Combining DNA and Non-DNA Evidence: How a Pony, Census Records, and Unexpected DNA Results Unraveled a Family Mystery

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Summary of the Presentation

This case study shows the importance of combining DNA and non-DNA evidence to solve an unexpected genealogy mystery. With an extensive tree in hand, it might seem that DNA would only help fill in gaps and breakdown brick walls. However, DNA pruned an entire branch of the client's tree and uncovered a mystery. DNA—along with census records, family stories, and a pony—helped reconstruct the pruned branch.

Added bonuses include:

- the mathematical beauty of testing multiple generations and multiple people at one generation and
- how DNA evidence (and its absence) can help put the pieces together.

Detailed Description of the Presentation

This case study shows the importance of combining DNA and non-DNA evidence to solve an unexpected genealogy mystery. With an extensive tree, it might seem that DNA would only help fill in gaps and breakdown brick walls. However, DNA pruned an entire branch of the client's tree and uncovered a mystery. DNA—along with census records, family stories, and a pony—helped reconstruct the pruned branch.

Client's DNA Testing

The client DNA tested the following six family members:

- Her maternal uncle (Oldest Generation)
- Herself and her three siblings, including a maternal ½-sibling (Middle Generation)
- Her son (Youngest Generation)

All family members matched three people: Match 1, Match 2, Match 3 (collectively, "Three Matches"). The amount of DNA shared between the client's family members and each of the Three Matches is shown in the table below.

Each of the Middle Generation shared different amounts of DNA with the Three Matches. The average for each match is shown in the "Ave. cm" column. Testing multiple people at one generation provides additional evidence upon which to draw conclusions. Here, the individual numbers varied from 93 to 227 cm. The averages were much more consistent at 148.5, 149.25, and 144.25.

Also, for Match 3, one person (Brother 2) in the Middle Generation shared *more* DNA (227 cm) than the uncle in the Oldest Generation (185 cm). If only this person and the uncle had tested, it would've been much more difficult to determine relationships.

The table below shows person tested, possible relationships, shared centimorgans (cm), and average cm for the Middle Generation. Possible relationships are abbreviated as follows: C = cousin, R = removed, 1/2 = a half relationship, e.g., 1/2-1C1R is a half first cousin, once removed.

Match	Possible Relationships	cm		Ave. cm
Match 1				
Maternal Uncle	2C, 1/2-1C1R, 1C2R	359		
Brother 1		156		
Brother 2		178		
Maternal 1/2-Brother 3		155		
Client		105		
	2C1R, 1/2-2C,1C3R, 1/2-1C2R	594	4	148.5
Son	3C, 2C2R	37		
Match 2				
Maternal Uncle	2C, 1/2-1C1R, 1C2R	276		
Brother 1		156		
Brother 2		207		
Maternal 1/2-Brother 3		120		
Client		114		
	2C1R, 1/2-2C,1C3R, 1/2-1C2R	597	4	149.25
Son	3C, 2C2R	106		
Match 3				
Maternal Uncle	2C, 1/2-1C1R, 1C2R	185		
Brother 1		142		
Brother 2		227		
Maternal 1/2-Brother 3		115		
Client		93		
	2C1R, 1/2-2C,1C3R, 1/2-1C2R	577	4	144.25
Son	3C, 2C2R	48		

This case study provides important DNA lessons, including why testing

- multiple generations provides stronger evidence from which to draw conclusions,
- older generations gets you closer to ancestors being studied, and
- multiple people at one generation provides additional evidence upon which to draw conclusions.

The amount of shared DNA between matches can be used to predict the relationships between matches. Probabilities can be assigned to the possible relationships. The Client's strong DNA testing plan provided many data points to work with, as is discussed below.

Ancestral Couple of the Three Matches

The Three Matches had family trees posted. Each had the couple, JWD (1840-1928) and KC (1851-1934) ("Ancestral Couple" or AC), in his or her tree. Thus, the Three Matches were related to each other as direct descendants of the AC, who immigrated to Bay City, Wisconsin,[1] married in 1865, and had 9 boys and 5 girls.

The AC was in the client's family tree, as their daughter married into a collateral line of the client's family. Also, the 1900 Census showed the AC living next door to another of the client's family member. These families were intertwined!

Nevertheless, these things didn't explain why DNA was shared between the client's family and the Three Matches who are direct descendants of the AC. Thus, how the AC fit into the Client's family tree had to be determined.

Shared cM Project

The Shared cM Project at DNAPainter.com provides possible relationships based on the amount of DNA sharing between matches. It also supplies the probability for these possible relationships. Users input the shared centimorgans (cm) or percent of shared DNA. The program outputs possible relationships and their probabilities.

