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Nature in 1860s San Francisco"

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Introduction

CHRISTOPHER BRICK: Hello everyone and welcome back once more to the *Intervals* podcast. I'm your host, Christopher Brick, here on behalf of the Marketing and Communications Committee of the Organization of American Historians.

Intervals is a public humanities podcasting initiative of the organization, and with support from the National Endowment for the Humanities we are pleased to welcome today Dr. Jennifer Seltz, an Associate Professor of History at Western Washington University. Jennifer's talk is our first encounter in this lecture series with a smallpox outbreak that took place in the 19th century, this

one in San Francisco in the late 1860s just after the Civil War.

Smallpox has already factored prominently into several other talks at earlier points in the series, and if you're wondering why, not only are you asking a great question but giving me the chance to share with you a bit of the answer, so thank you for that.

For purposes of this series, which was devised to respond to the Covid pandemic with some historical context for interpreting and understanding it, we were particularly interested in the history of smallpox because it's one of the few viruses for which a basic vaccine technology existed very early, centuries ago in fact. And so the history of smallpox also gave us the chance to take a long view of the history of inoculation, which the committee felt very important to consider in the present moment as well.

Mistrust of vaccines isn't new. Neither is resistance to public health measures, nor the broad skepticism of government officials' ability to control infectious disease outbreaks, as Jennifer's talk demonstrates.

In the winter of 1868-1869, San Francisco faced its second serious outbreak of smallpox in fifteen years. The disease killed several hundred people and disabled or scarred thousands more by the time the epidemic ended in the city in the spring of 1869.

San Francisco public health officials, politicians, newspaper editors, parents, and other city residents argued more about vaccines and vaccination than about smallpox itself.

Counterintuitively, it was the public health officials who discouraged vaccination as a tool to fight the epidemic, while local politicians, physicians, and others pushed for more publicly funded vaccination efforts.

These arguments turned on a set of competing ideas that may sound familiar to contemporary listeners. There was discrepancy about the source of trustworthy vaccine; about how environmental change might worsen disease; and about how capable state and local governments were of managing safe vaccine production.

These discussions were neither abstract nor rarefied. Mothers ground up the scab fragments harvested from smallpox-infected patients to immunize their children with homemade vaccine. Vaccinated children with homemade vaccine, made of ground-up scabs. Doctors held demonstrations of vaccine's safety by injecting themselves with lymph on a weekly basis for curious audiences.

Through Jennifer's talk, the overlooked environmental and cultural histories of a crucial, intimate, and common form of state power in the nineteenth and twentieth-century United States comes into view, even as they also complicate familiar narratives of the periodization, goals, and practices of Gilded Age and Progressive Era urban public health.

When Jennifer's not working on these topics she's also busy teaching courses at Western Washington U on the history of health and medicine, the US West, and energy and environmental history, as well as finishing a book manuscript on disease and

environmental change in the 19th-century North American West.

It's all tremendous work and my colleagues and I are so thrilled to be able to share just a small bit of that with the Intervals audience today, and here it is: Dr. Jennifer Seltz on Smallpox, Vaccine, and Urban Nature in 1860s San Francisco.

Lecture

JENNIFER SELTZ: On December 19, 1868, a doctor named Joseph Haine made an unusual offer to the readers of the San Francisco Daily Alta California. Haine invited anyone in the city to come to his office any Saturday morning to watch him vaccinate himself for smallpox. Joseph Haine explained that he was trying to prove vaccination's safety, and that over the course of his long medical career, he had vaccinated himself at least 150 times. I don't know if the doctor had any takers. The week his letter was published, nearly five hundred people had died of smallpox in San Francisco since midsummer, and at least 1500 had fallen ill. Smallpox killed over 700 people in the city between July 1868 and June 1869, in the disease's worst outbreak in nineteenth-century San Francisco.

During the epidemic, vaccine and vaccination dominated public conversation about the disease. The city's newspapers and medical journals were filled with discussions of vaccination's merits and problems, and of the local government's actions, inactions, and responsibility for stopping the epidemic through vaccination.

Physicians, editors, public health officials, politicians, and ordinary San Franciscans argued about vaccination until the epidemic ended in the spring of 1869, as they tried to make sense of why the city had been hit so hard by smallpox and how it could prevent the next bad outbreak. They debated whether getting vaccinated during the epidemic made sense. They debated whether vaccine made with lymph from infants' arms or from pustules on cows' skin worked better. They debated whether there was something in the air which made smallpox worse, and old vaccinations lose their protective power. They debated whether cleaning up streets and enforcing quarantine would do more to end the epidemic than a bigger push to distribute vaccine.

Ultimately the spread of smallpox in 1868-1869 and the apparent failure of existing vaccine regimes strengthened the powers and capacity of the San Francisco health department to import vaccine from out of town and distribute it. By the next time smallpox hit San Francisco in 1876-1877, vaccine supply was no longer a problem, and doctors and city residents had stopped arguing in public about how to perform vaccinations, how to read vaccine scars, and where the best vaccine came from. Joseph Haine's use of his own body to advertise the safety of smallpox vaccine would go out of fashion after this epidemic, as vaccination began to change from an idiosyncratic, local experience to one defined by imports of a standardized commodity from a newly organized and productive industry - the "vaccine farms" of the Midwest and Pennsylvania.

This change sounds like a typical story of the Gilded Age, an example of how new transportation and manufacturing capacities transformed Americans' everyday lives and connected them in new ways to

distant people, places, and animals. It also sounds like a typical story of Progressive-era public health, as reformers and city health departments gained new powers and new confidence in their ability to clean up dirty cities and make real improvements to urban health. But city health officials only turned reluctantly to new sources of smallpox vaccine.

And San Francisco residents, physicians, and politicians were often skeptical at best about the sanitary improvements health officials wanted to make first. And since its introduction to North America in the early nineteenth century, smallpox vaccine had always linked human and animal bodies across long distances. New vaccine technology became attractive only as older ideas, about how local environments shaped the behavior of vaccine inside individual human bodies, began to fall apart during the hard smallpox winter of 1868-1869.

The public debates about vaccination in 19th-century San Francisco show a world which is familiar in some ways. There wasn't enough vaccine for everyone who wanted it. Public health officials were criticized for a slow and disorganized response to the rapid spread of a deadly disease. In response, these officials pushed for what we'd now call non-pharmaceutical interventions, and claimed no one could have known how bad the epidemic would get. Poor people living in crowded conditions were apparently more likely to get sick and more likely to die. Parents were skeptical about the sources and purity of vaccine, and decided whether or not to vaccinate their children based on conversations with friends and neighbors. But 1868 wasn't 2021.

