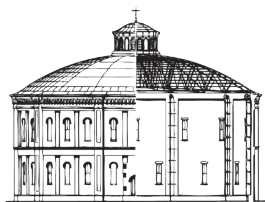




**SOCIETY FOR INDUSTRIAL ARCHEOLOGY  
49th ANNUAL CONFERENCE**

**AUGUST 23 - 27, LEHIGH VALLEY, PENNSYLVANIA**

**CONFERENCE PROGRAM**



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

[www.sia-web.org](http://www.sia-web.org)

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# SCHEDULE AT A GLANCE

*All locations are within the HOTEL BETHLEHEM except where noted (\*, \*\*)*

*All tours (►) depart from the hotel lobby*

## TUESDAY, AUGUST 24, 2021

7:30 AM - 9:00 AM	Self Check In .....	Hotel Bethlehem Lobby
8:00 AM - 5:00 PM	► T1 - An Embarrassment of Bridges	
8:30 PM - 5:00 PM	► T2 - An Embarrassment of Slate	
9:00 AM - 11:00 AM	► T3 - Walking Tour of Moravian Industrial Quarter	
12:30 PM - 5:00 PM	► T4 - An Embarrassment of Museums*	
4:00 PM - 6:00 PM	Self Check In .....	Hotel Bethlehem Lobby
6:00 PM - 6:30 PM	New Members' Welcome Reception .....	Hotel Bethlehem
6:30 PM - 9:00 PM	Opening Reception .....	Hotel Bethlehem

## WEDNESDAY, AUGUST 25, 2021

7:00 AM - 9:00 AM	Self Check In .....	Hotel Bethlehem Lobby
7:45 AM - 5:00 PM	► W1 - Anthracite, Anthracite, Anthracite	
8:00 AM - 6:00 PM	► W2 - Go East Tour	
8:30 AM - 4:00 PM	► W3 - A Day Set in Cement	
7:30 PM - 9:30 PM	SIA Industrial Film Festival - "The Molly Maguires" .....	Lehigh Room, Hotel Bethlehem

## THURSDAY, AUGUST 26, 2021

7:00 AM - 10:00 AM	Self Check In .....	Hotel Bethlehem Lobby
ALL DAY	Exhibits, Posters & Book Sales .....	2nd Floor Mezzanine & Northhampton Room
8:00 AM - NOON	Morning Presentation Sessions .....	Hotel Bethlehem Meeting Rooms (Lehigh, Lafayette, Moravian)
NOON - 2:00 PM	Luncheon & Annual Business Meeting .....	Hotel Bethlehem Banquet Room
2:00 PM - 5:30 PM	Afternoon Presentation Sessions .....	Hotel Bethlehem Meeting Rooms (Lehigh, Lafayette, Moravian)
6:30 PM - 9:30 PM	Thursday Banquet .....	National Museum of Industrial History**

## FRIDAY, AUGUST 27, 2021

9:00 AM - 3:00 PM	► F1 - An Embarrassment of Canals	
8:00 AM - 5:00 PM	► F2 - An Embarrassment of Iron Furnaces	
9:00 AM - 11:00 AM	► F3 - Historic Bethlehem Walking Tour	

► Please arrive at least 15 minutes early for tour departures. Departure times are firm. Return times may vary.

\* T4 tour participants must provide their own transportation..

\*\* The National Museum of Industrial History is located at 602 East 2nd St on the south side of the Lehigh River, approx. 1.5 miles from the Hotel Bethlehem..

# ACKNOWLEDGEMENTS

## PRESENTATION COMMITTEE

David Simmons (Chair)  
Saul Tannenbaum  
Christopher Marston  
Steven Walton  
Bob Newbery

## TOUR LEADERS / COORDINATORS

Martha Capwell Fox  
Patrick Harshbarger  
Daphne Mayer  
Bode Morin  
Kara Mohsinger  
Mike Piersa  
Brian Schmult  
Don Young  
Nick Zmijewski

## SIA NATIONAL LEADERSHIP COMMITTEE

Saul Tenenbaum  
Aaron Kotlensky  
Christopher Marston  
Steve Walton  
David Simmons  
Bode Morin  
Courtney Murtaugh (SIA tours and conferences coordinator)  
Daniel Schneider (SIAHQ)

## SIA TOUR DEBRIEFING CREW

Patrick Harshbarger  
Fred Quivik  
Helena Wright  
David Simmons

## COVID COORDINATORS

David Simmons  
Aaron Kotlensky

## SIA TOUR HOSTS

Atlas Cement Company Memorial Museum  
Bridesburg Foundry  
Eckley Miners Village  
Highwood USA  
Historic Bethlehem  
Hopewell Furnace National Historic Site  
Jeddo Coal Company  
Joanna Furnace  
Lafarge North America  
Lehigh Anthracite  
Lehigh University  
Lock Ridge Furnace  
Mack Rail Bus  
National Canal Museum, a program of the Delaware and Lehigh National Heritage Corridor  
National Museum of Industrial History

## **ACKNOWLEDGEMENTS, Cont'd.**

### **SIA TOUR HOSTS, Cont'd.**

Number 9 Mine  
NYS&W Railroad  
Penn Big Bed Slate Quarries  
Phillipsburg Pump House  
Sigal Museum  
Slate Belt Heritage Center  
Swope and Bartholomew  
Warren County Parks  
Warwick Furnace

### **ORGANIZATIONS/SPONSORS**

The Industrial Archives & Library  
National Museum of Industrial History  
National Canal Museum  
Delaware and Lehigh National Heritage Corridor  
Anthracite Heritage Museum  
Pennsylvania Historical and Museum Commission

### **CONFERENCE LOCAL COMMITTEE**

Ann Bartholomew  
Mark Connar  
Bill Inderieden  
Ed Hoy  
Jet Lowe  
John McConnell  
Kevin Mock  
Missy Nerino  
John Rohal  
Jill Schennum  
Trevor Shellhammer  
Kris Thompson  
Ron Triani  
Ethan Wallace

### **CONFERENCE LOGO DESIGNED BY**

Glenn Koehler



## CITY OF BETHLEHEM

10 East Church Street, Bethlehem, Pennsylvania 18018-6025

### MAYOR'S OFFICE

Phone: 610-865-7100

Fax: 610-865-7257

TDD: 610-865-7257

[www.bethlehem-pa.gov](http://www.bethlehem-pa.gov)

[rdonchez@bethlehem-pa.gov](mailto:rdonchez@bethlehem-pa.gov)

Robert J. Donchez  
Mayor

# GREETINGS FROM THE MAYOR OF BETHLEHEM

On behalf of the residents of the City of Bethlehem, I would like to take this opportunity to welcome all the participants, organizers, and the public to the Society for Industrial Archeology's 49<sup>th</sup> Annual Conference hosted by the National Museum of Industrial History, Pennsylvania Historical and Museum Commission - Anthracite Heritage Museum and the National Canal Museum – a program of the Delaware and Lehigh National Heritage Corridor.

I would also like to thank Saul Tannenbaum, President of SIA for selecting Bethlehem for the conference.

The fact that Bethlehem was once home to the second largest steel making company in the nation helps set the stage for this conference.

Best wishes for a successful and exciting convention. I invite everyone to visit our North and South Bethlehem historic shopping districts, visit our fine historical buildings, museums, and restaurants, and return to Bethlehem to experience the many festive events in our community that highlight our diverse cultures and historic landmarks.

A handwritten signature in black ink that reads "Robert J. Donchez". The signature is fluid and cursive, with a long, sweeping line extending from the end of the name.

Robert J. Donchez  
Mayor



# WELCOME

On behalf of the SIA Lehigh Valley Conference 2021 committee, welcome to Bethlehem. We're thrilled to finally be seeing all of you in the cradle of American Industrialization. Eastern Pennsylvania played a unique role in the early development of American industrial and economic systems. From the 18th century Moravian industrial quarter, to Philadelphia's workshop of the world, to the 19th century explosion of Anthracite coal, iron and steel, and the configuration of massive rail systems, Eastern Pennsylvania defined and shaped what would become the American industrial complex.

The highlights of the tours this week will include four key resources that led the nation in production: anthracite, cement, iron and steel, and slate and we will visit active production sites for three of them and major heritage sites for the other. Further key sites include significant US canals that followed major rivers and, as such, an embarrassment of bridges crossing these waterways. We'll visit significant museums including the National Museum of Industrial History founded in the electrical shops of Bethlehem Steel, tour the important bank of Bethlehem blast furnaces, visit and ride along at the National Canal Museum, tour the former company town of Eckley Miners' Village, and have a chance to visit locations of the newest US World Heritage Site —Moravian Church Settlements in Bethlehem.

Our host city, Bethlehem, is an enigma of the past and future. Founded by Moravians in the mid 18th century, it rose to national prominence and scale with the explosive growth of Bethlehem Steel, and is now a rapidly growing municipality home to the prestigious Lehigh University founded by coal, iron, and railroad barons in the 19th century. Along with Allentown and Easton, it is part of a growing metropolitan region now the third largest in PA. The area is home to many universities and colleges, new ethnic populations, and an expanding network of recreational and historic trails driven by the Delaware and Lehigh National Heritage Corridor that will eventually connect Wilkes-Barre to Philadelphia. I hope you enjoy your stay and this conference.

As you all can imagine, the COVID pandemic, which postponed this conference twice, dominated the planning process. I thank you all for your understanding, patience, and commitment to this event. We're not out of the woods yet and we appreciate your continued good nature as we refine protocols and procedures. Please follow the guidelines we present—it's for all our benefit.

