Using Autosomal DNA for 18th and 19th Century Mysteries

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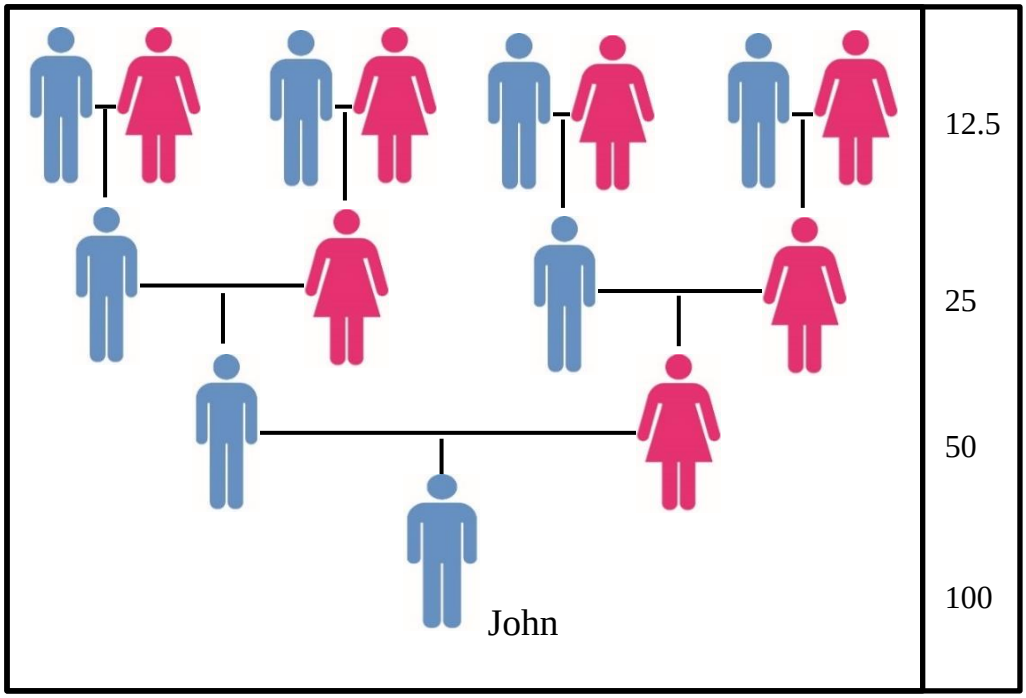
Using Autosomal DNA

Autosomal DNA is the 22 pairs of non-sex chromosomes found within the nucleus of every cell. The 22 autosomes, or autosomal DNA chromosomes, are numbered approximately in relation to their sizes, with autosome 1 being the largest and autosome 22 being the smallest. The following figure follows the inheritance of autosomal DNA through four generations of a family, from eight great-grandparents to their great-grandchild John:

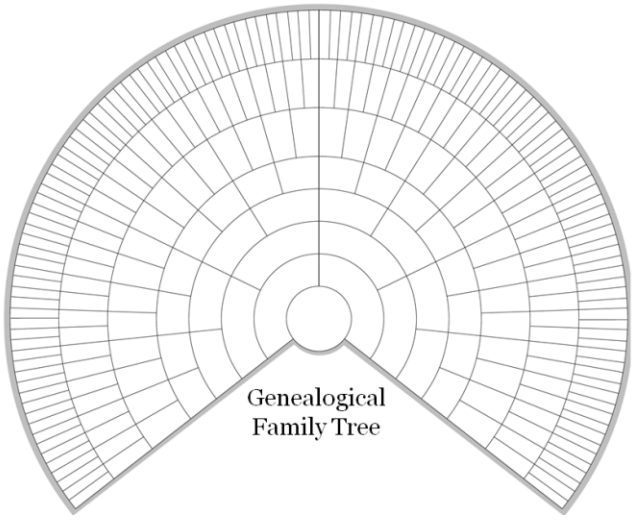


John received about 50% of his DNA from each of his parents, about 25% of his DNA from each of his grandparents, and about 12.5% of his DNA from each of his great-grandparents. Although not shown in this figure, Frank will inherit about 6.25% of his DNA from his great-great-grandparents, and so on.

