wide spectrum of conservation approaches ranging from full restoration, to stabilization, and to the salvage of historical, technological, and archaeological information. Specific projects that will be discussed include: the assessment, storage and display recommendations for a fully restored early 20th-century steam launch, the Phoebe, in Ontario; the assessment and conservation treatment of the Martin B-26 Marauder WW2 U.S. Army aircraft bomber in Whitehorse, Yukon Territory; and the assessment and evaluation of preservation options for the charred remains of the Casca III Sternwheeler paddle wheel in Whitehorse, Yukon Territory.

**Kelly Caldwell** is a professional member of the Canadian Association of Professional Conservators (CAPC), a member of the Canadian Association for Conservation of Cultural Property (CAC), and a professional associate of the American Institute for Conservation (AIC). She has 10 years' experience in conservation analysis and treatment of art and artifacts. Kelly has experience working with museum collections and outdoor artworks, in a range of materials including stone, wall paintings, mosaics, organics, metals, and ceramics.

**Sophia Zweifel** is a member of the Canadian Association for Conservation of Cultural Property (CAC), the American Institute for Conservation (AIC), and the Institute for Conservation (ICON). Sophia has 5 years' experience in conservation including her Master of Art Conservation training and internships. She has experience in conservation research, and is practiced in assessing, analyzing, and treating diverse materials and objects. Sophia is proficient with on-site work, having been involved in multiple projects, including extensive treatments of bronze and concrete sculptures as well as large-scale composite artifacts.

## Mark Rabinowitz

### *Assessing and Conserving an A-12 Spy Aircraft for the CIA*

In the early 1960s, the U.S. Air Force and the Central Intelligence Agency (CIA) combined efforts to create a high-flying, extremely fast aircraft capable of photographing sensitive foreign sites without being shot down. The program produced the A-12 and the SR-71 planes built by Lockheed which, to this day, hold the record for piloted aircraft altitude (90,000 ft) and speed (Mach 3.29). With advancing technology, the program ended in 1968 and was replaced with the un-manned spy satellites that now continue to serve this mission.

The A-12 aircraft was built with extensive use of titanium, which could withstand the heat generated by the speeds it flew when aluminum could not, and a unique coating system that also was designed to ward off heat. One of the remaining examples of this astonishingly beautiful craft is on static display outside the CIA headquarters in Langley, Virginia. Conservation Solutions, Inc. assessed the condition of the plane in 2014 and developed treatment plans, which is occurring in 2018. Designed with an open titanium skin that would swell and seal itself from the heat of flight, it was left vulnerable to intrusions of moisture and insects that contributed to the deterioration of the painted coating and interior. This paper will discuss the conservation and preservation challenges of more modern materials and with the constraints of working on a secure government site. We will discuss the details of the treatment plan which called for removal of overpaint, restoration of damages to the surface, sealing of openings, and protection of the equipment in the pilot's cockpit.

**Mark Rabinowitz** has worked exclusively in the assessment and treatment of heritage art, architecture and artifacts since 1991. He has been a Principal Conservator with CSI since 2003. His work has received numerous awards from state, local and national organizations. He is a Fellow of the American Institute for Conservation and a Fellow of the American Academy in Rome. Some high-profile projects include the assessment and treatment of three Saturn V rockets, the decommissioning and exhibition planning for the Atlantis Orbiter Space Shuttle, and the treatment of a spy satellite for the Smithsonian National Air and Space Museum. Other industrial sites and artifacts include the treatment of a 1911 cotton gin in Arkansas, the treatment of numerous artifacts salvaged from the R.M.S. Titanic and R.M.S Carpathia wreck sites, and a collection of hundreds of artifacts from the National Maritime Institute Collection. Mark has published and presented research and papers on topics in the preservation field in conferences throughout North America and Europe.

# POSTER SESSION

## Joseph Costello

***Pump House Park Revitalization Plan***

*See description under presentation session 2A: IA IN RICHMOND, page 13.*

## Barbara Leskovec

***From Puddle to Cement: The Development and Evolution of the Federal Canal System in Canada***

Through the years, Canadian canals have played vital roles as waterways for transport as well as water sources for lumber, manufacturing, and hydropower industries. This poster presents the development and evolution of the federal canal system in Canada, drawing upon historical and archaeological records to illustrate construction techniques and later modifications carried out in response to issues encountered during canal operations. This poster will also look at the multitude of industries that flourished along the waterways, identifying some of the challenges faced by the Parks Canada Agency as administrators of these industrial assets.