These vaccine controversies emerged from a long environmental and political history of experience with and disagreement over two viruses - smallpox and vaccine - now essentially unknown in the United States and in the world. In 1868, however, smallpox and smallpox vaccine were familiar entities in San Francisco. Both viruses had repeatedly arrived in and circulated around northern and central California, smallpox for nearly a century and vaccine for at least half that long. Both pathogens depended on human movement and dense settlement to thrive. Both could survive in dried form outside human bodies for a time.

Smallpox had no nonhuman hosts or vectors, while vaccine seemed to have originated in cattle as cowpox, an illness relatively mild in humans, which granted about ten years of immunity to variola. Vaccine was also, however, much more fragile and apparently not at all contagious between people. For most of the nineteenth century, vaccine was hard to make, hard to preserve, and hard to use.ⁱ It had to be produced one arm at a time, and the lymph seemed to work best when it was fresh. Its finicky nature shaped and limited governments' efforts to produce and distribute it.

Imperial and national authorities in North America had tried to spread the vaccine virus and the practice of vaccination since shortly after their introduction in Western Europe, with only intermittent success. Inconsistent and underfunded vaccination campaigns contributed to a patchwork landscape of immunity in California's biggest city by the late 1860s. The Spanish government sent vaccine and instructions to New Spain beginning in 1803, and the lymph probably entered California

from central Mexico and from Pacific ports from Monterey to Sitka in the first years of the nineteenth century. In 1823, the Mexican government ordered provincial officials to procure and circulate vaccine, without providing any resources to execute a vaccination policy, while by the late 1830s Mexican soldiers and officials had twice spread smallpox from northern to central California.

By the time the United States claimed California, it had been decades since the American government had tried seriously to supply vaccine to anyone except Native peoples.

Although Thomas Jefferson and other prominent American naturalists and physicians had quickly obtained and successfully tested vaccine from Edward Jenner and other British proponents of the new substance early in the nineteenth century, it also quickly became clear that cowpox could easily be mixed up with smallpox.

Ineffective or dangerous vaccine was a problem for advocates from the beginning. One of the federal government's first attempts to subsidize vaccination and spread vaccine nationally ended abruptly in 1822 after a Baltimore physician working under congressional oversight, accidentally sent smallpox rather than cowpox to a North Carolina colleague, a mistake which cost at least ten people their lives.

By the early 1850s, the federal government had scaled back its vaccine-providing ambitions. Congress authorized but apparently did not often fund the position of national vaccine agent.^{vi}

During the Civil War, soldiers in Union armies were vaccinated, but this part of the wartime state faded away after 1865.

As in other parts of the United States, in California vaccination became part of local medical police powers rather than a national responsibility. In the two years before the 1868 epidemic, San Francisco's municipal government strengthened quarantine requirements, made city health officers responsible for procuring and distributing vaccine, required parents to have children born in the city vaccinated by the time they were six months old, and made it a misdemeanor for adults not to be vaccinated themselves.

This growing municipal concern with smallpox and vaccination was part of a wider expansion of the city health department's duties, from regulating food markets and animal markets to recording mortality statistics by city ward.

However, the health officer had no power to enforce these ordinances. The Board of Supervisors made persuasion, rather than coercion, a major part of the position's vaccination duties, instructing the health officer "to impress upon the citizens of the City and County of San Francisco the importance and duty of re-vaccination in the case of all persons who have passed a period of more than seven years since their first vaccination."

It was up to individual residents (or their parents) to fulfill that duty. By the beginning of the Gold Rush years, bringing vaccine to California and maintaining fresh supplies of it had become largely a private, entrepreneurial project.

Smallpox and vaccine were familiar parts of the local medical scene, and American doctors new to San Francisco advertised their supplies of "genuine vaccine virus." San Francisco's rapidly growing population after 1849 showed how widespread smallpox and vaccination were globally. New residents who arrived in the city from places as close as Washington Territory and as distant as Germany showed the scars of vaccinations, while Chinese immigrants practiced nasal inoculation.

Western European immigrants were often veterans of both compulsory vaccination or inoculation and fights against such mandates. New arrivals from the East Coast of the United States sought out local doctors for what we'd now call booster shots during an 1853-54 epidemic which swept from the West Coast to Hawaii.

Californians were well aware that vaccination was both popular and imperfect in its scope and effects, and that smallpox had hardly been eliminated as a threat. Children, immigrants, and people whose vaccinations had not "taken" continually replenished the local disease pool. According to one prominent physician, the 1868 epidemic was the third significant outbreak in California in twenty years.

But most years, smallpox was only a potential threat. Tuberculosis, diphtheria, and gastrointestinal illness were much more dangerous overall than smallpox. Between November 1865 and June 1866, for example, 223 San Francisco residents died of "consumption of the lungs," 79 of "cholera infantum," and 73 of "diphtheria," and only one of smallpox.

When smallpox began to spread in San Francisco in the summer of 1868, the city government and public health officials were neither taken by surprise nor especially well prepared to perform many more vaccinations than usual. By 1868, public health officials in urban California, like their counterparts elsewhere in the United States, were both technically responsible for vaccination and unable to procure and maintain reliable vaccine supplies. They competed and cooperated by turn with private vaccine providers, like Joseph Haine, in a crowded medical marketplace. Neither health officials nor private physicians were well prepared to deal with a situation where smallpox was more dangerous and vaccination less effective than it had seemed to be in earlier outbreaks.

In June 1868, local doctors began noticing a few cases of smallpox. By the middle of July, teenager Henry Morton was stopping off at his doctor's on his way to Sunday school to be vaccinated, noting in his diary that "Small Pox is around and Mother thought it was safe to be vaccinated. I do not think it will take but however it is not safe to run the risk of having the disease."

Morton was one of many children and teenagers made or told to get vaccinated through midsummer, but a diverse group of adults also showed up daily at the city's free clinic. At the end of the week Henry Morton was vaccinated, according to the city health office, 133 people had fallen ill with smallpox, and 43 had died. Smallpox had begun to disrupt daily life, but the city was not panicked. (In late July, a lawyer trying a case in the city's federal district court asked for a delay because a witness had smallpox; the judge denied his request, ruling

the witness would appear before a vaccinated commissioner.)

