

DNA Basics

[Video Link](#)

DNA can be a very powerful tool for your genealogy research. In this video and handout, I'm not going to go into a lot of science behind the genetics. I suspect what you're interested in is how it can help you with your family history research. That's where we'll focus for today.

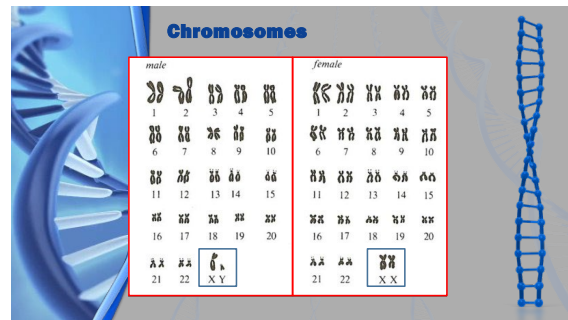


Note: I refer to DNA cousins throughout this document, but that could include close family like siblings, parents, aunts, uncles, grandparents, etc. Basically, anyone on the DNA match list.

Let's dig in.

Chromosomes

We have 23 pairs of chromosomes that we inherit from our parents. A male will have an X and a Y chromosome and females will have two X chromosomes. We use this information to help find genetic links with DNA cousins to help us find more ancestors. Knowing these basic facts will help with our genealogy. That's the end of your science lesson for today. 😊



Main Types of DNA Used in Genealogy

There are three major types of DNA that is used most for genealogy.

Autosomal DNA (atDNA) is the most common and is found on all the genealogy platforms. For example, AncestryDNA® uses autosomal DNA. This looks at the entire family tree.

Next is **Y-DNA**, which is used for looking at the paternal line, (up the father's line) also known as the surname line.



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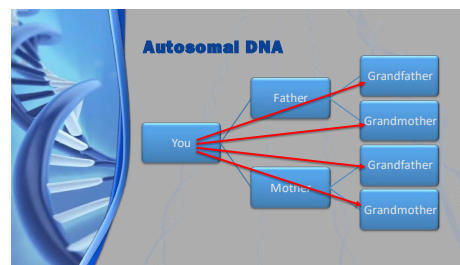
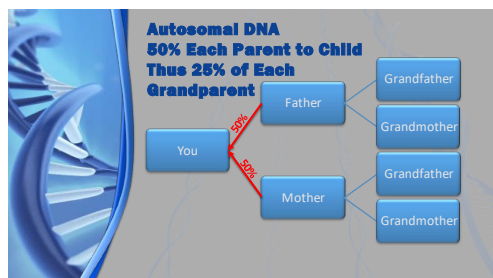
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The last one we're going to talk about, is the **Mitochondrial DNA (mtDNA)**. Mitochondrial DNA looks at the maternal line (mother's line) but has some unique opportunities. We will not be discussing X-DNA.

Autosomal DNA (atDNA)

Autosomal DNA looks at the entire family line. I call it a shotgun view of the DNA family tree. This is the most used DNA test.

With atDNA, you inherit about 50% of your DNA from each parent.



Thus, you have about 25% DNA from each grandparent. Then about 12.5% from each great grandparent, halving the DNA with each generation.

This is good to know when researching those DNA cousins.

By the time you reach your 2X great grandparents, you have only about 6% of their DNA within you.

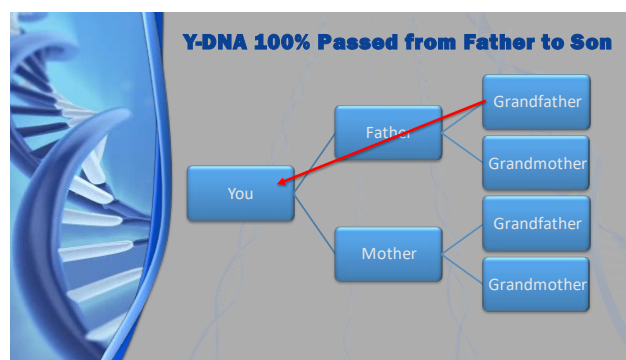
Think about that for a moment. That means that there is a lot of DNA from those 2X great grandparents that you don't have... but other cousins might. Therefore, atDNA is helpful for about 200-500 years back in time depending on how old your ancestors were when they had kids.