**Barbara Leskovec** is a professional archaeologist with +15 years of experience in the field of Cultural Resource Management. Currently employed with Parks Canada, she oversees archaeological projects along the federal canal system. Barbara has conducted archaeological assessments of canal sites, military fortifications, urban sites including Parliament Hill, pioneer farmsteads, an 18th-century tavern, an historic Acadian village, and a Roman camp. Barbara also has a special interest in public archaeology and developed a successful program for the National Museum of Slovenia, introducing children to the field of archaeology.

## Steven A. Walton

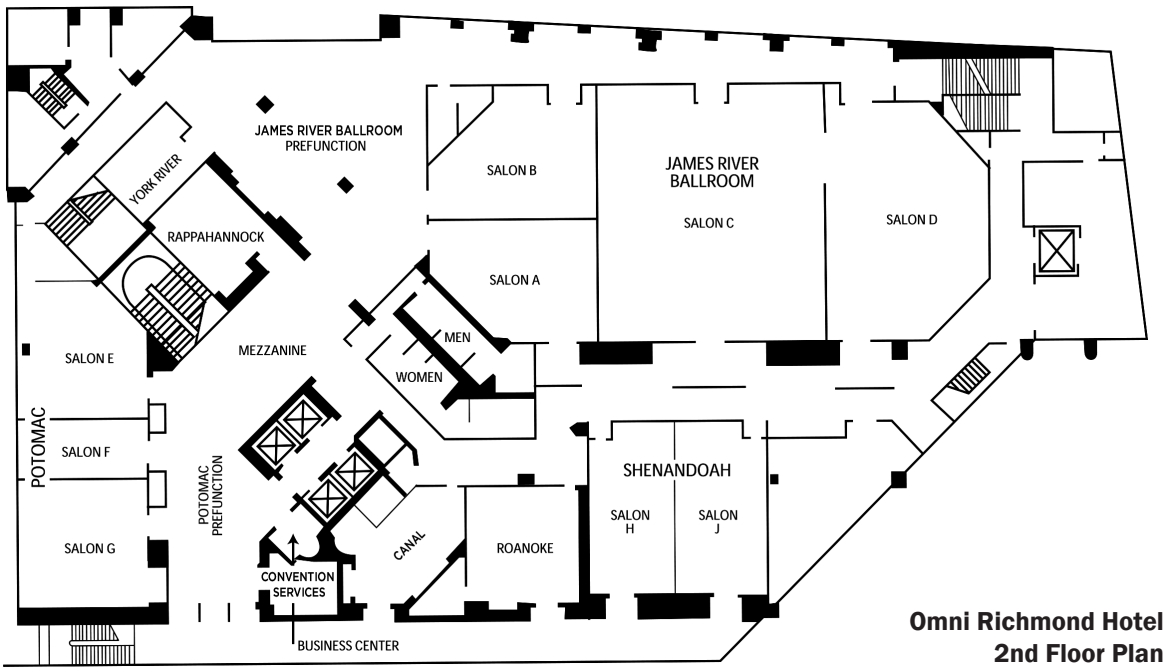
***Results of the SIA Membership Survey 2018***

After the fall 2017 board meeting, the SIA membership committee (chaired by Mark Brown and including Nanci Batchelor, James Bouchard, and Steven Walton, assisted by Daniel Schneider) performed an internal audit of our membership numbers and characteristics since 1997. This updated earlier data was compiled by James Bouchard and Don Durfee. The results of that audit were presented on the SIA website in March 2018. Pursuant to the membership committee's charge in "advising the SIA Board on matters relating to membership, including member relations, new membership recruiting and member retention," and given that the overall declining membership numbers were concerning, the committee created an online web survey and asked all members to take it (notifications were sent with annual ballots in April). This poster presents the results received to date of that survey. There are plans in place to do a more thorough sampling assessment of the SIA membership and the results of this survey will guide Prof. Junhong Min (Marketing, Michigan Tech) and a student chapter of the American Marketing Association in developing and administering that assessment in fall 2018.