Lastly, I want to thank our dedicated team of Lehigh Valley 2020-21 planners and coordinators who stuck with us for what will be well over 40 months, and the National Museum of Industrial Heritage for being a key host for the event. I want to honor the SIA tour leadership committee who wrangled with COVID, postponements, procedures, and ultimately the decision to go forward—none of which came with a proscribed direction or outcome. And finally, I'd also like to note that while the role of the SIA president is not supposed to be too easy, this particular administration faced unprecedented challenges regarding not only the continued mission of the SIA, but the health and welfare of members, vendors, and sites. I think we all need to recognize the significant leadership roles President Saul Tenenbaum, Vice President Aaron Kotlensky, and Past President Christopher Marston played in dutifully guiding this conference planning process through very uncertain waters. When you see them this week, give them a thumbs up or buy them a beer—but only from six feet away.

Sincerely,

Bode Morin  
SIA Lehigh Valley Conference Committee

# CONFERENCE HOTEL INFORMATION

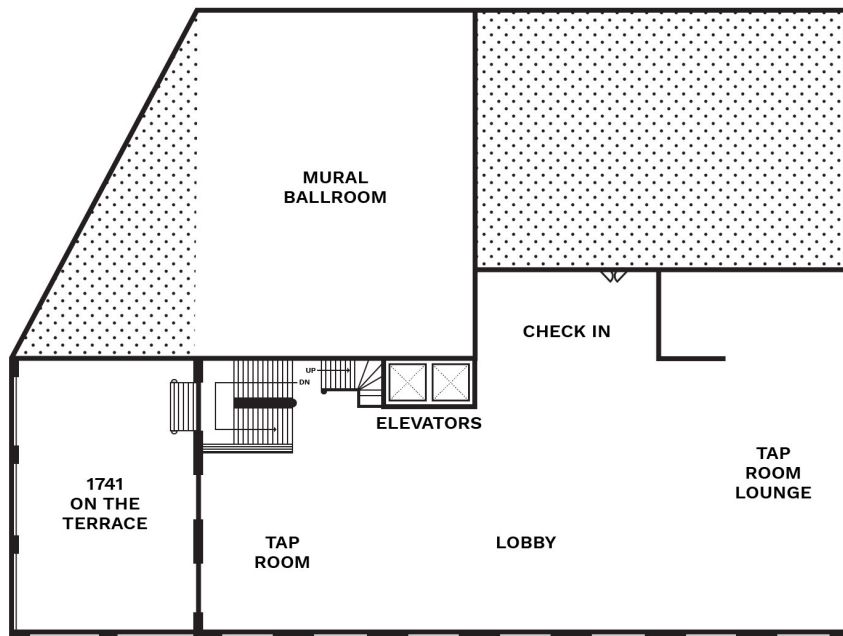


## CONFERENCE HEADQUARTERS

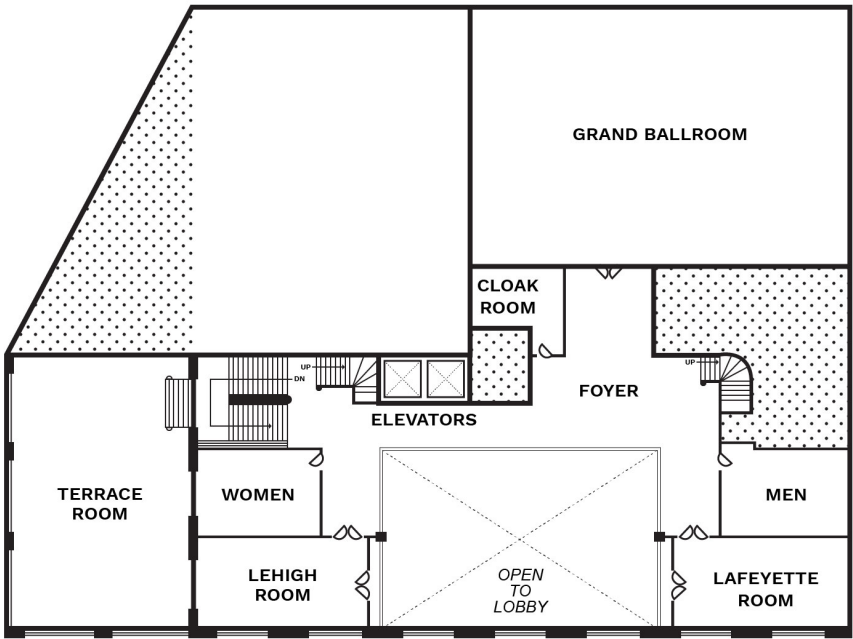
Historic Hotel Bethlehem  
437 Main St, Bethlehem, PA 18018  
Phone: (888) 231-9320

The Historic Hotel Bethlehem, or “Hotel B” as the locals call it, is located downtown directly adjacent to the Moravian National Historic District. It includes an industrial quarter which was home to 35 craft industries by 1747. The hotel is located approximately 1 mile from the National Museum of Industrial History and Steel Stacks, the revitalization effort of the former Bethlehem Steel South Works. Downtown Bethlehem is a lively, revived district with many new and outstanding restaurants, coffeeshops, and entertainment venues.

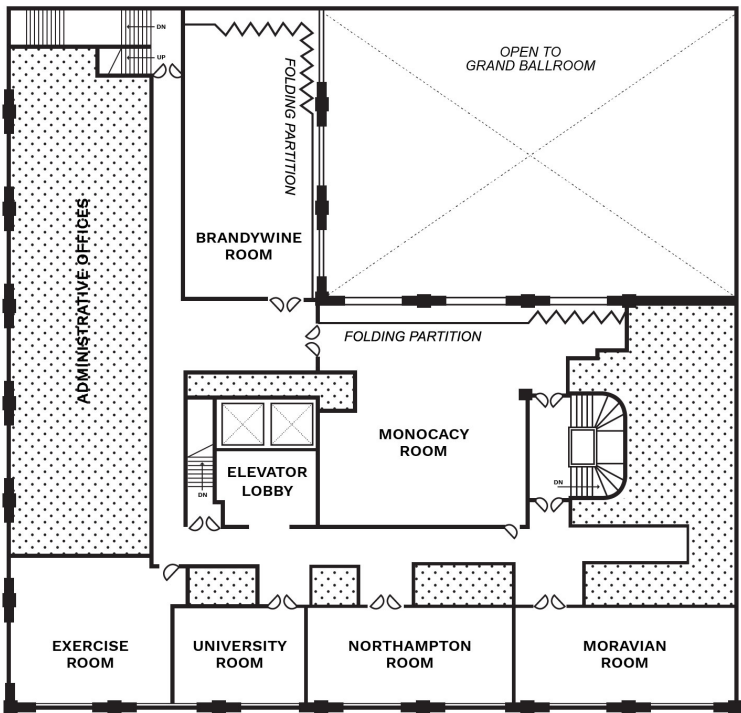
## HOTEL BETHLEHEM - MAIN FLOOR



**HOTEL BETHLEHEM - MEZZANINE FLOOR**



**HOTEL BETHLEHEM - THIRD FLOOR**



# SIA LEHIGH VALLEY COVID PROTOCOLS

All registrants have provided proof of vaccination.

All attendees will wear masks on buses and indoor events. Masks, preferably N95s, must be worn properly. Double masking is encouraged.

COVID surveillance will rely on individual self reporting. Attendees who are experiencing COVID symptoms are expected to self-isolate and take a COVID test as rapidly as feasible. If you are not feeling well in the morning, please DO NOT get on a bus or attend session or events. If you feel symptoms while on a tour, please alert the bus guide or wrangler and contact SIA's Covid coordinators, David Simmons or Arron Kotlensky (906-487-1889), who will assist in arranging transportation and testing. Attendees who get tested agree to report the results to the SIA Covid coordinators. We will notify attendees of potential exposures via text message. CDC guidelines state that fully vaccinated people do not have to quarantine after exposure to Covid if they show no symptoms, but should get tested 3-5 days after exposure.

## THE CDC IDENTIFIES THE FOLLOWING AS COVID SYMPTOMS:

Fever or chills  
Cough  
Shortness of breath or difficulty breathing  
Fatigue  
Muscle or body aches  
Headache  
New loss of taste or smell  
Sore throat  
Congestion or runny nose  
Nausea or vomiting  
Diarrhea

## TESTING RESOURCES:

### **Coordinated Health Bethlehem**

3100 Emrick Blvd  
Bethlehem, PA 18020-8037  
Phone 610-861-8080 (No appointment necessary for drive up. Note hours)  
Drive-through COVID-19 Testing  
Monday, Wednesday: Friday, 10 a.m.-2 p.m.  
Tuesday, Thursday: 2 p.m-6 p.m.

*The site is open to everyone, but only residents of Northampton County will have the cost of testing covered by the county if they do not have health coverage. Tests are processed through HNL Lab Medicine, unless your insurance requires another lab.*

### **CVS Pharmacy's Covid testing location finder is here:**

<https://www.cvs.com/minuteclinic/covid-19-testing>  
Must schedule a test appointment online.

### **West Fourth Street Bethlehem Covid - 19 Testing Site, CVS**

305 West Fourth Street, Bethlehem, PA 18016  
Test type: Molecular lab test (PCR / NAAT)  
Accepted for most travel and recreational purposes  
Drive-thru test (vehicle required)  
<https://www.cvs.com/minuteclinic/clinic-locator/covid-19-testing/bethlehem-covid-2459.html>

**Eighth Avenue Bethlehem Covid - 19 Testing Site, CVS**

1457 Eighth Avenue, Bethlehem, PA 18018

Test type: Molecular lab test (PCR / NAAT)

Accepted for most travel and recreational purposes

Drive-thru test (vehicle required)

Results within 1-2 days

<https://www.cvs.com/minuteclinic/clinic-locator/covid-19-testing/bethlehem-covid-820.html>

**Bethlehem - Catasauqua Rd Poct Covid -19 Testing Site, CVS**

2434 Catasauqua RD, Bethlehem, PA 18018

Test type: Rapid-result test (antigen)

Not accepted for all purposes, so be sure to check with venue, destination or airline.