In June and July close to seven hundred people were vaccinated at the city Health Office, as around thirty new cases of smallpox were reported in the city each week. Private physicians also reported seeing more patients for vaccinations as the epidemic intensified over the summer and into the fall; by November, nearly eight thousand people had been vaccinated in the city since June.

As the health office began vaccinating many more people than usual, however, supplies began to run short, and physicians' and patients' concerns about vaccine's availability, safety, and efficacy became more pressing. By the late fall of 1868, it was clear that vaccination was both popular and insufficient so far to halt an epidemic of what appeared to be a smallpox worse than the usual kind - more dangerous, faster-acting, and more uncomfortable when not fatal.

And the physicians who were supposed to supply that vaccine and perform vaccinations were divided among themselves on crucial questions of medical experience and knowledge: what vaccine was; how well it worked in San Francisco's heterogeneous, transient population; and how the combination of San Francisco's complicated climate and rapid urban development had changed its action within those bodies.

The crisis of the epidemic pushed doctors to make these arguments about vaccine, vaccination, and local environments more strongly and in more public forums. Physicians' debates over what kind of vaccine worked best and why framed public

discussion of the epidemic and shaped the city's response, from attempts at quarantines and street cleanups to attempts at intensified vaccine production and distribution.

Physicians agreed, though, that this form of smallpox posed two kinds of danger to vaccine's usefulness. Doctors' assessment of both dangers was rooted in the assumption that both disease and human bodies could be altered - weakened or strengthened - by invisible but powerful environmental factors. Vaccination might not work against smallpox worsened by "an epidemic constitution of the atmosphere."

This was the conclusion the city health officer, along with some other prominent physicians, had come to by December 1868, when he urged people not to get vaccinated. Another problem was how adaptation to California altered the bodies of those already vaccinated. If smallpox and related fevers could be shaped by epidemic influences, so could the bodies of even vaccinated city residents. Acclimation changed new Californians, and possibly weakened vaccine's protection.

Physicians trying to assess how well vaccine was working focused on San Francisco residents varied environmental exposures and histories of vaccination, mobility, and acclimation, rather than other markers of bodily difference. Throughout the epidemic, medical commentators raised questions of how race, ethnicity, and national origin might affect vulnerability to smallpox and vaccine, only to dismiss them. Newspapers and doctors noted that Chinese residents of San Francisco, living in crowded conditions, and often facing occupational exposure to clothing from all over the city, should

have been sicker, but were protected by histories of inoculation in China.

Doctors argued over whether Germans were particularly susceptible to that year's smallpox, and ultimately dismissed the idea, instead blaming all immigrants' vulnerability to "the great change of climate in coming to California, which had possibly "impaired the influence of vaccination." Most San Francisco doctors thought that their ability to make judgments about vaccine and vaccine depended on their understanding of California's climate. Before and during the 1868-1869 epidemic, doctors speculated about how the city's and state's unique collections of microclimates might shape smallpox, vaccine, and the bodies of the people they vaccinated.

They applied the tools of medical geography, including highly local measurements of temperature, wind, soil quality, and elevation, to smallpox. Smallpox and vaccination needed to be understood in terms of the conventional tools of medical topography despite smallpox's unique status in nineteenth-century medical culture.

Unlike other common fevers, smallpox was a specific disease caused by a particular if invisible agent; it could not transform into a different kind of illness within sufferers' bodies, and bodies of all kinds were vulnerable to it. California physicians mostly agreed that smallpox was also at least in theory contagious. The disease itself could be passed from person to person and existed independently in some form apart from its victims and the broader environment.

Despite smallpox's specificity and its unchanging nature, physicians still needed environmental knowledge to understand its behavior and to perform and assess vaccinations properly. In discussions of smallpox and vaccine, San Francisco and California doctors saw no contradiction between seeing smallpox as a specific pathogen and seeing both bodies and their environments as dynamic and interdependent.

The San Francisco and California doctors who were interested in medical topography examined the interactions of disease and environment at broad and narrow scales. Large outbreaks of contagious disease, which swept across diverse and far-flung landscapes, still depended on "an epidemic constitution of the atmosphere" separate from contagion itself, without which illness could not spread.

And even contagious illnesses were probably consequentially shaped by both ongoing and unique local environmental events, from cold fog to earthquakes.

To local medical experts, the unhealthiness of urban landscapes, as well as distinctive climatic trends and unusual geological phenomena, mattered to how smallpox began and spread and how well vaccination worked. San Francisco's growth had slowed during and immediately after the Civil War, but some of the most crowded parts of the city, including waterfront neighborhoods and rapidly growing neighborhoods south of Market, were still plagued by what the city health officer called "the want of proper drainage, low grades, and filled-in ground."

Land which had recently been water would always be less healthy than higher, drier, and more settled neighborhoods. A strong earthquake shook the city and the East Bay on October 21, 1868, after over six hundred cases of smallpox had been reported. The parts of the city most vulnerable to earthquake damage were also the most likely to spawn fevers.

Doctors regularly blamed smallpox's 1868-1869 virulence on unknown but evident climatic factors. Physicians could see and begin to measure, but not fully explain, much less ameliorate, atmospheric conditions which made bad diseases worse and made vaccination ineffective. One solution to ineffective vaccine and unprotected mobile bodies was to focus on stopping smallpox environmentally and spatially, through quarantine and sanitary reform. This was what city health officer Isaac Rowell favored. He blamed bad drainage, which brought "effluvia from the discharge of smallpox patients" all over the city, for the disease's spread.

He was in a minority in San Francisco, though. City health officials tried to bring smallpox patients to the municipal smallpox hospital, and during and after the epidemic officials defended the care patients received, but most San Francisco residents were not interested in having their loved ones sent there. Quarantining blocks where smallpox patients lived was equally unpopular and ineffective, although in the early fall those who wanted the city health office to push vaccination more vigorously also pushed for a stronger quarantine and for cleaning up dirty streets.

But by mid-November, as the number of deaths from smallpox in the city continued to climb, these

advocates had nearly given up on forcing or convincing those exposed to smallpox to stay at home. Instead, the *Call-Bulletin* concluded, "(w)hen some hundreds of tons of filth have been washed down to the sea, and the last man has died who refused to be vaccinated, we expect to be able to announce that there is no further danger that the small pox will be epidemic in this city."