Y-DNA (The Father's Line)

Only men have a Y Chromosomes.

With Y-DNA, males inherit 100% of the Y-DNA from father to son. Therefore, a male will have the same Y-DNA as his father, grandfather, great grandfather, great-great grandfather (on the paternal line), and so on for generations.

This is an excellent test if you are looking for a biological father or are trying to solve a missing male ancestor.

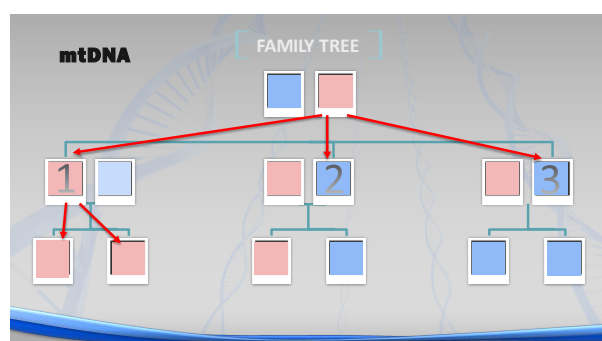
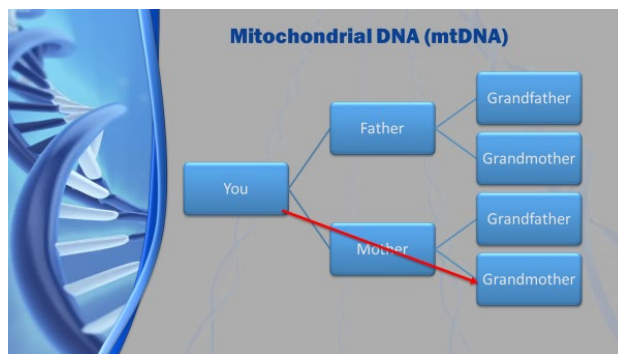


If you are female, you might consider asking a male descendant (of the branch you are researching) to take a Y-DNA test. If you do, I highly recommend you also do an atDNA test as well. Working both atDNA and Y-DNA together can prove helpful.

Mitochondrial DNA (The Mother's line)

Mitochondrial DNA is handed down from the mother to both male and female children. Males will not pass down the mtDNA to his children. They will inherit it from their mother.

This makes for a unique inheritance pattern that one should be mindful of when using mtDNA. This is the least used of the three tests and likely will result in far less DNA cousins from this test.



Here we see how a woman (pink) passes down her mtDNA to all of her children (both male and female, represented as 1, 2, and 3). However, the males (2 & 3) do not pass down the mtDNA to their children (male or female).

Using this knowledge when looking up the family tree from the bottom, might be helpful in some situations when trying to determine the

mother of a male. It's rare that I see people use mtDNA, so finding DNA matches might be challenging.

mtDNA is most helpful when researching the maternal line, as a female inherits the same mtDNA all the way up the maternal line.

What Are Centimorgans? (cM's)

The simple explanation of centimorgans is that it is a unit of measurement to demonstrate how closely related you are to another DNA cousin. The higher the cM count, the closer you are related.

You'll see cM's used on all DNA platforms. However, you might see some differences between companies as some count the cM's slightly differently.

Also know that cM's overlap with several relationship possibilities. For example, a 2nd cousin may share, say 296 cM, with you.

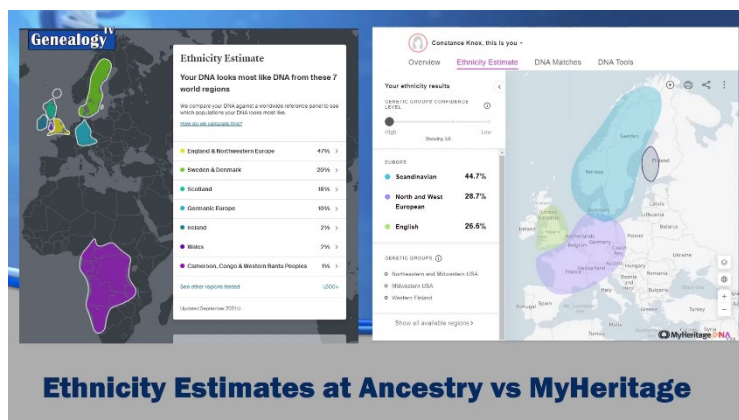
At 296 cM's you'll discover that the "2nd cousin" might not be a straight 2nd cousin, but instead is 58% likely to be your:

- half great grand-niece/nephew or...
- half great great aunt/uncle or...