Results within hours

<https://www.cvs.com/minuteclinic/clinic-locator/pa/bethlehem/1036.html>

**Sterners Way Unit 1 - Bethlehem Covid - 19 Testing Site, CVS**

6050 Sterners Way Unit 1, Bethlehem, PA 18017

Test type: Molecular lab test (PCR / NAAT)

Accepted for most travel and recreational purposes

Drive-thru test (vehicle required)

Results within 1-2 days

<https://www.cvs.com/minuteclinic/clinic-locator/covid-19-testing/bethlehem-covid-5533.html>



# PAPER ABSTRACTS

## 1A: BUILDERS & PROCESSES

8:00 AM - 9:30 AM

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### **Marty Johnston**

#### ***Charles Hunt's Innovative Materials Handling Industry***

In 1869, Charles Wallace Hunt moved to Staten Island New York and established a retail coal business. Labor difficulties inspired him to design and build an automatic railway to simplify the transportation of coal from ship to storage. Powered by gravity, the novel system significantly reduced the cost of labor and increased the throughput of material. Seeing an opportunity, Hunt formed the C. W. Hunt Company in 1871 to manufacture and sell his transportation system. For the next forty years, Hunt designed, patented, and manufactured an amazing variety of innovative machinery used in the material handling industry. In addition to automatic railways, his firm built and installed coal handling systems, overhead trolleys, and complete cable and industrial railways. A prolific and creative inventor and engineer, Hunt received nearly 150 patents during the forty years he ran his company. From outside-flanged railways to expandable dining room tables, Hunt thought outside the box. At the time of his death in 1911, Hunt's conveyors, railways, hoisting engines, blocks, sheaves, rope, and electric vehicles were in use all over the globe. However, other firms were also in the market, with the founder gone and patents running out, the company started to struggle. Yale and Towne Manufacturing purchased the battery truck portion of the business in 1920, using it as the foundation for their lift truck. When the Gifford-Wood Co. made the Hunt industrial railway a division in their company in 1931, the C. W. Hunt Company was a shell of its former self. This presentation reviews Hunt's career, his creative solutions to difficult engineering problems, and discusses how his equipment functioned in comparison to standard practices of the day. In addition, the design for an interactive exhibit using models of Hunt's machinery to tie together industrial history and STEM education is covered.

Marty Johnston is a Professor of Physics at the University of St. Thomas in Saint Paul MN. His primary work focuses on experimental investigations of deterministic chaos but he also enjoys studying the history of technology through the eyes of a physicist. His history of the Iron Mountain Mine in Pardee, MT was published in IA, Vol 38, No 2.

### **Kevin Coffee**

#### ***Watersheds & Trees: 19th Century Textile Industry Impacts (Pre-Recorded)***

This paper expands upon material data and analysis of engineered structures that illustrate the broad environmental impact of integrated textile factories in Lowell, MA, specifically in terms of water and woodlands. Early industrialization in northeastern North America – typified by integrated textile factories – was reliant on several factors, especially labor. But two other fundamental resources were the large supply of industrial inputs and the system of waterways over which to move inputs and outputs. The large, water-powered, integrated American factories, unlike 19th-century mill structures in Britain or other European industrial centers, were built largely of timber girders and decks. This distinction is explained by the availability of vast old growth forests and by the primitive condition of the mineral extraction and metals sectors. Nonetheless, the use of wood in America, especially prior to the Civil War, shaped industrialization during that period. The tremendous pressure put on forested watersheds produce a matrix of environmental effects. Deforestation for structural materials and fuel is seen in the precipitous decline of forest cover throughout the northeast United States. The removal of trees in turn upended ecological communities, water cycles, and climate patterns – and thereby power and transport for the same industrialization that consumed so much timber. The tension between deforestation to obtain raw material and the impact of such deforestation upon the watersheds that fed rivers and canals foreshadows other consequences of the increased use of natural resources for mass production. The wide-area environmental impact of this rush to resources holds important lessons for our present understanding of global climate change.

Kevin Coffee is a historical archaeologist whose work explores 19th and 20th century industrialization and urbanism, especially the intersections of class, gender, ethnicity, and other practices that engender social function and dysfunction. He is Chief of Interpretation and Education for Lowell National Historical Park and holds an MA in historical archaeology from the University of Leicester (UK).

## **Paul C. King**

### ***Roebling and Ellet as Engineers in Pennsylvania***

With this year's SIA conference in Bethlehem, PA, it is appropriate to discuss the work of John A. Roebling and Charles Ellet Jr., both engineers from Pennsylvania, who together were responsible for bringing the wire suspension bridge to America. Ellet was born and raised in Bucks County, PA and Roebling, born in Muhlhausen, Germany, emigrated in 1830, settled outside of Pittsburgh, and founded the town of Saxonburg, PA. Before building bridges, both men worked as surveyors, with Ellet on the Susquehanna Branch of the Pennsylvania Main Line Canal, and Roebling mapping out the first route of a railway from Harrisburg to Pittsburgh in 1841.

The primary focus of this paper is on the bridges the two men built in Pennsylvania, including Ellet's Fairmount Bridge in Philadelphia—the first wire suspension bridge in America—and Roebling's three Pittsburgh bridges: the 1844 Aqueduct on the Pennsylvania Main Line Canal, the 1845 Monongahela Bridge, and his 1857 Allegheny River Bridge. The discussion will compare and contrast the technical aspects of the construction of their bridges, with Ellet following the French technique and Roebling following his own methods, which solved many of the issues of the stability of the French method.

Paul King is a professor of architectural technology at New York City College of Technology, located in the shadow of the Brooklyn Bridge, where he teaches courses in building technology, helping students better understand how the pieces of a building go together. A current project is a book manuscript titled "Roebling: Before the Bridge" focusing on the innovations of his early work embodied in the Brooklyn Bridge design.

# **1B: INDUSTRIAL PRODUCTION AND INTERPRETATION**

**2:00 PM - 3:30 PM**

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## **Jet Lowe**

### ***Making Music at Martin Guitar, Nazareth, PA***

Martin Guitar Company of Nazareth, Pennsylvania, is one of the oldest family owned businesses in the United States. This paper will examine the methods of production as well as the way the company has weathered extreme economic cycles since the establishment of Frederick Martin's first workshop in the United States, very near to where the Holland Tunnel exits into Manhattan. Connections will be made between the nature of the Moravian settlement in Nazareth and the particular aesthetic qualities of the best instruments made by CF Martin. Finally, an examination of how going back to some production methods of the highly revered guitars of the 1930's have been revived to maintain the vitality of the company in the 21st century.

Jet Lowe is an architectural photographer specializing in historic architecture and engineering. His large format (mostly 5x7) images of American engineering, architecture and landscapes comprise a large percentage of the photographic collections of the Historic American Engineering Record, Historic American Buildings Survey, and Historic American Landscapes surveys housed in the Prints and Photographs division of the Library of Congress. Retiring after 35 years with the National Park Service in 2013, in recent years Lowe has been exploring the built environments and landscapes of France, Italy, and India. He continues his photography work recording structures of world heritage significance as well as accepting commissions from architects, engineers, and preservationists. Along with his photographic interests, he has pursued a lifelong interest in the classical guitar.



## **Bierce Riley**

### ***Slater's Mill, Riverdale, NJ: Fur Felt to Disco***

Located at the junction of two early Morris County roads, this site was first Nathaniel Ford's grist mill (1757), but was better known since the mid-19th century as Slater's Mill, a local landmark that served a variety of purposes over the years. After a fire, the gristmill was replaced in 1849 by an imposing 3½ story structure: it was acquired in 1861 by Joseph Slater and refitted for the processing of beaver fur into felt for hats. Slater's major client was the John B. Stetson Company of Philadelphia, maker of broad-brimmed hats such as the National Park Service ranger hat and cowboy hats worn by the Lone Ranger, Hopalong Cassidy, and John Wayne. Such hats are simply called "Stetsons". After Joseph Slater's death in 1871, his son Robert took over the business, employing six to eight men. By 1910, Slater's Mill was producing wool shoddy, and a decade later it was producing felt. In the 1920s, the site was purchased by Walter Carpenter for an automobile service station. A one-story addition on the west side became a lunch room run by his wife. After her husband's death, Mrs. Carpenter continued to run the gas station and tea room well into the 1960s. The mill was then sold and reopened as a restaurant and bar called Slater's Mill. Under new management, the mill morphed into a disco in the '70s and a go-go bar in the '80s. After a murder, its reputation never recovered. In the 1990s, due to a road widening to accommodate an interstate highway exit just 200' to the west, a road regrading left the mill well below grade. The front sill rotted and the main structure developed a 15-degree list. It was demolished in November 2019.

Bierce Riley is past president of the Roebling Chapter, SIA, and a board member of the Canal Society of New Jersey. Particular IA interests are waterpower, the early iron industry, and bridges; she was employed as an historian for the New Jersey Historic Bridge Inventory in the 1990s. She has served on the Mendham Township and Morristown Historic Preservation Committees, as well as boards of various museums and historical societies in North Jersey and the national SIA. Bierce devotes much of her free time to researching industrial and technological developments in Morris County, NJ. She was a volunteer in the water-powered gristmill at Waterloo Village until it closed in 2019. Holding a degree in chemistry from Drew University and an MBA in pharmaceutical marketing, she is semi-retired from her consulting practice. Riley is a member emeritus of the American Chemical Society.