The next tool the health department tried was disinfection, which made sense according to both the theory of smallpox's contagion and the theory that some quality of the atmosphere was making smallpox worse. Rowell tried bleaching patients' clothing and bedding; "fumigating" sewers with chlorine; and sending "wagons through all the principal streets, with barrels of black oxide of manganese and hydrochloric acid emitting volumes of chlorine."

While Rowell later claimed success for these measures, other doctors, the city's newspapers, and the Board of Supervisors were skeptical. Isolating patients, fumigating their residences, and other sanitary and spatial precautions were useless once smallpox had mixed with vulnerable local bodies and environments. These physicians explained that "(w)hen the disease is not epidemic, the morbific germs emanating from a patient soon lose their vitality. But when an epidemic influence prevails, these germs resist decay, and infect the entire atmosphere."

Under these circumstances, the only solution local officials and many physicians saw was to make vaccination work better. The Board of Supervisors ignored Rowell's late December condemnation of vaccination, agreeing only to consider the idea of

spreading lime on city streets. The spread of the epidemic had pushed city residents, most of whom were not arguing in editorial pages or at medical society meetings, to seek out vaccine, even if they were not sure how effective vaccination would be. By the winter of 1868-1869, the nature of that vaccine became a topic of public argument. These arguments did not so much ignore environmental causes of disease and its spread as tacitly or sometimes explicitly acknowledge their power. When doctors, health officials, and elected officials argued over vaccination, an intervention in patients' bodies and not in the environment which surrounded and permeated them, they worked from the assumption that at least for a while, environmental causes of smallpox were too powerful to alter or adjust, and had to be worked around.

What doctors and the Board of Supervisors felt they should be able to control, though, was the abundance, purity, and efficacy of vaccine's source.

Old and unsettled scientific questions jumped from medical journals and local medical society meetings to newspaper columns, as critics and advocates debated which was best and safest: vaccine taken from cows, or from humans? One camp argued that healthy babies or children vaccinated with proven vaccine were the best source for new lymph. Isaac Rowell took this position, but also thought there were not enough of these healthy children in the city to make massive vaccine production practical. Few doctors went as far as Rowell in condemning the habits of San Francisco's families, but most acknowledged that "humanized" vaccine did apparently carry the risk of transmitting scrofula

(in modern terms, tuberculosis outside the lungs) or syphilis.

Contaminated vaccine pushed fearful consumers away from either vaccination in general or vaccination by strangers using strange matter. Contamination was only one potential problem with vaccine from children's arms. The larger issue was whether vaccine had been weakened by its passage through so many bodies since the beginning of the nineteenth century.

The professional disagreement over whether bovine or human vaccine worked better was rooted in a deeper uncertainty about what vaccine actually was: smallpox transformed by its passage through cows' and people's bodies, or a separate kind of disease originating in cows or horses? If vaccine could change from smallpox as it moved through bodies and across time and space, it could also become too weak to work. If it was a different illness altogether from smallpox, one originally found in domesticates but not in humans, then it might be even harder to locate and maintain reliable supplies.

This apparently arcane question had been around for nearly seventy years, and had not slowed vaccination's spread or made doctors and health officials across Europe and the Americas less enthusiastic about its effects. Epidemic smallpox accompanied by a deficit of effective vaccine made the question of vaccine's nature pressing, however. Whether vaccine had begun as a distinct entity called smallpox, which existed in humans, or as a distinct but related entity called cowpox or grease which existed in cows and horses, mattered tremendously to how more and more

reliable vaccine could be produced, and produced quickly.

One advantage of bovine vaccine, though, was that cows could not argue with physicians, try to circulate their own vaccine, or vaccinate their offspring themselves. Local doctors revealed their efforts to maintain authority with their patients as they debated the reasons for humanized vaccine's failure. Vaccination presented another challenge to physicians who were always struggling to establish their own (usually masculine) authority in a city filled with skeptical (often female) consumers. Their potential customers wanted vaccinations, but they didn't always want them from doctors.

Depending on human virus only worsened the problem of "nurses and midwives for money, and kind-hearted, well-meaning women, from motives of the purest benevolence...offering vaccination to those desiring it. They pick up crusts, supposed to be vaccine, generally from the arms of revaccinated persons."

This homemade vaccine, whether supplied by nurses, midwives, mothers, or neighbors, was, doctors concluded, not much good at best, "simply dried serum and pus, light yellow in color, and quite worthless." When health office vaccinations didn't work or appeared to spread more fevers, the problem of patient-supplied vaccine grew.

Physicians wanted to establish their own professional authority over vaccination choices, but they couldn't do it on credentials alone. Their individual relationships with patients, or at least individual displays of doctors' own unharmed bodies, made vaccination acceptable. Like Joseph

Haine, physicians sometimes tried to interrupt the circulation of homemade vaccine by demonstrating the safety of their own vaccine supply personally. Doctors wanted to convince their patients to be vaccinated with reliable, expert-approved, unpolluted virus, whether or not they had ever been vaccinated before. To do this, they had to show local audiences that vaccine was effective in unprotected bodies, but also harmless to those who were already immune.

The premise of these claims was that individual eyewitness testimony could establish humanized vaccine's safety. Some city residents, too, valued these relationships and the trustworthy vaccine they promised, and objected to the Board of Supervisors' efforts to send doctors out as neighborhood vaccinators, pointing out in public meetings that "(s)ome persons have fears of being vaccinated by strange physicians, with vaccine matter from some unknown source."

The efficacy rather than the safety of vaccine virus became more of an issue as smallpox persisted and spread. Bovine virus became a more attractive choice as professional medical debates spilled into public discussion. A few months into the epidemic, the Board of Health directed the city health officer "to take measures for the procurement of a fresh supply [of vaccine] by inoculating a cow."

The Board of Health did not much care whether the cow was inoculated with old vaccine, cowpox, or possibly even smallpox, so long as its body could begin a new chain of reliable vaccine production. Advocates of inoculated cows could also claim to be following international standards, as physicians with European experience noted that "(i)n

Berlin, Paris, London and other European cities, it has been the practice for many years to procure virus from the heifer. A heifer was selected at birth, and when five months of age was inoculated with kine-pox matter." This was still a controversial practice. Advocates of human lymph could also point to international opinion in favor of vaccine made from children's arms, and for the persistence of smallpox and cowpox as distinct diseases, which did not change significantly over time. They also noted the apparent ineffectiveness of bovine vaccine even when used by skilled vaccinators.

