
[00 - TITLE - 00.00.00 - 00.00.30]

Hello and welcome to: Presenting The Plague, Digital Exhibits as Interdisciplinary Method. In this demonstration, I'll be talking about creating exhibits for in-development projects.

And I'll be going over 3 aspects of the digital exhibit process that appeal to me including:

- 1) Experiencing a "**Playground for your Ideas**".
- 2) Fostering **Interdisciplinary Perspectives**, and
- 3) Creating opportunities to **Publish in Place**.

[01 - EXHIBIT 1 - 00.00.24 - 00.00.51]

The exhibit in this demonstration is a digital narrative, where scrollable text is presented in the left panel, with exhibit items and contextual evidence presented in the right panel.

A benefit of digital publishing is the ability to insert hyperlinks that encourages the reader to browse the sources used. All images here will redirect the reader to their original source. For example, on the right is a depiction of the 17th century London plagues, which links to an article about the surprising similarities between past and modern pandemics.

[02 - EXHIBIT 2 - 00.00.54 - 00.01.52]

The objects in this exhibit are samples of the plague bacterium, a pathogen known as *Yersinia pestis*. Plague is a debilitating disease that has caused numerous pandemics in history, including the infamous Black Death of the 14th century.

The samples here were collected over a period of 100 years and the DNA has been sequenced and made publicly available.

Why this form of evidence is interesting is because DNA can be compared against each other, to figure out which outbreaks were more similar or distantly related. The result is a disease network, or an evolutionary tree, as shown in the middle panel.

If I exit narrative mode, and enter data browsing, I can click on the bubbles to view contextual information about these plague samples, for example, date and country.

This exhibit is built using software created by the NextStrain project, which provides the ability to do genetic analysis.

But a close parallel in the digital humanities world would be StoryMaps, where narrative text is combined with geospatial data.

[03 - PLAYGROUND OF IDEAS 1 - 00.01.55 - 00.02.31]

Now I want to introduce the first aspect of digital exhibits I mentioned previously, a Playground of Ideas.

As part of a working paper, it's important to set up how this research compares with what's been done previously. One question I'm asking of this data is how do the spread networks based on DNA evidence compare to those constructed from other evidence, for example archival records of plague's appearance.

The map above proposed a migration of plague between East Africa and the Mediterranean. However this connection isn't observed in the map to the right. Instead samples from East Asia (ex. China, Mongolia) really dominate the story.

[04 - PLAYGROUND OF IDEAS 2 - 00.02.33 - 00.03.41]

While I did suspect a geographic bias in the data before I started, I didn't realize just how big that giant purple bubble was going to be. And so exhibits can be a powerful tool to explore these underlying problems.

Looking into it further, the figure below shows the distribution of recent human plague cases, which most frequently occur in Madagascar, Congo, and Uganda.

Yet the distribution of plague samples that have been sequenced doesn't reflect that at all [Pause]. And if we look at a study from 2010 (network on the left) there were 4 samples from China, which was 30% of the data. But in a later 2013 study more than 80% of the data points are now drawn from there.

These kinds of comparisons can be helpful as new studies get published to see how the composition of public data is changing overall, and whether our interpretations may be skewed.

Now, in contrast to this issue of over-sampling, there are no European samples on this map. Despite the fact that plague has similarly devastated Europe throughout history.

[05 - INTERDISCIPLINARY 1 - 00.03.44 - 00.04.12]

An upcoming addition for this exhibit will be to include the numerous ancient DNA samples of plague that have been produced along with their archaeological context.

Another viewpoint to provide the European perspective could be archival work, such as the Black Death Digital Archive project involving the digitization and critique of thousands of historical plague records.

These examples just serve to show how digital exhibits can be used to show what critical perspectives are missing in a current project. And what kind of datasets or collaborative work should happen next.

[06 - INTERDISCIPLINARY 2 - 00.04.14 - 00.04:56]

As an example of this work, is fusing epidemiology with ecology. When collaborators began to be interested in what animals can carry plague, I added that information in as an interactive filter.

In the data panels to the right, I've highlighted samples where plague was collected from marmots, an important rodent in plague ecology. And marmots are found all throughout the Northern Hemisphere, but in this analysis, plague has only been found in marmots collected in China and Mongolia. Which could indicate something special about these species or the environment there.

Or, it could be a good thing that I investigated the geographic biases in this data, and know that about 90% of all samples collected originate in China and Mongolia. So those issues need to be carefully dealt with first.

[07 - PUBLISH IN PLACE - 00.04.58 - 00.05.43]

Finally, an appealing part of working with digital exhibits is the ability to share interactive figures.

If I go to explore the data there is a lot of metadata here. It's not uncommon to have 10+ layers or legends reflecting different questions or theoretical perspectives. And I have often struggled with presenting this information elegantly in static figures.

While many data visualization programs can do interactive figures, I really value the expansive space for comments and interpretative text. Space to write cannot be overstated in its importance.

Links are provided for those interested in exploring the underlying data presented here, and the code used to generate it.

[08 - CONCLUSION - 00.05.45- 00.06:22]

To sum up, the digital exhibit platforms that have been enjoyable and rewarding tended to share the following three features:

- 1) The digital exhibit itself became exploratory data analysis, evoking the sensation that it was a playground for ideas and discovery.
- 2) Incorporating more multimedia and ensuring sources are easily linked encouraged seeking out perspectives from other disciplines.
- 3) Having data analysis, discussion, and online publication occur within the same software makes it much more likely to actually distribute ideas for feedback.

And with that, thank you for listening and exploring the demonstration:

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