## **Michael Froio**

### ***From the Main Line: Understanding the Pennsylvania Railroad Through the Contemporary Landscape***

The Main Line of the Pennsylvania Railroad connected the eastern United States to the midwestern interior. Chartered in 1846 to secure Philadelphia's route to western trade, the PRR grew into a network of 28,000 miles of track, with 279,000 employees moving 6,700 trains daily. At its peak, the railroad carried ten percent of America's freight and twenty percent of the traveling public. The self-proclaimed "Standard Railroad of the World" built infrastructure and traffic-control systems still critical to rail transportation. Following its 1968 collapse, the once unified system was carved into separate, but interdependent corridors across the Mid-Atlantic. Froio's ongoing documentation project considers historical context while examining the contemporary landscape, using photography, research and visual ephemera to tell the story of one of the most celebrated transportation systems in American history. Taking a HABS/HAER level approach to documentation through use of large format film-based media and digital capture, this field-work focuses on imagery, looking at surviving infrastructure, the adjacent landscape and industries associated with the corridor. The outcome is a multi-tiered display ranging from essays tying local histories to contemporary imagery to exhibitions and publications that rely solely on contemporary imagery to conjure the importance of a transportation system that was dissolved over 50 years ago.

Michael Froio is a photographer and educator in the Philadelphia metropolitan area. Much of his work focuses on understanding the built environment and how history creates a compelling narrative in photography. Michael's commissioned work includes architectural, railroad, and heavy industry documentation and research projects in various mediums, including large format film, digital stills, videos, and time-lapse photography. His work resides in noted collections, including the Library of Congress, the Philadelphia Museum of Art, the Woodmere Museum, and the Camden County Arts Bank collection.

# 1C: KEYSTONE STATE IA-1

8:00 AM - 9:30 AM

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## David Blackburn

### *Transatlantic Links in Iron History and Heritage*

Iron has been smelted and forged in Pennsylvania for over 300 years. As English citizens until the American Revolution, foundry and forge owners throughout Pennsylvania and the colonies would have had trade connections to Britain, the mother country. Unfortunately, the English connections are tacitly interpreted at Hopewell Furnace National Historic Site, as well as other preserved forges and furnaces in Pennsylvania, and are poorly understood. As the beneficiary of an international travel grant, the site manager of Hopewell Furnace NHS sought to investigate transatlantic iron trade in the 18th century with a focus on a single industrial area, Ironbridge Gorge World Heritage Area. The site of the world's first iron bridge—built in 1779—the World Heritage Area encompasses the landscape and sites of the Severn River Gorge, center of English iron manufacturing in the 18th century. Today, the Ironbridge Gorge story is told at ten different sites and museums, all administered by the Ironbridge Gorge Museum Trust. The project had three goals: improve connections with the English iron heritage sector, research American colonial trade connections, and examine the interpretation of English iron history. This presentation highlights the results of the project: the interpretive missteps and best practices from Ironbridge Gorge, the primary documentation found that identifies iron export connections between the American colonies and Britain, and the interpretive changes Hopewell Furnace and its iron heritage partners can make in engaging the visitor in the story of iron.

David Blackburn is the Site Manager of Hopewell Furnace National Historic Site in Elverson, Pennsylvania. Fifty miles northeast of Philadelphia, Hopewell is among the best-preserved, small-scale iron communities in the United States. David's career with the National Park Service spans 32 years in 14 different units in California, the southwest, Missouri, and the east coast. Prior to coming to Hopewell Furnace in 2015, he served as the Director of Cultural Resources and Community Programming at Lowell National Historical Park in Lowell, Massachusetts. Blackburn has a BA in Anthropology from the University of Arizona with an emphasis in archaeology and a MA in Cultural Resource Management from Sonoma State University with an emphasis in architectural history and cultural landscapes. He has completed several certificate programs in English furniture and decorative arts through the Attingham Trust and Victorian Society.

## Brian Schmult

### *Casting Cleaners at Hopewell Furnace*

This presentation examines the work of paid casting cleaning at Hopewell Furnace, a National Historic Site near Elverson, Berks County, Pennsylvania, by exploring the economics and nature of cleaning work and the quality of the "cleaning job." The economics is based on an analysis of account books, while the nature of the work is derived from historical research and examination of extant castings from regional museums. Cleaning is shown to have consisted of gate and sand removal and limited fin chipping, plus probably a significant amount of moving castings. Between 36% (documented) and 58% (extrapolated) of all castings are estimated to have been cleaned "professionally." Of this, about 87% was paid by weight—almost exclusively at \$0.75/ton—with the remainder paid at piece rate or possibly fixed price. The pay structure tracked a shift in molding pay structure from mostly piece rate in the late 1810s to mostly tonnage rate thereafter, probably resulting from a shift in stove plate making from open sand to flask casting. The work appears to have been similar to other unskilled period work, with commensurate to slightly higher pay rates and a need to move heavy objects. Few, if any, workers can be called "career" casting cleaners. Most only did cleaning on the side, while the remainder either had very low total earnings, or still earned most of their income from other work. There is evidence that cleaners were mainly family and friends of the molders. These cleaners were all white and mostly adult men, plus two adult women (4% of paid cleaning). There were several cases of accounting minor male children doing cleaning, with payment to the fathers (5% of paid cleaning). There is no accounting evidence of inequitable treatment among subsets of cleaners.

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.

## POSTER SESSIONS

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**Larissa Harris** - “Heritage Erasure at Soudan Underground Mine”

**Lesley Maia Horowitz** - “Infiltration and the Effects to Save Lackawanna Steel’s Headquarters”

**Claire Marcus** - “Railroad Perspectives: Industrial Landscapes in NE Pennsylvania Art”

**Kyle Parker-McGynn** - “Online Digital Interactive Displays for Industrial Museums”

**LouAnn Wurst** - “Labor in the Northern Woods”

## 2A: DIGITAL STRATEGIES FOR IA

8:00 AM - 9:30 AM

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**John Hinchman and Frank Matero**

*Slatelands: Assessing Pennsylvania’s Slate Belt (Pre-Recorded)*

In order to bring a more critical approach to the preservation of a much-neglected category of America’s industrial heritage, the University of Pennsylvania’s School of Design, through its Center for Architectural Conservation, has recently completed a three-year study of the slate industry of Pennsylvania’s Lehigh Valley. The Lehigh Valley in Pennsylvania gave rise to several world class extractive industries, including iron, steel and cement production, coal mining, and slate quarrying, all of which would dominate the American and international scene by the first decade of the 20th century. The Lehigh Valley’s slate industry created a complex landscape with dramatic quarries, mill buildings, and rail networks within a narrow geological belt between the Delaware and Lehigh Rivers. These quarryscapes—the intersection of geology, technology, and culture—were an important part of American life. Their stories are still accessible through the visual testimony of the land, along with the remaining structures and machinery, as well as the stories of those who last labored there. As proven elsewhere, this industrial legacy holds the key to revitalization of the region by “regeneration through heritage,” not only in the preservation and possible re-use of these sites, but as catalysts for reviving and maintaining the social and cultural fabric of their surrounding communities and natural environment. Cultural and environmental conservation become powerful partners in the reclamation of this complex landscape through ecological as well as architectural concerns. The current project has sought to promote the use of a web-based interface to provide the community of scholars, professionals, and associated communities with an expandable platform for research and communication. For more information, see <https://www.design.upenn.edu/historic-preservation/post/quarry-desktop> and to access the website: <https://sites.google.com/view/theslatebelt/introduction>

John Hinchman is a senior research associate in the Center for Architectural Conservation within the Graduate Program in Historic Preservation at the University of Pennsylvania Stuart Weitzman School of Design, where he serves as operations manager. As a conservator he focuses on the integration of digital technology in the conservation field. As a lecturer within the graduate program, he teaches Applications of Digital Media in Preservation which focuses on developing a comprehensive understanding of the use of diverse software packages as a single integrated tool in historic preservation, as well as Documentation II which provides an introduction to the survey and recording of historic buildings and sites. Techniques of recording include traditional as well as digitally based methods including field survey, measured drawings, photography and rectified photography.

Frank G. Matero is Professor of Architecture and Chair of the Graduate Program in Historic Preservation at the Stuart Weitzman School of Design, University of Pennsylvania. He is founder and director of the Center for Architectural Conservation, a member of the Graduate Group in the Department of Art History, and Research Associate of the University Museum of Archaeology and Anthropology. He is founder and editor-in-chief of *Change Over Time*, the international journal on conservation and the built environment published by Penn Press. His teaching and research are focused on historic building technology and the conservation of building materials, with an emphasis on masonry and earthen construction, the conservation of archaeological sites, industrial heritage, and issues related to preservation and appropriate technology for traditional societies and places.

## **Chuck Williams**

### ***Census and LiDAR Prospecting for Colliers and Charcoal Hearths in Clarion County, PA (Pre-Recorded)***

Clarion County was a leader in iron production in rural northwestern Pennsylvania during the 19th century, earning the nickname, “Iron County.” Thirty-one iron furnaces operated here from 1829-1882, most (28) fueled by charcoal made from local forests. Despite the importance of charcoal as industrial fuel, little is known about the colliers that crafted charcoal for the county’s iron industry or the hearths where they worked. This project was launched to document the forgotten lives and work of colliers in the rural charcoal iron industry of 19th century Clarion County. Using United States census data from 1850 to 1880, I collected demographic information on Clarion County colliers and compared it to the northwestern Pennsylvania iron region at large. Collier numbers in Clarion County and the region declined exponentially from 1850 to 1880, mirroring industry decline. In 1850, Clarion County colliers were overwhelmingly white (99.3%), male (100%) and Pennsylvania-born (82.4%), a profile that remained constant in the county and region until the industry’s crash in the 1880s. I used LiDAR imagery to identify putative relict charcoal hearths (RCH) within an 8.5 km<sup>2</sup> study area adjacent to Shippensburg Furnace, a water-powered, hot-blast charcoal furnace in production in Clarion County from 1832-1859. Twenty-five putative RCHs were selected for ground survey; 21 (84.0%) were confirmed by soil cores. RCHs exhibited cut-and-fill platform morphology, had a mean diameter of 13.5 m, and were located on gentle slopes and plateaus. Soil cores from all RCHs showed a single A horizon of charcoal dust and fragments, indicating that each had been fired but once. Results of this study demonstrate that: 1) the demographics of Clarion County colliers reflect an opportunistic response by local residents to an ephemeral, boom-bust industry; and 2) colliers employed a network of spatially extensive, single-use charcoal hearths that persist to the present.