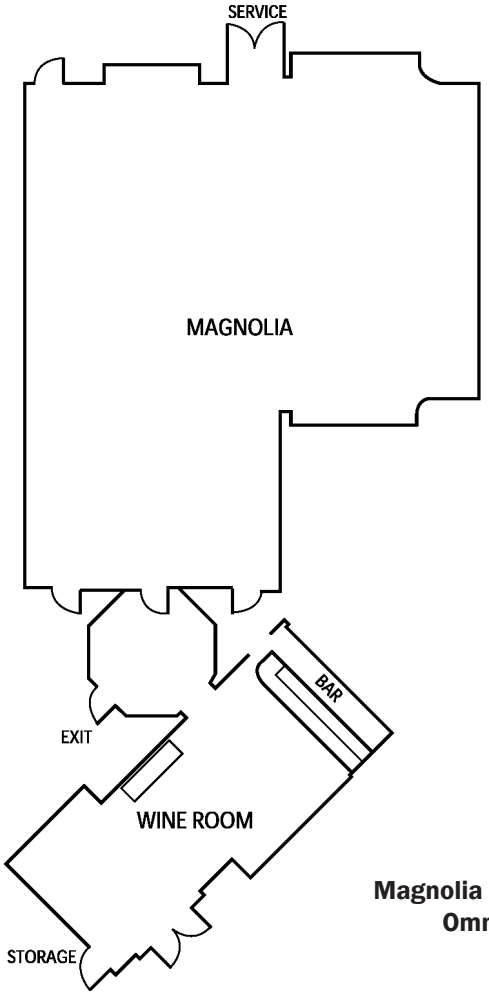
**Steven A. Walton** is the Executive Secretary of SIA and the journal editor for IA. He is also an associate professor of history in the Industrial Heritage and Archaeology program at Michigan Tech. Although his research interests are broad both topically and chronologically, for our purposes, he works on the history of industrial production and machinery in the nineteenth century, particularly on those industries related to military-industrial production. He is currently working on a study of "Networks of Technology Transfer and Circulation of Technical Experts in Antebellum American Cannon Foundries" and simultaneously developing a book on the history of the West Point Foundry and its industrial, social, political, and artistic networks.