Neither cows nor children could provide enough vaccine to meet public demand by early 1869, however. The city spent nearly \$15,000 on "extra employees at the health office, and vaccinators" (less than half of the unpopular smallpox hospital's cost) during the epidemic, but vaccine didn't amount to a line item in the auditor's report.

None of the Health Department's measures were adequate to stop the epidemic before March 1869, when new reports of smallpox cases dropped below triple digits for the first time in eight months. Local production of bovine vaccine was still ineffective and insufficient, whether cows were injected with vaccine, with smallpox, or caught cowpox naturally. It took until the beginning of the summer for the epidemic to end completely.

The 1868-1869 debates over contaminated human vaccine and scarce, inert, or harmful bovine vaccine pushed physicians and health officials to start to look further afield for reliable sources of virus.

Local doctors and officials began advocating for a new vaccine regime. During the epidemic, some local doctors had begun advertising their vaccine supplies as fresh and pure either because they came from England, the heartland of vaccine expertise and the original source of Jenner's cowpox, or because the vaccine orders, via telegraph to New York, took advantage of modern transportation and communication technologies.

The state vaccine agent, who did not seem to supply much vaccine during the epidemic and who apparently did not take part in publicized medical society debates, briefly advertised new supplies of vaccine from New York and London in January and February 1869.

Vaccine had always come from outside San Francisco, to be naturalized by newcomers, but the severity of the 1868-1869 epidemic and the widespread condemnations of locally ineffective virus sparked a new interest in standardized, industrially produced vaccine from beyond California.

The emergence of "vaccine farms" on the other side of the country provided a new option for San Francisco. By the early 1870s, companies in New York, Massachusetts, Pennsylvania, and Wisconsin were advertising shipments of pure vaccine, propagated through children's arms or calves' bodies or both. When smallpox predictably returned to California in 1876, health officers once again focused on vaccination as the key to cutting the epidemic off quickly.

By that year, vaccine producers in Pennsylvania, including the early version of at least one modern pharmaceutical giant, advertised "(a) fresh supply

of this Genuine Virus in quills, crusts, tubes and on ivory points, constantly on hand, and received weekly direct from the farm," or "fresh Humanized and Bovine Virus Crusts," promising that "(w)ith every Vaccine

Crust we will send the date of its removal from the child, the name of the physician, and when possible the name of the child," in San Francisco medical journals. Public health officials, however, opted for midwestern cows rather than Philadelphia children this time, ordering "a supply of pure bovine virus from the vaccine farm in Wisconsin, having been unable, at that time, to obtain a sufficient quantity in San Francisco." The 1876-1877 outbreak, which killed many fewer people in San Francisco and in California than the epidemic of 1868-1869, also saw far less controversy over vaccine and vaccination.

Both city and state health officials congratulated themselves on having turned vaccine into a commodity which could be reliably imported into San Francisco and used with a broad range of people. Public purchase of bovine vaccine from outside California was both cause and symptom of significant shifts in state (or municipal) capacity; in the influence of expert medical assessments of local environments; and in expert medical assessments of the significance of bodily histories and identities to smallpox's spread.

Those shifts emerged partly from the crisis of the 1868-1869 epidemic, which happened in a city where vaccine was both widely accepted and widely seen as insufficient to halt that year's death and suffering from smallpox. While the vaccine farms of the Midwest and East Coast represented technological (and medical/veterinary)

breakthroughs, their success depended on the willingness of officials, physicians, and consumers to accept vaccine from distant places and distant bodies as reliable.

That willingness emerged only after other and more local options became unworkable, and only after sustained public debate about public health responsibilities, and about the complex relationships among diverse bodies, changing environments, and the nature of vaccine.

Q+A

[segue from lecture]

CHRISTOPHER BRICK: And next up is the Q+A with myself and Jennifer, and here it is.

[beginning of group conversation]

CHRISTOPHER BRICK: Jennifer Seltz, welcome to the podcast!

JENNIFER SELTZ: Thank you for having me.

CHRISTOPHER BRICK: It's great for you to be here. I appreciate it; I appreciate your talk. And I wanted to know if we could start here: one of the issues - not issues but - one of the factors that has arisen, I'm thinking in particularly in another talk in this series by Kylie Smith at Emory, who studies kind of racism in Southern psychiatry, and part of the discussion I had with her when we were talking through her lecture was these regional variations in the history of public health itself. So her talk framed things as an exploration and

history of *Southern* psychiatry in a specific time and place, and so I asked her a variation of the questions that I wanted to ask you, which is: is this a new western history or a western history (with a capital 'W') of public health in the mirror sort of way that Kylie was talking about Southern psychiatry - I mean, is this a Western history in the Patty Limerick, Richard White, Bill Cronin kind of sense? Or no?

JENNIFER SELTZ: I mean sure, to the last part. It is a western history. You know, there is- it operates on the premise that there are things that are distinctive about the west in US history, and it is 1868 but, I mean, as you know from the talk that there is nothing in there about the Civil War or there is nothing in there really about Reconstruction.

It's a Western history in that it's also an urban history, right? This was kind of an older insight of the new western histories, and people like John Finley talk about the West as an urban place where most of the people particularly the settlers, the Americans who are defining it as the West and not as, you know, other people's homelands, are mostly in cities.

And so, I think in that way it is, but of course San Francisco as the predominant city on the Pacific Coast and the only city of any size in the 1860's, its connections with other places are also really important to the story, its connections to the East Coast, to immigrants from the Atlantic Coast and from Western Europe, as well as from East Asia and South America.

And the way that people from San Francisco and goods and pathogens circulate from San Francisco up and down the Pacific Coast and into Hawaii especially, are a part of the disease history as well. So in that way I think it is a western history, but it's a history of western routes of travel.

CHRISTOPHER BRICK: Yeah.

JENNIFER SELTZ: You know, as much as anything. And it's- you know, if- from the beginning of your question there is a distinctive Western history of public health. I'm not sure that I would frame it that way.

I think when you're interested in questions of urban power and what city governments can do and the dominance is of urban power and what city governments can do in the dominance of particular cities in their region for the West in the 19th century, particularly before the very end of the 19th century, you mostly are talking about San Francisco.

So in that way San Francisco can stand for the West in the way that I think, you know, other people at the time found oppressive and probably still.

CHRISTOPHER BRICK: Right, because San Francisco is the major metropolitan center-

JENNIFER SELTZ: Right.