1. You Have TWO Family Trees

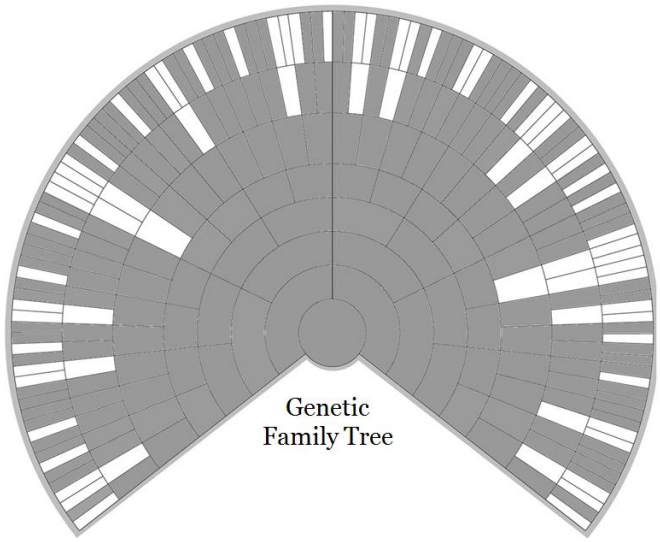
One of the most important aspects of genetic genealogy required to completely understand and interpret autosomal DNA test results is the fact that everyone has two very different, but overlapping, family trees.

The Genealogical Family Tree



The first family tree is your Genealogical Family Tree, which contains every ancestor that had a child who had a child who had a child, and so on, that ultimately led to you (see the figure below). This tree contains every parent, grandparent, and great-grandparent back through history. In most cases, this is the tree that genealogists spend their time researching, often using paper records such as birth and death certificates, census records, and newspapers to fill in. Many genealogists find that the paper trail ends or becomes much more difficult to identify beyond the 1800 or 1700's, making it difficult to fill in many of the openings in the Genealogical Family Tree.

The Genetic Family Tree

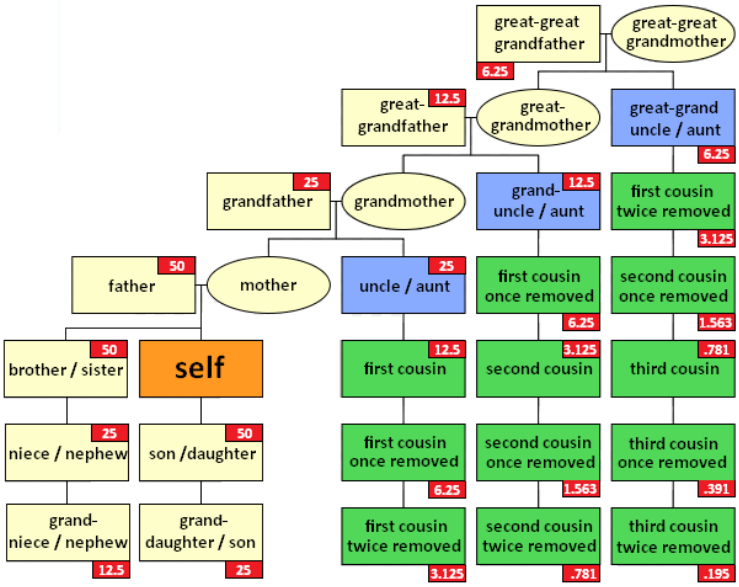


The second family tree is your Genetic Family Tree, which contains only those ancestors that contributed to our DNA. Not every person in your Genealogical Family Tree contributed a segment of their DNA sequence to your DNA sequence. A parent does not pass on all their DNA to their children (only about 50%); as a result, bits and pieces of DNA are lost in each generation. Somewhere between 5 and 7 generations back, your Genetic Family Tree starts to lose ancestors from your Genealogical Family Tree.

