

## ***Intervals - Episode 2***

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and Early America"

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### **Introduction**

CHRISTOPHER BRICK: Hello everyone I'm Christopher Brick and I want to welcome you back once again to *Intervals*, a public humanities podcasting initiative of the Organization of American Historians.

We of the OAH are the world's largest professional society devoted to the study and teaching of American history, and these days there are more than 7,000 of us toiling away on some aspect of the American past.

Today's lecture though comes to us courtesy of Dr. Shannon E. Duffy, a very gifted senior lecturer from the Department of History at Texas State University in San Marcos.

The title of Shannon's talk, "Smallpox and Early America, 1492-1793," is disarmingly simple

for a topic as laden with complexity as this one is, and I really want to applaud Shannon for opening up this content to all of us in such an engaging, accessible way.

It's not easy to distill into a brief forty minutes that several centuries of human interaction with a pathogen like variola major, a virus whose impact on the history of Vast Early America is a question that historians have wrestled with for a long time and are likely to continue analyzing and rethinking for the simple reason that you can't really grapple with the American past from the 15<sup>th</sup> to the 18<sup>th</sup> centuries without considering the history of smallpox.

And today, Shannon Duffy's here to help us do just that. Shannon's one of the real master teachers that we were fortunate to have joining us this season, and as you listen, I think you'll find as I did that through her narration it becomes possible to glimpse just a bit of the enormity of what smallpox unleashed on the human hosts it infected throughout the Americas in this period, a disproportionate number of whom were Indigenous First Peoples. Lacking the immunological exposure to smallpox that had long been endemic to vast sections of Europe, Africa, and Asia for millenia prior, the Native inhabitants of early America were particularly susceptible to the dangerous virus that Europeans brought with them to early America and with it a biological calamity that transformed that virus, variola major, at long last into a fully, truly global pandemic that went on to

persist in one way, shape, or form until the virus itself was finally eradicated in 1979.

So while the full history of smallpox transmission lasts nearly 3,000 years beginning to end so far as we can date and record it, variola major's most lethal iteration arises at this moment in the late second millenium of the common era.

But this is not just a story of despair or of bio-catastrophe, but of survival as well, resilience as well, and of the beliefs, institutions, communities, and technologies that intersected with the history of smallpox along *its* road to extinction, not anything or anyone else's.

Kariann Yokota will be joining me for the Q+A after this lecture, so be sure and stick around for a really memorable and fun conversation. As informative as this discussion with Shannon was, it was a great deal of fun as well.

And with that I now want to open it up to Shannon Duffy on "'The Speckled Monster': Smallpox and Early America."

### **Lecture**

SHANNON DUFFY: Hi there, I'm Shannon Duffy. Welcome to my podcast, which is "Smallpox in Early America."

I wanted to start off by talking, mentioning something that Frank Snowden, who is a historian of infectious diseases, said in his book "Epidemics and Society" in 2019. He made a couple of comments I thought were really interesting.

He said that, you know, diseases, studying diseases in history often is seen as, like, this esoteric subfield, but disease is as essential to human history as wars and other big phenomenon.

He also points out that, before the 20<sup>th</sup> century, infectious diseases are literally the leading cause of death throughout all of human history. Even in wartime, soldiers are more likely to die from disease than they are from their wounds.

And the third thing he points out is that epidemic diseases, infectious diseases have a unique effect on the human psyche that other kinds of diseases don't. The panic, the hysteria, the scapegoating, occasional resorts to religious enthusiasm, they play a unique role in society.

All of these things are particularly true for smallpox, which is really the great killer in the Americas pretty much throughout the whole colonial period. It's something that plays an outside role in the period of European conquest, the initial period of settlement. It shapes colonial American society, and then it will come back to play, again, an outside role during the Revolution.

So, a little bit about smallpox. There's actually two versions of smallpox. The one we're talking about is variola major, which is by far the more lethal one. This is an ancient disease. I mean, the first evidence of it is, you know, back in Africa and Asia going back to two thousand years ago. It's first described, for the first time in historical record, by a physician in Baghdad, Razi, in the 9<sup>th</sup> century. This is something that hit the Roman Empire, so this

is a very old disease. It was probably first brought to Europe during the period of the Crusades.

The fact that it is old, the fact that it is introduced to Europe centuries before the age of colonization actually will play a role.

Its name, I thought this was interesting, its Latin name "varis" just means "pimple." "Pox," its nickname, is from the pustules.

One thing I wondered about was why smallpox?

You now, what's the "big" pox?

Well, as it turns out, "the pox," "THE pox," is syphilis, is an STD. And that will actually come up, because there's kind of a pun on the name "pox." In the colonial period it's also called "the speckled monster," and as another historian noted, it's not necessarily the most lethal disease in colonial America, but it might well be the most feared because of how nasty it is and how debilitating it is to its survivors. This is a respiratory virus; it's usually spread by respiration, but it's also a fomite, and it can actually, particularly, linger on cloth for weeks, which also will play a role in colonial American history.

This version-- as I said there's a variola minor, which is about one percent lethal. Variola major is about thirty percent lethal, which is a pretty high lethality. That, combined with its incredibly contagion, is one of the reasons it is so dangerous.

So, what is it like if you get smallpox? Good news is you generally will not get it today. First of all, about twelve days after you're infected, you're going to feel like you had a mild flu. You'll get over that, you'll be relieved. It's just starting.

About four days after that, a rash spreads across the body, and then, after the rash, pustules develop, and, if you have a really bad case, these pustules will actually run all together. Most people die, they have this, it can entirely cover the skin. Eventually, the pustules scab up and then they fall away. When they fall away, they leave deep, permanent pits, scars. This is something that is permanently disfiguring. In the colonial period, as many as one third of the survivors also could be blinded. We also now know it causes male infertility. It is probably the reason that George Washington never had children. It may be the reason Andrew Jackson never had children.

This is not a disease that discriminates; throughout history even royalty got it. If you remember Elizabeth I, the pictures of her with that white makeup, that was to hide smallpox scars. The good news is you only get it once. As Elizabeth Fenn said, who is one of the big historians on smallpox, it leaves you either immune or dead. It's related to both the chicken pox and the measles and, like them, it is incredibly contagious.

One medical expert said if you didn't have a natural immunity, meaning you hadn't caught it before, if you walked through a room you almost certainly would come down with it. And, as I said, throughout the period of, especially, the Age of Exploration, smallpox is the biggest killer throughout the Americas.