Chuck Williams is an ecologist and archaeologist with particular interests in the past and present landscapes of Pennsylvania’s northern Allegheny Plateau and the Appalachian region at large. His current research focuses on landscape archaeology and environmental history, particularly historic environments, use of LiDAR and remote sensing in landscape prospection and archaeology of charcoal iron production. Chuck was a Fulbright Scholar in environmental history/archaeology at the University of Iceland and was a biology professor at Clarion University of Pennsylvania for 15 years. Chuck currently teaches biology and ecology online and has a small consulting business, Williams Ecological, LLC. He earned his Ph.D. in ecology at Virginia Tech and recently obtained an MA in archaeology and heritage from the University of Leicester in England, completing a thesis titled “Coaling the Iron County: Colliers and charcoal production in the historic iron industry of Clarion County, Pennsylvania.”

## **Lee R. Maddex**

### ***IA with LiDAR and an 1854 Iron Mining Report in Coopers Rock State Forest, WV***

LiDAR (Light Detection and Ranging) is a remote sensing technology which uses reflected laser light to produce precise digital 3D images of the earth’s surface. LiDAR also has the capacity to penetrate forest canopy and can reveal hidden landscapes features. Probably the most notable archaeological use of LiDAR was in the 2018 discovery of some 60,000 Mayan structures, the “Megalopolis,” hidden under the jungle in Guatemala. In 2011, the West Virginia University (WVU) Natural Resources Analysis Center made LiDAR fly overs of Coopers Rock State Forest (CRSF),

located near Morgantown, West Virginia. The CRSF LiDAR imaging, which Professor Peter Butler very kindly shared, reveals remarkable information about the historic ironmaking that occurred on the state forest during the years from circa 1800 to the end of the Civil War. It clearly delineates the location of historic features, including charcoal hearths, iron ore mines, and tramroads, revealing the extent of the industrialization on the state forest landscape. LiDAR has been used in a study of charcoal hearths in Connecticut, but significantly, to the presenter's knowledge, this research is the first use of LiDAR imaging in locating and documenting historic iron mining sites. This presentation concentrates on iron mining sites described in the 1854 "Report on the Pridevale Coal and Iron Ore, [West] Virginia" (this report was part of sales prospectus for the Pridevale Iron Works). The presenter also drew upon historic economic geology maps and geological reports to identify the types of ores noted in the 1854 report. The presenter combined the LiDAR imaging and the historical and geological record with field work to locate and photograph these iron mines on the state forest. The preliminary results of ongoing research will be described.

Lee Maddex has been a member of SIA since 1991 and has attended and presented at multiple conferences. He helped organize the 1993 Pittsburgh Conference and was paper chair for the 2009 Pittsburgh Conference. Maddex also organized the 1999 Ironmasters Conference. He is a Historic American Engineering Record alumni, having worked on a diverse number of documentation projects and was a historian at the Institute for the History of Technology and Industrial Archaeology at West Virginia University. He is presently a Library Technical Assistant II at WVU. His principle research interests are canal systems, especially the C & O Canal, and the history of the American antebellum iron industry, in particular in Coopers Rock State Forest, which he has been studying for the past thirty years.

## 2B: DEBRIEFING WEDNESDAY'S PROCESS TOURS

10:00 AM - NOON

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### Patrick Harshbarger and Fredric L. Quivik

#### *Panel Discussion*

One of the hallmarks of the SIA are the process tours arranged for each annual meeting and fall tour. These experiences are more than merely interesting; they are useful contributions to our professional and scholarly development. Each year, members informally exchange responses to tours in the hotel, at the bar, and over meals, but a more formal venue is required for such exchanges. This year Patrick Harshbarger, Fred Quivik and Helena Wright will moderate a discussion of the previous day's process tours, asking participants to help each other analyze what we have learned about several of the enterprises just visited. The debriefing session will build on the success of a similar, well-received trial session moderated by Harshbarger and Quivik at the 2019 Chicago conference. The addition of Wright will broaden perspectives and offer the moderators better coverage of the Friday process tour offerings. It is the moderators' hope that the "debriefing" may become a regular feature of SIA events if it continues to prove successful and interesting to participants.

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

Patrick Harshbarger is Vice President and Principal Historian at Hunter Research, Inc., a cultural resources consulting firm based

in Trenton, New Jersey. Patrick's recent IA project highlights are a historic bridge programmatic agreement for the State of Hawaii, archeology of the tidewater terminal of the Camden & Amboy Railroad in South Amboy, New Jersey, and planning for the restoration of the three-tiered waterpower raceway system of Alexander Hamilton's Society for Establishing Useful Manufactures in Paterson, New Jersey.

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

## 2C: KEYSTONE STATE IA-2

10:00 AM - NOON

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### James Stone

*Documenting Electrical Power in Bethlehem Mines: The LNC Company Electrical System from the Twentieth Century into the Bethlehem Mines Era*

The electrical system of the Lehigh Navigation Coal Company (LNC) was large, robust, had high horsepower loads and was served from a single point of contact, meaning the whole system has one incoming metering location. This single point of contact, unlike other mining companies with a number of electrical delivery points, was spread over a large area; it resulted in complexity and required significant planning, design and operating support. This is a fascinating subject that gives a snapshot of the equipment and technology when viewed against present day practices. Little remains of the records, any of the physical locations and equipment, nor people with direct knowledge of the system. Few of us were fortunate enough to have worked with the company electrician and engineers in the 1970s at a time when the LNC evolved from the steam era to the electrical era. At this time, some of the electrical physical plant from the 1930s was still in place. This presentation captures the details of the electrical system design and make up to provide an understanding of the system.

James F. Stone PE is an electrical power engineer specializing in the engineering and maintenance of medium voltage utility systems, 138 KV and below. He has direct involvement in the layout of utility distribution, including substation, overhead line maintenance and protective relaying. Stone has conducted many workshops and training programs for linemen and engineering personnel in the areas of grounding and bonding, direct handling (gloving) of overhead systems, layout of distribution facilities and protective relaying. As a direct employee of and consultant to industrial customers, he directed the activity for repair replacement and maintenance of major electrical equipment including medium voltage motors and switchgear, power transformer circuit breaker diagnostics and capacitor applications. In addition, he performs ongoing studies in protective relaying, harmonic mitigation and electrical system upgrades. Stone also supports major testing companies and line and substation construction companies. He is a registered professional engineer in Pennsylvania and New Jersey.

### Trevor Shellhammer

*Bethlehem Steel and Lincoln Tunnel: Bethlehem's Place in Tunnel History*

The presentation will give an overview of early underwater tunnel construction in America in the late 19th century, and Bethlehem Steel's interest in the subject. The history of the Iron Foundry building in the Bethlehem Plant will be reviewed along with historical photographs. The foundry building was one of the first in the early iron works in Bethlehem, PA, and is still standing, adjacent to the Smithsonian's National Museum of Industrial History. Finally, details of the production of the steel and iron castings in the plant's Manufacturing Division for the third tube of the Lincoln Tunnel in the 1950s will be presented. This will include specific information on sand molding procedures and metal specifications, as well as finishing processes, including machining, for the over 28,000 cast segments and keys required for the Lincoln's third tube. The Lincoln tunnel, with original superstructure, is still being used by over 50,000 vehicles every day.



Trevor Shellhammer is a graduate of Lehigh University in Bethlehem, Pa., with BS and MS degrees in metallurgy, and an MS in quality engineering. He joined Bethlehem Steel's "Loop" management training program in 1973 and started in Bethlehem plant operations in the Iron & Brass Foundries, eventually becoming manager of the plant's five foundries and pattern shop. He also managed operations in the Blast Furnace Division and the Structural Products Division. He moved to Bethlehem's Homer Research Labs in 1997, in primary process research, overseeing ironmaking, cokemaking, refractories, and continuous casting. He went through the transition to International Steel Group, Mittal Steel and finally Arcelor Mittal, currently the largest steel company in the world. In 2008, he formed Shellhammer Consulting, working with select ferrous and non-ferrous foundries and iron and steel plants in North America. He retired in December 2019.

## **Jill A. Schennum**

### ***Mexican Steelworkers in Bethlehem, PA***

This talk examines the history of Mexican steelworkers in Bethlehem, Pennsylvania. Bethlehem Steel (BSCO) actively recruited Mexican workers to work at the South Bethlehem plant in the 1920s. These Mexican recruits moved into a labor camp near the coke works and worked at some of the hardest jobs in the steel mill. They went on to establish a vibrant Mexican community in Bethlehem, built community institutions such as the Mexican Aztec Club, supported Puerto Rican immigrants to the mill in the 1950s, and left descendants who live in the city today. Bethlehem Steel turned to Mexico for workers, as the large steel companies needed workers in the 1920s when immigration from Europe dried up with the passing of restrictive immigration laws. The new immigration rules, combined with increased production, created labor demand in urban industrial centers across the northeast and Midwest, fueling the Great Migration of African Americans northward and the aggressive recruitment of Mexican workers from US/Mexico border areas. After political intervention by BSCO President Eugene Grace, a contract shipped Mexican workers by train to Bethlehem in April and May 1923, bringing new immigrants to the labor camp and to jobs at the coke works. Workers first lived in a relatively isolated community, but moved out in the 1930s to South Bethlehem neighborhoods. Most worked in the coke works, at some of the hottest, most difficult, lowest-paid jobs in the plant. While many of these workers did not stay, a core of 50 families remained after the Great Depression. This talk relies on primary and secondary sources and oral histories to communicate the importance of Mexican workers for the American steel industry, the role of large corporations like BSCO in influencing immigration policy, and the resilience and agency of Mexicans coming to Bethlehem in building work and community relations.