As shown in the figure below, your Genetic Tree is actually just a sub-set of your Genealogical Tree. Your genetic tree is guaranteed to contain both biological parents, who each contributed approximately 50% of your entire DNA sequence. Your genetic tree also likely contains each of your four biological grandparents and eight biological great-grandparents, but with each generation it is much less likely that every person in that generation contributed a piece of their DNA to your DNA.

2. Finding and Classifying Your Genetic Matches

Each of the testing companies return a list of genetic matches, which are all people in their database that share DNA with you above a certain threshold. The threshold used for matching is important; if the threshold is set too low you'll match everyone in the database. If the threshold is too high, you'll miss too many real matches.



Each company tries hard to find a suitable threshold, but it is important to keep in mind that all of the companies will provide matches that are "false positives" (matches who are not related to you in a genealogically relevant timeframe). This is just one reason that it is important to **concentrate on your best matches first**. Your "best matches" are those who share the most DNA with you.

The more segments you share with another person, and the larger those segments are, the closer your genealogical relationship with that person is. We inherit entire chromosomes from each parent, which are a collage of segments from our grandparents' chromosomes, which in turn are a collage of even smaller segments from our great-grandparents, and so on.

The chart demonstrates the percentage of DNA that we share in common with our genealogical relatives. The more distant the relative, the fewer and smaller the segments of DNA that we share in common with that relative.

Although you are predicted to share 0.781% of your DNA with a third cousin, there's no guarantee that you will match a third cousin, as described in the next chart. Some (~10%) third cousins will not match. Anecdotally, however, no one to my knowledge has ever had a second cousin NOT match.

Your "Secret Weapons" for Solving Mysteries

There are some secret weapons you can use to learn about unknown new matches, including the following:

1. Shared Matching
2. Tree Building

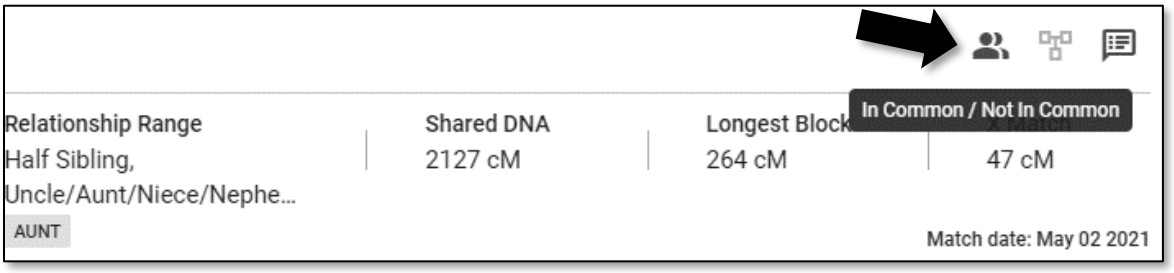
Although not the only mechanisms to learn about matches, they are both extremely powerful!

1. Shared Matching

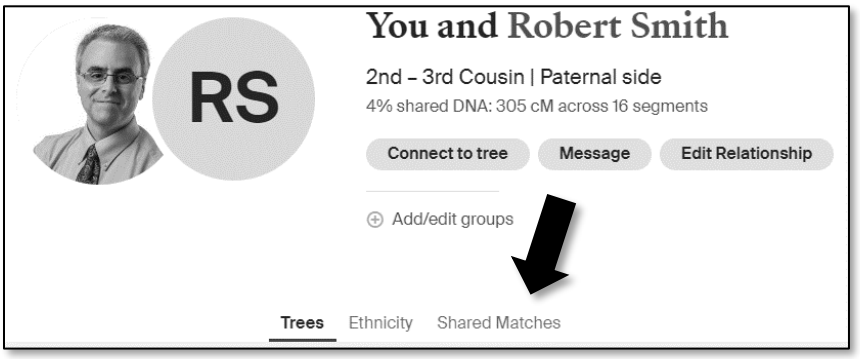
Shared Matches (also called "In Common With" matching) are potentially **the most powerful tool** for analyzing the results of DNA testing, yet they are underutilized and misunderstood. Together we will look at some of the ways to take advantage of these tools to work with our matches and break through brick walls.