One thing to note is by the 15<sup>th</sup> century, 1492, you know, the 14<sup>th</sup> and 15<sup>th</sup> century, it is endemic in Europe. And what that means is, that it just exists,

it is a permanent disease, so it is the killer of children. Every generation, the kids are going to get it. Babies do have some immunity from their mothers, but the little kids are the most at risk; some of those children are going to die. But the adults are generally immune. What that means is the conquistadors, your John Smith types, they're immune when they come to the Americas and, of course, the Native Americans are not.

Of all the diseases that will just devastate the Americas throughout the whole period of colonization, this is by far the worst. It seems to have first been introduced at the Isle of Hispaniola around 1517, probably Columbus's second voyage. And the death rate - of course, there's a great deal of debate about how many people lived in the Americas before the Europeans first really arrived, but, generally, there were probably, based on contemporary counts, as many as two and a half million people just living on the Island of Hispaniola at the beginning of the Spanish conquest.

Within a half century, the population is a fraction of this. By the early 1600s, which is when mainland Anglo-America settled, it is ravaging all the way from New England all the way to the Chesapeake. And, of course, this is one of the major reasons why Powhattan's group, why the New England Indians, the Pequots, cannot really mount an effective military resistance.

A very clear example, early example, this is what happened to the Aztec Empire in Mexico. The Aztec Empire may have held as many as sixteen million people at its height. Its capital Tenochtitlan (never can

say that capital) -- its capital alone had about two hundred thousand, and, of course, there's the famous story of Hernandez Cortez.

How exactly do the Spaniards take this with five hundred men, which is the story that Cortez told? Tenochtitlan was at the end a seventy day epidemic disaster from the smallpox. It had hit the royal family; it killed several members of the royal family. It had killed a great number of the people who basically were the leadership of Tenochtitlan and it just devastated the entire capital. The population had fallen by about forty percent.

In other words, Cortez and his men, in addition to other things that were going on, they arrived in the middle of an epidemic. And this is a story that will happen again and again in the Americas.

We have, for the sixteenth century, slightly better numbers courtesy of the Spaniards. 1519, the population for Aztec men, Aztec Mexico, is estimated around thirty million. A half century later, in 1568, the population is between 1.5 and 3 million.

Now, this is not all smallpox, but one thing I should note about smallpox is smallpox makes you vulnerable to other diseases in its wake, so that it can be a contributing factor to secondary epidemics.

One quote that we have from a contemporary at the time, Bernal Diaz, who is Cortez's chronicler, in 1520, he said, "We could not walk without treading on the bodies and heads of dead Indians. I have read about the destruction of Jerusalem, but I do not think the mortality was greater there than here at Mexico. Indeed, the stench was so bad that no one could endure



it. Even Cortez was ill from the odors which assailed his nostrils." Poor guy.

For the people who settle mainland America, New England, the Chesapeake, the first generation, these people are, of course, also European-born. So, what that means, for them smallpox was also something that maybe had killed members of their family, siblings, but as they are generally arriving as adults, they have a certain immunity.

But what happens as colonial America becomes more mature, more mature colonial society, is that a larger percent of the population is American-born, and as this happens, immunity drops. Just to give you some statistics, over the course of the 17<sup>th</sup> century, about sixty percent of the American immigrants are going to contract the disease and about ten percent die of it. But, by the mid 18<sup>th</sup> century, most colonial Americans have not been exposed to it.

And this is in striking contrast to the Europeans. Europeans including English, of course—it is still endemic in Europe and England. This is going to play a very big role in the 18<sup>th</sup> century, especially when we get to the period of the French and Indian war and, particularly, the American Revolution.

For colonial Americans, the areas that have, sort of, the most settled populations and non-mixed - what I mean is fewer constant immigrants coming, especially from continental Europe - this is New England and the Chesapeake, they have the lowest rates of immunity. Another thing to keep in mind about colonial America is it's mostly countryside, it's mostly rural, and so people away from the cities are also going to be a lot more vulnerable. And this plays

a big role in why 18<sup>th</sup> century Europe and America had very different reactions once the concept of inoculation is introduced in the West.

Smallpox is actually going to be the very first disease that the West has, sort of, a method of combatting. I mean, not just treating, but actually trying to avoid.

So, what is inoculation?

Inoculation is the more dangerous forerunner of today's vaccination. Essentially what you're doing with inoculation is you have someone who's sick from the smallpox, you basically make a cut in one of the pustules (this may not be a lecture you want to listen while eating lunch). You make a cut in one of the pustules, take some of the puss, and you're actually going to introduce this into the bloodstream of someone else. This will give the second person smallpox, but generally they will get a milder version.

Inoculation is an extremely old, Eastern practice. This is something that China, Africa, Asia, have been practicing, there's evidence in China, as far back as a thousand B.C. Interesting, I thought, the European name for inoculation, actually, it's a gardening term. It comes from potatoes. The thing about inoculation, and if you think about, sort of, vaccination debates today, the vaccination debates are not new.

Really, from the very beginning this idea was introduced into western science, it is extremely controversial, for a couple of reasons. First of all, it is counterintuitive—it sort of still is today. You are taking someone, especially in the case of

inoculation, who is healthy, and you are deliberately making them sick. And they will get sick and they will have, you know, the usual run of smallpox in a mild version, but they still can die from it and some will. The second thing is that it is dangerous because they have smallpox and because -and I think I forgot to mention this-smallpox has a long course.

From the time you get your rash, you break out in your pustules, eventually they scab-this entire process takes a month. From the moment you get the first symptoms to the moment the last scab falls off of you, you are contagious. And so it is a dangerous process and it is basically controversial from the first moment it is introduced. The fact that it is an Eastern concept, as you'll see, also plays a role.

It was introduced pretty much at the turn of the 18<sup>th</sup> century to Europe. One of the very first accounts we find Joseph Lister, who is an East India Company representative, wrote an article about it to the Royal Society, which is pretty much England's premier scientific organization, in 1700. He was proposing the Chinese method which is dried scabs up the nose. Somehow, this didn't catch on.

It was really introduced to England in 1721 by, you might kind of call her the 18<sup>th</sup> century equivalent of a jetsetter (didn't have jets back then). Lady Mary Wortley Montagu was a very cosmopolitan, very prominent socialite at the time, very respected and esteemed. She was visiting Constantinople, which is, you know, was a city where inoculation was very common. While she was in Constantinople, she learned about it and it made a big impression on her, apparently, because she had lost a beloved younger

brother. This is often the case with Europeans. She had survived, she was herself immune, but in childhood she had lost a brother too inoculation. Because of this she makes the decision to inoculate her own very young children. She actually did her son while she was there, but she wanted to inoculate her daughters when she returned to England. And this was initially quite controversial.