Jill Schennum has a PhD in Cultural Anthropology from the Graduate Center, CUNY. Over the past decade, she has conducted research examining steelworkers, the culture of the mill, and the experience of deindustrialization at Bethlehem Steel's Bethlehem Plant over a 50-year span. Schennum is a Professor at County College of Morris, and Chair of the Department of Sociology, Economics and Anthropology. Since 2010, Schennum served on the board of the Steelworkers' Archives, a steelworker-founded not-for-profit dedicated to preserving the history of Bethlehem Steel workers. She worked with Lehigh University on the Mellon-funded project The Women of Bethlehem Steel. She has engaged in public anthropology, giving talks and moderating panels at many community institutions. She has presented papers on panels at national social science and history conferences. Schennum received a National Science Foundation grant to support ethnographic research in 2009.

## **3A: INTERNATIONAL PERSPECTIVES ON COVERED BRIDGE TRADITIONS**

**2:00 PM - 3:30 PM**

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## **Ronald G. Knapp and Terry E. Miller**

### ***China's Covered Bridges from a Worldwide Perspective***

Each of the three great traditions of covered wooden bridges—China, Europe, and North America—evolved distinctive solutions to spanning water with wood. One cannot easily identify what is unique to a particular tradition without having experienced at least one of the other two. Together, the authors have documented over 1200 bridges in North

America, 400 in Europe, and 200 in China. We will focus on China's covered bridges, called langqiao "corridor bridges," these being the least known of the three areas, in order to identify and highlight their uniqueness, describing them in relation to those of Europe and North America in terms of origin, function, structure, and historical trajectory. Though the coverings of China's bridges have an artistic flair in striking contrast to the utilitarian appearance of American and European bridges, the essential differences are found in their structures and functions. Western covered bridges' essential function is to transport vehicles, pedestrians, and animals (and in some cases trains and canal boats) over waterways, while China's bridges transport pedestrians. In addition, China's bridges serve as shelter for travelers when located on remote mountain paths as well as social centers when located in villages and towns. Structurally, Western bridges are essentially trussed frameworks, i.e., two parallel trusses with deck bracing and an overhead structure with roof and siding serving to protect the trusses and other members. China's langqiao, in contrast, do not use trusses, having instead a variety of beneath-the-deck structures, including simple beam, various cantilever forms, and—unique to China—woven [polygonal] arches that use two interwoven sets of polygonal arches, one set having three logs, the other normally five. In China, then, the covering is less essential for protection of the structure than it is for protecting users and providing weight to keep the modular structure intact. See biographies below

## **Terry E. Miller**

### ***America's Covered Bridges: Continuing or Reinventing European Traditions?***

Since the first documented covered bridge in North America was Timothy Palmer's three-span "Permanent Bridge" over the Schuylkill in Philadelphia, completed and covered in 1805, and European covered bridges can be traced back to the 14th century, it would seem logical that bridge designs in the New World were a continuation of those developed in Europe. Based on both historical documentation and existing structures—America's oldest from 1825 and Europe's oldest from the early 1500s—it is clear that American covered bridges were in fact not a continuation from Europe. Palmer's many bridges from the 1790s and beyond, none covered until 1805, exhibit truss patterns unknown in Europe. European bridges built until the mid 19th century and even beyond made use of only three fundamental patterns: 1) the arch, 2) kingpost, and 3) queenpost. Even when queenpost spans were elaborated with ever more complex internal bracing, with or without an arch, they rarely spanned distances greater than 65 meters. Palmer's outer spans measured 68 meters and the central span 88 meters. German-born Lewis Wernwag built "The Colossus," also in Philadelphia, in 1812 with a clear span of 154 meters, also using a truss unknown in Europe. Thus, we have concluded that American bridge designs developed independently of European. In the 1850s, however, Europeans discovered American designs. Three truss patterns were widely used: 1) Ithiel Town's lattice, 2) William Howe's simple panel design (X panels with iron verticals), and 3) William Howe's original 1840 "double web" design, originally intended for railroad bridges and first used in Europe that way, in Kempton, Germany's König-Ludwig-Brücke (King Louis Bridge), a three-span deck rail bridge built between 1847 and 1851. After that Germany, Switzerland, and Austria continued building "double-web" Howe highway bridges until well into the 20th century.

Terry Miller is Professor Emeritus of Ethnomusicology at Kent State University. He has spent a lifetime visiting and documenting covered bridges in North America, Europe, and China. With Ronald Knapp, he is co-author of *China's Covered Bridges: Architecture over Water* (2019) and *America's Covered Bridges: Practical Crossings, Nostalgic Icons* (2014)

## **Ronald G. Knapp**

### ***China's Folk Traditions and "Corridor Bridges" Langqiao***

It is common in the West to focus on covered bridges as structures, emphasizing the external aesthetics of sides and roof as well as the internal composition of timber trusses. The interior timber trusses and the external wooden shell are complementary, indeed justifying calling them "covered bridges." By contrast, the general term used in China for what might seem at first glance to be a similar type of span is langqiao that privileges the interior linear space, hence the term "corridor bridge." As buildings, "corridor bridges" serve more than as mere passageways from bank to bank. Langqiao are viewed more as buildings than mere timber structures and thus share the full repertoire of traditions employed in the erection of dwellings, temples, and palaces. Like other rural buildings, local folk practices are employed including the careful selection of a site according to fengshui, determination of auspicious dates for specific actions, performance of ritual during construction, presence of auspicious and protective amulets, and, importantly, in a special composition to harness positive energy as determined by fengshui. Elaborate ritual accompanies even



the selection of standing timber and culminates in the placement of the ridgepole. This paper will present rarely seen visual documentation of traditional ritual practices that underscores the “corridor bridge” typology as a “building” type. Beyond ritual related to the erection sequence, this paper will demonstrate the significant social purposes regarding langqiao that clearly set them apart from Western covered bridges. During the day, villagers or townsfolk utilize the benches that line the interior as places for socializing and marketing while langqiao offer overnight shelter for traveling porters. Within langqiao, altars or shrines are common along the downstream wall.

Ron Knapp is SUNY Distinguished Professor Emeritus at SUNY New Paltz. He is the author or editor of more than 20 books dealing with vernacular architecture in China and Southeast Asia. With Terry Miller, he is co-author of *China's Covered Bridges: Architecture over Water* (2019) and *America's Covered Bridges: Practical Crossings, Nostalgic Icons* (2014)

## 3B: INDUSTRIAL HISTORY CONSEQUENCES

4:00 PM - 5:30 PM

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### Mark Nonestied

#### *Its Vast Manufacturing Interest Would Be of Great Aid to the Nation: Middlesex County During the Great War*

On Sunday, March 11, 1917, *The Sunday Times* ran an article on how the citizens of New Brunswick, New Jersey were preparing for active service in the event of war. The reporter calculated that just as the city sent a well-trained force to fight in 1898 during the Spanish American War that New Brunswick could quickly muster 1,000 of its citizens for the impending conflict. Although focusing on its citizens' potential battlefield contribution, the importance of the city's vast manufacturing interests on the home front were also highlighted. Within a month, the United States entered the war and the preparedness of its citizens and industry was put to the test. Industry supplied the vast military campaign, and New Brunswick and the rest of the communities in Middlesex County shifted gears for the war effort. Numerous manufacturing concerns produced a variety of materials including surgical supplies, rubber, airplane engines, terra cotta practice bombs, and munitions to name a few. Many of the factories not only contributed to the war effort but also aided in the well-being of its workers. The Wright Martin Aircraft Corporation established programs to assist in the welfare of its female work force. Near the vast aircraft factory, the United States Housing Corporation, a federal agency, built an entire community of workers homes on streets named after prominent World War I aviators. This lecture will look at the manufacturing concerns in Middlesex County and how they contributed to the war effort. The lecture will examine Middlesex County on the eve of the Great War and show how an established work force developed transportation systems and an ideal location all contributed to a robust industrial environment. It concludes with the impact these industries had on today's landscape.

Mark Nonestied is the Middlesex County Historian and a division head with the Middlesex County Office of Arts and History. He oversees both East Jersey Old Town Village and the Cornelius Low House Middlesex County Museum in Piscataway, NJ. He has lectured and written on a number of topics related to New Jersey and Middlesex County history and is the co-author of *New Jersey Cemeteries and Tombstones: History in the Landscape*, published by Rutgers University Press. The book received the 2010 New Jersey Studies Academic Alliance Award, non-fiction scholarly category and has received an Award of Recognition by the New Jersey Historical Commission for outstanding service to public knowledge and preservation of the history of New Jersey.