Every major atDNA testing company (23andMe, AncestryDNA, Family Tree DNA, and MyHeritage) and the third-party tool GEDmatch offers a shared matching tool. Armed with shared matching and a few known cousins, you can almost instantly create **hypotheses** about how matches shared with the known cousins are related. This is also a recursive process, so you can create large genetic networks of clustered relatives.

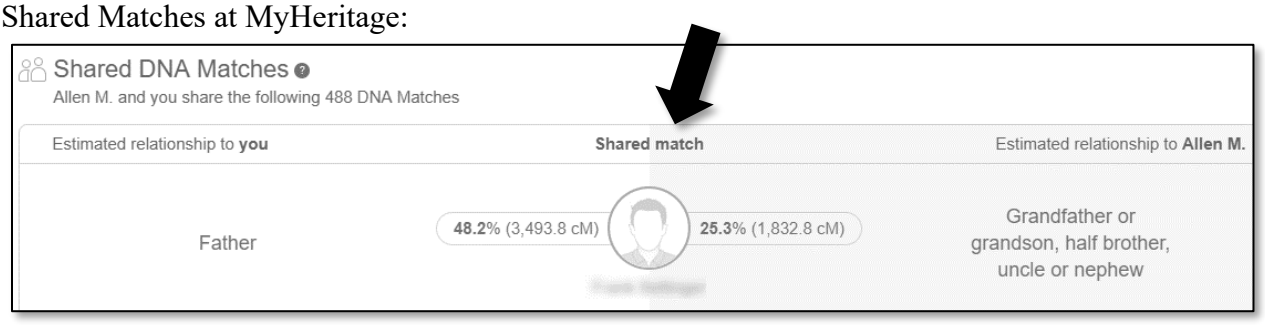
In Common With at Family Tree DNA:



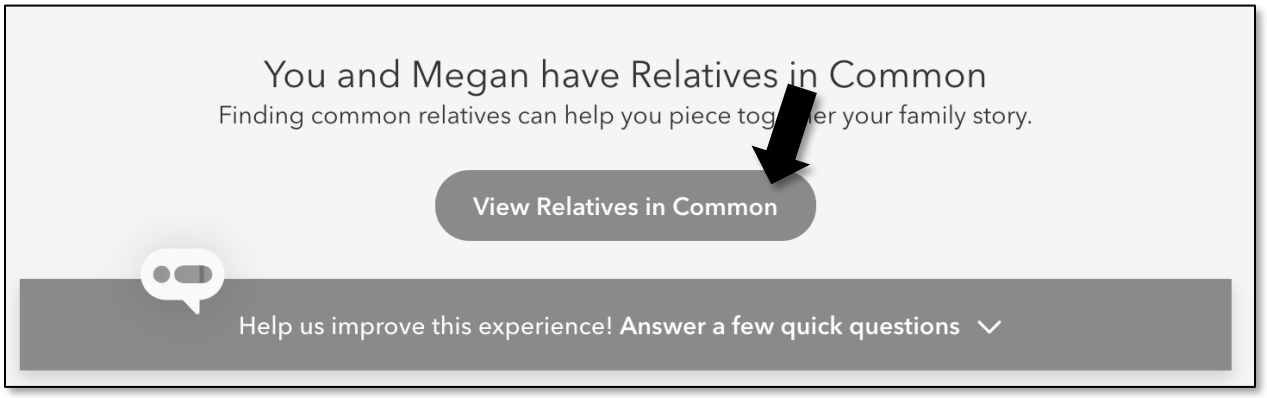
Shared Matches from AncestryDNA:



Shared Matches at MyHeritage:



Shared Matches at 23andMe:



Using Genetic Networks

A genetic network, whether Shared Matching or Shared Segments (or both!), helps the genealogist form a group of people that provide HINTS to a shared ancestor or ancestral couple. The theory is essentially this: ***it is reasonable to hypothesize (but NOT to conclude) that people in a Shared Match Cluster or a Shared Segment Cluster share the same common ancestor. Thus, if we can find the ancestral couple we share with one or more members of the cluster, we can hypothesize how we're related to the other members of the cluster!***