You know this is sort of rather a typically aristocratic solution to the problem of trying something that might be dangerous; they first tried it out on prisoners in the Newgate Prison.

The prisoners got what I think is a deal you can't beat which is they were going to be executed anyway. If they would try out this new inoculation procedure, then they would be let out free. After that they tried it out on all the orphans in the London prison. When both of these groups, nothing untoward happened to them, it becomes somewhat more socially acceptable.

A big sort of, I think, psychological barrier was breached when the heiress to the throne, Princess Caroline, actually inoculated her own daughter which, of course, then makes it somewhat more socially acceptable.

Interestingly enough, New England is finding out about inoculation the exact same year, which is 1721, but there doesn't seem to be a link between the two of them. What is going on in Boston in 1721 is the worst epidemic that Boston has seen in an entire century. New England, of course, in the colonial period was generally healthy. But in 1721, the HMS Seahorse, a ship from the West Indies, had sort of snuck into the harbor, breaking quarantine, that was

rather common, and it brought smallpox into Boston.

And in a one-year period, Boston, which had a population of around eleven thousand, and over six thousand cases and over eight hundred and fifty deaths. Another nine hundred people fled the city. Because of this, one of the leaders of Boston, Cotton Mather-- yes, it is that Cotton Mather if you remember the Salem Witch trials.

This is probably one of the most prominent puritans ever, one of the most prominent puritan ministers ever. He had played a role for which his reputation had suffered rather a hit, encouraging the Salem Witch trials. He's an old man by this point. He is someone, even though he's a leading religious figure, he is a brilliant man, was a brilliant man.

He graduated from Harvard at fifteen, has the largest library in New England. He had always been fascinated by science and he had actually learned about the inoculation procedure and decided to introduce it into Boston with the help of one of the local physicians, a guy named Zabdiel, Zabdiel Boylston. The two of them, basically write to, sort of, the local physicians in town trying to get them to come on board with this new idea. Mather actually learned about it from his own West African slave, Onesimus. Onesimus had told him he had undergone this procedure which had given him something for the smallpox and that his people back in Africa had long known how to do it. I think it's interesting, Mather didn't really start believing this until a few years later. He read about it in one of those Royal Society reports.

However, once Mather introduces it, there is an absolute firestorm of opposition to it. Pretty much all the other leading doctors opposed it. The person who was really leading the attack was Dr. William Douglas and the religious leaders of the community also opposed it. Now, some of this was religious.

Boston 1721 is still, still got that old time puritan religion.

But there also is a scientific opposition to it.

If you think about sort of, and again this is something that comes up again and again both with inoculation and, later, vaccination, if you think about the hypocritic oath, this is seen as in opposition to the hypocritic oath. You are deliberately causing harm to a well person. And then also, of course, there was this argument that you were violating divine law.

Mather's house was almost burned down as a result of the controversy, somebody threw a bomb through one of his windows with a note that said, "Cotton Mather, you dog, damn you! I'll inoculate you with a pox with you!"

Which, again, "pox" is a pun because it does have sexual connotations.

One thing that was interesting, I found, about this contest is that, in some way, it's pitting the forces of old-time religion against the rising forces of the Scientific Enlightenment which is, kind of, the 18<sup>th</sup> century movement. If you look at the person who's leading, sort of, the anti-inoculation charge, Dr. William Douglas is very different than Dr. Boylston, Dr. Zabdiel Boylston. Douglas was university trained in Edinburgh, which is the best

medical school in pretty much all of Europe; he's trained in Paris. Whereas Boylston, like a lot of American doctors, was basically home trained; he's an apprentice. Douglas presents inoculation as something that quacks and meddlesome, superstitious preachers are pushing.

Another opponent of inoculation was the leading new newspaper, the New England Courant. The New England Courant, which is going to be sort of this new voice for the press, was being run by James Franklin, who is Ben Franklin's older brother. A lot of Franklin's opposition to it was because it was being pushed by Mather. Mather, to him, was sort of a hold back from the old puritans that had been running New England. Of course, the interesting thing about this situation is, in this situation the old guard were actually right.

When I read about that story for the first time I wondered - how is Ben Franklin responding to all of this? Because Ben Franklin, of course, had grown up in Boston and he actually was a young man, fifteen years old, at the time of the Mather controversy.

He doesn't seem to have said anything when he was working for his brother James, who was rather a bad taskmaster, that might have had something to do with it, but Ben Franklin actually will become, later, one of the leading early advocates for inoculation once he moves to Philadelphia. As early as the 1730s, he is throwing his printing presses behind supporting inoculation. One big factor here seems to be that in 1736 he lost his young son, Frankie Franklin, to the smallpox.

This was something that he actually mourned for years. The gravestone he put up describes this kid, who was about four years old, as "the delight of all who knew him." At the time that he lost this little boy, he took the time out from grieving to actually write to the newspapers because there had been a rumor at the time that Frankie Franklin had died from being inoculated, and Ben Franklin basically said no, he died in "the natural way"—that was the expression they used if you just caught it naturally. He was only four years old, he was kind of small for his size, he'd been ill, we were holding off getting him inoculated.

When Franklin wrote his biography in 1788, he was still regretting this. He wrote, "in 1738, I lost one of my sons, a fine boy of four years old by the small pox, taken in the natural way. I long regretted this bitterly and still regret that I had not given it to him by inoculation. This I mention for the sake of parents who admit that operation." And Franklin threw his newspapers and, of course, one of the leading newspaper editors, basically kept arguing mainly through statistics - and this was sort of a very enlightenment thing to do - yes, inoculation is dangerous, but look at the deaths from inoculation versus the deaths in the natural way. It is still a hard uphill battle for colonial America. And the reason for this is that, given colonial America's circumstances, in some ways inoculation can be seen as more dangerous.

And the reason for this, again, to inoculate your patients, you basically have to keep them - you know they're going to come down with smallpox, they're



going to have smallpox for a month - during that month you have to keep them in strict quarantine. While they are suffering from smallpox, their immune system is also suppressed, so they can come down with secondary infections.