### Jayashree Shamanna and Martina Bacarella

#### *Bridging Fiscal Prudence and Profligacy in Failing to Save a Landmark*

Fueled by a large immigrant labor population, Scranton in the 1920s was a thriving hub of the iron and anthracite industry with a growing population, diverse in both economy and race. The Harrison Avenue Bridge connected the prosperous neighborhood of East Scranton and the labor class neighborhood of South Scranton during this peri-

od. Although other bridges and highways connected the two disparate parts of the city in roundabout ways, public pressure for a direct connection across the Roaring Brook gorge necessitated the construction of this bridge. At a time when social activism was making headlines in the United States, the idea that local citizens spearheaded the construction of this bridge in the early 20th century is noteworthy. The events that lead to the rise and fall of the Harrison Avenue Bridge are more significant than the actual bridge itself, which connected the labor class to the benefits of a growing city. In comparison to other bridges designed by the chief engineer Abraham Burton Cohen, this bridge, a three-span reinforced concrete deck structure, was not extraordinary in its design and construction, but was listed on the National Register of Historic Places in 1988. Time and weather were not kind to this local landmark. Deterioration and wear, despite repairs and renovations, showed through its structure. The decision to tear down and replace this historic bridge put the local community and Pennsylvania on different sides of the “bridge.” The crowning glory of a grassroots movement became the blunder of a bureaucratic process. This paper focuses on the history, the rise and fall, the glory, the local significance, and the lack of vision in saving this bridge in the setting of a city that powered America’s Industrial Revolution.

Jayashree Shamanna graduated from architecture school in Bangalore, India, and received an MS in architecture with a certificate in historic preservation from Texas A&M University. Her passion for the built environment has taken her through architectural firms in New York, working on preservation and adaptive reuse projects. As an educator, she has run studios with an emphasis on sustainable preservation and reuse and developed courses that focus on the principles of adaptive reuse as a means for sustainability and applied these theories to practice. She advises many local non-profit organizations in preservation and construction and is a board member of the PA SHPO for National Register nominations. She has presented research papers on preservation, reuse and the sustainability of the built environment at local, national and international conferences.

Martina Bacarella graduated from architecture school in Bangalore, India, and received an MS in architecture with a certificate in historic preservation from Texas A&M University. Her passion for the built environment has taken her through architectural firms in New York, working on preservation and adaptive reuse projects. As an educator, she has run studios with an emphasis on sustainable preservation and reuse and developed courses that focus on the principles of adaptive reuse as a means for sustainability and applied these theories to practice. She advises many local non-profit organizations in preservation and construction and is a board member of the PA SHPO for National Register nominations. She has presented research papers on preservation, reuse and the sustainability of the built environment at local, national and international conferences.

## 3C: KEYSTONE STATE IA 3

2:00 PM - 3:30 PM

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### Harold Aurand Jr. and Cynthia Dravenovich

#### *Manufacturing Moves Out of the City: A Case Study of an Anthracite Coal Town*

During the nineteenth-century, American industrial production centered on areas accessible to steamboats and railroads. These brought coal and raw materials to the factories, and dispersed finished products to consumers. Most workers lived near their workplaces. As time passed, both production and workers residences decentralized. In part this was due to changes in transportation, including the development of trolleys, trucks, and the automobile. By the end of World War II, most new industrial construction took place in suburban industrial parks. This paper compares this model of industrial decentralization with what happened in Hazleton, Pennsylvania. An anthracite mining town, instead of being surrounded by suburbs of commuters, it was surrounded by collieries, where miners worked and lived. As the anthracite community collapsed after World War, and the community tried to diversify its economic base, it was aware of the role of industrial parks in the United States as a whole, but had to work with a very different geography.

Dr. Harold Aurand Jr. is an associate teaching professor of history at Penn State-Schuylkill Campus. During his twenty-eight years there most of his research has been focused on Pennsylvania History. Several years ago he joined the board at Eckley Miners’ Village, a Pennsylvania Historical and Museum Commission site that preserves and interprets a nineteenth-century anthracite mining community. This paper is an outgrowth of his work with Eckley.

Cynthia Drazenovich earned a Master of Arts in Community Psychology from The Pennsylvania State University. Her thesis research focused on environmental issues, including community psychology of Treskow, PA, a community suffering from an underground mine fire. She has also done research on the 1918 flu epidemic in Schuylkill County, PA, and other local topics. She works in the Penn State-Schuylkill Office of Community Engagement.

## **T. Arron Kotlensky**

### ***Pittsburgh Steel: Forging a National Heritage Area from Blast Furnace Ashes***

Southwestern Pennsylvania has experienced significant periods of industrialization and deindustrialization around natural resource exploitation, including coal, coke, electric production, steel, and glass manufacture, all benefitting from constantly evolving river, canal, rail, and automotive transportation networks. NPS and HAER completed their initial state industrial survey in 1971 which confirmed the overwhelming stories of iron and steel in the Monongahela Valley and other industrial sites throughout the region. In this presentation, the author will detail urgent documentation completed at sites such as the Duquesne and Homestead Works of U.S. Steel targeted for demolition in the 1980s, as well as several other projects under the umbrella of the Mon Valley Steel Heritage project. As part of the project, NPS and HAER helped coordinate a Mon Valley Heritage Task Force which considered perspectives of tourism and economic development. One important outcome connected to this work was creation of the Rivers of Steel National Heritage Area in 1996, which continues to promote heritage tourism and is directly involved in the preservation of critical industrial sites, buildings, and manuscript resources.

T. Arron Kotlensky, a graduate of Michigan Tech's Master's of Science program in Industrial Archaeology, has worked in cultural resources management since 2006. At Michigan Tech, he worked as a graduate student on the West Point Foundry project in Cold Spring, NY, and remains involved in preservation and research of the WPF. Kotlensky has focused on the recording and documentation of industrial heritage in the scope of the National Register and National Historic Landmarks program. He is interested in how citizens and communities can better adapt National Register nominations and HAER documentation in cultivating interest in industrial heritage and history. He currently is the SIA vice president, was previously on the SIA board of directors, was local coordinator for the 2017 meeting in Houston, and received the Society's 2014 Robert M. Vogel prize. He is a native of western Pennsylvania and is employed as a staff archaeologist with PennDOT.

## **4A: HISTORIC BRIDGES**

**4:00 PM - 5:30 PM**

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## **Michael J. Cuddy**

### ***Hill-To-Hill Bridge: An Engineering Marvel for Bethlehem's Transportation Needs***

Steps from the Historic Hotel Bethlehem stands an engineering marvel that when completed in 1924 was the first hi-level structure to connect the Bethlehem business center with the growing residential areas east and west of the city. The Hill-to-Hill Bridge is unique due to its original configuration, comprised of a 13-span main bridge crossing over the Lehigh River, Lehigh Coal & Navigation Company's Canal, and four different railroad facilities. Eight approaches provide access to the bridge. The bridge is constructed almost entirely of reinforced concrete, except for two truss spans that were designed to permit the connection of an access ramp in the middle of a truss span and the movement of vehicles between the vertical members. This presentation will focus on the history and engineering details of this unusual structure, the measures taken during the last major rehabilitation of the structure in 1990 (designed by the presenter), and the future plans for the structure to meet the current transportation needs of the area.

Michael J. Cuddy, P.E. is a principal/senior vice president with TranSystems and area manager responsible for the firm's transportation work throughout Pennsylvania. A 34-year-employee of the firm, he is responsible for many of its major bridge design, rehabilitation and inspection programs, particularly those involving historic bridges and complex structural systems. He has been the project manager on such notable rehabilitation projects as the Wheeling Suspension Bridge, the oldest existing suspension bridge with a span greater than 1,000' and the Frankford Avenue Bridge in Philadelphia, the oldest bridge in America built in 1697. A graduate of The University of Pennsylvania, he is a registered professional engineer and is noted for his innovative and practical approach to the evaluation and rehabilitation of historic bridges.

## **Perry Green**

### ***Aesthetic and Structural Lessons from the Walnut St. Bridge Rehab***

This paper will discuss the aesthetic, structural and combined decisions and lessons learned during the rehabilitation of the Walnut Street Bridge, circa 1860, located in Hellertown, Northampton County, PA. The bridge was rehabilitated between 1994 and 2000 through the joint efforts of a small volunteer group of civil/structural engineering graduate students at Lehigh University, Bethlehem, PA and the Hellertown Historical Society. Recorded by HAER, the structure is a single-span, single-lane through Pratt truss previously located on Walnut Street that spanned Saucon Creek in Hellertown. It was removed from service due to structural and functional deficiencies in the early 1970s and relocated to a "temporary" holding place nearby along the banks of the creek. Here it remained for about 25 years. Necessary aesthetic decisions ranged from selecting a new location where the bridge would still fit into its local environment to the proper paint color, stonework, and wood stringer and decking materials to be used as part of a rehabilitation. Structural decisions initially focused on the repair or replacement of 1) the vertical and horizontal wrought iron round bar bracing members and 2) the round bar wrought iron tension chord members. Various diameters of bars were used in the construction of the bridge, but their historic value was deemed insignificant relative to all the unique cast iron members that made up the primary load-carrying structural system of the bridge from the floor beams and columns to the upper chords and lateral struts. The combined decisions and lessons learned were extensive and involved minor to major repairs of these primary structural members so that their structural functions would not be compromised and repairs would not detract from the bridge's appearance once returned to service as a pedestrian bridge. The final lesson learned involved the cast iron columns. A seemingly routine movement for repair resulted in a column being broken in two locations. Repair was no longer an option and this column needed to be replaced. This might have been the silver lining to a successful completion of this project because the rehabilitated Walnut Street Bridge has stood for over 20 years.

Perry Green received a BS in civil engineering from Columbia University in 1977, and a MS (1979) and Doctorate (2001) in civil engineering from Lehigh University. He previously worked as a structural engineer and engineering manager for the architectural/engineering firm Burns & Roe, Inc., Oradell, NJ where he was involved with the design and construction of new nuclear power plants and the evaluation and modification of existing nuclear power plants. Prior to joining the Bechtel Corporation in September 2011, he was a steel industry consultant, the technical director of the Steel Joist Institute from 2004 to 2010, and an assistant professor at the University of Florida, Gainesville, from 1998 to 2004. Green has been a member of the Structural Stability Research Council since 1994 and is a member of the American Institute of Steel Institute Cold-Formed Steel Main Committee on Specifications and chair of its connections subcommittee. A member of the American Society of Civil Engineers, he is part of its Structural Members Committee.