CHRISTOPHER BRICK: -on the West Coast -

JENNIFER SELTZ: Right.

CHRISTOPHER BRICK: You talk quite a bit about the fault lines that arise around the vaccine question.

So, could you talk about that a bit more? Because I found that fascinating.

JENNIFER SELTZ: the kind of fault lines in term of the diversity of smallpox and vaccine experiences or the sort of long running intellectual arguments over the nature of vaccine itself, or both?

CHRISTOPHER BRICK: Both—I was thinking, there's a specific set of conditions that arise in San Francisco based on not just the people over there, but the microclimates in which all of them are existing and negotiating, so this creates a unique situation and that those factors in turn support a unique set of fault lines that arise on this central vaccine question of vax vs anti-vax—

I find it fascinating how you talked, for example that if the public health officials in San Francisco, there seems to be this internecine war going on between the professional class of San Francisco itself, between public health officials on the one hand, and as you said, politicians, physicians, on the other who are advocating for enhanced public commitments for vaccination.

So, all of these are intertwined, and I think in your talk you did a really good job on that. So, to answer your question, it's both.

JENNIFER SELTZ: Yeah! Actually the medical writers who are some of if not most of my sources in this talk never tire of pointing out that San Francisco is complicated and diverse and cosmopolitan in a way that very few places work, really around the

United States—certainly at this scale, in the United States in the 1860s. And in terms of vaccination histories, because you have people coming from places in Western Europe in particular, where vaccination was mandatory and often unpopular, but they might show up either having survived smallpox in childhood, particularly if they are from European cities, or they might have been in the military in another context where they had to get vaccinated and they resisted it. So you have some people that their bodies carry either probably life-long immunity or ten-year immunity of the smallpox vaccine. And then you have other immigrants from Southern China, mostly, who had a different form of inoculation which consists of inhaling dried small-pox lymph, which is actually very [inaudible]. And so they might also be immune.

And then you had large numbers of people who, because of age or because of the absence of smallpox and the absence of vaccines in the communities that they come from, were not immune and would be vulnerable to smallpox. You have more of those people coming in in the 1860s as San Francisco becomes a place that's trying very hard to make sure that it's past the gold rush, basically, but there are -- they want to make less of a place dominated by people trying to either hustle for gold or make money off of minors, trying to become a more subtle, and domesticated and white American place.

And the numbers of white American women and children, or European immigrants who would surely count as white do go up quite a bit during this period, and this is how it is in some ways a post-Civil War story because it is a story of -- with the end of the war and the readjustment of the

Western economy and waiting for the railroad to be finished – and San Francisco.

CHRISTOPHER BRICK: Yeah, I grew up on the East Coast, so I've been in review panels where it's so interesting—you might be evaluating a proposal that comes from the West and the Western historians will react differently to it than the ones on the East.

And that is not at all something that is uncommon in this line of work, that we all have these regional positionalities that affect the questions we ask and how we enter the exploration of them.

Public health is such a part of the way that Progressive-era reformers brand themselves, right? So temperance is connected to issues of public health, sanitation is connected to issues of public health, even the political reform movements for good government and the like are connected to these issues of public health.

But the stories we tell about them, especially on the East Coast where I am speaking to you from, tend to be infused with a regionalized, kind of urban, Eastern coastal bias, so I am curious to hear you respond a little bit more to how this works within those narratives and those periodizations of the progressive era.

JENNIFER SELTZ: Yeah, I mean I think and this builds on obviously like as we all do on other people's work. I mean this in some ways responding to or building on like Nancy Thomas -- great book, *The Gospel of Germs*, which talks about how this creation of a progressive public health was in many ways like not only the work of people who were elite or educated or male medical reformers, but

also just ordinary, often ordinary women who managed to kind of blend two things that still in kind of the popular imagination of public health gets conflated, right?

Like this solutions kind of separation between, you know, the idea when or when mathematics theory dominated and then germ theory arrived, right?

And what she should, and you know in that book and and other people have talked about too is that no, those two ideas could coexist. The idea that diseases could come out of specific places and that they were caused by specific pathogens where there's not really such a hard and fast boundary in either sort of elite medical history, or in the kind of popular culture of medicine.

And as we might think, and I think this this particular narrative about arguments over smallpox vaccine in the middle of an epidemic in San Francisco, in some ways, fits into that and that what I'm trying to emphasize is that there's -- in order to understand the actual growth in public health capacity, in what public health officials could do, in what people expected of local public health, and in the arguments over those.

And you also do have to understand this sort of cultural history of environment as well and understand how much Americans imagined the connections between their bodies and other peoples' bodies and the places where they were, right?

CHRISTOPHER BRICK: Yeah.

JENNIFER SELTZ: And in particular -- and this maybe gets to your question about regionalism -- and it's

obviously like the experience of migration is not unique to the American West in the 19th century. This mobility is a defining feature, right, for a lot of the United States in the 19th century.

Accentuated and accentuated in in the sources we have is that this part of the identity of San Francisco was that nearly everybody had come from someplace else right at this, at this moment, particularly for San Francisco: doctors, politicians, newspaper writers and editors, and public health officials.

And they're utterly discounting indigenous people in and around San Francisco, and they don't even really enter into the conversation. So I should, I should note that.

But the identity of San Francisco is of a place where people came from somewhere else and that part of the problem of coming from somewhere else is getting your body to acclimate to this new place, right?

And this, you know, Linda Nash's work explains this beautifully, for particularly the Central Valley of California. But it's also true in San Francisco, which you know just topographically like in 1868 and now, right is. And I don't know if you're so much of an East Coast person that you've never been to San Francisco.

CHRISTOPHER BRICK: No, I've been there. Yeah I have. I have. It's a glorious place and you know, I think probably the most visually striking American City that certainly I've ever been to, because there's just so much going on with the bay and the bridges and the landscape - you know those hills

and -- it's a beautiful place to visit so I have been to San Francisco many times. I love San Francisco.

Uh, but I feel that absolute sense of deficit because, in my own readings of the past, I don't know much about its history beyond you know what you've taught me, and you what a couple of others have taught me.

I mean, I've done that typical pilgrimage to San Francisco many times, where you know I've been to Alcatraz.

JENNIFER SELTZ: Yeah, yeah, I mean the geography that people have, the visitors to San Francisco -- You know, you have to kind of erase most of that, so if you're trying to picture 1860s San Francisco, you know, which is now, which is largely, you know, built around the eastern side of it, and the kind of downtown side, right?