And if anybody breaks quarantine, if, you know, people come in or out or your patient leaves, what you're actually risking is setting off an actual smallpox epidemic. Considering that by mid, you know, early/mid 18<sup>th</sup> century colonial America doesn't have high rates of smallpox, naturally, this seems like a dangerous thing. So, what is colonial America doing to combat smallpox in other ways? You know, sort of in keeping with enlightenment principles, they try to, you know it's associated with filth, so they have street cleaning, they try to regulate their markets, their green grocers, their butchers.

Somewhat more effectively, whenever a ship reaches port, it is supposed to sit there for forty days. The idea here is to make sure no sailors had gotten sick. They actually had been doing that since 1701; the ship that had started the 1721 epidemic had actually broken quarantine.

This generally works until mid-century when the outbreaks of the French and Indian and, particularly, the American Revolution, because what happens after 1750 is you start having thousands of English and European, German troops tromping all over colonial America. And this was particularly the case with the outbreak of the American Revolution in 1775.

Elizabeth Fenn, who has probably one of the best titles of a book that I've run into recently, *Pox Americana*, points out that the smallpox epidemic that

hit America in 1775 to 1782, has almost the exact same dates as the American Revolutionary war. It is basically like the secret weapon of the British, although, ultimately, it will hurt both sides militarily. And, again, what's happening very, very simply, is that most colonial American adults, especially in New England and in the Chesapeake, don't have any immunity to smallpox.

They've never been exposed to it, however, most Europeans, including most English, have been, as adults, exposed to it.

And, you know, this had been augmented by the fact that really by mid-century, because of the danger of inoculation, there were laws on the books pretty much throughout New England and the Chesapeake, particularly, that had actually banned the inoculation procedure.

Whereas, by contrast, overall in the English side, the British army regularly inoculated their troops because, again, smallpox was simply a regular threat over in Europe. Smallpox will play, on the American side, a major—it will be a major headache for the patriot war effort, particularly in two places: in the siege of Boston, which happened in 1775-76.

George Washington, the patriot troops pretty much surrounded Boston — they had an extended siege rather than attacking a much smaller British force. One of the major reasons for that was smallpox had broken out in the city of Boston and there is evidence that the British actually were encouraging rumors that they were deliberately spreading smallpox to keep the patriots from attacking. But where it really played

a role in the American war effort was our rather ill-fated attack on Canada.

The Americans actually had been attempting to conquer Canada throughout their colonial history and it does not work - the Canadians are actually tougher than they look. But, in this case, the attack on Canada in 1776 was just an absolute debacle and the main reason it was a debacle was smallpox. Benedict Arnold, he lost thousands of people, including the new commander. They had actually sent, they had a new commander, Thomas, that had gone up there, and they had told him, he had never been exposed to smallpox, "you really should get inoculated." He didn't; he was sick within a couple months; he was dead a month after that along with thousands of his troops. It was actually a complete disaster.

Smallpox also effects the patriot war effort, really especially up to 1777, and I'll explain why that date's a turning point in another, kind of, long term way, which is through the recruitment efforts.

Again, I mentioned, smallpox is probably the most terrifying disease because it leaves you pock marked, it leaves you disfigured, it can leave you blind, they don't seem to know it could leave you infertile, but that's enough by itself. Particularly soldiers in the countryside and, again, and awful lot of Washington's troops are coming from the countryside, are terrified of it. And so this is a major impediment to recruitment; it's also when rumors break out in the camps of smallpox. It's a major force for widespread desertion.

And, again, inoculating the troops is an option, but inoculation takes a month during which, of

course, your fighting force can't fight. They're debilitated, but, not only that, not only are they vulnerable to spreading the infection, but the nearby community is also incredibly vulnerable. The person who basically changes this situation, this is really a situation where one person has a major role here, is George Washington.

Washington himself was actually immune to smallpox, he'd actually caught it as a young man in Barbados.

He fought the Second Continental Congress's war board and a variety of civilian organizations for over two years for the right to inoculate, not only his troops, because it's not enough just to inoculate the troops, but also the nearby civilian communities. He essentially manages to do this pretty much through military edict. He wrote Patrick Henry in 1777, "You'll pardon my observation on smallpox. I know it is more destructive to an army in the natural way than the enemy's sword." But, pretty much due to his inoculation program, the situation for the Americans stabilizes by the end of 1777.

So how many people did the Americans lose?

We really will never know mainly because the Americans keep truly lousy casualty records for the Revolutionary War. They don't distinguish in their records between deaths that come from battlefield injuries and deaths that come from wounds and deaths that come from disease, and for disease they don't distinguish between the diseases.

But what we do know - John Adams who was on the war board wrote his wife, Abigail, that for every one soldier that they lost to a battle injury, they were

losing nine soldiers to diseases. And, again, the problem with smallpox is we're losing a lot of soldiers to things like typhus, but smallpox can make you vulnerable to secondary-- In other words, if you had a smallpox outbreak in the camps, that could then lead to dysentery and typhus because of the general suppression of the immune systems.

Smallpox is not just a problem on the American side, which is probably why military historians until recently haven't paid that much attention to the smallpox epidemic that's going on at the same time as the war. The English are immune, the Germans are immune, so how is it effecting the English? It is affecting them through the Black loyalists, the slaves.

The person who is a big figure on this side is the Royal Governor of Virginia, Lord Dunmore. The war starts for Virginia really only days after Concord and Lexington. Virginia kind of missed license plate bragging rights by days. And the Royal Governor, his is one of these Royal Governors, he is an Englishman-- you have to kind of admire these guys, they just keep on swinging--he was, I have to say, a very inventive Governor in terms of trying to find new ways of fighting against the patriots.

In November of 1775, he declared martial law in Virginia. This is Dunmore's proclamation, but what was the most shocking thing about this proclamation at the time was he slaves who were attaining to the rebels, if they came and joined the British war effort, they would actually be given their freedom. It's actually the largest, the first large-scale emancipation pretty much in western history.

As it turned out, it was only supposed to be the rebel slaves, but Dunmore is actually trying to build a military force so he, it turns out, he wasn't all that picky. He was taking the slaves that were running away from the loyalists as well. Dunmore himself is not actually anti-slavery, he happened to actually own a plantation in Virginia, he was a slave owner himself. He's basically trying to think outside the box. He is trying to disrupt the Virginia rebels' ability to wage a rebellion.

At least initially, it works. Virginia's got about a forty percent slave population and between eight hundred and a thousand slaves initially start running to Dunmore's lines. Dunmore actually calls these guys the Ethiopian regimen, he outfits them, and, for about two months, they are engaged in guerilla warfare, raiding the coastline.