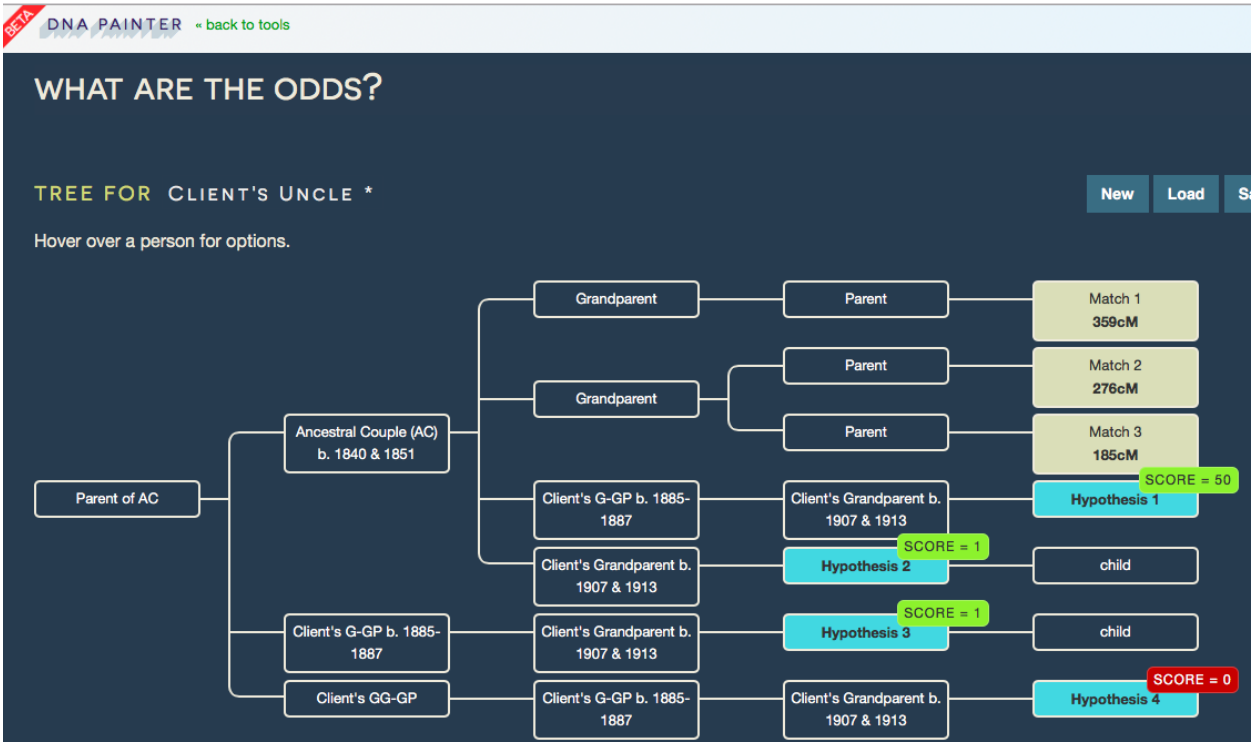
What Are the Odds?

A new tool, What Are the Odd is available at DNAPainter.com. Users input a tree from related matches, along with the centimorgans (cm) of shared DNA with each match. The user then adds hypotheses to the tree, for example, the Uncle is a 2nd cousin (2C), 1C1R, or 2C1R to the matches. The tool automatically calculates the probabilities for the hypotheses. The probabilities are pulled from the Shared cM Project.

WATO then calculates the relative odds for the probabilities. For example, if the probability of Hypothesis 1 (H1) is 1, and the probability of Hypothesis 2 (H2) is 10, then the *odds* of H2 over H1 is 10. This means that H2 is 10 times more likely than H1.

[1] The town's name has been changed to protect the client's identity.

Here, the matches' tree and the shared cm with each match were put into the WATO tool. This was done for each of client's family members. On the next page is a screenshot of the Uncle's WATO results.



The strongest hypothesis had a score of 50. The next two closest hypotheses had scores of 1, along with one hypothesis with a score of 0. This meant that the strongest hypothesis was 50 times more likely than the next two, with the other hypothesis not being possible. The strongest hypothesis was that the uncle was a 2nd cousin to the Three Matches.

This conclusion was supported by running the WATO tool on the client and her brothers and combining the results in an Excel spreadsheet. This resulted in the following.

