

## Preserving Your New York Story:

### Connecting living and historical people with ancient DNA

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A major challenge in genealogical research is that historical records often focus on only a small fraction of society, leaving the stories of countless others—especially the most marginalized—undocumented. But ancient DNA technology is now helping to fill these gaps, enabling researchers to identify connections between historical and living people where the paper trail has run cold.

This handout accompanies a recorded talk by Dr. Éadaoin Harney, a population geneticist and ancient DNA expert at the 23andMe Research Institute. It summarizes each section of the talk and provides references to further resources for those interested in learning more about the topics discussed.

## What is ancient DNA?

There is no strict age limit for when DNA is considered “ancient.” Instead, the term generally refers to the specialized techniques used to extract DNA from a specimen, rather than the age of the specimen itself.

### Unique characteristics of ancient DNA molecules:

- **Fragmentation:** Ancient DNA molecules are typically short, often <100 base pairs.
- **Chemical modifications:** As DNA degrades, cytosine bases can undergo deamination, so “C”s in the DNA sequence may appear as “T”s when sequenced.
- **Contamination:** DNA from bacteria in soil, other organisms, or even people who have handled the remains can be present. Special care is required to avoid misinterpreting this contamination in analyses.

### Sources of ancient DNA:

- **Most common:** Bones & Teeth
- **Less common:** Hair, cultural artifacts, soil, feces, and more!

### Ancient DNA must be extracted and sequenced using specialized laboratory techniques.

For those interested in a deeper dive into the methods and challenges of this work, I recommend this excellent primer:

- Warinner, C. (2025). *Introduction to ancient DNA*. In *Introduction to ancient metagenomics*. SPAAM Community.  
[spaam-community.org/intro-to-ancient-metagenomics-book/introduction-to-ancient-dna.html](https://spaam-community.org/intro-to-ancient-metagenomics-book/introduction-to-ancient-dna.html)

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## How we search for genetic connections to the past

The genetic connections we focus on are known as **identical-by-descent (IBD)** connections.

**Identical-by-descent:** Segments of DNA that are identical between two people because they were inherited from a shared ancestor.

### Tips for interpreting IBD shared between historical and living people:

- Longer and more numerous IBD segments indicate a more recent shared ancestor.
- Most IBD shared with historical individuals reflects ancestors who lived long before that person.
- Sharing IBD with a historical individual **does not** automatically mean they are your direct ancestor.
  - In certain rare cases, IBD connections can serve as evidence of a direct descent or other close genealogical relationship. But this requires that:
    - The historical individual must have lived in the last few hundred years.
    - You must share an exceptionally large amount of DNA (>30 cM).

Scientists at 23andMe and Harvard University developed a method to detect IBD connections between historical and living people. Prior to our 2023 study, no established methods existed for detecting IBD in ancient DNA data.

### By studying IBD connections between historical and living people, we can:

- Learn about the biogeographic ancestry and genetic legacy of historical individuals.
- Identify the closest living relatives of historical individuals.

### For more on IBD and our detection methods, see:

- The new approach is detailed in:
  - Harney, Éadaoin, et al. "The genetic legacy of African Americans from Catoctin Furnace." *Science* 381.6657 (2023): eade4995. [pubmed.ncbi.nlm.nih.gov/37535739](https://pubmed.ncbi.nlm.nih.gov/37535739)
- The IBD detection algorithm was first described here:
  - Freyman, William A., et al. "Fast and robust identity-by-descent inference with the templated positional burrows–wheeler transform." *Molecular Biology and Evolution* 38.5 (2021): 2131-2151. [pubmed.ncbi.nlm.nih.gov/33355662](https://pubmed.ncbi.nlm.nih.gov/33355662)
- This study describes how we can use IBD connections to reconstruct family trees:
  - Jewett, Ethan M., et al. "Bonsai: An efficient method for inferring large human pedigrees from genotype data." *The American Journal of Human Genetics* 108.11 (2021): 2052-2070. [doi.org/10.1016/j.ajhg.2021.09.013](https://doi.org/10.1016/j.ajhg.2021.09.013)

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## Case Study #1: Catoctin Furnace

Catoctin Furnace is an 18<sup>th</sup>–19<sup>th</sup> century iron furnace located in northwestern Maryland. The furnace was in operation by the start of the American Revolution and is credited with providing ammunition to American soldiers during the Battle of Yorktown. The important contributions of enslaved (and free) African American laborers to the success of the furnace were largely unappreciated until the Catoctin Furnace African American Cemetery was rediscovered in the 1970s during a highway construction project.

Although at least 270 African Americans were enslaved at Catoctin, until recently almost nothing was known about their lives or the fates of their descendants. In our 2023 study (linked below), we sequenced the genomes of 27 individuals buried at the Catoctin Furnace African American Cemetery and searched for genetic connections between them and over 9.2 million consenting research participants in the 23andMe genetic database.

Through this analysis, we were able to learn about the Catoctin individuals' ancestral connections to regions in Africa (and Europe) and identify where their closest relatives in the United States live today.

