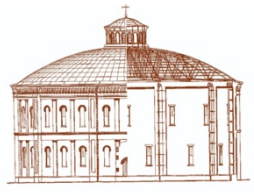
SOCIETY FOR INDUSTRIAL ARCHEOLOGY

50th ANNUAL CONFERENCE

JUNE 9 - 12, 2022
PORTLAND, OREGON

CONFERENCE PROGRAM



SOCIETY FOR INDUSTRIAL ARCHEOLOGY
MICHIGAN TECHNOLOGICAL UNIVERSITY
1400 TOWNSEND DRIVE
HOUGHTON, MI 49931-1295
www.sia-web.org

CONTENTS

NOTE: Safe Space and Covid Protocols will be available as separate handouts at registration.

ACKNOWLEDGMENTS

Our heartiest thanks to all who made this conference possible. Conferences are difficult in the best of times, and we know that these aren't them. Thanks to the many hours, emails, phone calls, miles driven, and mental watt-hours of worry that have gone into the conference planning, and then the hundreds of person-hours that will be needed to make it happen in June. We could not do it without you.

CONFERENCE LOCAL COMMITTEE

Rebecca Burrow, Sandy Carter, Robert Hadlow, Susanna Kuo, Anthony Meadow

SIA NATIONAL LEADERSHIP COMMITTEE

Saul Tannenbaum (President)

Aaron Kotlensky (Vice-President)

Christopher Marston (Past President)

Steve Walton (Executive Secretary)

Courtney Murtaugh (SIA Events Coordinator)

Daniel Schneider (SIA HQ)

PRESENTATION COMMITTEE

Steven Walton (Chair), Christopher Marston, Paul White

SIA TOUR DEBRIEFING CREW

Fred Quivik, Robert Newbery

SPONSORING ORGANIZATIONS

SIA would like to thank the following companies for assistance in making this conference a reality:

- Willamette Falls Paper Company, who donated paper for program;
- TriMet, who donated transit passes; and
- Travel Portland, who provided maps

Schedule at a Glance

All **LOCATIONS** are within the Benson Hotel except where noted (†). For **ROOM MAPS**, see page 8. All tours (►) depart from the **HOTEL LOBBY**. Please arrive at least 15 minutes early for tour departures. Departure times are ***firm***; return times may vary due to dawdling tour members (don't be that person!) and traffic (not much wea can do there…).

THURSDAY, June 9, 2022		
7:30 AM–9:00 AM	Self Check In	Mezzanine lobby
12:30 PM–5:00 PM	► T1–Antique Powerland	
2:00 PM–4:00 PM	► T2–Portland Walking Tour	
7:30 AM–5:00 PM	► T3–Timber Old & New (*early check-in avaiable for this tour*)	
4:00 PM–6:00 PM	Self Check In	Mezzanine lobby
6:00 PM–6:30 PM	New Members' Welcome Reception	The Lemon Grill
6:30 PM–9:00 PM	Opening Reception (*all registrants welcome*)	The Lemon Grill
FRIDAY, June 10, 2022		
7:00 AM–9:00 AM	Self Check-In	Mezzanine lobby
8:00 AM–4:00 PM	► F1–Early Industry	
7:45 AM–5:15 PM	► F2–Modern Industry	
8:30 AM–5:00 PM	► F4–Columbia River Highway	
Dinner hour	Dinner on your own. See local area guide (see p. XXX)	
7:30 PM–9:30++ PM	Pub Crawls and SIGs (see p. XXX)	
SATURDAY, June 11, 2022		
7:00 AM–10:00 AM	Self Check In	Mezzanine lobby
ALL DAY	Exhibits, Posters & Book Sales	Oxford Room
8:00 AM–NOON	Morning Presentation Sessions	Benson Hotel Meeting Rooms
NOON–2:00 PM	Luncheon & Annual Business Meeting • *Livestreamed via Zoom*	Mayfair Ballroom
2:00 PM–5:30 PM	Afternoon Presentation Sessions	Benson Hotel Meeting Rooms
4:00–5:00 PM	Plenary Lectures (*open bar*)	Mayfair Ballroom
6:00 PM–9:00 PM	SIA 50th Banquet (*ticketed*)	McMenamins Edgefield Hotel†
SUNDAY, June 12, 2022		
9:00 AM until …	► S1–Rail Heritage (*return time is up to you*)	
10:00 AM–4:00 PM	► S2–Portland Bridges	

† The Saturday evening banquet will take place at the McMenamins Edgefield Hotel, located at 2126 SW Halsey St., Troutdale, OR 97060, approximately 15 miles east of downtown. A *single bus* will leave the Benson Hotel at 6:00 *sharp* (so be on board by 5:45). The single bus return will be at 9:00, but those wishing to stay longer (perhaps at the Power Station Pub!) are welcome to but will need to find their way home on their own; A ride service car should cost approximately $30–40 for up to 6 people.

Welcome to Portland

The SIA Portland Conference 2022 committee welcomes you to Portland, Oregon. Despite the delays and continued uncertainty, we are thrilled to finally get to share our region with you. When we began planning to bring you to Portland in 2019, we had no idea what the intervening years were to bring. Many plans had to change, and we beg your forgiveness as some of those changes happened at the last minute.

By most standards, Portland is a young city. When it was founded in 1845, New York City was already home to nearly half a million people. But despite its youth, Portland rapidly found its place in the world, serving as a transportation hub for grain and timber from the Columbia River Basin and the Willamette Valley through the deep-water port facilities at the confluence of the two rivers. All of the Friday tours will highlight a different feature of the Willamette and Columbia Rivers, including navigation, power generation, and shipbuilding.

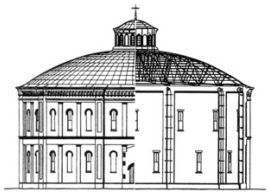
While these traditional industries helped to form Portland, today the city is known for some less traditional things. These include the food cart culture that proliferates throughout the region. It also includes the craft brewing and wine-making industries. Hopefully you will find time during your stay in Portland to enjoy a quick bite from a food cart washed down with a craft beer. A few of these locations will be visited Friday night, if you choose to join us. If food and beer isn't your thing, you're in luck. This weekend is part of the Portland Rose Festival, and there will be lots to see and do just a short walk away along the waterfront.

Getting out and exploring is highly encouraged, but while your out, keep in mind that COVID is still among us. Many businesses in Portland require or encourage masks, and protocols continue to evolve. I thank you for continuing to comply with all such guidelines with patience and understanding. Compliance with any special procedures will help to ensure the safety of our most vulnerable SIA members.

In addition to welcoming you, I also want to thank all those who have helped to organize this conference. Planning this event has been a fitful process, full of challenges and changes. Many venues have stuck it out with us, making themselves available despite limited volunteers. The tour guides who have stepped up to put on tours in these difficult times are fully deserving of honor. In addition, I want to thank all those who have put together presentations, at a time when travel is expensive and budgets are low, we are extremely thankful for your participation. And lastly, thank you to the SIA leadership and to event planner Courtney Murtaugh. Without your assistance, none of this would be happening. You have stepped up to cover tasks I didn't even know needed doing, and it was vital. Thank you all.

Sincerely,

Rebecca Burrow
Local Coordinator for SIA50 in Portland



SOCIETY FOR
INDUSTRIAL
ARCHEOLOGY

Welcome to Portland and the Society for Industrial Archeology's 50th Conference. This is, of course, not the SIA's 50th year, and the discrepancy can serve as an ongoing reminder of the Covid years and how a global pandemic disrupted almost everything. Rebecca Burrow and her local organizing committee —Sandy Carter, Robert Hadlow, Susanna Kuo, Anthony Meadow —persevered and brought together an event that will explore the industrial heritage of Portland, particularly its river-oriented industries. Steve Walton, SIA's Executive Secretary, assisted by Christopher Marston and Paul White, have put together an excellent slate of papers and presentations.

These last two years have been a unique time to have the privilege of serving as the SIA's President. Besides the obstacles of a global pandemic, I've faced some personal health challenges. i want to offer effusive thanks to SIA leadership — Steve Walton, Daniel Schneider, Arron Kotlensky, Christopher Marston, Courtney Murtaugh — all of whom stepped up in big ways and small to guide the SIA through these times. Stay safe and enjoy Portland.

Yours in IA,

Saul Tannenbaum
SIA President

WELCOME FROM PORLAND MAYOR WHEELER

Office of Mayor Ted Wheeler

City of Portland

Dear Attendees and Guests of the Society for Industrial Archaeology:

Welcome to Portland, Oregon, for your 50th Annual Conference. I know that the Society for Industrial Archaeology had many destinations from which to choose. It's exciting to know that "The City of Roses" was selected.

Portland's attributes have garnered a lot of positive attention recently. In 2018, *Food & Wine* called Portland "America's Next Great Pizza City" while *Travel + Leisure* readers voted Portland International Airport the best in the nation for the sixth consecutive year. *Meetings + Events* named Portland one of the 10 best cities for conferences, calling it "the safest and most fun of the study."

I can assure you that these are not empty platitudes. Portland has worked hard to nurture the arts, to encourage eco-friendly practices and ideas, to encourage innovative public transit, to support the chefs and winemakers of our region, and to protect and preserve the city's surrounding natural beauty.

We hope you have the pleasure of experiencing this firsthand. And we are thrilled to welcome the Society for Industrial Archaeology to Portland.

With warm regards,

Ted Wheeler
Mayor

1221 SW Fourth Avenue, Suite 340 ♦ Portland, Oregon 97204
MayorWheeler@PortlandOregon.gov

Conference and Hotel Information

The Benson Portland

Curio Collection by Hilton

309 SW Broadway, Portland, OR 97205

Phone: +1 503 228 2000

Opened in 1913 as part of a downtown building boom tied to the Lewis and Clark Centennial Exposition in 1905, the Benson is Portland's premier historic downtown hotel.

In the heart of downtown Portland, our hotel is a short walk to the Pearl District, waterfront park, shops, bars, and restaurants. Pioneer Courthouse Square and Powell's Books are a five-minute walk from our doors.

TripAdvisor calls it "the city's only premier hotel that unites the charm and civility of the old world with the elegance of contemporary design and mindful service. In homage to the hotel's namesake Simon Benson, guests are invited to experience legendary service, European design, 5-star dining and an acclaimed lobby bar. The Benson seeks to cultivate the best in all of us."

One interesting feature of the hotel is its Historic Stairwell Museum. This twelve story original marble stairwell tells the story of how Simon Benson and architect A.E. Doyle built The Benson (now on the National Register) in 1912, as well as its transformation over 100 years. The Historic Stairwell features over 50 other famous landmarks in Portland and photos dating back to 1847, showcasing the history of the hotel, the city, and its inhabitants.