Early in 1776, though, Dunmore lost control of the capital and he had to, basically, move his operations to a bunch of war ships that are floating in the harbor, so it's essentially a floating base of operation. This is where he really starts running into a problem with smallpox. If you can imagine all these people crammed onto the ships, and then slaves continue—they're actually swimming to the ships.

And early in 1776, smallpox begins breaking out on the ships. By February, he is losing hundreds of his slaves and he moves the whole operation to Gwynn Island to try to start inoculating his slaves. But, again, this is the problem all along with inoculation, you have to keep strict quarantine and the whole time, slaves just keep arriving. Gwynn Island becomes an absolute death trap. As many as,

there may have been two thousand slaves in all, as many as five hundred slaves may have died by the time that Dunmore finally gives up and leaves.

And, again, it's not just smallpox.

They are also dying from typhus. Medical historians have looked at, you know, why are certain groups particularly vulnerable to smallpox? One thing, often, is malnutrition, which is something the slaves easily could have suffered from. And, of course, again, another thing when is you're in crowded conditions, which, of course, Gwynn Island would have been.

By the summer dozens are daily dying. July 9<sup>th</sup>, Dunmore basically just abandons Gwynn Island and he leaves, pretty much, he takes the slaves who are still mobile but he leaves hundreds of dead and dying slaves all over the island. This is found by patriots, who just absolutely exploit this disaster for all it's worth. A Virginia Gazette article, July 20<sup>th</sup>, this is how y described their first sight of Gwynn Island: "You might see a poor wretch half dead making signs for water, others endeavoring to crawl away from the intolerable stench of dead bodies lying by their sides."

In short, it was a shocking scene. "Dunmore's neglected these poor creatures, suffering numbers of them to perish for want of common necessities and the least assistance. One would think enough to discourage others from joining them." This actually fits really well into sort of the standard patriot narrative that they're trying to use to keep the slaves from running to the British, which is "don't trust the British, they're just after their own

agenda and they cannot be trusted to take care of you."

Despite this, thousands of slaves will continue to run to the British lines throughout, particularly, the Southern campaign, but they will have the same problem. You're going to have the same rates of smallpox infection. This is particularly the case with the slaves who fled to the British during the campaigns for Savannah and for Charleston. After the Revolution, thousands of black loyalists end up, pretty much, all over the British Empire and about five hundred of them end up in London.

If you'd been living in London in the years after the Revolution, some of the early abolitionists ran into someone who made a big impression on them and who actually may have been one of the influences for the earliest abolition movement, which, of course, really starts in England.

Chadwick Furman, who had actually been a free person in Virginia, had joined the British side. He actually as a courier, which is a nice way of saying a spy. He was captured by the Americans. They had tried to get him to talk, and they had flogged him five hundred lashes, which usually kills you. He'd survived that but then he'd caught the smallpox and when he arrived in London he was blind from smallpox, he was lame from being flogged, he was supporting himself on the streets of London as a fiddler. As I said, the sort of pathos of this story is something, the reason we know about this guy is because some of the early abolitionists wrote about him.

After 1783, smallpox moves west in America, and it will continue to wreak havoc in the 19<sup>th</sup> century.



Even more so than the slaves, the Indians seem to have the least immunity to it, and it was probably throughout, sort of, really well into the 19<sup>th</sup> century, their greatest killer.

Around 1798, Edward Jenner, in England, developed a vaccination, which is a safer and more effective method of combatting it than inoculation. What Jenner had noticed was that out in the English countryside, milk maids, the women who were milking the cows, were not coming down with smallpox. They caught something called cowpox.

Cowpox, like measles, like chickenpox, is related to smallpox, and if you catch one you don't catch the other. And so, what Jenner was using, quite simply, was he was inoculating not with smallpox, but he was using cowpox. He actually, sort of a great 18<sup>th</sup> century tradition here started on his own family. After this is really when the rates for smallpox disease, for smallpox deaths, really start dropping drastically.

But it continues to be a killer, especially in the non-developed world, really into the 20<sup>th</sup> century. Today, smallpox is the only creature that humans have deliberately rendered extinct. We've killed lots of things accidentally, but the only critter—I was trying to think of what to call it, it's not an animal-creature, that we've deliberately killed. There was a campaign by the World Health Organization in the 1960s and 1970s, a global effort to combat it.

It was mainly spreading in Africa. The last known case, sort of in the wild if you will, the last case in nature, was in 1977, but I think this is a sign of just how dangerous this disease always was and how

contagious, that that was not the last death. The last death was actually in England a year later, in 1978. There was an English lab in a building and there was an accident in the lab and there was a family that was living down the hall and a flight up, that all came down with smallpox. One of the members of the family died. This is actually the last known death, in 1978. Since 1979, smallpox exists, hopefully, only in labs. I thank you for your attention.

### **Q+A**

[segue from lecture]

CHRISTOPHER BRICK: Shannon Duffy-- welcome to the podcast!

SHANNON DUFFY: Hi there! Happy to be here.

CHRISTOPHER BRICK: We're happy to have you and when I say "we," that's very much on purpose because today we have the pleasure of once more welcoming my wonderful chair of the Marketing and Communications committee, Kariann Yokota! Madame chair, welcome.

KARIANN YOKOTA: Thank you. It's so great to be here and I always appreciate your welcomes.

CHRISTOPHER BRICK: Well, if you'll bear with me one moment-- If you'll permit me this little bit of self-promo on our part and on the part of the Committee, because I do think there is going to be some-- If you're an OAH member out there, and you are listening

and you like the work that we're doing with the podcast, or you're interested in helping the community of American historians that OAH brings together to kind of deliver content this way and in all kinds of innovative ways and to empower us to be more forward-facing, to reach more people.. If you're interested in that work and bringing your own perspective to it, I do think there are going to be some vacancies on the committee opening up soon and I think Kariann and I..

[recording breaks suddenly here]

SHANNON DUFFY: Okay so- one of the things that had confused epidemiologists for a long time is why is smallpox-- and we're talking really from the Columbian Exchange throughout really the 19th century-- why is it so lethal? Why does it have such a high mortality? Because it didn't in later periods. And it might also not have had it in earlier periods, like the 16th century.

What it is, is that there are actually two versions-- there's variola major and variola minor. And in the time period-- pretty much from the Columbian Exchange until the end of the 19th century-- variola major is the dominant one. And it has a mortality rate of between 30 and 50%, which as we know is very, very high. But it's also extremely contagious. It is sort of in the same camp as measles and chicken pox, where if you are exposed-- if you have no natural immunity and you are exposed in close contact with somebody-- it's like a 90% that you will become infectious.