The downtown topography is now would be more or less recognizable. You could map it onto that. But this is a city that was built in, was built in a hurry. Much of the shoreline was fill and dominant kind of experience with people in the 1850s was sort of horror at how messy it was, literally messy, right -- this is -- and how dangerous it was even to kind of try to disembark from a ship and make your way to you know to a hotel, or anywhere else you're trying to go, because it's literally just planks over mud, and they could fall into the water at any time, and generally it just sort of has all the signs of kind of a very hastily built Boomtown.

But at the same time they also you know recognize that the situation of the city in terms of the harbor and the Golden Gate are amazing, and we're going to make it the center, the center of commerce. And as it becomes the kind of gateway to you know to the gold regions and then the place that becomes the source of capital for almost any place else in the West, right?

It does -- it does get a little bit more -- it does get considerably more respectable, less sort of overtly dangerous, but it's often that the immediate experience of newcomers is that, "it's an unhealthy place and you know, it's muddy, the weather is kind of weird, you know, it's cold in the summer."

CHRISTOPHER BRICK: It is, yes. It is, like you said, microclimates are a huge part of what makes the place distinctive.

JENNIFER SELTZ: Yeah, right, and so that's what -- and to get back to something. What people then made of it in terms of the public health measures of the 1860s and its medical, medical geographers -- these physicians who are very interested in the interaction between bodies and places, are fascinated by California overall because of the diversity of landscapes and climates, right.

And San Francisco seems to be almost sort of a microcosm of that -- its human diversity and its environmental diversity, you know that the weather can change going over one hill to another, and so that becomes -- partly it's a kind of place where this provincial knowledge can be produced and sent back to these intellectual metropolises and can sort of help make people these careers.

And so that's part -- a part of what I hope that projects like this can do is also show the importance of this medical geography, which was sort of entirely this settler project that wasn't unique to the United States.

And European physicians did this too -- just, you know, just sort of the job of doctors who find themselves in places new to Europeans to report back on how different diseases act, how different bodies act in these different places. And then what can we know about this? About whether or not these places are safe for Europeans to settle?

CHRISTOPHER BRICK: Yeah, I mean, does this have any impact of industry transformations in the size or scope or breadth of state power?

You know that seems to be -- one of the thru-lines, the things that seems to recur in a lot of these talks is that public health emergencies -- and I think we're seeing this in our own time with respect to COVID-19 -- often give rise or act as a goad to state formation, right?

Because there's all this, you know, need to not just socialize costs, but also benefits, because those two things are so interconnected when you're talking about disease-monitoring and management. And so what happens in San Francisco with respect to that?

I mean, it sounds like there's an enhanced set of institutions that arise in connection through this work that's going on?

JENNIFER SELTZ: Yeah, I mean when things by -- and what happens is -- by the end of this epidemic, or even more sharply by the next outbreak of smallpox in 1876, so within 10 years -- and this did the local government, and the State Board of Health, they do have this new capacity to get vaccine from far away and to distribute it and they begin to kind of supersede these smaller local networks which literally go kind of arm to arm, right? In terms of producing vaccine and moving it around and that is a significant change.

CHRISTOPHER BRICK: When you say arm to arm, you mean sort of like more DIY?

JENNIFER SELTZ: Yeah, that was generally, you know, this irritated doctors, but it was not uncommon to them because everybody understood the theory behind smallpox vaccination -- like it was, you know you would -- the stuff that would come out of a pocked arm right would then be injected or kind of basically scraped really into somebody else's arm and they would get a mild, hopefully a milder, you know, a milder version of the disease, right? Or of what was called the vaccine disease, or vaccinia, and then they'd be immune.

And so that was something that was a kind of technology that people would look at physicians performing. If you like, well, I can do that. And I can do that, you know, as well as a doctor or -- doctors themselves, this was a skill that many doctors you know had. It was just sort of a basic part of what they knew how to do.

But the supply, but keeping the vaccine fresh enough, right, and still active, was very difficult. And so that's where there becomes this

kind of niche for the places that can figure out how to do this industrially, right, or eventually on a kind of industrial scale. And so by the last third of the 19th century, and you start to see these new kinds of businesses -- still call themselves farms, I mean often because the vaccine is literally grown on cow skin and this was how smallpox vaccine was produced so well into the 20th century.

The local -- the city itself, and also the state, the state of California has much greater capacity to get that vaccine and then to distribute it because that had gone so badly in 1868 and 1869. And because the kind of private sector was not able to supply the demands.

And then, I think that also opens up some space and I didn't talk about this in my talk because I wanted to focus on this kind of cultural-environmental history of smallpox vaccine. But one of the things that I think is also familiar in progressive public health is the way in which these new powers you know are directed -- are racially focused right? Are directed at racially marginalized groups in different ways.

And San Francisco, and most famously, it's the idea that the Chinese are spreading smallpox becomes part of the politics of Chinese exclusion by the late 1870s, and that really is a kind of shift, I think from the epidemic that I'm talking about where there is a kind of -- there are some people kind of blaming the Chinese for spreading smallpox, but they're relatively marginal in the politics of the city and in the politics of public health at that moment.

But after, after this epidemic, when vaccine itself becomes less of an issue, that's when you start to see smallpox really weaponized against Chinese residents of the city.

CHRISTOPHER BRICK: When you say weaponized, meaning scapegoating?

JENNIFER SELTZ: Yeah, they're not just being blamed because of their -- yeah, I mean, in particular, you know because of the crowded living conditions in Chinatown, [inaudible] forced upon Chinese residents, and because many Chinese residents are domestic workers, and had sort of, you know, intimate contact with people, clothes and households.

Until this week, this is a way that people know that through what we now call fomite transmission. This is a way that smallpox can spread, although it wasn't probably the most common way. And this is a way that Chinese are scapegoated.

And also -- and then their you know, their perhaps relatively more widespread immunity from people who had been, who had grown up in China and who had done this sort of inhaled inoculation-style vaccination. That becomes rather than just something that's kind of noted as a kind of diversity, as in 1868, by later in the 19th century that's seen as more a way in which they're a threat. The Chinese can't get smallpox, but they can spread it to others.

CHRISTOPHER BRICK: Right, right. So there is a kind of racial fault line that arises.