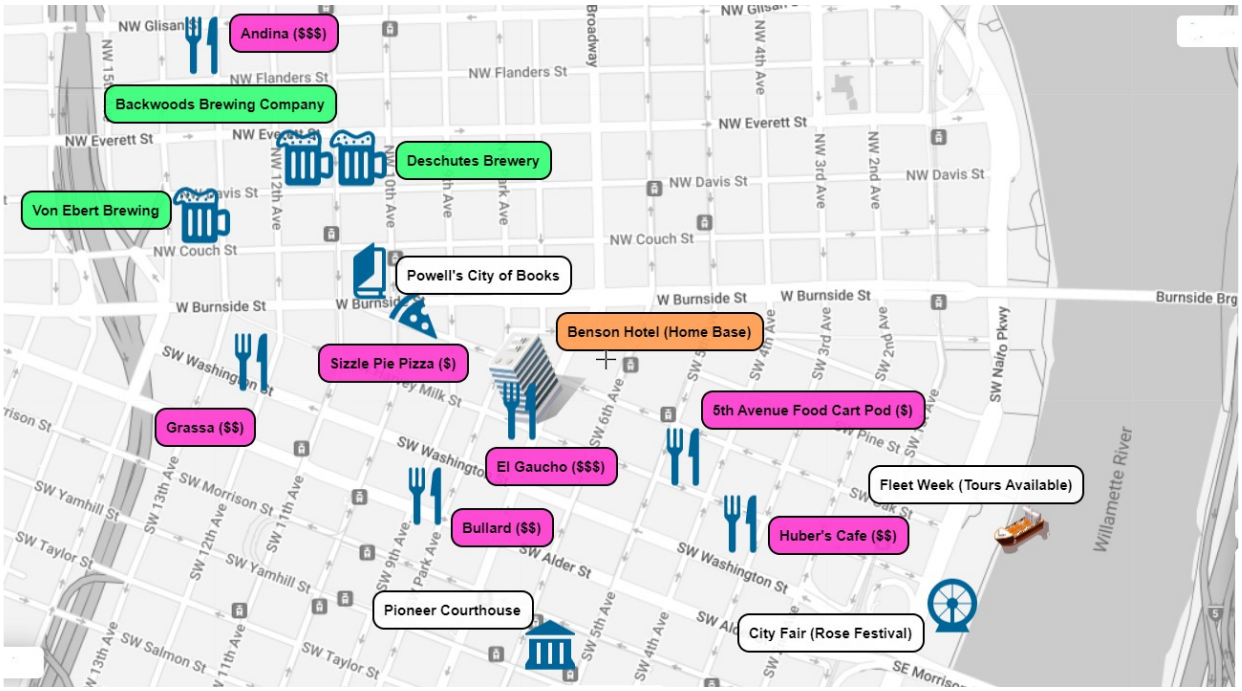
Simon Benson (1852–1942) was A Norwegian immigrant—born Simon Berger Iverson in Gansdal, Norway, but Americanized his name upon arrival in Wisconsin in 1868—who made his fortune in the Oregon timber industry in the late nineteenth century. Eventually amassing over 46,000 acres of prime timber and settlement land, Benson became a business and philanthropic leader of Portland in the twentieth century.

Perhaps most importantly from the point of view of IA, Benson was a strong adopter of small steam railroads for logging and also developed massive ocean-going log rafts that could take his timber to his sawmills as far away as San Diego (over 1,100 miles down the coast!). Further, he was the main force behind the development of the Columbia River Highway in the 1910s. He also is remembered for the $10k he donated to the city of Portland in 1912 for twenty brass free-running water fountains known as "Benson Bubblers," which he donated to provide free and clean water to residents in the downtown, but also apparently to decrease reliance on spiritous beverages (as the *Oregon Encyclopedia* says, "he was tired of workers showing up drunk on Monday morning"!). [For more on Benson, see https://www.oregonencyclopedia.org/articles/benson_simon_1851_1942_]

Downtown Portland

Portland's compact, walkable downtown offers easy access to great food, green spaces, cultural offerings, tax-free shopping and seemingly endless things to do. It is also well served by TriMet, the city's public light rail, the Portland Streetcar, and the bus system. Most of you are likely to have arrived downtown from Portland International Airport on the light rail and we hope you will have a little time to explore the city outside SIA tours. A map of some dining and libation suggestions are below, or the hotel staff can point you towards areas, shops, restaurants, and attractions of interest. Rather than try to point to everything here, we suggest you have a look at **TravelPortland.com, DowntownPortland.org, or TripAdvisor.com**'s page on Explore Portland.

Note that the Portland Rose Festival (far more than the flower show that the name implies!!) is happening the weekend we are in town, with may events occurring on the river just to the east of the hotel. See **RoseFestival.org** for more information.



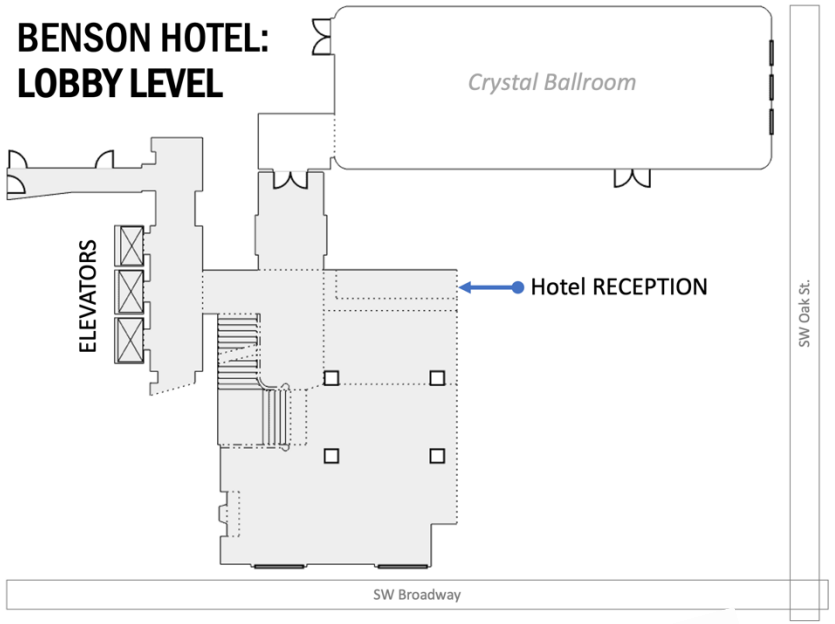
Pub Crawls and Special Interest Groups

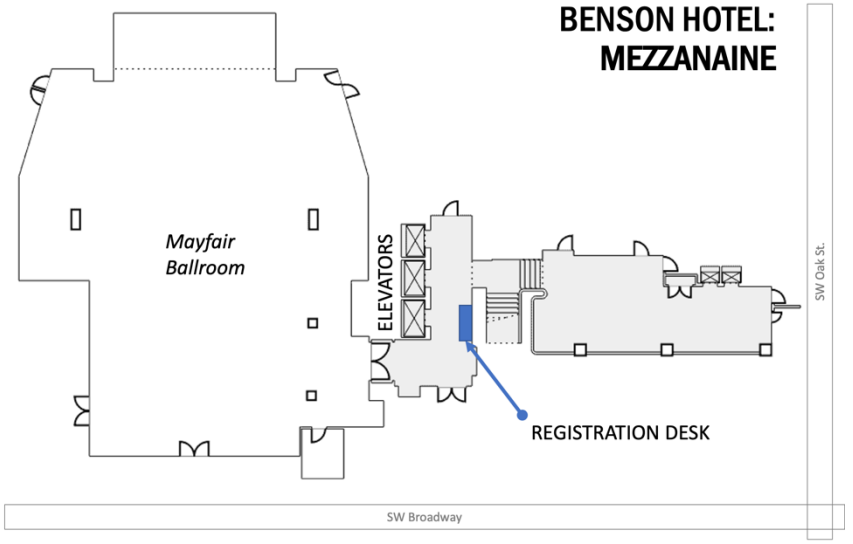
7:30–9:30 pm Friday evening Pearl District Pubs

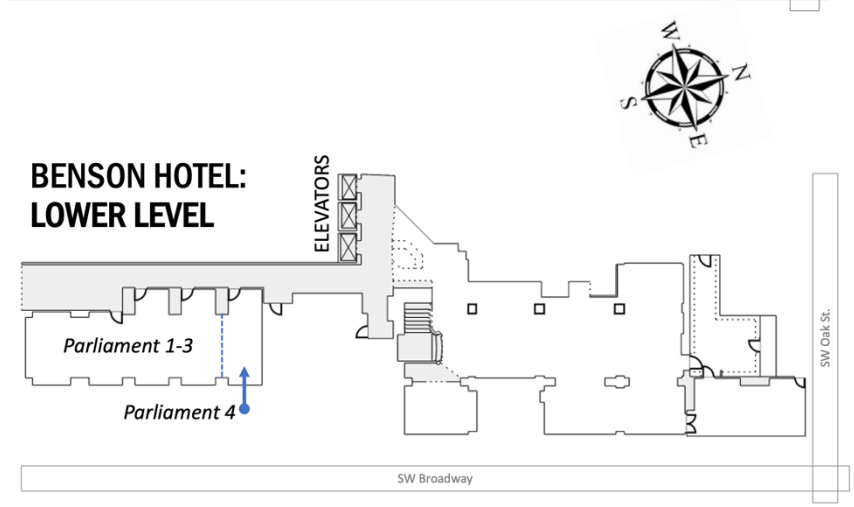
In celebration of Portland's brewing industry, we will be visiting three pubs in the Pearl District of Portland, a five block walk from the hotel. Along the way, we will have tables reserved for Special Interest Groups (SIGs) to meet. The first out of the gate, founded at Bethlehem last year, is the Iron & Steel SIG, to which we have added a Bridges SIG, but all and any are welcome. We will also be developing a notification system for where and when the SIGs may meet up on Friday nights—watch the registration desk area for updates—and SIGs are invited to start a Google Group mailing discussion list with the imprimatur of SIA. Inquire at SIA HQ if you are interested in being the convener of a SIG.

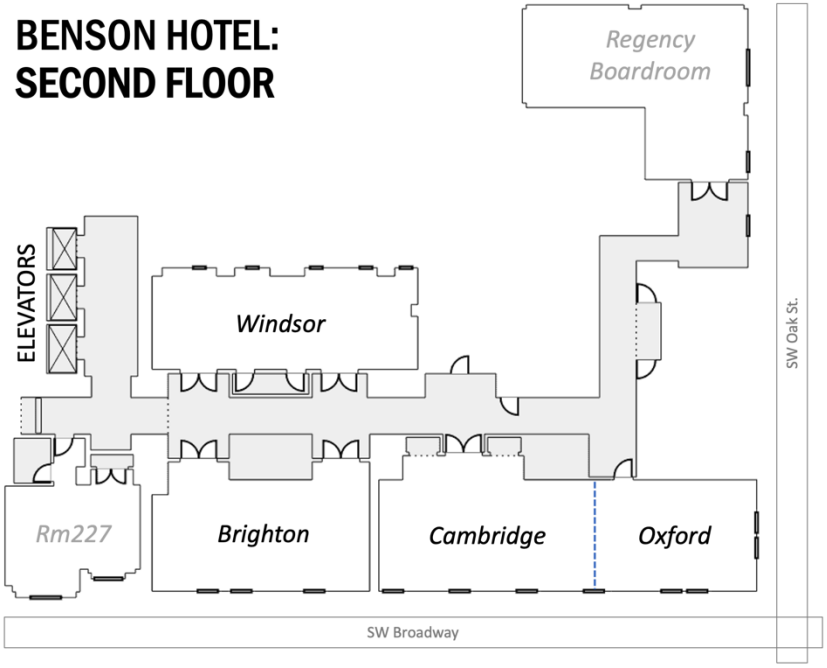
Pubs on the list this year: Backwoods Brewing Co., Deschutes Brewery, and Von Ebert Brewing. Check the registration desk for more information.

BENSON HOTEL ROOM MAPS









Thursday Reception

Join us from 6:30PM onwards in The Lemon Grill in the lower level of the Benson Hotel for a welcoming reception with light refreshments and a cash bar.

RECEPTION SPEAKER

At 7:00PM we will have a 30-minute presentation on Pacific Northwest railroading from VIC NEVES, producer of Winterail, the West's original railroad photography exposition based in Corvallis, OR (**www.winterail.com**); they also have a huge railroadiana fair, but that will not be part of our reception. Winterail features an outstanding lineup of digital presentations from top rail photographers.

The title of Neves' show at our reception will be "**Metallic Machinations**" by Frederic Simon, which showed at Winterail in 2019. This show gives a look at railroading from the point of view of a locomotive engineer. It gives us his inside look at railroading in eastern Washington state near Spokane and the Funnel, and closes in on the railroad he worked on, The Washington Eastern. This show has incredible photography and stunning video.