The other thing that makes smallpox particularly difficult to deal with-- even though it's the first

disease for which we have an inoculation procedure it's really the first disease for which we have (How do I put it?) a proactive way of combatting it-- is, the length of time in which you are sick and the level of contagion for most of that time- a month!

You go through stages. You get infected, there's about 12 days in which you had the flu for a couple of days, and then you think you're better. And of course this is when people will be wandering around. Then you get a rash, then you break out in the pustules, then they scab, then they fall off. From the time you get the fever to the time the last little scab falls off, you're contagious. And furthermore, the scabs themselves, if they fall into bedding or blankets or sometimes even hard surfaces, they can last up to three months. [laughs] Kariann is now wincing over there. This is what my students do, too.

So, it is kind of- talking in comparison to COVID where we talked about the variants being both more contagious and more lethal, that's unusual with diseases. It's usually a seesaw. Usually if they get more contagious, they get less lethal. This one was both. It particularly-- you know, there's a huge raging debate, sort of going back to the Columbian Exchange-- why where the Native Americans hit *that hard*? I mean, of course they died from a multitude of diseases but from the descriptions-- their own descriptions as well as Europeans-- smallpox is by far and away the big killer.

First of all, of course, it's a virgin swell epidemic. Smallpox also tends to take out babies and pregnant women. And also, because it takes a month, it can completely pretty much wreck havoc with your whole

community. Because people were getting sick and continuing to stay sick and more people were getting sick-- it requires a lot of care. You know, you're going to have sores, you're going to need people--you're not even going to have the strength to get water for yourself. And so if the entire community is down, then you probably also have additional fatalities just for lack of care.

CHRISTOPHER BRICK: Yeah, it sounds completely terrifying. And one of the points that you make very early in your talk that I really appreciated and that gave me a new way to be thinking about the history of disease and of infectious disease in particular is this idea of fear.

SHANNON DUFFY: Uh-huh.

CHRISTOPHER BRICK: And because it has this reaction, it often gives rise to-- you were making the point about there's something kind of special about epidemic disease that we don't see-- if you're talking about-- this podcast was about the history of obesity, right, there wouldn't be-- now there are disease ecologies for obesity too. But, we don't see the same kinds of fearful reactions arise. We don't see the same kind of scared scapegoating that occurs, we don't the religious revivalism or the transmutation of religious thought patterns that tend to occur in dialogue with these epidemics. And so, I was wondering if you could reflect on that a bit more.

SHANNON DUFFY: So when I first got interested in diseases in American history, one of the books that I read was by a gentleman named Snowden. And he made a

point that I actually now start my lecture with, which is that-- sort of three major points. One, the first one is that for the 20<sup>th</sup> century, infectious diseases are the number one killer of humanity, by far and away. Even during wartime, most soldiers are dying from disease, they're not dying from wounds. I think as historians we all know that, but we don't really think about it. The second thing he says is that it's not a weird, esoteric subfield. If that's the case, why is it that there a very few people studying disease-- as opposed to studying war, or politics, or kingly succession, sort of the man-made stuff. This is playing as big a role, at least as big a role in human history. But it tends to be this weird little side niche that people don't spend that much time on.

And the third is kind of your point that you're making which is that infectious diseases in particular-- it's invisible, they have in some sense, it's contagious, even if their science at the time isn't supporting that. They don't understand. Before the invention of microscopes, they have no idea how they're getting sick. It freaks people out in a way that nothing else does. And you see following in the wakes of epidemics, as you say religious revivals, also political-- the fact that we're having political upheavals right now, that's actually a constant pattern. You saw it in the Middle Ages with the plague: peasant revolts, just social unrest-- as you say scapegoating-- these are things that are frequently happening at the same time as epidemics.

KARIANN YOKOTA: And well because this is an OAH podcast, let's talk more about the art, or the profession of writing history. And I was thinking,

after hearing your lecture and thinking about the history of disease in general, as early Americanists, we've been talking for past several years about trying to globalize Early American history, or pushing globalization amongst Americanists-- American historians. And I think if you're studying something like smallpox, you have to by definition write {global history.}

SHANNON DUFFY: {Absolutely.}

KARIANN YOKOTA: Which I find really interesting. And you have to incorporate the history of war, and of politics, and nation-building, so I found that really interesting. The question that I was going to ask in conjunction with that was if you could talk a little bit more about the difference in the ways that the American colonists, and then later the American citizens, approached the science of inoculation versus their counterparts in Europe {if you could do a little bit more of a- about that}.

SHANNON DUFFY: {Sure, absolutely.} So, this of course is going to play out in a very big way in the First French and Indian War and then particularly in the Revolutionary War when a whole bunch of Englishmen and German men show up and start tromping all over America. Because before that point, Colonial America-- especially from the latter point in the 17th century to the first half of the 18th century-- they have far less threat from smallpox. Whereas over in England and Europe, its endemic. By the 17th century-- probably earlier than that-- it is simply something that is always around.

It's a killer of children. Every generation, the little kids all get it-- a lot of them die. But of course smallpox is a disease that once you get it-- and this is why vaccination works--once you get it, you're immune. And so when the very first people come over to colonial America are conquistadors and all the rest of them-- John Smith and his crowd-- they're adults and so they're immune, but they can transmit it to the Indians. But by about the second half of the 17th century, there's sort of less people moving back and forth. And especially if you think about colonial America being mostly rural-- we have a few ports, but mainly people are living in the countryside-- they have far less exposure.

And so, this is why-- even though they've known since 1721 how to inoculate-- inoculation is dangerous. The main reason is, people break quarantine and you can start an epidemic where there had not one [sic]. And it happened several times. So by the mid-18th century, a lot of-- several of the different colonies', the colonial legislatures had passed laws against inoculation.

Meanwhile, Europe and England have-- it's not that they loved inoculation, it was more necessary and so it had become, you know-- like I said the British Army does it as a matter of course. Also, they just simply have a natural immunity, too. There's really sort of two completely different sort of disease patterns going on. And then when you, you know, during the Revolution particularly a whole bunch of English and Europeans arrived, they bring the smallpox with them. And you asked earlier about the role of fear-- George Washington is really sort of single-handedly



responsible for finally inoculating the continental troops during the Revolution. And in some ways, the biggest enemy-- obviously his troops dying from it was his problem-- but the biggest enemy was the fear. Because he was losing so many troops from rumors. The minute a rumor would spread that smallpox was in a camp, he would have so many desertions. It would be such a hindrance for recruitment that you basically-- he had to do something about it.