### Read more about what we discovered:

- Harney, Éadaoin, et al. "The genetic legacy of African Americans from Catoctin furnace." *Science* 381.6657 (2023): eade4995. [pubmed.ncbi.nlm.nih.gov/37535739](https://pubmed.ncbi.nlm.nih.gov/37535739)
- Harney, Éadaoin, et al. "Ethical considerations when co-analyzing ancient DNA and data from private genetic databases." *The American Journal of Human Genetics* 110.9 (2023): 1447-1453. [doi.org/10.1016/j.ajhg.2023.06.011](https://doi.org/10.1016/j.ajhg.2023.06.011)
- 23andMe Blog. 2023. "23andMe connects living family to enslaved African American from historic site." [blog.23andme.com/articles/23andme-connects-living-family-to-enslaved-african-american-from-historic-site](https://blog.23andme.com/articles/23andme-connects-living-family-to-enslaved-african-american-from-historic-site)
- The Catoctin Furnace Historical Society's website: [catoctinfurnace.org](https://catoctinfurnace.org)

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## Case Study #2: Historic St. Mary's City

St. Mary's City was founded in 1634 and served as the capital of Maryland until 1695. It was the first permanent English settlement in the colony of Maryland and the fourth in colonial America. The city's first settlers arrived aboard the ships Ark and Dove, and many living Americans can trace their family history directly back to these settlers.

We sequenced the genomes of 48 individuals buried at the Brick Chapel at St. Mary's City and compared them to approximately 11.5 million consenting research participants in the 23andMe database.

Through this analysis, we were able to connect the St. Mary's individuals to specific regions in Great Britain and Ireland and identify where their closest relatives in the United States live today. By studying the known family histories of participants who shared the closest genetic connections to one of the St. Mary's individuals, we were even able to speculate about the likely identity of one of the individuals who was buried at the site.

**Although this work is still unpublished, you can learn more about Historic St. Mary's City here:**

- The Historic St. Mary's City website: [hsmcdigshistory.org](https://hsmcdigshistory.org)

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## Wrapping Up

Since the 23andMe database is re-contactable, we have the ability to return results directly to research participants (and other customers). In order to do this, we developed the 23andMe Historical Matches<sup>SM</sup> feature. This feature can connect you to the Catoctin Furnace individuals and hundreds of other historical and ancient individuals whose genomes have been published.

**Learn more here:**

- 23andMe Blog. 2024. "23andMe's Historical Matches." [blog.23andme.com/articles/23andmes-historic-matches](https://blog.23andme.com/articles/23andmes-historic-matches)
- 23andMe Customer Care. "Historical Matches FAQ." [customercare.23andme.com/hc/en-us/articles/21884658457879-Historical-Matches-FAQ](https://customercare.23andme.com/hc/en-us/articles/21884658457879-Historical-Matches-FAQ)

And remember, the approaches discussed in this presentation can also be applied to the study of other historical sites, including those located in New York.

## Get Involved with the NYG&B

### **JOIN:**

The New York Genealogical & Biographical Society (NYG&B) is a nonprofit organization dedicated to preserving, documenting, and sharing family history and stories from across New York State. Our award-winning publications; expert staff; professional research services; extensive online records and collections; and comprehensive educational programming and resources help our members become New York family history experts. Learn more at:

<https://www.newyorkfamilyhistory.org/content/join>

### **VOLUNTEER:**

Volunteering with the NYG&B—either in person or remotely—is a great way to actively support a community dedicated to researching New York ancestors. And there are so many ways to help, whether virtually wherever you may be, at one of our regional Digitization Centers, or at our bustling New York City headquarters. Volunteers can assist with scanning documents, indexing records, and editing images. We provide both remote and in-person training and guidance.

Please visit <https://www.newyorkfamilyhistory.org/volunteer> or email us at [volunteer@nygbs.org](mailto:volunteer@nygbs.org) for more information.

### **PARTICIPATE IN PROGRAMMING:**

The NYG&B holds a wide range of online, in-person, and hybrid events, conferences, classes, research trips, and seminars, both paid and free of charge. To see a list of upcoming events and to register, please visit <https://www.newyorkfamilyhistory.org/events>

### **DONATE TO SUPPORT OUR MISSION**

Consider making a tax-deductible donation to advance our mission and support additional record and collection preservation efforts, educational programming, and landmark publications and resources. Learn more at [www.newyorkfamilyhistory.org/get-involved/donate](http://www.newyorkfamilyhistory.org/get-involved/donate) or call 212-755-8532, ext. 208.

### **STAY CONNECTED:**

Stay up to date on the latest happenings at the NYG&B and broader genealogy community—including new programming, publications, and more—by subscribing to our free eNews. Sign up on our website at [newyorkfamilyhistory.org](http://newyorkfamilyhistory.org). You can also follow on Facebook at [www.facebook.com/nyfamilyhistory](http://www.facebook.com/nyfamilyhistory) and Instagram at [www.instagram.com/nyfamilyhistory](http://www.instagram.com/nyfamilyhistory).