NEW MEMBERS' WELCOME RECEPTION

New members are welcomed by SIA leadership at 6:00PM in The Lemon Grill —your first drink is on us! It can be hard to meet people at a conference, but we would like to meet you, and you can meet us to discuss your interest in SIA, hopes for the future, and ideas for change. Look for SIA leadership who have the color-tinted badges and say hello!

Presentation Abstracts

1B: A River Runs Through It

8:30–10:00 am Brighton

Renegotiation of the Columbia River Treaty: Hard Structures Make for Hard Choices

Mary Durfee

Michigan Technological University (*Emerita*), Eugene, OR.

Water offers a powerful means of exploring the relationships between policies and technologies. The renegotiation of the 1961 Columbia River treaty is in progress. It was controversial when it was signed, due to the massive infrastructural changes that would take place in the basin—a complex of rivers and lakes the size of France. Dams and other "hard" structures changed the landscape as they turned the treaty into reality. The agreement has improved some features of the basin relative to needs for more hydro-electric power and more flood management. In other ways, it threw away natural, cultural, and economic features of the river, notably salmon. That loss left Indigenous Peoples of the basin without their fish and the culture associated with the salmon. The renegotiation of the treaty is once again controversial with competing goals for energy, flood control, and the return of salmon--all in the face of a rapidly changing climate. A request on both sides of the border to include one tribal member on each negotiating team was rebuffed, but indigenous participation does go on in committees. Whether fish will get their technological due along side power and better flood control is unclear. The hard technology of water management makes change in any of those official or deeply desired uses of the river system difficult. Hard politics follow.

KEYWORDS: Hydropower, Salmon, Treaty

MARY DURFEE Mary Durfee is Professor Emerita from Michigan Tech. She took her Ph.D. from Cornell University in Government and is co-author of two books: *Thinking Theory Thoroughly* and most recently with Rachael Johnstone, *Arctic Governance in a Changing World*. She has published on pollution prevention and on the Canada-Ontario Agreement Respecting Great Lakes Water Quality. This paper is connected to a new book project on US-Canada relations seen through treaties, in which water—including massive joint engineering projects—figures prominently. She is familiar with the SIA through Michigan Tech's Social Sciences Department, marriage, and as co-organizer of the SIA study tour of Malta.

"The Greater Portland Plan": The Industrial Development of the Lower Willamette River

David Ellis

Willamette Cultural Resources Associates, Portland, OR. **davee@willamettecra.com**

Into the late nineteenth and early 20thcenturies, almost all industries in Portland were in or near the city center. As a major port city, proximity to the Willamette and Columbia Rivers was and continues to be critical for industrial development. In the first decades of the 1900s, the City Beautiful Movement, combined with other economic and political factors, led to a shift of industry to the Willamette River floodplain below the city and downriver to its

confluence with the Columbia. I will be exploring the history of this shift and the character of the industries that occupied this seven-mile stretch of the river. What has been the history of this area over the past century and how has the industrial landscape evolved? While some industries remain, many others have disappeared and have left little physical trace. Where is there extant archaeological evidence of this historical development? What are the opportunities for preserving this evidence given modern redevelopment and clean-up associated with the Portland Harbor Superfund Site?

KEYWORDS: Portland, Willamette River, industry

DAVID V. ELLIS has directed archaeological fieldwork and research throughout the Pacific Northwest since 1976. His focus has been on both precontact and historic resources in the northern Willamette Valley and especially in the Portland metropolitan area. His work with historic-period archaeological resources has ranged from a nineteenth-century Chinese laundry to a twentieth-century industrial cooperage to WWII shipyards. David was the lead in developing a model for both precontact and historic-period archaeological resources for the Portland Harbor Superfund Site, the largest and most complex Superfund Site in Oregon. He is currently the project manager for addressing archaeological and historic resources for major new bridge construction in the Portland city center. David has served as president of the Association of Oregon Archaeologists and was appointed by the governor to three terms on the Oregon Heritage Commission.

THE THREE-PILE BULKHEAD AND EARLY 20TH-CENTURY LANDMAKING IN ASTORIA, OREGON

Rick Minor

Heritage Research Associates, Inc., Eugene, OR. **RickMinorHRA@aol.com**

Beginning as a fur trade post in 1811, Astoria at the mouth of the Columbia River is the largest deep water port on the Pacific coast of the United States between San Francisco and Seattle. Due to steep topography, most of the historic business district was constructed on piling, leading Astoria to be referred to in promotional brochures as “the American Venice.” Between 1914 and 1920, a major effort was made to expand the city’s footprint by filling areas along the waterfront previously covered by tidal flats. Known as land-making, this process generally involves building a perimeter structure and filling behind it until the ground level is above the high-tide mark. A distinctive type of perimeter structure known as the three-pile bulkhead was constructed in Astoria. The bulkhead is distinguished by a rock glacis of hand-laid black columnar basalt cobbles that represents the uppermost portion or cap to the bulkhead system. The tops of pilings, remnants from the three sets of timber piles that held the bulkhead system in place, are visible among the rocks of the basalt glacis. The bulkhead extended along the shoreline over a total distance of approximately 9,300 feet. Approximately 2,070 feet (22%) of the bulkhead and glacis have been covered over and developed upon, leaving approximately 7,230 feet (78%) of the glacis capping the bulkhead still visible today. Construction of the three-pile bulkhead was the key development in creating the footprint along the waterfront in this major West Coast seaport as it exists today.

KEYWORDS: Landmaking, River Bank Protection, Seaport Development

RICK MINOR (M.A., Ph.D. Anthropology, University of Oregon) is co-founder and Senior Archaeologist with Heritage Research Associates in Eugene, Oregon, which since 1980 has specialized in studies of prehistory, history, and historic preservation in the Pacific Northwest. Rick enjoys archaeological fieldwork, and feels blessed to have had opportunities to direct investigations in a wide variety of environmental settings and historical contexts recovering archaeological remains spanning the last 10,000 years. He admires scholars who regularly cross disciplinary boundaries, and his research is marked by integration of data from a range of archaeological specializations as well as collaborations with historians and geologists. He was honored to have the opportunity to serve as an Instructor at the University of Oregon

(UO), where between 2009 and 2017 he taught the courses Historical Archaeology in Historic Preservation and Thesis Proposal in the UO Historic Preservation Program. With Susana C. Kuo, he won the 2021 SIA Vogel Prize for their article, “The Oswego Furnace: Industrial Archaeology at the First Iron Works on the Pacific Coast,” *IA* 42, no. 1 (2016).

1C: MINING I

8:30–10:00 am Cambridge

ARCHEOLOGY OF ARTISANAL GOLD BENEFICIATION AND MERCURY PROCESSING 1849-1972

Duane Ericson

Bureau of Land Management, OR. **duaneericson@hotmail.com**

The scope of this presentation is to chronicle the development of the technologies employed in artisanal gold milling and processing (beneficiation) practices, and how the technological advances and common practices are reflected in the built environment, architecture, and archeology of the thousands of artisanal milling sites found across in the American West.

Artisanal beneficiation of gold ore in the western states increased significantly after the California Gold Rush commenced, quickly adapting ancient technologies from around the globe, such as arrastras, Chilean mills, and stamp mills. These basic milling devices and beneficiation processes evolved slowly until newer technologies, such as cyanide processes and ball mills, were introduced in the late nineteenth century, through the Depression-era when innovative miners scrambled to configure often bizarre contraptions combining modern and older technologies, such as arrastras powered by repurposed automobiles. While not well-documented, vernacular milling operations persisted at small gold mining operations well into non-historic times, leaving a surprisingly common, yet overlooked legacy on the mining landscapes of the American West. The findings of this presentation are the culmination of 12-years of research and field surveys.

KEYWORDS: Gold, milling, beneficiation

DUANE ERICSON Duane Ericson has worked as a historic archeologist for the Bureau of Land Management's Abandoned Mining Lands Unit (AMLU) since 2009. During this time, Duane and the AMLU team have researched, recorded, and evaluated thousands of mining and milling sites and features in Idaho, Montana, Nevada, Oregon, and Washington. Duane has researched mining sites throughout the American West since the 1980s and has authored two books pertaining to mining and railroad history. He is currently authoring a book on the evolution of mining camp architecture. Duane holds a M.S.in Historic Preservation from the University of Oregon, with a Terminal Project documenting artisanal milling technology in Southwest Oregon.

USING THE RESULTS OF A PHOTOGENIC MINE TO RECONSTRUCT DETAILS OF A MINING LANDSCAPE

Fred Quivik

Quivik Consulting Historian, Inc., Saint Paul, MN. **quivik@usfamily.net**

Colorado is known for its photogenic mining remains. One of the more photogenic locales is Creede and its surrounding mining district, tucked away in the San Juan Mountains of southwestern Colorado. A particularly popular view, going back to the 1890s, has been that of Bachelor Mountain and its mine workings. The steepness of the mountains in the area created a complex array of mining structures and property relationships among the competing mining companies, relationships which had to be untangled and understood in the context of recent Superfund litigation. This paper will describe how the author used historical photographs of Bachelor Mountain—many of them undoubtedly made because of the photogenic nature of the subject—along with plat maps for patent applications and other historical resources, to create an understanding of development of the companies' mine-waste piles, which were the objects of inquiry in the Superfund litigation. The presentation

will include a summary overview of the Creede mining district and the history of the two main companies involved at the site, the Nelson Tunnel and Mining Company, and the Commodore Mining Company. Because the limited space for waste rock in the West Willow Creek canyon, where the mine portals are located, the two companies negotiated legal agreements around 1890 that resulted in distinct deposits of waste rock. Extreme flow in West Willow Creek during spring run-off in 2005 eroded major portions of the waste rock, leaving it impossible to discern distinctions in waste-rock piles without resort to historical evidence in photos and maps of that surface topography. This paper will describe the conclusions the author was able to draw based on that historical evidence of the mining landscape in West Willow Creek.

KEYWORDS: mining, waste rock, photography, Colorado

FRED QUIVIK Fred Quivik retired in 2015 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 served a six-year stint as editor of IA: The Journal of the Society for Industrial Archeology. Now living in Saint Paul, he continues working as an expert witness in environmental litigation. One of his recent cases involved the Creede mining district.

RAIL TRANSPORT AT THE YELLOW ASTER GOLD MINE

Dan Quine

independent scholar, San Francisco, CA. **gwernol@gmail.com** and Narrow Gauge RRs: **danquine.com/rail.php**

Yellow Aster was the most productive gold mine in southern California. Its discovery in 1895 spurred a gold rush that led to the development of the twin boom-towns of Randsburg and Johannesburg in the mountains of the Mojave Desert. The gold-bearing granite deep within Rand Mountain was extracted using a mule-hauled 18-inch gauge railroad. Once the granite was exhausted, lower-grade schist was mined from a vast “glory hole” open pit using an unusual 30-inch gauge gas locomotive built by the Union Gas Engine Company of San Francisco. This was later augmented by a trio of Porter steam locomotives specially adapted for use underground. The unique physical layout of the mine resulted in innovative trackwork and working practices.

This in-depth study describes the rapid development of the Yellow Aster mine, its gold extraction technologies and the railroads that served it, from its discovery to the start of the Second World War. It includes detailed computer reconstructions of the mine site, mills and railroad, and charts the rapid development of the system from a set of isolated hand-dug adits to a self-sufficient and fully integrated gold mining operation that extracted more than 3 million tons of rock in less than 50 years.

KEYWORDS: Railroads, mining, California

DAN QUINE Dr. Quine is a Computer Scientist who is currently Senior Vice President of Engineering, Product and Design for San Francisco analytics company Mode. He is also a researches the history of narrow gauge railroads around the world, having published more than 30 articles and two books on the subject.