Ethnicity Estimates

Ethnicity Estimates are based on a reference panel of deeply rooted DNA test takers in various regions of the world.

As DNA evolves so does the DNA reference panels. Additionally, as DNA companies understanding of genetics, reference panel genealogy, and the DNA tests grow in numbers, so does the ethnicity estimates evolve. You'll find over time percentages will change and regions will split into more refined groups.

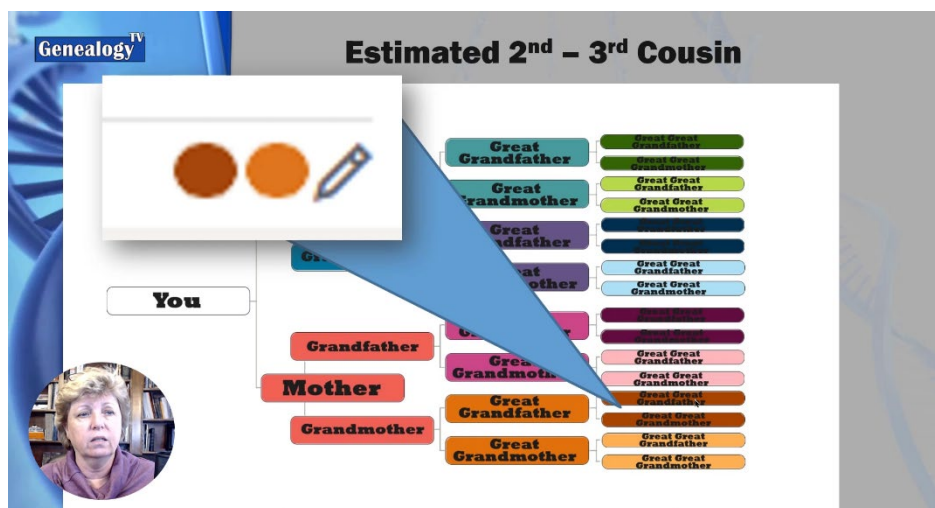


DNA Cousin Matches

This is where all the gold happens. While the number of DNA Cousin Matches may look overwhelming at first, the trick is to organize them along the lines of the family tree. We do this through a process of “grouping” or color coding them along the various lines of the family tree.