## **Kathryn Auerbach**

### ***Stone Pillar Bridges: Substructure of Our Country (Pre-Recorded)***

Stone pillar bridges were once common in our county, but now only two are left, one we are struggling to save. The stone substructure established the successful engineering dynamics to enable construction of supports for longer, wooden covered and metal truss spans. The stone pillar bridge is generally characterized by repeating pillars at 25-foot spans to support wooden beams for open wooden bridges. (also known as pier-to-pier bridges). These bridges, built in the 18th and early 19th century, served on many major roads well into the 20th century. Many were often replaced with concrete supporting I-beams, or, on busier roads, with wider, modern bridges.

Kathryn Auerbach has been a historic preservation professional and architectural historian since 1977. She graduated with a BA from The College of William & Mary with interdisciplinary in American Studies. She had additional coursework in architectural design and completed the University of Florida's Preservation Institute Nantucket in 1977. Auerbach was employed by the Virginia SHPO as an archaeologist under Dr. William Kelso and studied under Colonial Williamsburg's Director of Architectural Research

Paul Buchanan. She has 8.5 years experience directing Historic Preservation Programs and surveys for the Bucks County Conservancy (now Heritage Conservancy). She has been an instructor in the Historic Preservation Certificate Program at Bucks County Community College since its inception in 1991. Since 1986, she has been the sole proprietor of a preservation consulting firm doing business in Vermont, New York, New Jersey, Massachusetts, Maryland, Virginia, and Pennsylvania for public and private clients. She has conducted HABS/HAER documentation on a variety of historic bridges, as well as prepared National Register nominations and historic assessment documents for Section 106 reviews on numerous bridge projects.

## 4C: KEYSTONE STATE IA 4

4:00 PM - 5:30 PM

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### **Mark W. Connor, Damian Nance, and Lauren Schmitz**

#### ***Recreating the President Pumping Engine, Friedensville Mines, Lehigh County, PA***

At the 47th SIA Conference (2018) in Richmond VA, we discussed 19th-century zinc mining in the Friedensville, Lehigh County, PA, area, and, as part of this discussion, we discussed the preliminary efforts to protect and stabilize the ruins of an engine house which once held the largest beam engine ever built in the United States. It was also the largest and most powerful single-cylinder, rotative steam engine ever constructed. We will update this discussion with presentations on the steps being taken to not only preserve the ruins but to also recreate the engine itself. Damian Nance will be the moderator and give an overview of Cornish steam engines and discuss the attributes of The President Pumping Engine and how it fit within the classification of Cornish-inspired engines. Mark Connor will pick up the discussion to explain the status of preservation activities and then introduce Lauren Schmitz, a structural designer with the engineering firm of Keast & Hood in Philadelphia. Keast & Hood performed the engine house structural assessment and is now finalizing construction repair drawings. Lauren will discuss how Keast & Hood used a laser scan prepared by another consultant, Borton Lawson, to conduct the assessment and prepare structural repair drawings. Mark Connor will then return to discuss how archival and other information was used by technical artists to digitally recreate the pumping engine and surrounding environment. As part of this discussion, we will show an animated movie that was created using this information.

Mark Connor is a retired businessman with an AB in Anthropology and International Relations from Brown University. He holds an MBA from Lehigh University. Before entering the business world, Mark did post graduate study in archaeology at the University Museum, University of Pennsylvania. During that period, he participated in archaeological surveys in the United States and the United Kingdom. He is on the Board of Trustees, Historic Bethlehem Museums and Sites 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 The President engine house ruins. After extensive research, he is currently working with Lehigh University, the property owner, and others to protect, stabilize and repair the surviving engine house ruins as part of a heritage park or other suitable protective environment.

Damian Nance is Distinguished Professor Emeritus and past Chair of Geological Sciences at Ohio University, and is currently a Visiting Fellow at Yale. A native of Cornwall, UK, Nance received his bachelors and doctoral degrees in geology from the universities of Leicester and Cambridge. His research focuses on the supercontinent cycle, which he co-proposed in 1982, and the application of plate tectonics to ancient mountain belts and oceans. He is a Fellow of the Geological Society of America, a Gesner Medalist of the Atlantic Geoscience Society, and twice received his university's outstanding teacher award. He is also past-editor of *Lithosphere* and *GSA Today*, associate editor of *Gondwana Research* and *Geoscience Frontiers*, and has published over 250 papers and 6 books. In addition, he has published over 50 papers and 3 books on Cornish mining history and technology, particularly in the USA, a parallel research interest for which he was elected Bard of the Cornish Gorsyth.

Lauren Schmitz is a structural designer at Keast & Hood Structural Engineers in Philadelphia. She holds a Bachelor of Civil Engineering from the University of Dayton and a Masters in Civil Engineering from Johns Hopkins University. Prior to joining Keast & Hood, she interned for the firm in 2016 in the Washington, DC office and gained experience as an engineering intern at Skarda & Associates Structural Engineers in Baltimore, MD as well as serving as the engineering intern for the City of Huber Heights, Ohio. Schmitz is an active member of the Women in Structural Engineering (WiSE) group in Philadelphia, the Delaware Valley Association of Structural Engineers, and the Association for Preservation Technology International – Delaware Valley Chapter. While working to stabilize The President engine house, she also worked on large renovation and restoration projects including the Broad Street Ministries exterior restoration and interior renovation, as well as the University of Pennsylvania Quad renovation.

# NOTES





# Society for Industrial Archeology 49th Annual Conference - Schedule of Paper Sessions for Thursday, August 26, 2021

TIME	LEHIGH ROOM	LAFAYETTE ROOM	MORAVIAN ROOM
<b>8:00-9:30 AM</b>	<p><b><u>Builders and Processes</u></b></p> <p>Marty Johnson - "Charles Hunt's Innovation Materials Handling Industry"</p> <p>Kevin Coffee - "Watersheds &amp; Trees: 19th Century Textile Industry Impacts" (Pre-Recorded)</p> <p>Paul C. King - "Roebbing and Ellet as Engineers in Pennsylvania"</p>	<p><b><u>Industrial Production and Interpretation</u></b></p> <p>Jet Lowe - "Making Music at Martin Guitar, Nazareth, PA"</p> <p>Bierce Riley - "Slater's Mill, Riverdale, NJ: Fur Felt to Disco"</p> <p>Michael Frolo - "From the Main Line: Understanding the Pennsylvania Railroad Through the Contemporary Landscape"</p>	<p><b><u>Keystone State IA 1</u></b></p> <p>David Blackburn - "Transatlantic Links in Iron History and Heritage"</p> <p>Brian Schmult - "Casting Cleaners at Hopewell Furnace"</p>
<b>MORNING BREAK &amp; POSTER SESSIONS</b>			
<b>10:00 AM-NOON</b>	<p><b><u>Digital Strategies for IA</u></b></p> <p>John Hinchman &amp; Frank Matero - "Slatelands: Assessing Pennsylvania's Slate Belt"</p> <p>Charles E. Williams - "Census and LiDAR Prospecting for Colliers and Charcoal Hearths" (Pre-Recorded)</p> <p>Lee Maddex - "IA with LiDAR and an 1854 Iron Mining Report in Coopers Rock State Forest, WV"</p>	<p><b><u>Debriefing Wednesday's Process Tours</u></b></p> <p><i>Panel Discussion</i></p> <p>Patrick Harshbarger</p> <p>Fredric Quivik</p> <p>Helena Wright</p>	<p><b><u>Keystone State IA 2</u></b></p> <p>James Stone - "The Electrical System of the Lehigh Coal and Navigation Company"</p> <p>Trevor Shelhammer - "Bethlehem Steel and Lincoln Tunnel: Bethlehem's Place in Tunnel History"</p> <p>Jill A. Schennum - "Mexican Steelworkers in Bethlehem, PA"</p>
<b>BUSINESS LUNCH</b>			
<b>2:00-3:30 PM</b>	<p><b><u>International Perspectives on Covered Bridge Traditions</u></b></p> <p>Ronald Knapp &amp; Terry E. Miller - "China's Covered Bridges from a Worldwide Perspective"</p> <p>Terry E. Miller - "America's Covered Bridges: Continuing or Reinventing European Traditions?"</p> <p>Ronald Knapp - "China's Folk Traditions and 'Corridor Bridges' Langqiao"</p>	<p><b><u>Industrial History Consequences</u></b></p> <p>Mark Nonestied - "Its Vast Manufacturing Interest Would Be of Great Aid to the Nation: Middlesex County During the Great War"</p> <p>Jayashree Shamanna &amp; Martina Bacarella - "Bridging Fiscal Prudence and Profligacy in Failing to Save a Landmark"</p>	<p><b><u>Keystone State IA 3</u></b></p> <p>Harold Auran Jr. and Cynthia Dravenovich - "Manufacturing Moves Out of the City: A Case Study of an Anthracite Coal Town"</p> <p>T. Arron Kotlensky - "Pittsburgh Steel: Forging a National Heritage Area from Blast Furnace Ashes"</p>
<b>AFTERNOON BREAK</b>			
<b>4:00-5:30 PM</b>	<p><b><u>Historic Bridges</u></b></p> <p>Michael J. Cuddy - "Hill-to-Hill Bridge: An Engineering Marvel for Bethlehem's Transportation Needs"</p> <p>Perry Green - "Aesthetic and Structural Lessons from the Walnut St. Bridge Rehab"</p> <p>Kathryn Auerbach - "Stone Pillar Bridges: Substructure of Our Country" (Pre-recorded)</p>		<p><b><u>Keystone State IA 4</u></b></p> <p>Mark W. Connor, Damian Nance &amp; Lauren Schmitz - "Recreating the President Pumping Engine, Friedensville Mines, Lehigh County, PA"</p>