1W: PLACES AND MAKING

8:30–10:00 am Windsor

A CAN OF WORMS?
A CHRONOLOGY OF CAN OPENERS AND A DIAGNOSTIC READING OF THEIR EFFECTS ON CANS

William Schroeder

Arete Cultural Resources Management, Yakima, WA. **ochreman.ws@gmail.com**

Pull tabs revolutionized the way beverage cans and food containers were opened and their contents consumed. Ermal Fraze is credited with this, yet he was not alone in the invention nor was he technically the first. Until recently, pull tabs were not considered anything other than 'noise' in Historical Archaeology because they had not yet met the 50-year-old threshold. As of 2015, ring pull tabs entered the historic era, yet relatively little is known about these artifacts. In order to place these artifacts in context for historical archaeologists who have located and will more frequently encounter these items of disposable material culture, a typological database has been built by Dutch Archaeologist, Jobbe Wijnen, to provide a world-wide archival reference (**pulltabarchaeology.com**). There are hundreds of patented variations and manufacturing methods in the United States Patent and Trademark Office filed and accepted between c. 1950 and 1980, yet there are really only two geni--pull and push, and four species--"snap top," ring pull, stay-tab, and push button. Taking a cue from Biology, US patents were arranged by family based on the first instance of a morphological characteristic (clade) and by progenitor (inventor) then put in numerical/chronological order based on their patent or design filing and/or acceptance dates (cline) thereby generating a genealogy or family tree that charts their evolution. Not all patents or designs saw nationwide production or distribution; some never saw production. One should also keep in mind the "time lag" between a patent's filing, patent pending production, and its official acceptance. Products also had a use life and disposal period that often extended past its manufactured date range. Functional ease, compatibility with can manufacturing machinery, reduction of harm, and social externalities also influenced the food and beverage container industry to "build a better mousetrap." Then there's also "Sister Frange"...

KEYWORDS: Can openers; technologies; chronology; patents

WILLIAM SCHROEDER William Schroeder is an Archaeologist with a passion for the sublime as well as the mundane. He has investigated the hybridizing of digital images with antique stereoscopes, the evolution of beverage can opening technologies (i.e., zip tops and ring pulls), has used LiDAR imagery to locate the object of Mormon ideological desire in the nineteenth and early twentieth centuries, New Zion, in the landscape archaeological record of North America, has trained others on documenting placer mining features and irrigation ditches, and more recently has turned his attention to tin cans and can openers. William earned his M.S. in Cultural and Environmental Resource Management-Archaeology from Central Washington University in 2010 and his Ph.D. in Cultural Heritage and Applied Anthropology--Historical Archaeology and Preservation from the University of Montana in 2018. He currently serves as the Supervisory Forest Archaeologist for the Confederated Tribes and Bands of the Yakama Nation in Washington State.

THE RISE AND FALL OF CORPORATE SAWMILLS IN MONTANA

Brian Shovers

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In order to fully understand the dominance of corporate sawmills in Montana in the twentieth century and their subsequent decline, one must consider a number of factors besides the technology needed to operate them, such as the source of the trees needed to cut boards; public differences on how to manage public forests; international markets; Montana's short growing season; and distance from markets. The story spans five decades, beginning in the 1940s and ending in the 1990s.

The combination of a decade of severe economic depression and four years of war culminated in a significant housing boom, creating an unprecedented demand for lumber. By the end of the 1950s, over 15 million housing units were under construction, and the Montana sawmills responded by building plants to make plywood, particleboard, and dimensional lumber As the demand increased so did the exploitation of both private and public timberlands. The adoption of both new technologies in the woods and the mills would lead to serious environmental problems in the forest, such as soil erosion and stream siltation. Without sustainable forestry practices you cannot expect to have a sustainable industry.

Between the end of World War II and the early 1980s a number of major national wood products companies began consolidating local mills in Montana. Montana timber employment peaked in 1978 with 13,494 workers. The nine largest mills produced 98 percent of the state's lumber. Montana's largest mills were purchased by prominent out-of-state corporations like Champion International, Stimson Lumber, Weyerhaeuser, Louisiana Pacific and Smurfit-Stone, creating a series of challenges beyond their control. These included slumping housing markets, forest disease and fire, a burgeoning environmental movement, and depletion of both private and public forest lands.

Between 1990 and 2016 twenty-seven corporate mills closed in Montana.

BRIAN SHOVERS has been a leader in IA since the early 1980s and recognized for his efforts documenting and preserving resources at nationally significant mining heritage sites, and his many spectacular efforts at promoting his state's varied industrial heritage through tours, conferences, workshops, surveys, research and publications. He was the recipient of the 2020 SIA General Tools prize and is a founder and long-time president and newsletter editor of the SIA chapter in Montana (Klepetko). He has also co-leader of three highly memorable SIA Fall Tours.

2B: A BRIDGE TO SOMEWHERE

10:30 am–12:15 pm Brighton

THE 1882 HAYDEN RAILROAD BRIDGE *[PRE-RECORDED]*

Julie Bowers

NSRGA/Workin' Bridges, Grinnell, IA. **jbowerz1@gmail.com**

A nineteenth-century phoenix cast iron whipple truss stretching 223' feet across the McKenzie River in Springfield Oregon is one of the reasons the timber industry flourished in the Mohawk Valley in the twentieth century. Served by a railroad and a bridge that was moved from the Bear River in Corrine, Utah as documented in 1896, erected and serving the valley by 1901.

Pictures and the history of the bridges beginning on the transcontinental railroad are few, and the history of the bridge in Oregon has been chronicled over time. This presentation utilizes the research of historian Jay Swofford that correct and adds to the record. A National Register nomination is now in the works to showcase this bridge's part of development in Oregon.

The Hayden RR Bridge was owned by Weyerhauser when the railroad stopped bringing timbers to Springfield in 1989. In 2015 it was going to be scrapped, the price was out of reach at a million dollars to pull the bridge and it was put up for sale as means of preservation to North Skunk River Greenbelt Association (NSRGA). NSRGA replaced missing railroad ties, utilizing the old as possible, adding deck and railing. The bridge was opened to pedestrians in 2018 and efforts to find a local owner continue are aided by the creation of Hayden Bridge Foundation who is hosting with NSRGA/Workin' Bridges a summer series promoting the area in 2022.

Our conclusion is the same as always, every historic truss bridge project is different. The differences are driven by location, state, cost including risk management, and engineering. Hayden RR Bridge exhibits an exceptional degree of the patina of time, and it has been our pleasure to preserve that, while showcasing the incredible cast iron bridge where it stands over the McKenzie River in Lane County, Oregon.

KEYWORDS: Mohawk Valley, timber, historic truss bridge, whipple, phoenix.

JULIE BOWERS has worked to preserve bridges for NSRGA / Workin' Bridges for over 12 years. The first preservation project was to find a home for the wrecked Skunk River–McIntyre Bridge bowstring, which now lives in the heart of Delaware's newest state park, Auburn Valley. Other bridges in the trail system for Auburn Valley include a pony truss from York, Pennsylvania, a pratt truss from Owosso, Michigan and the Portland Water Works bridge over the Sandy River. Workin' Bridges is currently wrapping up the DNREC projects and Watts Mill Road Bridge that will become part of Beaver County inventory for Pennsylvania. All of these bridges are in contract to Bach Steel. Leaving Hayden RR Bridge in good hands is one of the last projects for the company, writing and presenting papers and documentaries advocating in-kind restoration and preservation of historic bridges and the greenbelts they occupy. Success rate of about 15% on saving bridges that site visits were provided by NSRGA.

ORIGIN STORIES: THE MYSTERIOUS MAKER'S MARKS OF THE BRIDGEPORT COVERED BRIDGE

Christopher Marston

HAER / SIA Past President, Silver Spring, MD. **chmarston29@gmail.com**

A thirty month-long rehabilitation project was completed in October 2021 at the Bridgeport Covered Bridge, an 1862 Howe truss in California Gold Country. During the disassembly process, the rehab team discovered maker's marks on several of the original wrought-iron tension rods. Over a dozen different stamps were identified on the 50+ rods found to have markings. While some were associated with a variety of foundries from Staffordshire, other locations in the UK, and possibly even Australia, the origins of the other markings remains a mystery. Although the historic rods were ultimately replaced by Cor-ten steel rods as part of the engineer's design, eight of the original rods were inserted into the bridge in the end panels for display. This presentation will review this unique rehabilitation project and explore the origins of some of the historic elements found on this 160-year-old bridge.

KEYWORDS: covered bridges, rehabilitation, British wrought iron

CHRISTOPHER MARSTON Christopher H. Marston has been an architect and project leader with the Historic American Engineering Record for over thirty years and has documented numerous bridges and railroad-related structures, among others. A thirty-year member and past president of the SIA (2018-2020), his most recent books are Covered Bridges and the Birth of American Engineering (2015) and Guidelines for Rehabilitating Historic Covered Bridges (2019).

ST. JOHNS BRIDGE: INNOVATION IN SUSPENSION BRIDGE DESIGN

Robert Dermody

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The historic St. Johns Bridge is a remarkable feat of innovative structural engineering design and a landmark example of early American bridge building. The steel suspension bridge spans 1207 feet over the Willamette River a few miles northwest of downtown Portland. When it opened in 1931, it was the longest spanning suspension bridge west of Detroit. In a controversial choice, an east coast consulting firm, Robinson and Steinman of New York, was selected to design the new record-setting span. David B. Steinman, who would become one of America's most prominent bridge builders during the first half of the twentieth century, took the role of lead engineer.

Steinman proposed designs for both a cantilever and a suspended form. The suspended form was ultimately selected to accommodate site conditions, to reduce costs, and for aesthetic reasons, an important aspect of Steinman's approach to engineering projects.

The proposed bridge featured the creative use of materials and unique structural forms to achieve an economical, efficient, and elegant design. Reinforced concrete pedestal piles were used in the anchorage foundations. Tall concrete arched viaduct piers were reinforced with steel frames to support the approach spans. The "all steel" towers which had become standard for suspension bridges, reached almost 400 feet tall, to accommodate the required sag of the main cables, and the 200-foot clearance above the water below. One of the bridge's signature design features were the gothic arch braces in the towers, much more expressive than traditional cross-bracing. The 16-inch diameter main suspension cables were also innovative, using twisted strand steel wire cables fabricated by the John Roebling Company in New Jersey.

This paper will focus on the unique design and construction of the historic St. Johns Bridge and evaluate its significant contributions to twentieth-century American bridge building, as it approaches its hundredth anniversary.

KEYWORDS: Suspension bridge, structural design

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

THE EVOLUTION OF CABLE MAKING TECHNIQUES IN NINETEENTH CENTURY SUSPENSION BRIDGES

Paul C. King

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As the nineteenth century began, engineers experimenting with the "suspension method" tested different means of suspending bridges. These "modern" suspension bridges began with American James Finley who added vertical suspenders of varied lengths to hold a level deck capable of supporting horse drawn carriages. Finley's 1801 bridge across Jacobs Creek in Pennsylvania, made use of two suspension chains of large iron links, hanging from wooden trestles.

By 1811 Finley's ideas traveled to England where Samuel Brown and Thomas Telford advanced the construction of chain suspension bridges. In 1820 Brown completed the Union Bridge, with England's first level deck for carriages, using three parallel chains on each side. Instead of large links, Brown used long round eye-bars pinned together by a large shackle, making chains of greater strength. By 1826, Telford completed his first suspension bridge across the Menai Straits, flattening Brown's round bars to form chains of multiple parallel links, a method that became standard among English engineers.

In the early 1820's the French sent their engineers to England to learn their methods but opted instead for iron wire cables. Led by Marc Sequin, Guillaume Henri Dufour and Joseph Chaley, the French suspended their bridges from multiple small wire cables strung "like garland".

As engineers in England and France built their first suspension bridges, a young John Roebling attended the Bauakademie in Berlin where he was exposed to both schools of thought and in 1830 Charles Ellet Jr. travelled to study in France. These two engineers would bring suspension bridges back to America, with Ellet following French techniques and Roebling developing his own unique methods, many of which we still use today.