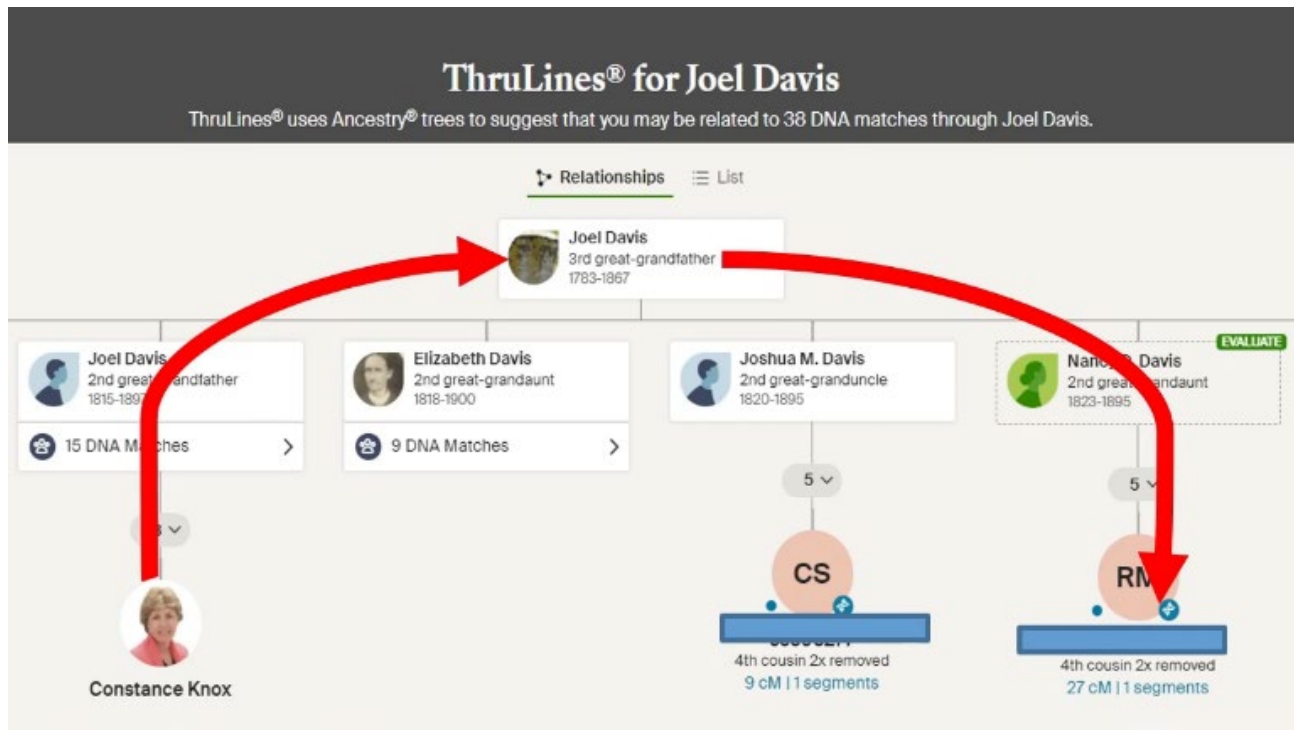
As you learn more, you can start to add more groups and refine what common ancestors the DNA cousin descends from. From there you can start to research the public trees of those DNA Cousins (in the branch of your tree you are researching) for clues and records.

Be mindful that other member trees may not be accurate, so be sure to evaluate the records and connections to make your own conclusions.



Visualizing Possible Relationships

Both Ancestry and MyHeritage give you possible connections with your DNA cousins. At Ancestry it is called ThruLines® and at MyHeritage it is called the Theory of Relativity. Both are estimating what the connection could be based on the estimated amount of DNA you share in combination with those DNA cousin trees (who both show the same common ancestors in the family tree).



Keep in mind that those visualization tools are based on other member trees and whose trees might not be accurate.

Also, it will not show all children of the common ancestor if there are no DNA cousins that descend from the missing sibling. For example, in the image above, if Joel Davis had five children, but only four of them had descendants who took a DNA test, the fifth child will not be seen in the ThruLines® view because there is no DNA cousin match. It doesn't mean that the fifth child did not exist, but that there are no descendants who have taken a DNA test from that fifth child... or that a DNA cousin (from that 5th child) has not built their tree to the extent that it shows the common ancestor (in this case Joel Davis).

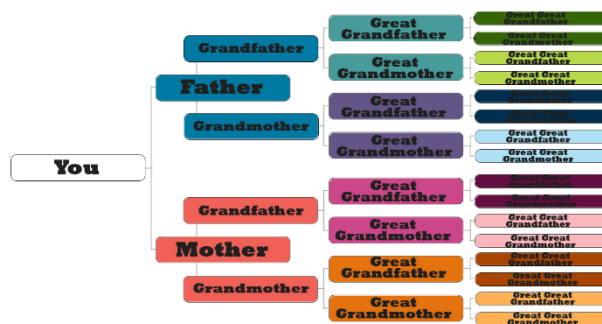
How Does DNA Help with Your Family History?

The simple answer is we look at the DNA cousins match list and look for clues in their family trees and records. Keep in mind that DNA research must be used together with traditional genealogy (a.k.a. the paper trail). DNA does not stand alone (unless it is a parent-child relationship). Using both allows us to verify what we are seeing in records and genetics to help tell the story. There's a saying in genealogy that "DNA doesn't lie, but people do." Sometimes, you'll discover that genetics will reveal a different story than the paper records, so be aware of that.

Grouping DNA

With numerous DNA cousins it might feel a little daunting at first. However, we can divide those DNA cousins along branches of the family tree to help narrow down the match list into something manageable and focused on our research question.