# NOTES

# NOTES




**Omni Richmond Hotel**
**2nd Floor Plan**




**Magnolia Room & Wine Bar**
**Omni Richmond Hotel**
**(1st Floor)**

| TIME | A | B | C |
|---|---|---|---|
| 8:00-9:30 | **1A: SALT, CLAY, STONE**<br>• Robert C. Whisonant & Cliff Boyd. "18th and 19th Century Salt Production in Saltville, Virginia"<br>• Andrea Stahman Burden. "Nineteenth-century Folk Stoneware Potteries: Preliminary Results of National Register of Historic Places Eligibility Testing at 41LT441, Limestone County, Texas"<br>• Henry Ward & Susan Bupp. "Identification of Historic Paving Materials from the Virginia Avenue Tunnel Replacement Project" | **1B: TAINTED LEGACIES**<br>• Simon Litten. "Industrial History of Chemicals: PCBs"<br>• Fred Quivik. "Mill Tailings Used for Railroad Ballast in the Coeur d'Alene Mining District: Physical Data from ICC Valuation Reports"<br>• Thomas Speight & Allen Hatheway. "An Overview of the Historic Manufactured Gas Industry in Massachusetts, 1826–1970" | **1C: ENGINEERING HISTORY, LARGE AND SMALL**<br>• Bruce Greenberg. "The History of Lionel Trains: The Revolution of 1923"<br>• Gerald M. Kuncio. "Rediscovering an Engineering Marvel: Surveying the Delaware, Lackawanna & Western Railroad's Clarks Summit to Hallstead Cutoff"<br>• Paul C. King. "Before the Bridge: Roebling's Ropes" |
| **MORNING BREAK & POSTER SESSIONS** **(See page 36 for poster descriptions)** | | | |
| 10:00-12:00 | **2A: IA IN RICHMOND**<br>• Ellen Chapman. "Industrial Heritage as Community Amenity: The Integration of Industrial Fabric within the James River Park System in Richmond, Virginia"<br>• Joseph Costello. "Pump House Park Revitalization Plan"<br>• Douglas Peter Sefton. "Richmond's Fulton Gas Works"<br>• Lyle E. Browning. Anatomical Investigation of Two James River Canal Freighters" | **2B: INDUSTRIAL COMMUNITIES**<br>• Erin Schwartz & Nick Belluzzo. "Seeing and Being Seen: Analyzing Spaces of Industrial Slavery through 3-D Photogrammetric Modeling"<br>• John R. Mullin. "The Estey Organ Company: Making Music in Brattleboro, Vermont"<br>• James Schwaderer. "A Call for Nuance in Logging Camp Interpretation"<br>• Matthew Lawrence Daley. "An Island in the 'Furniture City': The Black Hills Neighborhood, Godfrey Avenue's 'Furniture Row,' and Homeownership in Grand Rapids, Michigan, 1890–1930" | **2C: HISTORIC BRIDGES**<br>• Todd Wilson. "Using Historic Maps to Discover Pittsburgh's Lost Bridges"<br>• Ann L. Miller. "Historic Bridge Identification and Management in Virginia"<br>• Anne Peden & Ty Houck. "Piedmont Manufacturing Company Footbridge"<br>• Rebecca Burrow. "How to Pour Concrete in 1920: The Story of the Dry Canyon Bridge" |
| **BUSINESS LUNCH** | | | |
| 2:00-3:30 | **3A: ZINC MINING IN 19TH CENTURY LEHIGH VALLEY**<br>• Michael Kaas. "19th Century Zinc Mining in the Friedensville Mining District and the Birth of the U.S. Zinc Industry"<br>• Mark Connar. "The President Pumping Engine and Engine House"<br>• Gerard P. Lennon. "Heritage Park to Preserve the President Pumping Engine & House, Friedensvile Mine Site, PA" | **3B: INFRASTRUCTURE SYSTEMS**<br>• Peter Hutchinson. "Unraveling Tesla's Wardenclyffe Site"<br>• Stephen Thompson. "Watering 'The Lawn': The Evolution of Water Supply Systems at the University of Virginia During the Nineteenth Century"<br>• Robert Kapsch. "Building the Infrastructure for the New Federal City on the Potomac, 1790–1840" | **3C: REVIVING MACHINE HISTORY**<br>• Zachary Liollio & Steve Howell. "Hot Riveting Technology: Perpetuating an Age-Old Method of Metal Joinery"<br>• Daniel Schneider. "Creativity Within Mechanical Constraint: 1890s Wood Type for the 21st Century"<br>• David Shields. "American Wood Type: Planing Patterns and Sleuthing Origins" |
| **AFTERNOON BREAK** | | | |
| 3:45-5:30 | **4A: THE IRON, COPPER, AND COAL INDUSTRIES: ORIGINS, EVOLUTION, DECLINE**<br>• Sean Gohman. "Unalloyed Potential: Envisioning Mass Copper Workscapes under an Organic Energy System"<br>• Charlie Yuill. "Integrating Spatial, History, and 3-D Documentation for Documenting 19th Century Mining Operations"<br>• Brian Schmult. "Evolution of the Hopewell Furnace Blast Machinery"<br>• David J. Knapp. "Beneath the Smokestacks: Heydays of Iron Founding on Canvas" | **4B: INDUSTRIAL HERITAGE: CHALLENGES AND PROSPECTS**<br>• Erik Nordberg. "Archives as Material Culture: Who Controls What is Collected?"<br>• Aurora Donoso-Sequeiros & Narciso Vazquez-Carretero. "The Structural Rehabilitation of Tharsis Pier (Huelva, Spain), Monument of the Spanish Industrial Heritage"<br>• Oscar L. Rodríguez Cavielles, Paz Benito-del Pozo, and Carlos J. Pardo Abad. "Industrial Heritage in Spain: Current Situation and Potential as a Tourist Resource<br>• Andréa Livi Smith. "Industry, Preservation & Renewal in Fredericksburg, VA" | **4C: CONSERVATION OF INDUSTRIAL HERITAGE**<br>• Joseph Sembrat. "The Conservation of Industrial Archaeology and its Role in Preserving the History of American Technology"<br>• William Hoffman & Hannah Fleming. "Two Decades of Progress: An Update on the Conservation of the USS Monitor"<br>• Kelly Caldwell & Sophia Zweifel. "Inside and Out: Conservation Approaches to Preserving Canadian Industrial Heritage"<br>• Mark Rabinowitz. "Assessing and Conserving an A-12 Spy Aircraft for the CIA" |