This paper presentation does not focus on any specific bridge but looks to contrast and compares the "methods of suspension" practiced by English, French and American engineers.

KEYWORDS: Suspension, Bridges, Roebling

PAUL C. KING is a professor of Architectural Technology at New York City College of Technology, and a licensed Architect with degrees in Architecture, Landscape Architecture and Urban Design. He is a past president of the NY chapter of the Society of American Registered Architects and a member of the Society of Industrial Archeology. His research focus is the early work of John A. Roebling for which he is writing a

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

2C: MINING II

10:30 am–12:15 pm Cambridge

AN ASS-KICKING TRAIL IN NEVADA'S CORTEZ MINING DISTRICT

Robert McQueen

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North-central Nevada's Cortez Mining District was a silver camp discovered in 1863, shortly after the mineral rushes to Virginia City/the Comstock. The initial discoveries were in Mill Canyon on the north face of 9,200-foot (2,800m) Mount Tenabo. It was here that miners established the first town (1863), and the first mill (1864). However, richer mineral discoveries on the south side of the mountain quickly gained prominence. Connecting the two sides of the mountain became an important consideration, especially the delivery of ore from the south facing mines to the mill in the north canyon. The only reasonable wagon road had to circumvent the mountain, a 10-mile route. A significantly shorter but much more arduous choice was to go through the mountain via Arctic Canyon, which cut the travel in half but was only capable with mule teams, not wagons. Historic accounts indicate that both travel routes were built and used extensively until the 1880s when Mill Canyon was finally abandoned. The mule trail was largely forgotten until 2015 when archaeologists started systematically recording the mine ruins in Arctic Canyon. The mule trail turned out to be a surprising piece of early transportation engineering in the Cortez District and this paper presents on that discovery.

KEYWORDS: Mining, Transportation, Western US

ROBERT MCQUEEN is Principal Investigator with Summit Envirosolutions, Inc., an environmental and cultural resources consulting firm in Reno, Nevada. For over 20 years Mr. McQueen has been documenting and writing about Nevada's ghost towns, mining camps, and historic ranches, including several articles and a book on the Cortez Mining District. Mr. McQueen helped organize the SIA's 2019 Fall Tour of Reno and the Mining History Association's 2020 conference in Elko, Nevada.

THE HEADFRAMES OF BUTTE

Eric Kneebone

Independent scholar, Bremerton, WA. **edkneebone@gmail.com**

Headframes have become symbolic of mining culture, adorning public and private logos, and forming a focal point to rally preservation efforts. Much like the Eiffel Tower has come to symbolize Paris for many people, these examples of unintentional monumental architecture have become a source of identity for hard rock mining communities. As headframes were always intended, like most mining surface plants, to be a temporary installation, all that is left of thousands of such sites are foundations and dumps. Butte, Montana, Eureka, Utah; Tonopah, Nevada, Victor, Colorado, and Houghton, Michigan all have the iconic headgear of their mines as identifying features. In the Butte District, hundreds of headframes were erected, and many were simply abandoned after their use had passed. Photos from the early 1900s show many small two post development class structures all over the Butte Hill, many even in backyards of homes. Today, these small headframes and shallow workings are all but forgotten, while the steel headframes are as integral to the identity of butte as the Hollywood sign is to that city. The steel headframes that remain were under threat of dismantlement in the early 1980s, and one was partially dismantled after 1983, resulting in a preservation movement. However, much as myths and legends begin, what people know

about these structures is “what people know”, and there is a surprising amount of technological achievement that has been forgotten. Examples include the largest steam hoists of the nineteenth century, the largest electric hoist of the early twentieth century, and the early commitment by mining companies to renewable energy for operations (albeit for economic reasons as opposed to environmental stewardship). This presentation will explore the history of Butte’s Headframes, their status, and touch on preservation for future generations.

KEYWORDS: Mining, Butte

ERIC KNEEBONE has been a professional archaeologist since 2008, working for Powderhorn Archaeology, San Juan County Museum Association Division of Conservation Archaeology, ERO Resources, Ecosystems Management, Aztec Archaeology, and the Falls Creek Shelter Project for the Colorado State Historic Fund. Concurrently, he has been employed in Facilities Mangement at San Juan College, Olympic College, and is now with the Environmental Services Department of Harborview Medical Center and is a APPA Certified Educational Facilities Professional (CEFP). Mr. Kneebone's background is in southwestern archaeology and mining archaeology, with work in the San Juan Mountains and Leadville Colorado areas coupled with extensive knowledge of Butte mining operations. Eric is a member of the Colorado Council of Professional Archaeologists and SIA.

WARTIME INDUSTRIAL BOOM: THE DEFENSE PLANT CORPORATION AND INDUSTRIAL AMERICA, AS EXEMPLIFIED BY THE SCOTIA, PA

Steven A. Walton

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As the largest sponsor of industrial sites that you have probably never heard of was the Defense Plant Corporation (DPC)m which existed only from 1942–1945. It was formed as a subsidiary of the Reconstruciton Finance Corporation (RFC, one of Roosevelt’s “Alphabet soup” agencies) as a wartime emergency measure to boost production during WWII. The DPC facilitated the development of over 6,000 industrial sites across America, took control of large sectors of American industry indirectly (and in some cases directly nationalized it for a time), and were responsible for both the wartime boom in production to defeat the Axis. Also in at least in some sectors, they set the stage for the reconversion—swords into plowshares and all that—of industry after the war.

This paper will trace how the abandoned late nineteenth-century Carnegie iron mines of Scotia, Pennsylvania—the earlier period having been the focus of two of my earlier SIA presentations and an article and *IA*—were independently reopened immediately following Pearl Harbor by M.E. Wallace of Sunbury, PA, but then seriously upgraded by the DPC after its formation in mid-1942. The DPC facilitated new equipment, technology, and massive concrete installations which still survive on the landscape. That said, the entire endeavor was a failure and Wallace quite a literally walked away from his investment and left the keys with the government. The federal intervention brought not only financing but also the regional dissemination of industrial knowledge from mining firms in the Mesabi Range of MN and a noted Cleveland engineering firm.

KEYWORDS: WWII, iron mining, federal support, PLANCOR

STEVEN A. WALTON has been a member of SIA since 1994 when our conference came to his graduate school city of Toronto, and he enjoyed stuffing the packets and leading a tour to Hamilton so much that he has stuck around (more or less) since then. He is now an associate professor of history in the Industrial Heritage and Archaeology Program at Michigan Technological University. He works on the history of industrial production and technology, spanning the centuries from the sixteenth up to the early twentieth,

and often where that technology has connections to military industrial history. He is currently editor of *IA* and the SIA's executive secretary.

A Hazardous Profession: The Construction and Deconstruction of the Industrial Worker in Industrial Accident Reports

Paul White

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Discussions of accidents and fatalities in the mining industry often draw attention to the dangers of underground work for good reason. Falls, cave-ins, explosions, flooding, and toxic gases ranked as leading causes of injury, and a single accident underground sometimes claimed multiple lives. But the hazards of the job also extended to nearly all facets of mining operations, including surface facilities where material from the underground was processed. Milling plants were a common feature at gold and silver mines because they offered immense savings to shipping costs. However, accident records show that investment in ore processing mills also came with a human cost. This paper outlines the complex history of industrial accident reporting in the United States, with a case study of injuries reported at the Alaska Juneau Mill, Alaska's historically largest gold mine. There, an unusual thoroughness in reporting permits detailed insights into the causes and consequences of more than 700 milling accidents occurring between 1928 and 1941. The analysis of these records reveals distinct patterns in mill-related injuries as well as insight into the causes of accidents ranging from the mill's structural design to the culture of work. Notable silences in accident reporting also highlight ways that industrial worker's body came to be defined for purposes of compensation.

Paul White is an Associate Professor of Geography at the University of Nevada, Reno. His research interests in industrialization center upon the social, technological, and environmental transformations associated with North American mining. His archaeological work has included the documentation of historic mining sites in Alaska, California, Michigan, Vermont, as well as Cornwall, England His book, The Archaeology of American Mining (2017), which synthesizes 50 years of archaeological scholarship, received the 2019 Mining History Association's Clark Spence Award. His most recent article in *IA* examined historic labor routines at a small-scale gold milling plant.

2W: MUSEUMS AND LEARNING

10:30 am–12:15 pm Windsor

KNIGHT FOUNDRY TODAY–50 YEARS IN THE MAKING

Leonard Fallscheer

Knight Foundry, Sutter Creek, CA. lfallscheer@csuchico.edu

Knight Foundry in Sutter Creek, California is the last remaining example of early manufacturing that developed in the Mother Lode region to service the gold mines of the area starting in the 1850s and running through 1942. Knight Foundry continued to serve the lumber and timber industries, other mining activities, historic preservation and equipment manufacturing into the 1990s.

Today, Knight Foundry is owned by the City of Sutter Creek and operated by the Knight Foundry Alliance, a non-profit organization managed and run by volunteers starting in 2017. The foundry site is now open once a month for public tours and group tours by reservation. Volunteers are doing continuous repair and maintenance on the site, historic technology classes are being offered and more are planned and a group of machine tool restoration volunteers refurbish vintage machines for sale for fundraising. The foundry blacksmith volunteers and the California Blacksmith Association now offer blacksmithing classes regularly. A California Foundry History Museum, classroom, office and archives room is planned for the reconstructed pipe shop building at the east end of the site.

Historic preservation and program development can be a slow process and the path to the Foundry operation today started in 1972. This presentation will quickly cover the various efforts that have taken place since then and then look at the current state of the Foundry site—organization, current programs and activities and plans for the future. Next year Knight Foundry will be 150 years old and of those years, it has taken 50 to save it for future generations.

KEYWORDS: Knight Foundry, preservation, public programs

LEONARD FALLSCHEER was born and raised in Seattle, WA, moving to Los Angeles in 1956. He attended San Diego State College, majoring in Chemistry and Physics, for two years and then spent the next year traveling through 28 countries in Europe on a motorcycle. He then returned to San Diego and worked for Don Vesco Yamaha as a motorcycle mechanic and tried to enroll back at SDSC with no success because of enrollment impact due to Vietnam. He did get into Cal Poly Pomona (math and computer science) and worked and raced for K&N Motorcycles until drafted into the Army in February '69. He was given a "civilian acquired skills" MOS 84B20-Photography as a result of previous work in motorcycle race photography and association with *Cycle News* as a journalist. He ended up in Vietnam for a year as a PIO (public information office) journalist for the 1st Cav Division then returned to Santa Rosa for 3 years working for the *Press Democrat* newspaper and buying and selling old 356 Porsches that required rebuilding engines and transmissions as well as electrical and suspension issues.

He moved to Perth, Australia early in 1974 and took a job with Porsche doing machine work as well as engine and transmission rebuilding before returning to the U.S. to get a teaching credential at Chico State University, getting a M.S. in Computer Aided Manufacturing along the way. Chico State offered him a job as a lecturer in the Metals Manufacturing program as well as teaching computer programming in Computer Science. He shifted to a tenure-track Professor specializing in manufacturing tooling and industrial automation (robotics, PLC programming and conveyor control) in 1982. He also taught machining (material removal) and material joining (welding, mechanical fasteners and adhesives), as well as fluid metallurgy (foundry) before retiring in 2015. He is currently a member of the board of directors for Knight Foundry in Sutter Creek, and still works on Porsches and motorcycles when he gets a chance.