We do this division of DNA cousins (or filtering) to branches of the family tree through a process called DNA Grouping. This is basically a color-coding system you can set up and customize as you wish. That way you can group your father's side from your mother's side. Or you can create groups for your paternal grandparents, or your maternal grandparents and so on. As you discover more about your family tree, you can create new groups.



I have an entire grouping system I've created with the color-coded chart (shown above) that matches the colors on Ancestry. This way, as you create groups there is some method to the madness. To learn more about grouping, see this [playlist of videos](#) and watch them in order as one builds on the other. This system is included in the playlist in a video called [Grouping DNA Cousin Matches at AncestryDNA](#). Here is the full step by step instructions [handout for DNA Grouping](#) on Ancestry (with the color chart).

All Testing Companies Use atDNA

There are five major companies (currently) that use autosomal DNA (atDNA).

That's **AncestryDNA®**, **Family Tree DNA™**, **MyHeritage™**, **Living DNA**, and **23andMe**, as well as more newcomers coming to the market.



All testing companies use atDNA. Some have additional services like, health or wellness, and traits information with the atDNA kit. Some are more focused on ancestry and others are more focused on wellness.

For **AncestryDNA®**, autosomal DNA is the only test they have these days. AncestryDNA is by far the largest of the group with over 20 million tests today. While you can download DNA from Ancestry, you cannot upload DNA to them.

At **Family Tree DNA™**, it is called the Family Finder. They offer other test such as Y-DNA and mtDNA.

At **MyHeritage**, their atDNA is referred to as a DNA kit (but it is autosomal). They also offer a health option. MyHeritage has some of the most DNA tools to explore such as their chromosome browser that no one else has. Using the chromosome browser is an advanced technique.

At **Living DNA**, their atDNA is just referred to as a DNA kit (but it is autosomal). They also have a relationship with **FindMyPast** (a UK & Irish ancestry website). If you are a FindMyPast subscriber and wanted to do a DNA test through them, you'd be redirected to Living DNA.

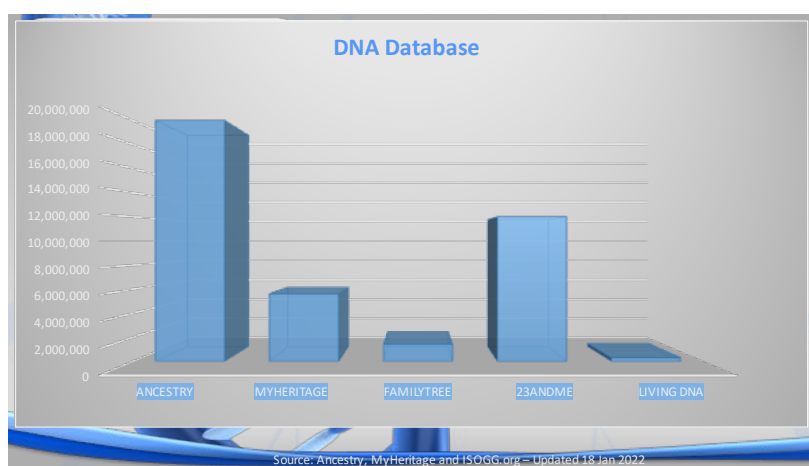
At **23andMe** their atDNA is called “Ancestry Service” or “Ancestry +” which adds either traits or health. 23andMe originated as a health testing company and later added ancestry.

Companies Compared

If you are new to DNA, start with AncestryDNA. Because they have the largest database of DNA test takers, you will find more DNA cousins to match with.

If you choose, you can download your Raw DNA and upload it to most other services if you need to look for more DNA cousins.

I will not be comparing prices between companies, as they vary over time. However, they are always on sale during the various holidays, like Christmas, Mother's Day, Father's Day, Veteran's Day, etc.



Conclusion

DNA can be a very powerful tool but needs to be used in conjunction with traditional genealogy.

The best place to start is with the DNA cousins. Group them by the father and mother's side. Then start to group them by the grandparents' lines... and so on. See the Grouping videos for more details.

Don't forget...

Enjoy the Journey!