Strongest hypothesis: Hypothesis 1 (H1): Uncle is 2nd Cousins (2C) to 3 matches (share great-grandparents)

- 71 million times more likely than 1C1R (H2)
- 36 million times more likely than 2C1R (H3)
- 0% chance that they're 3C (H4)

Second cousins share great grandparents. This meant that the uncle should share great-grandparents with the Three Matches. However, the client didn't know who the Three Matches were, even though her extensive family tree included all of her uncle's great-grandparents. Thus, it appeared that the Client's tree included biologically-unrelated ancestors.

Inserting the Ancestral Couple into the Client's Family Tree—Knitting Two Trees Together

The next step was to examine the client's family tree to see where DNA evidence supported it—and where it didn't. Three of the uncle's four sets of great-grandparents were supported by DNA evidence. That left one set of great-grandparents to study—and the most likely branch to prune off the client's tree.

The uncle's great-grandparents were born between 1841 and 1863. The AC was born in 1840 (JWD) and 1851 (KC). Thus, they would fit into this generation. This is consistent with the Uncle being 2Cs with the Three Matches. The tree above shows placement of the uncle (Hypothesis 1) in that Matches' tree.

This left a one-generation gap between the uncle's mother (b. 1913) and the AC. This narrowed the research question to "Who is the uncle's maternal grandmother or grandfather?"

It's much more likely to have a misattributed *paternity* situation rather than misattributed *maternity*. Thus, the AC's nine sons were examined to see if one was the uncle's maternal grandfather.

Ancestral Couple's Nine Sons

The sons were grouped into the following categories.

Category 1: Ruled Out

Two sons were ruled out because if these were the uncle's maternal grandfather, then he'd be 1st cousins to the Three Matches. 1st cousins share, on average 850 cm of DNA.

- Son 9 (Match 3's grandfather)
- Son 8 (Match 1 and Match 2's grandfathers)

Category 2: Unlikely

Two sons were unlikely because they were in South Dakota when the uncle's mother was conceived, presumably in Wisconsin.

- Son 7
- Son 6

Category 3: Erroneous

One son was eliminated as being an error in client's tree.

- Son 5

Category 4: More Likely

The uncle's mother was born in 1913 in Bay City, Wisconsin. The following sons lived in Bay City with their parents (the AC) during the 1910, 1920 and/or 1930 Censuses. Thus, the following three sons were placed in the *more* likely category for being the uncle's maternal grandfather.

- Son 4
- Son 3
- Son 2

Category 5: Most Likely

Surprisingly, there was a 1920 Census showing Son 1 living as a farm hand with the uncle's mother's family when she was 7 years old. Thus, although a visiting brother cannot be ruled out, the non-DNA evidence, i.e., the 1920 Census, pointed to Son 1 being the uncle's maternal grandfather.

- Son 1

Further Non-DNA Evidence – The Pony

The client and her uncle discussed these findings. He remembers the family of the Three Matches.

The uncle also had a photograph of his mother with a pony that Son 1 bought for her. The pony, along with the uncle's stories, are the latest pieces of evidence supporting the hypothesis that Son 1 was the uncle's maternal grandfather. Thus, he was put in the *Most Likely* category.

Post-Script on Additional DNA Testing

The hypothesis could be further tested if living descendants of Son 1 or other brothers could be tested. Of the *more* likely candidates, given budgetary constraints, no evidence of them having children was found. Also, two of the *More Likely* sons and Son 1 were buried with the AC with "Son" headstones. This is evidence that these sons didn't marry or have children.

Conclusion

DNA evidence—along with census records, family stories, and a pony—most strongly support Son 1 being the uncle's maternal grandfather and the Ancestral Couple being the uncle's great-grandparents.

This case study shows how DNA evidence lopped off a branch of a well-documented family tree. DNA evidence combined with non-DNA evidence, including the unusual evidence of a pony, re-built the pruned branch.

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Research Steps

1. When new matches are found that don't fit into your tree, are they related to each other?

2. If no, then maybe the new match is an adoptee or other person with unknown parentage.

3. If yes, then what are the possible relationships to the new matches?

    a. Use the WATO tool to determine this

        i. Build the matches' tree

        ii. Add hypotheses (possible places that you might fit into the matches' tree)

        iii. Determine the hypothesis with the highest odds

            1. Want a hypothesis that's 10-20 times more likely than the next

4. See if there's DNA evidence in your tree

    a. If a branch lacks DNA evidence, does an ancestor/ancestors of the matches need to be grafted into your tree?

Resources

- **DNA Painter**
  https://DNAPainter.com
  What Are the Odds Tool and the *Shared cM Project*

- **DNA Painter: What Are the Odds? (WATO) Facebook Group**
  https://www.facebook.com/groups/WhatAretheOdds/

- DNA Do-Over Facebook Group
  https://www.facebook.com/groups/dnadoover/