THE PORTLAND ZOO RAILWAY (PZRY): PRESERVING AND RESTORING A MARVELOUS RIDE

Melissa Darby

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The Portland Zoo Railway (PZRy) was built in 1958-1959 and called "The Biggest Little Railway in the Country." It was constructed in forest land on the western edge of the city limits of Portland. There are approximately one and one-half miles of track built on a series of grades through the Oregon Zoo and Washington Park. The zoo itself was still under construction when the first passengers came aboard. The railroad gave passengers views of animals in the zoo, wooded landscapes, and the spectacular vista of the cityscape and the Cascade Mountains beyond from the Washington Park Station. The route was surveyed by engineers of the Southern Pacific Railroad, and the grade was engineered by the staff of the Spokane, Portland and Seattle Railroad. The line includes a 150-ft long tunnel, a 210' long 24' high trestle built on a 75' radius loop, and two significant embankments on an "S' curve. The track is 30-inch gauge track and the rolling stock was built to 5/8ths -size standard railroad equipment. There are five locomotives which include a classic American 4-4-0 steam engine called the Oregon; the custom built Zooliner, a streamlined aluminum-bodied mid-century futuristic train; and a diesel-powered engine built in 1929 by Baldwin Locomotives, and a gas-powered industrial locomotive built by Whitcomb Locomotive Company in 1938 for use in a lumber mill.

The railroad (tracks, tunnel, trestle, platforms, and signals) and the rolling stock are the work of many talented professionals, and as a whole these elements embody the distinctive characteristics of a well-designed and engineered railroad, distilled to smaller scale. This presentation will describe the community effort it took to build the railroad and describe the some of the engineering features of the railroad and rolling stock.

KEYWORDS: Railroad, Engineering, Steam Locomotive

MELISSA DARBY is an award-winning historian and anthropologist, and affiliated research faculty in the Anthropology Department at Portland State University. She is principal investigator and sole proprietor of Lower Columbia Research & Archaeology. Darby has worked for over forty years in the Northwest and is a noted authority on the ethnohistory of the Native people of the lower Columbia River region. Her book *Thunder Go North: The Hunt for Sir Francis Drake's Fair & Good Bay* was published by the University of Utah Press in 2019 and is about the mysterious and vexed question of where Francis Drake landed the Golden Hind in the summer of 1579.

ONLINE INTERACTIVE DISPLAYS FOR DIGITAL INDUSTRIAL HERITAGE

Kyle Parker-McGlynn

Michigan Technological University, Evans, CO. **jparkerm@mtu.edu**

The goal of this paper presentation is to do an in-depth examination of the current state of public digital interaction in industrial heritage. I will examine what digital technologies industrial heritage sites are using, what digital technologies they not using, and why that is. This paper will identify what are the current digital learning plateaus out there and which museums are running into them and why. By understanding what types of technologies are being used in digital industrial heritage a proper definition of "good" digital industrial heritage can be obtained. The idea of defining what it means to have "good" digital industrial heritage is so important right now because so many museums are already operating on a limited budget. Although there is no such thing as a one answer solution to

such a broad question as what good digital industrial heritage is. By identifying “good” examples of how museums of different sizes and technological capabilities use digital industrial heritage a museum can make more informed decisions on how to move forward in digital industrial heritage.

KEYWORDS: Industrial Heritage, Digital, Online Museums

KYLE PARKER-MCGLYNN is currently a graduate student in the Social Science department at Michigan Tech University, on the doctoral tract for Industrial Heritage. He is interested in digital heritage with a focus on how digital industrial heritage can augment not replace how current industrial heritage is done. By finding ways to properly augment industrial heritage he believes that an all-around more enriching experience can be created.

3B: IRONS IN THE FIRE

2:15– 3:45 pm Brighton

FIRST IRON SMELTING OPERATION ON THE PACIFIC COAST, LAKE OSWEGO, OREGON

Clark Niewendorp

Geologist–retired, Tualatin, OR. **cniew@yahoo.com**

The story of mining iron for the iron furnaces at Oswego (i.e., Lake Oswego), Oregon provides one more piece of the tapestry that makes up the fascinating history of Oswego's iron industry. Over a period of 27 years the smelting operation in the small-town of Oswego 10-miles south of Portland produced 93,404 tons of pig iron.

The first furnace was built in 1866; went into operation in 1867 and smelted iron ore intermittently until 1885. A portion of the furnace still stands at George Rogers Park. A year later a new furnace was built a short distance north and operated from 1888 until 1894. Nothing visible remains of this furnace except the furnace's crucible.

The Prosser mine lies about 2.5-miles west of the furnaces. There the limonite (bog-ore) bed has been worked to a considerable extent with mining beginning as early as 1867. According to historical maps, the length and breadth of the area mined-out is about a mile long along strike and half mile wide. This mine provided about three quarters of the iron ore shipped to the furnaces. The rest came from a smaller deposit, known as the Patton mine, about two miles to the south. Iron ore was strip-mined at the Patton mine of which nothing visible remains today.

The locations of four collapsed adits (passages leading into the mine) and a possible three more are visible from the lidar imagery. Other abandoned mine features are also apparent including the outline of two waste rock dumps, the trace of a wood track bed between the four adits, and part of a narrow-gauge steam railroad that traverses the south side of Iron Mountain.

CLARK NIEWENDORP Clark Niewendorp has lived in Oregon over 20 years. He is a retired geologist with a B.S. in Geology from Southeast Missouri State University and a M.S. in Geology from Western Michigan University. Clark has 38 years of varied geologic experience starting as a mine geologist for the former Ozark Lead Company in southeast Missouri including work in the Kentucky-Tennessee oil fields, in environmental regulatory and consulting, and 10 years with the South Carolina Geological Survey. Clark retired in 2018 after 19 years with the Oregon Department of Geology and Mineral Industries (DOGAMI) shepherding various projects.

PETER KIRK, SEATTLE PIONEER WITH AN IRON WILL *[PRE-RECORDED]*

Saundra Middleton

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In 1886, industrialist and inventor Peter Kirk, arrived in the Pacific Northwest to investigate building a subsidiary to his Moss Bay Hematite Iron & Steel Company of England, a world-renowned rail manufacturer. The new operation was expected to be the largest ironworks west of the Rockies, with a capacity of 3000 tons a week to supply North America's western rail lines in addition to foreign markets in China and South America.

This paper covers Peter Kirk's background, including a summary of his family's 100-year history in iron manufacturing in Derbyshire, England during the Industrial Revolution. Kirk was immersed in the iron trade from birth. It was his education and ready-made livelihood.

He was a product of the Victorian Age and subsequent Second Industrial Age with its flood of inventions and the introduction of Bessemer steel. His iron and steel works were very successful, augmented by his many patents he utilized in his company to cut labor and fuel costs, increase the quality of his products, and create new merchandise. This paper will discuss some of those inventions and how Kirk sought to duplicate that success in the US to combat Britain's diminishing iron market ravaged by America's expansion.

He found a likely place in the Puget Sound area. However, no matter how much he steeled his resolve, he could not overcome hostile immigrant status, feuding frontier towns and railroads, nor the devastating 1893 Financial Panic. Even though Kirk's steel mill in Kirkland, Washington never produced an ingot, his effort brought attention and investors to the Pacific Northwest. The region's raw materials were mapped and tested. Railroads were expanded, which in turn spurred growth. KEYWORDS: ironworks, inventor, industrialist, pioneer

SAUNDRA MIDDLETON is the author of "The Pioneering Life of Peter Kirk---From Derbyshire to the Pacific Northwest," released in the summer of 2021. This biography about Peter Kirk, iron master, culminated after decades of research, some taking place in the archive vaults of England. Saundra received her bachelor's degree in English from the University of Alaska. She has published dozens of articles in *Alaska Business Monthly*, *Alaska Magazine*, and other publications.

THE FATE OF THE STEEL INDUSTRY IN THE WESTERN UNITED STATES, 1850–1938

Anthony Meadow

independent scholar, Oakland, CA. **ameadow@gmail.com**

The history of the iron and steel industries in the western United States is very different than what most people are familiar with in the eastern and midwestern states. There were more than 800 iron furnaces in Pennsylvania alone, not to speak of blast furnaces, rolling mills, etc. In the history of the western states (WA, OR, CA, ID, MT, WY, CO, AZ, NM) there were no more than a few dozen iron furnaces, blast furnaces, rolling mills, etc. in total built (or even attempted) between 1850, the year California was admitted to the union, and 1938, right before World War II.

Some enterprises were well-funded, certainly for the west, such as the Columbia Steel Company. The investors included prominent San Francisco capitalists and the company built a steel mill in Pittsburg, California. The plant made tin plate, in much demand in California to make tin cans to pack fruits and vegetables, as well as wire rope and fencing.

Other companies used new technologies, such as the Noble Electric Steel Company. This company used electric arc furnaces to make steel in California in 1909. They brought in a prominent engineer, Paul Héroult, to consult for them. Héroult was the French inventor of the aluminum electrolysis and developer of the first successful commercial electric arc furnace.

Why did the iron and steel businesses from this era leave so few remains? In this paper we will look at the geography of iron and steel in the west and some interesting examples. Then we'll examine the factors that determined the fate of steel in the west: the opening of the Panama Canal and the Great Depression. By the mid-1930s every significant Western steel business was acquired either by US Steel or Bethlehem Steel.

ANTHONY MEADOW is an independent scholar researching the history of the iron and steel industries in the West. At the 2011 SIA conference in Seattle, He gave a paper titled "Steel in the Northwest: From Irondale to Nucor." He was president of the SIA Samuel Knight Chapter for about ten years and organized many events for the chapter.

3C: ALL THAT IS FIT TO PRINT

2:15– 3:45 pm Cambridge

THE WAY BOOKS WORK: CODEX MECHANISMS FOR CONCEPT MANAGEMENT

Gary Frost

University of Iowa, Coralville, IA. gary-frost@uiowa.edu

Use of book mechanism crosses most cultures and disciplines. It is book mechanism that supports and paces conceptual works of all kinds. This cognitive tool is so fully assimilated into culture that the book mechanism is frequently overlooked and unacknowledged but particular focus on book mechanism is occasionally pursued.

Components of book mechanism include pages and page design, binding structure and book action, intervention of books remade by use and descriptive sources of inadvertent and deliberate reflexive book mechanism performance. A description of the mechanical mobility of pages in a sixteenth-century wooden board binding of northern Europe is described as well as the foundational paper binding. Five type of intervention considered are those of production, marketing and distribution, ownership, library processing and restoration. Operational book mechanism features are examined in detail and scope across time and cultures. The discussion pursues specific examples and exemplars as well as providing helpful illustrations, diagrams and glossary of terms.

KEYWORDS: mechanism, book, operations

GARY FROST Gary Frost holds a Master of Arts degree from the School of the Art Institute of Chicago (1970). Frost is currently Conservator Emeritus of the University of Iowa Libraries. Gary has served on Faculties of Columbia University, New York, the University of Texas at Austin, Texas, and the Buffalo State Conservation Program at State University of New York at Buffalo. He is recipient of the Banks/Harris Award of the American Library association and the Lifetime Achievement Award of the Guild of Book Workers. He is known for innovation of codex structures and application of historical structures for book conservation practice. Gary Frost is recognized for his publications and exhibitions.

LETTERPRESS PRINTING AND THE KEARSARGE MINE POOR ROCK PILES

Daniel Schneider

Industrial Rust Press and Independent researcher, Lake Linden, MI. danielsc@mtu.edu

During the summer of 1956, the Calumet & Hecla Consolidated Copper Company sent surveyors to calculate the tonnage of the poor rock piles at the company's mine sites, to get an idea of how much copper they might be able to extract from the rock using dressing methods more advanced than those that prevailed when the rock was discarded as waste during the previous century. The rock came from shaft sinking and drift cutting and other mining activity occurring outside of the copper vein. Miners called it "poor rock" because it held so little copper relative to the ore situated in the veins, which was sent by train to the mill for processing while the "poor rock" was left piled at the mine location. The surveyors produced drawings in 1956 that rendered cross sections of the rock piles as abstract polygons. These shapes are the basis for my current letterpress printed book project. This presentation is about that project, still in its early stages, and more broadly about my use of IA methodologies to develop thematic content for my book arts work.