The steps for utilizing a genetic network are relatively straightforward:

1. **STEP 1**: Identify a Shared Match or Shared Segment Cluster
2. **STEP 2**: Review the trees of the individuals in the cluster (if any);
3. **STEP 3**: Identify one or more ancestors shared in common between your tree and the tree(s) of one or more individuals in the cluster. If there are no identified ancestors shared in common, review the trees for surnames and/or locations you recognize;
4. **STEP 4**: Formulate a hypothesis that you are related to the other members of the cluster via the same identified one or more ancestors; and
5. **STEP 5**: Pursue the hypothesis by gathering new evidence (build trees, contact matches, test other relatives, etc.).

2. Tree Building (Including "Research" Trees)

It is **ESSENTIAL** to build trees for your genetic matches, if you want to identify who they are and how they are related to you. If you can discover enough information about a match, often just a name or the name of a single ancestor, you can often build a tree for that match.

You can build a tree online, in your genealogy software, or however you prefer to build trees. Be sure to keep the tree private so that you don't spread misinformation or disrupt a match's tree. One type of tree built for genetic matches is the "Research" tree. A Research tree is a HINT generator (JUST LIKE ANY OTHER FAMILY TREE is a hint generator!) which is built without meeting accepted genealogical guidelines or standards. It is only to generate hypotheses about relationships, to fish for clues, and is NEVER used as standalone evidence. Let me repeat that to be clear:

A Research tree is for hints ONLY; it is NOT a final product!!

There are two great YouTube videos about building Research trees. The first is an AncestryDNA video by Crista Cowan and Angie Bush. The video is approximately 23 minutes long and can be found at https://www.youtube.com/watch?v=VP8rUlZbmeA (or search "AncestryDNA Mirror Trees" at YouTube).

The second video is by me and is entitled "The Matching Tree Method." The video is approximately 20 minutes long and can be found at https://www.youtube.com/watch?v=UmOZXCxsqNU (or search "Quick and Dirty Trees" at YouTube).

Additional Quick & Dirty Tree Building Resources

- Bettinger, Blaine. Are You Doing Everything to Identify Your Matches? *The Genetic Genealogist*, 11 March 2017 (https://thegeneticgenealogist.com/2017/03/11/are-you-doing-everything-to-identify-your-matches/).
- Jones, Thomas. Perils of Source Snobbery, *OnBoard* 18 (May 2012) (published online at: https://bcgcertification.org/skillbuilding-perils-of-source-snobbery/).
- Hocker, Kris. Quick & Dirty Trees for DNA Matches, *A Pennsylvania Dutch Genealogy,* 25 Oct 2018 (http://www.krishocker.com/quick-dirty-trees-for-dna-matches/).

Additional Resources:

Here are for much more about shared matching:

- 23andMe. Relatives In Common Tool. *23andMe Customer Care* (https://customercare.23andme.com/hc/en-us/articles/221689668-Relatives-In-Common-Tool).
- Ancestry.com. AncestryDNA Shared Matches. *Ancestry Support*, 22 June 2017 (https://support.ancestry.com/s/article/AncestryDNA-Shared-Matches).
- Bettinger, Blaine. Clustering Shared Matches. *The Genetic Genealogist*, 3 January 2017 (https://thegeneticgenealogist.com/2017/01/03/clustering-shared-matches/).
- Bettinger, Blaine. Are You Doing Everything to Identify Your Matches? *The Genetic Genealogist*, 11 March 2017 (https://thegeneticgenealogist.com/2017/03/11/are-you-doing-everything-to-identify-your-matches/).
- Bettinger, Blaine. Using Shared Matches – A Quick Example. *The Genetic Genealogist*, 7 October 2017 (https://thegeneticgenealogist.com/2017/10/07/using-shared-matches-a-quick-example/).
- MyHeritage. Introducing the DNA Match Review Page. *MyHeritage Blog*, 22 August 2017 (https://blog.myheritage.com/2017/08/new-review-match-page-discover-how-you-are-related-to-your-dna-matches/).