KARIANN YOKOTA: And going even more-- going back to the theme of globalization, and going even further afield outside of the Anglo-American world. So, you mention for instance China, right? I wonder do you think and if-- if you don't know that, that's not the exact subject of your lecture so that's fine-- but I was curious if you knew why maybe Asian societies... So-- I am very interested in America's relationship with China and with Asia. Did you read anything that talked about whether Asian societies or African societies had less of that fear or stigma, and I wonder if we could even talk about how it comes to today. Or how today's society-- if whether the West or Americans are more fearful of-- in our case now, vaccination versus other countries around the globe.

SHANNON DUFFY: I don't know about- I am going to skip on the modern one, because I think that's a whole other kettle of fish. I think that has more to do with what I have read recently: societies that are more controlled, versus more individualistic societies. I think that is probably the biggest explanation. But with regard to-- colonial America doesn't think it comes from China. They mainly think it either comes from Turkey, if they've heard of the Turkish, that was sort of... it's

called the Turkish cure, is one of the things its called. Or, as in the case of Cotton Mather, they've heard of it from their slaves. And of course this would be those first generations of African-born slaves. And that is a part of the pushback against it, definitely. The idea that this sort of Eastern, or you know again sort of an infidel, kind of thing. But by the 18th century of course, white and black, most people in colonial America are Native-born. And that's why the immunity has dropped.

CHRISTOPHER BRICK: I wonder if I could follow up on something that was just particularly of interest to me that I learned from your talk. It got me thinking about all the way back to my eleventh-grade social studies history education and I remember... And I think it's a point that holds up, actually, not just because its stayed with me all this time but it seems to make sense that-- we were talking about the Early Republic period, George Washington's iteration, his two terms in the presidency and then stepping down. That there was a sense among-- one of the things that the kind of republic had going for it earlier than Washington himself-- did not male children, did not have an heir.

SHANNON DUFFY: Mhm-hm!

CHRISTOPHER BRICK: There wasn't some kind of concern about a system of hereditary privilege being set up or being claimed in his name by a male descendent. Before I listened to your talk, I had never thought to connect that...

SHANNON DUFFY: Mhm-hm!

CHRISTOPHER BRICK: ...to the history of disease and to the history of this disease in particular. So, this point you raise about male sterility, obviously shapes outcomes for our national story in a way that you help me put together for the first time...

SHANNON DUFFY: Mhm-hm!

CHRISTOPHER BRICK: ...so thank you very much. But also I just wonder if-- I mean-- was it understood at the time because when you're talking about an illness that has that side effect-- that has that consequence to it-- I mean, now you're really getting into real stigma, you're getting in to-- there's all kinds of opportunities for I think gender politics to come into this-- the way that these diseases are understood and represented and processed by the people living through...

SHANNON DUFFY: Well, if you're asking if they know it causes sterility, I don't know that they made that connection. They were more focused on the fact that it causes horrible scarring and blindness. The blindness is what really terrifies people because a-- its like 1/3 of the bad causes end up permanently blind. It is the leading-- and of course the scarring, you know, it may seem cosmetic, but especially for women, it was something that was terrifying. I just learned-- I never knew-- that Elizabeth I is wearing that heavy makeup because of smallpox. I didn't know she was bald. That she went completely bald as a result of smallpox. And you know that pus-- when the pustules come together, they can basically form like one big ole oozing scab. Apparently that's why she had to wear wigs. So, the fact that several people said its not necessarily the worst killer in the 18th century-- 18th century

America-- it's the one everyone is the most terrified about. The debilitating qualities-- it can leave you so marked up, it can leave you blind. I don't know if they knew about sterility, but by the way, we have two presidents that were probably hit by it: Andrew Jackson. Remember, he caught it as a young man on a [sic] American Revolutionary prisoner ship. He also was never able to have children. I mean, you can't say for sure that this is why but it could easily be the reason.

CHRISTOPHER BRICK: Yeah, super interesting. The more that I think through all the parameters of how endemic, I think {is that the right word?}...

SHANNON DUFFY: Endemic, yeah, when it's just always around.

CHRISTOPHER BRICK: Right, 'cause you make the point that its endemic in Europe for quite some time, but it takes a little while to gain the kind of foothold {here...}

SHANNON DUFFY: {It actually} is really not endemic like in America until after 1790 and then only in Mexico. Which is sort of a mixed blessing, because when its not endemic, that means that when it hits, it hits with ferocity. It's sort of {a slow and steady versus a hurricane coming through.}

CHRISTOPHER BRICK: {So what if...} Could I follow up on that? What accounts for the-- why does it not become endemic in North America the same way it is in Europe when you think the climatological similarities between saw Western Europe and {the Northeastern US... They're pretty similar.}

SHANNON DUFFY: {Okay so a couple of things. First of all,} it is a weird disease compared to other diseases, it doesn't care what the weather is. This is something that spreads in the summer, or the winter, it is only-- and another thing about it is that its only in humans. Its not a species jumper. And so it kind of--I was trying to picture this in my head, earlier-- TO keep it alive-- its been around since, you know, ancient times, I mean it literally goes all the way back to almost to recorded history-- it always have to be moving. Or I mean like the scabs can exist for months but it always has to be moving from person to person. Europe is just more densely populated, I think is the simplest answer to it. 18th century America does not have that population density. So that it just does not implant there in the same way.

And of course after the 1790s is when vaccination is introduced. But it still is-- it still [sic] very much a problem, particularly a problem for America because apparently there's a lot of things we don't have in the Americas, and one of the them is cowpox. We don't have the cows that get cowpox and so it actually had to get shipped from Europe and it didn't ship well. Unlike smallpox, cowpox is a very fragile little critter and doesn't travel well.

CHRISTOPHER BRICK: And cowpox is {what they used, right?}

SHANNON DUFFY: {Yes, vaccination.}

KARIANN YOKOTA: {Yeah,} I was gonna say, Shannon, although smallpox doesn't jump from species to species,

there is another animal that plays a big part in your story {so maybe you could talk about the difference between inoculation and vaccination}.

SHANNON DUFFY: {Alright... and vaccinations!} It is funny because we started out talking about Cotton Mather and his friend Zabdiel Boylston, and Zabdiel got a lot of flack for just being kind of a country doctor. And this is the story of another country doctor!