JENNIFER SELTZ: Right, but that arises later and that I don't think it's necessarily something that was an inevitable consequence of this rise in state capacity, which you do have then as a result of this this kind of vaccine crisis.

But I think it's an interesting kind of state capacity to me because it's -- because what it does is, it's getting the city sort of to have been able to extend its reach to places further away, right? It's not only that they're exerting power and/or greater surveillance on sort of the spaces of the city. That is sort of happening at the same time. But this is about building new connections to vaccine farms in Pennsylvania or Wisconsin.

CHRISTOPHER BRICK: Well, so we're not just talking about San Francisco's sort of immediate hinterland?

JENNIFER SELTZ: No, in fact they would have loved to be able to find it, but none of the cows -- and what people cut -- but what people called cowpox, the disease related to smallpox within the same family of viruses.

CHRISTOPHER BRICK: The variola family?

JENNIFER SELTZ: Yeah, yeah, right. But it's actually was for what -- and I don't know the veterinary history here, but for whatever reason it was quite rare in the cows around San Francisco. There are plenty of cows around San Francisco, but there was not apparently any cowpox.

CHRISTOPHER BRICK: So they had to -- they had to reach across the continent?

JENNIFER SELTZ: Right, more cows and they also figured out how to make this a kind of an industrial process, right?

CHRISTOPHER BRICK: You know, another recurrent theme that has struck me time and again is this question of vaccine and attitudes toward it. And the contemporary public discourse of vax versus anti-vax rarely invokes or calls upon this deep history.

But for the most part this has been there, you know, the skepticism along with this boosterism and the tension that arises therein.

It seems to me that a fair number of people working in this field probably were drawn to these questions, in part because of that context, so I'd be curious to hear more about what brought you to this work as well?

JENNIFER SELTZ: You know, this comes from a larger project on health and environment in San Francisco. I just kept running across references to vaccine and the amount of time in particular that physicians spent arguing about what vaccine was I just thought was bizarre, right?

Like, I mean 19th-century medical journals are filled with things that are surprising to us now or are not what the kind of language that contemporary physicians use. And so partly it's just the sort of the strangeness of that. And so I was just wanting to figure out what was going on: you know, why are doctors talking about sick cows at length at medical society meetings? And what's going on with that?

But then I think -- I still actually, I don't know that I have a good answer to your first question, which I think is a really important question is: Why don't contemporary anti-vaccinationists ever invoke this law? I mean, ever is probably too strong, right -- but so rarely invoke this law.

CHRISTOPHER BRICK: I didn't know much about the history of public health before we put this, started putting this series together and I'm so grateful to all of you who work in this field because it's been totally indispensable to helping me process the moment.

But one of the things that absolutely struck me the further I got into this content is how deep this history goes and how much historical ignorance/illiteracy there is out there about that thru-line?

JENNIFER SELTZ: Yeah, yeah. I mean I have a kind of uncertainty -- I mean, unsympathetic to contemporary antivaccination answer to it, which is that it seems as if it's common -- and their common sets of concerns about vaccines, right? Like, there's a kind of common suspicion of how can the state have the power to order something to be done? You know, to my body or to my child's body, or to withhold something you know, withhold education unless I allowed this intrusion into my child's body? Like where do I? How do I know where this has come from? Like couldn't this cause disease? And of course, like yes -- I mean, vaccines in the first vaccine, smallpox vaccines could cause and often did cause disease, right?

But those to my mind were very rational concerns in the 19th century and the early 20th century and the

shift in you know, the efficacy and the safety of vaccines since then has been so great that in some ways it's hard for me to make those connections. I mean, it's if you were -- if you were a parent and were worried about smallpox vaccine in the 1860s or 1870s, or even particularly later on, when smallpox seemed to be a more mild variance, it could be a real question whether or not it made sense to get your child vaccinated. Because smallpox could be horrible, but smallpox vaccine could also be contaminated, and that was not uncommon.

CHRISTOPHER BRICK: Well, it seems to me, you know, a perfectly reasonable concern to have when the public health officials themselves are discouraging it.

JENNIFER SELTZ: Yes, absolutely. And it's also part of it. That was the next part. The other thing that sort of interested me about this episode is that it is a moment of kind of vigor, really vigorous public debate which didn't neatly fall along standard political lines. I mean, I tried to kind of just spend a good bit of time trying to figure out where the physicians who wanted more vaccine, or the editors who wanted more vaccine, versus the ones who wanted to focus on sanitation and quarantine. You know, did this line up with the somewhat confusing politics of 1860s San Francisco, and as far as I can tell, it did not really.

These were arguments over, what kind of environmental and medical interventions we're going to [inaudible] that people have very different answers to depending on their different experience. And even sometimes there are people who have very

similar experiences came out on very different sides of this argument and answered.

And so the level of -- the sort of back and forth, and the ways in which like, more indirectly, in the case of people who are not physicians or newspaper editors or politicians -- but the numbers of voices who were able to say like no, we want vaccine; or, we certainly don't want the smallpox hospital; or yes, you can try sanitary methods, but it's not going to work. And I found that particular, that part of the story sort of interesting and or it's -- and that's a good thing.

I found that in some ways a good counter to some of the arguments about progressive public health, which might see it as something that's more top down and this seemed to be a more widely-shared conversation among people.

CHRISTOPHER BRICK: Yeah, I mean you touch on that, the way that there are mothers in particular who who sort of forage for vaccine too -- so there is a bottom-up.

A lot of times when we talk about the history of public health it tends to get framed as this kind of technocratic elite that that enters into the dynamic when there's an epidemic situation that needs to be addressed and in turn kind of makes the arm of the state and the power of the state to dictate outcomes, as it were, more visible, and in turn oftentimes as a result of that, provoke a backlash of sorts or pushback that affects you, know, not just the disease ecology and how it's either contained or amplified but the local politics and the regional politics of these spaces.

Wow, well I want to thank you.

JENNIFER SELTZ: Thank you! Those were great questions.

CHRISTOPHER BRICK: Jennifer Seltz thank you for joining us.

JENNIFER SELTZ: Thanks so much for having me.

Conclusion

CHRISTOPHER BRICK: And that's a wrap.

I want to thank Jennifer again for a wonderful talk and invite you to join us again next time when Megan Birk will walk us through "Poor Farms and Poor Health: Sites of Public Health Care in the 19th Century." I learned so much from that talk and the Q+A with Megan and Kariann was great fun as well, so please do join us and we'll catch you then.