DANIEL SCHNEIDER is an industrial archaeologist, letterpress printer, and book artist based in Lake Linden in the Upper Peninsula of Michigan. His archaeological research focuses on manufacturing and extractive industries, particularly wood printing type manufacture in the United States and native copper mining in the Upper Peninsula of Michigan. His book arts work pursues themes derived from his archaeological practice, including industrial work as situated activity within mechanized environments and industry's transformation of landscape.

BUT WHAT DID THEY PRINT? EVERYTHING

Jeff Shay

C.C. Stern Type Foundry, Portland, OR. **www.metaltype.org**

A brief history of metal typecasting leading to a description of the C.C. Stern Type Foundry and our preservation and education activities. The Foundry is a working museum that uses its collection and programming to show the evolution of a craft and industry spanning over multiple generations, while keeping alive the foundry equipment and skills for use today and into the future. Their educational programs include tours, lectures, type jams, hands-on work sessions, and other special events and are offered to support a growing community of artists, designers, printers, educators and historians who are interested in the art and industry of the cast letterform. The core of the collection is the type foundry that C. Christopher Stern originally created for Stern & Faye, Printers, in Sedro-Woolley, Washington. In the past decade, the working museum has grown to include additional machines, tools, and a library of letterpress printed artwork and ephemera. Working displays include a hand mould, a Linotype, and a variety of mechanized Monotype casters, all designed to make metal type for letterpress printing.

JEFF SHAY is the Board Chair of the C. C. Stern Type Foundry, a non-profit organization in Portland, Oregon, with the mission of preserving the heritage of the metal type casting industry. It is a working museum that uses our collection and programming to show the evolution of a craft and industry spanning over multiple generations, while keeping alive the foundry equipment and skills for use today and into the future.

3W: DEBRIEFING FRIDAY PROCESS TOURS

2:15– 3:45 pm Windsor

One of the hallmarks of the SIA is the set of process tours we arrange for the Annual Meeting and the Fall Tour. These experiences are more than merely interesting; they are useful contributions to our professional and scholarly development. Each year, members informally exchange responses to tours in the hotel, at the bar, and over meals, but we have not provided a formal venue for such exchanges. This year, Fred Quivik and Bob Newbery will build on the success of a previous well-received session like this in Chicago (2019) and Bethlehem (2021). They will moderate a discussion by the audience of the previous day's process tours, asking interested audience to help each other analyze what we have learned about several of the enterprises we have just visited.

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

FRED QUIVIK retired a few years ago from teaching in the Department of Social Sciences at Michigan Tech, where he was affiliated with the graduate program in Industrial Heritage and Archaeology and performed 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.

ROBERT NEWBERY is has worked for the last ten years for CORRE, Inc. a private transportation engineering firm. Bob spent 32 years with the Wisconsin Department of Transportation as their Historic Preservation specialist. He oversaw the production of the Department's three volume series, *Historic Highway Bridges In Wisconsin*, and was the principal author of vol. 2, *Truss Bridges*. He is an Emeritus member of the Historic and Archeological Preservation Committee of the Transportation Research Board.

PLENARY SESSION: IA AND THE FUTURE OF INDUSTRY

4:00–5:00 PM Mayfair Ballroom

CHAIR: Saul Tannenbaum, President, SIA

In honor of the 50th anniversary of SIA, we ask "What will the next 50 years of IA look like?"

Industrial archeology is the systematic study of material evidence associated with the industrial past. This evidence has generally included buildings, machinery, artifacts, sites, infrastructure, documents and other items associated with the production, manufacture, extraction, transport or construction of a product or range of products.

But, as the nature of industry changes, so does the nature of industrial artifacts. While industrial archeology has grappled with the temporary nature of some of its artifacts by developing extensive documentation methodologies, and with the inaccessibility of others by use of remote sensing technologies, emerging challenges may be more profound. How does one study an artifact in earth orbit, or on the surface of the moon? As software, in Marc Andreessen's memorable phrase, "eats the world," what does "artifact" even mean? What are the artifacts of the video gaming industry or the social media industry?

Industrial archeology came of age with the study of the inputs and especially the output of complex engineering and production processes. We now have to ask, what methodologies apply when that output is just a string of digital bits?

To address these questions, we present two distinguished lecturers who will each present their thoughts live via Zoom, and then we welcome an engaging discussion afterwards.

ASTRONAUTS AND ARTEFACTS: THE ARCHAEOLOGY OF A HABITAT IN SPACE

Alice Gorman (Livestreamed)

Associate Professor, College of Humanities, Arts and Social Sciences, Flinders University of Australia

How is material culture used to adapt to life in a microgravity habitat orbiting Earth? Answering this question is the aim of the International Space Station Archaeological Project (ISSAP), which was established in 2015. In 2022, ISSAP conducted the first archaeological fieldwork outside Earth by asking the crew to systematically photograph six sample locations inside the space station over a period of two months. This talk provides an overview of the methods and results of the project, and how these might be applied to future space habitats such as those currently being planned for the Moon.

ALICE GORMAN is an Associate Professor at Flinders University in Adelaide, Australia. She is an internationally recognized leader in the field of space archaeology and author of the award-winning book *Dr Space Junk vs the Universe: Archaeology and the Future* (MIT Press, 2019). Her research focuses on the archaeology and heritage of space exploration, including space junk, planetary landing sites, off-earth mining, and space habitats. She has also served as a heritage consultant for over 25 years, working with Indigenous communities in Australia. Gorman is also a Vice-Chair of the Global Expert Group on Sustainable Lunar Activities and a member of the Advisory Council of the Space Industry Association of Australia. In 2021, asteroid 551014 Gorman was named after her in recognition of her work in establishing space archaeology as a field.

Industrial Archaeology and the New Manufactured Landscapes, or, "Who Will Love the Sunnyvale Corridor?"

Andrew Reinhard (Livestreamed)

Research Affiliate, Institute for the Study of the Ancient World (ISAW), New York University

The multi-billion-dollar video game industry continues to inspire transhumant migrations between the natural and synthetic worlds, created by an increasingly mobile workforce and driven by global market forces, politics, and now the COVID-19 pandemic. Starting in the 1970s and culminating in the mid-1980s is gaming's first wave, dominated by research incubators such as Moffett Park in Sunnyvale, California, in the heart of what would become Silicon Valley, which birthed a new type of landscape that evolved a new kind of human settlement. These early studio spaces such as the campus once occupied by Atari, Inc., on Borregas Avenue, have long since been abandoned but can be visited today. Unlike textile mills, printers, or assembly lines, the office park architecture offers little clue to the intellectual property being created inside. The number of factories used to produce gaming cartridges and later disk media continue to dwindle and are repurposed for other kinds of production. The gaming industry's decentralized workforce now asynchronously inhabits personal, often temporary spaces, creating two emerging types of industrial landscapes: 1) micro-spaces occupied by the individual knowledge-worker, and 2) a complex network of nodes one level removed from the technosphere. Both leave different environmental and ephemeral footprints that require new ways of identifying, interpreting, and preserving archaeological evidence of increasingly immaterial spaces hosting major investments in time, money, and labor without yielding any physical output. The paradox, however, is that these new manufactured landscapes populating the datasphere do leave physical traces if you know where to look. This presentation compares the early days of video game production through its buildings in Sunnyvale and the legacy of the Atari Burial Ground in Alamogordo, New Mexico, comparing these to 21st-century spaces and media: a Guildford, UK ghost town, and the emerging sprawl of invisible empires.

ANDREW REINHARD is a Research Affiliate at the Institute for the Study of the Ancient World (ISAW) at New York University in New York City. He is also the Director of Publications for the American Numismatic Society, having formerly worked for Bolchazy-Carducci Publishers. For this plenary he plans to focus on how much things have changed between the Silicon Valley research parks of the 1980s with their physical, manufactured output, and their twenty-first-century counterparts, and what an archaeology of these new means-of-production might look like in 20–50 years.

Poster Abstracts

All Day | Oxford

Data Recovery at Anaconda's Yerington Mine

Lauren Culleton and Margo Memmott

Broadbent and Associates, Inc., Reno, NV. lculleton / mmemmott both @broadbentinc.com

The US involvement in the Korean War beginning in 1950 triggered a sharp increase in the demand for copper for military and industrial use and prompted one of the largest copper companies in the world to establish itself in Yerington, Nevada. While the Singatse Range of Mason Valley had already been intermittently mined for copper since the 1860s, the entrance of the Anaconda Company brought a new style of mining to the region that was defined by substantial capital investment and large scale, complex processing plants. The Yerington plant, designed by Wilbur Jurden, originally consisted of oxide ore crushing and processing areas, an acid plant, a tailings pile, and company housing. By the time Anaconda ceased operations in 1978, nearly 360 million tons of earth had been removed from the mine; there were 15 operational areas including a sulfide plant alongside the oxide plant, dozens of support buildings and other infrastructure, and a network of roads and conveyors. Dwarfing these process areas were enormous landscape elements, largely still extant, including evaporation ponds, leach pads, and mountains of waste rock and tailings.

Since 2019 Broadbent and Associates, Inc. has been conducting data recovery work at Anaconda's Yerington Mine. The mine site has a diversity of archaeological, architectural, and landscape-scale remains, supplemented with massive amounts of archival data, which allows for a high degree of interpretation. Archival researchers, architectural historians, archaeologists, and UAV pilots have all contributed to a variety of public-facing products, including HABS-style drawings, a virtual tour of the mine site, and an interactive ArcGIS Story Map.

KEYWORDS: Mining, Nevada, CRM, Post-War

LAUREN CULLETON is a graduate of the University of Nevada's Masters program in Anthropology with a concentration in Historic Preservation. After making a mid-life career change from pastry chef to historic preservation specialist, she served as the Executive Director for the Historic Reno Preservation Society where she oversaw all operations for a non-profit organization dedicated education, advocacy, and leadership in the field of historic preservation. She is currently an archaeological consultant working on cultural resource projects that range from documenting a World War II-era mine in southern Nevada to documenting mid-century neighborhoods on the outskirts of Reno.

MARGO MEMMOTT has over 20 years of professional experience conducting cultural resources investigations throughout the Great Basin and Sierra Nevada Mountains. She holds a B.A. in Anthropology from Utah State University and an M.A. in Anthropology from the University of Nevada, Reno. Margo is the director of Broadbent's CRM division and has worked at Broadbent since 2012. She thrives when given the opportunity to work on projects that require innovative approaches from her cultural resources team. Ms. Memmott has extensive experience working in Nevada's historic-period mining districts, recording and researching mining and milling technologies from the Comstock-era through the mid-twentieth century.

KNIGHT FOUNDRY TODAY–50 YEARS IN THE MAKING

The Knight Foundry

Knight Foundry, Sutter Creek, CA. **www.knightfoundry.com**

Knight Foundry in Sutter Creek, California is the last remaining example of early manufacturing that developed in the Mother Lode region to service the gold mines of the area starting in the 1850s and running through 1942. Knight Foundry continued to serve the lumber and timber industries, other mining activities, historic preservation and equipment manufacturing into the 1990s.

Today, Knight Foundry is owned by the City of Sutter Creek and operated by the Knight Foundry Alliance, a non-profit organization managed and run by volunteers starting in 2017. The foundry site is now open once a month for public tours and group tours by reservation. Volunteers are doing continuous repair and maintenance on the site, historic technology classes are being offered and more are planned and a group of machine tool restoration volunteers refurbish vintage machines for sale for fundraising. The foundry blacksmith volunteers and the California Blacksmith Association now offer blacksmithing classes regularly. A California Foundry History Museum, classroom, office and archives room is planned for the reconstructed pipe shop building at the east end of the site.

KEYWORDS: Knight Foundry, public programs, interpretation

LEONARD FALLSCHEER will be present to present for the foundry and take your questions.