Edward Jenner was a country doctor in England, and he noticed that the milkmaids don't get smallpox, but they were getting a localized infection on their hands called cowpox. Other people had noticed this, but he was really kind of the first one to sort of run with it. As one study I read said, "It would take a country doctor to notice this. You wouldn't've noticed it in London, because you would not have been around the milkmaids." And so he borrowed the gardener's son-- that's such an aristocratic thing to do-- you know, "let's test it on the little people." And, he inoculated the seven year old boy, and it worked, and so this is basically the beginning of vaccination.

And vaccination-- the word inoculation actually comes from "eyes," like, basically potatoes. Like how you would grow one potato from another potato you cut the eyes off? That's where the inoculation comes from. "Vaccus" is basically cow. So essentially, when we say we are being vaccinated, we're being "cow-ized." Cow-is-ized? I don't know. Literally, it just means that-- and there were some, during the anti-vax--there were pushback that basically showed people growing horns, or like some of the 19th century stuff in Europe that people would end up basically sexually assaulting the

cows in the field. They would become more animalistic. So again, vaccination also had that same kind of emotional negative response. It didn't help that you're now introducing an animal's disease into a human body. But it's much safer and it spread like wildfire in Europe and in England. What really delays it in America for most of the 19th century-- aside from popularized hostility to it-- is simply that it's expensive-- it's harder to get.

CHRISTOPHER BRICK: My final question for this-- such a wonderful talk... You're just so wonderful to talk to. {So, thank you for this.}

SHANNON DUFFY: {Well, thank you for having me!}

CHRISTOPHER BRICK: Yeah, no, it's great! You talk about inoculation but you know this technology-- vaccination, that technology involves into vaccination-- smallpox also seems for all of it-- the exceptionalisms you talk us through with respect to this pathogen in particular-- smallpox also bears an unusual distinction (right?) in the history of infectious disease because later on (I guess) in the 20th century, it kind of brings us into the present day and everything. It ends up essentially-- it's one of the few pathogens we've been able to completely eradicate. Right? Or destroy? I don't know what the right terminology would be so correct me if I am using the wrong words. {Could you--}

SHANNON DUFFY: {I can talk a little bit about...}

CHRISTOPHER BRICK: {Do you know much} about how that happened? Yeah, if you wouldn't mind just sharing about-- because I think that's kind of interesting. And

what sorts of questions does it raise about-- I'm sure there are plenty of people out there that want to do the same to COVID-19. More and more so by the day. Is there something special about smallpox too that enabled us to... {and by us I mean humans...}

SHANNON DUFFY: {It helps that it's human-only. That actually helps} an awful lot. Why were able...? Well, first of all, there was a major push. Smallpox after the 19th century is not as lethal because variola minor largely replaces variola major. But, despite the fact that vaccinations are widely available--in fact, I just found out that in the United States until 1971, was still vaccinating for smallpox. It still was going throughout the 20th century. And so the WHO in the 1970s made basically an international, concerted effort to shut down smallpox. It is the only-- I was thinking about what term-- the only being, it's not really an animal, the only critter, that humans have deliberately rendered extinct. We've rendered lots of things extinct accidentally. It was the only one deliberately rendered extinct. So the very last case of smallpox in the wild, as it were, was in Somalia in 1978.

But just to show how dangerous it is, that's not the last fatality. In 1979, there was an English lab that had an accident, and there was a family that lived down the hall and one flight up-- the whole family came down with it, one person died from it. The guy who owned the lab committed suicide. That's actually our last recorded fatality from smallpox. So as far as we know, smallpox now only exists in labs that hopefully have better security measures than that one. It basically exists nowhere in the wild. And of course, we've stopped vaccinating for it! [Laughs]



CHRISTOPHER BRICK: Right, because essentially it only exists in labs anymore. Well, madame chair, I don't know about you but I really enjoyed this Q+A and I want to open the floor up to you one last time in case you have any more questions for our wonderful guest before we...

KARIANN YOKOTA: Yeah, no, thank you, Chris, for that, for letting me ask one more question. I did also enjoy this so much, Shannon, so thank you. I just thought that since we're in this very peculiar and troubling moment in our history, whether studying the smallpox disease as it spread over time. And I think that's also-- not only did your lecturing encompass a large geographic space, it also gets up as historians, it moves us throughout time very well. But I am wondering if it gave you any insights into what the globe is currently facing-- the current pandemic. Just, either about how people in societies deal with the unknown and with fear, or maybe something about the way technology interfaces with human history. {Any-- just any story that you might share.}

SHANNON DUFFY: {I guess there might be a cynical thing, I tend to take away from history that people don't} really change that much. We tend to be very superior. We assume we know so much more than the past. We're so much more enlightened and logical and rational. But you know, people's responses often aren't very-- are similar throughout time. When they are faced with something they do not understand, fear is usually the response. You know, I said the anti-vax movement disinformation, all this is literally-- it's been part of the story since the very beginning. Since

inoculation was first introduced-- including violence. I talked that there was pushback against Reverend Mather. Somebody threw a bomb through the window of his house! The bomb didn't go off, but, you know... Later in the early 18th century, attempts to introduce inoculation in other places provoked riots. And in the 19th century, over in Europe-- there-- even though it's a lot more endemic, a lot more of a constant threat, the only way the British could actually get their population at large vaccinated is to pass a law and mandate it. Which they did basically about the 1860s. Because before that, there was still deep resistance to vaccination.

CHRISTOPHER BRICK: Just as you're saying that, Shannon, it occurs to me that there aren't that many things in-- for those of us who study the past, that do seem transhistorical, right?-- but infectious disease is one of them. Right? And so, actually, you gave me a great way-- note-- to wrap up this up on. Because this is early in the series, and it being transhistorical, this story, is going to continue. We hope the listeners continue to tune in to hear the rest of it, because there's a lot more! Madame chair, thank you for joining us once more. I really appreciate it and it's always wonderful to see you in these Q+A's. If the listeners can detect that special lift of joy in my voice, it's always because these Q+A's are better when Kariann Yokota is here to join me with them. So, thank you.

KARIANN YOKOTA: {Thank you.}

SHANNON DUFFY: {Absolutely, well, thank you for having me!

CHRISTOPHER BRICK: {And thank you, Shannon Duffy} for this wonderful talk and the wonderful Q+A.

KARIANN YOKOTA: {Yes!}

SHANNON DUFFY: {I appreciate it.}

KARIANN YOKOTA: {Thank you!}

CHRISTOPHER BRICK: {Shannon} Duffy, everyone.

### **Conclusion**