SAVING THE OSWEGO FURNACE

Corinna Campbell-Sack and Susanna Campbell Kuo

Lake Oswego Preservation Society, Lake Oswego, OR

This poster display documents the preservation of the first iron furnace on the Pacific Coast. The masonry stack was built in 1866 and is located in Lake Oswego, Oregon, eight miles south of Portland. Six posters illustrate the preservation process, from preliminary archaeological investigations to restoring the crumbling masonry and, finally, stabilizing the stack to comply with Oregon's seismic building codes. Restoring the furnace presented special challenges because there is no comparable structure west of the Rocky Mountains. The furnaces on which it was modeled are in the Salisbury Iron District in northwestern Connecticut. Preparation for the project therefore included a visit to Connecticut by two members of the project team to learn how similar furnaces have been restored.

CORINNA CAMPBELL-SACK and **SUSANNA CAMPBELL KUO** are sisters who often work together. Campbell-Sack is a graphic designer who has designed numerous historical exhibits and interpretive signs. Kuo is an independent scholar who has written extensively about the Oregon iron industry and served as historical advisor during the furnace preservation. Among their other projects are the interpretive signs in the kiosk beside the furnace and on the Oswego Iron Heritage Trail.

3-D MODELING AND ANALYSIS OF THE BYRD PARK PUMP HOUSE

Penn Markham et al.

Friends of Pump House, Richmond, VA. **www.friendsofpumphouse.org**

At the time of its construction in 1883, the Byrd Park Pump House in Richmond, Virginia was a marvel of Victorian-era engineering. Unlike other pumping stations of that era, the Pump House took advantage of Richmond's premium location in the Atlantic Seaboard Fall Line

and used water-driven plunger pumps to lift approximately 12 million gallons of water per day from the James River and Kanawha Canal to the city reservoir.

Although the water-driven technology worked well for many years, it eventually became obsolete, and the Pump House ceased operations in 1924. Nearly all of the machinery inside was eventually sold for scrap in the 1930s. Today, the majestic neo-Gothic stone building remains unused, although the Friends of Pump House, a community non-profit organization, is working to preserve and rehabilitate the structure.

Our poster describes the process of creating digital 3-D models of the pumping machinery as it existed in the early 1920s. This includes the penstocks, Leffel turbines, and piston pumps. One of the main challenges of this project was the limited set of extant engineering drawings. However, site surveys and various historical documents provided some insight into what the pumps looked like and how they operated.

Models of the pumping machinery were created in SolidWorks and then fabricated using a 3-D printer. These models will be used to provide a tangible interpretation of Richmond's Byrd Park Pump House, allowing visitors to properly visualize and understand the function of the long-lost machinery. In addition, computer animations and augmented reality interfaces were developed from the models, which will further assist in educating the public about the building's unique history and technology. It is hoped that the results of this work will eventually be incorporated into a future museum/interpretive center that will be constructed in the building once it is restored.

KEYWORDS: waterworks, pumping, modeling

PENN MARKHAM received his B.S. in electrical engineering from Virginia Polytechnic Institute and State University in 2006, and his Ph.D. from the University of Tennessee, Knoxville in 2012. From 2013-2017, he worked in the Grid Operations and Planning research group at the Electric Power Research Institute (EPRI). Since 2017, he has been employed by Dominion Energy in Richmond, Virginia, where he works in the Electric Transmission System Operations Engineering group. He is currently the president of the Friends of Pump House, a volunteer organization devoted to preserving and restoring the historic Byrd Park Pump House. Dr. Markham is a licensed Professional Engineer in the Commonwealth of Virginia and a senior member of the IEEE.

JESSICA DINEP (**dinepjl@vcu.edu**), is a senior studying Mechanical Engineering at Virginia Commonwealth University. She focuses on creating public experiences and is pursuing a career in entertainment design. She strives to innovate the industry by blending art and technology into exciting feats of creativity.

ETHAN DOWNING (**downingee@vcu.edu**) is studying mechanical engineering with a minor in business at Virginia Commonwealth University. Currently they live in Richmond Virginia with an interest in design and the business applications of engineering. Their goal is to combine those interests to design products with a focus on intuitive operation.

BENJAMIN JEWELL (**jewellba@vcu.edu**) is a senior at Virginia Commonwealth University studying mechanical engineering. He is originally from Alexandria, VA, but will continue to reside in Richmond, VA following his graduation in May of 2022. His career aspirations are in Project Management, and he will be joining DPR Construction post-graduation as a Project Engineer.

MARIA ROBINSON (**robinsonme3@vcu.edu**) is currently a senior in mechanical engineering at Virginia Commonwealth University. After graduating in May 2022, she plans to work for WestRock as a Reliability and Maintenance Engineer at their Hopewell, VA plant. She is a native of Chesapeake, VA.

JOAO S. SOARES, Ph.D., (**jsoares@vcu.edu**) is Assistant Professor of Mechanical and Nuclear Engineering at Virginia Commonwealth University since 2017. Dr. Soares' research interests are patient-specific computational modeling and simulation of cardiovascular biomechanics based on medical imaging, and design and development of bioreactors for mechanically-conditioned cardiovascular tissue engineering.

A CAN OF WORMS? A CLINO-CLADISTIC LOOK AT PULL & PUSH TAB PATENTS C.1950-1980

William Schroeder

Arete Cultural Resources Management, Yakima, WA. **ochreman.ws@gmail.com**

Pull tabs revolutionized the way beverage cans and food containers were opened and their contents consumed. Ermal Fraze is credited with this, yet he was not alone in the invention nor was he technically the first. Until recently, pull tabs were not considered anything other than 'noise' in Historical Archaeology because they had not yet met the 50-year-old threshold. As of 2015, ring pull tabs entered the historic era, yet relatively little is known about these artifacts. In order to place these artifacts in context for historical archaeologists who have located and will more frequently encounter these items of disposable material culture, a typological database has been built by Dutch Archaeologist, Jobbe Wijnen, to provide a world-wide archival reference (**pulltabarchaeology.com**). There are hundreds of patented variations and manufacturing methods in the United States Patent and Trademark Office filed and accepted between ca. 1950 and 1980, yet there are really only two geni--pull and push, and four species--"snap top," ring pull, stay-tab, and push button. Taking a cue from Biology, US patents were arranged by family based on the first instance of a morphological characteristic (clade) and by progenitor (inventor) then put in numerical/chronological order based on their patent or design filing and/or acceptance dates (cline) thereby generating a genealogy or family tree that charts their evolution. Not all patents or designs saw nationwide production or distribution; some never saw production. One should also keep in mind the "time lag" between a patent's filing, patent pending production, and its official acceptance. Products also had a use life and disposal period that often extended past its manufactured date range. Functional ease, compatibility with can manufacturing machinery, reduction of harm, and social externalities also influenced the food and beverage container industry to "build a better mousetrap."

KEYWORDS: Beverage cans, pull tabs, ring pulls, technology

WILLIAM SCHROEDER is an archaeologist with a passion for the sublime as well as the mundane. He has investigated the hybridizing of digital images with antique stereoscopes, the evolution of beverage can opening technologies (i.e., zip tops and ring pulls), andhas used LiDAR imagery to locate the object of Mormon ideological desire in the nineteenth and early twentieth centuries, New Zion, in the landscape archaeological record of North America, has trained others on documenting placer mining features and irrigation ditches, and more recently has turned his attention to tin cans and can openers. William earned his M.S. in Cultural and Environmental Resource Management-Archaeology from Central Washington University in 2010 and his Ph.D. in Cultural Heritage and Applied Anthropology--Historical Archaeology and Preservation from the University of Montana in 2018. He currently serves as the Supervisory Forest Archaeologist for the Confederated Tribes and Bands of the Yakama Nation in Washington State.

SIA PORTLAND 2022 PAPER SESSIONS PROGRAM

TIME	BRIGHTON	CAMBRIDGE	WINDSOR	OXFORD
8:30 - 10:00	**1B: A RIVER RUNS THROUGH IT** *Chair: Laurene Harding Rivas* • Mary Durfee, "Renegotiation of the Columbia River Treaty: Hard Structures Make for Hard Choices" • David Ellis, "'The Greater Portland Plan': The Industrial Development of the Lower Willamette River." • Rick Minor, "The Three-Pile Bulkhead and Early 20th-Century Landmaking in Astoria, Oregon"	**1C: MINING I** *Chair: Bill McNiece* • Duane Ericson, "Archeology of Artisanal Gold Beneficiation and Mercury Processing 1849–1972" • Fred Quivik, "Using the Results of a Photogenic Mine to Reconstruct Details of a Mining Landscape" • Dan Quine, "Rail transport at the Yellow Aster gold mine"	**1W: PLACES AND MAKING** *Chair: Arron Kotlensky* • Brian Shovers, "The Rise and Fall of Corporate Sawmills in Montana" • William Schroeder, "A Can of Worms? A Chronology of Can Openers and a Diagnostic Reading of Their Effects on Cans"	POSTER SESSIONS, BOOK TABLES, OTHER DISPLAYS
	MORNING BREAK & POSTER SESSIONS			
10:30 - 12:15	**2B: A BRIDGE TO SOMEWHERE** *Chair: David Simmons* • Julie Bowers, "1882 Hayden RR Bridge" (pre-recorded) • Christopher Marston, "Origin Stories: The Mysterious Maker's Marks of the Bridgeport Covered Bridge" • Robert Dermody, "St. Johns Bridge – Innovation in Suspension Bridge Design" • Paul King, "The evolution of cable making techniques in 19th century suspension bridges"	**2C: MINING II** *Chair: Scott See* • Robert McQueen, "An Ass-Kicking Trail in Nevada's Cortez Mining District" • Eric Kneebone, "The Headframes of Butte" • Steven Walton, "Wartime Industrial Boom: The Defense Plant Corporation and Industrial America, as exemplified by the Scotia, PA" • Paul White, "A Hazardous Profession: The Construction and Deconstruction of the Industrial Worker in Industrial Accident Reports"	**2W: MUSEUMS & LEARNING** *Chair: Robert Newbery* • Leonard Fallscheer, "Knight Foundry Today – 50 Years in the making" • Melissa Darby, "The Portland Zoo Railway (PZRy): Preserving and Restoring a Marvelous Ride" • Kyle Parker-McGlynn, "Online Interactive Displays for Digital Industrial Heritage "	
12:30 - 2:00	**LUNCH & ANNUAL GENERAL MEETING WITH AWARDS CEREMONY**			
2:15 - 3:45	**3B: IRONS IN THE FIRE** *Chair: Steven Walton* • Clark Niewendorp, "First Iron Smelting Operation On The Pacific Coast, Lake Oswego, Oregon" • Saundra Middleton, "Peter Kirk, Seattle Pioneer with an Iron Will" (pre-recorded) • Anthony Meadow, "The Fate of the Steel Industry in the Western US, 1850 - 1938"	**3C: ALL THAT IS FIT TO PRINT** *Chair: Suzanne Wray* • Daniel Schneider, "Mine Waste in Book Form: Letterpress Printing And the Kearsarge Mine Poor Rock Piles" • Gary Frost, "The Way Books Work: codex mechanisms for concept management" • Exhibition and presentation from C.C Stern Type Foundry, Portland	**3W: POST-TOUR DEBRIEFING SESSION** *Discussion Moderators: Fred Quivik & Robert Newbery* Now an annual tradition, this session if you want to talk about what you saw on the tours, how its interpretation helps us further industrial archeology, or connections that you made	
	AFTERNOON BREAK & POSTER SESSIONS			
4:00 - 5:00	**MAYFAIR BALLROOM** **PLENARY ROUNDTABLE: IA AND THE FUTURE OF INDUSTRIES** *In honor of the 50th anniversary of SIA, we ask "What will the next 50 years of IA look like?"* *Chair: Saul Tanenbaum, President of SIA* • Dr. Alice Gorman (Flinders Univ. of Australia), "Astronauts and Artifacts: The Archaeology of a Habitat in Space" • Dr. Andrew Reinhard, "Industrial Archaeology and the New Manufactured Landscapes," or, "Who Will Love the Sunnyvale Corridor?"			