

Genealogy Basics: DNA

Topics

- Disclaimer
- What is DNA Testing?
- Autosomal DNA
- Autosomal DNA Matches
- Ethnicity Estimates

Disclaimer!

The science of DNA is very complex, and its use is constantly evolving in science, medicine, pharmaceuticals, and policework, to name just a few areas.

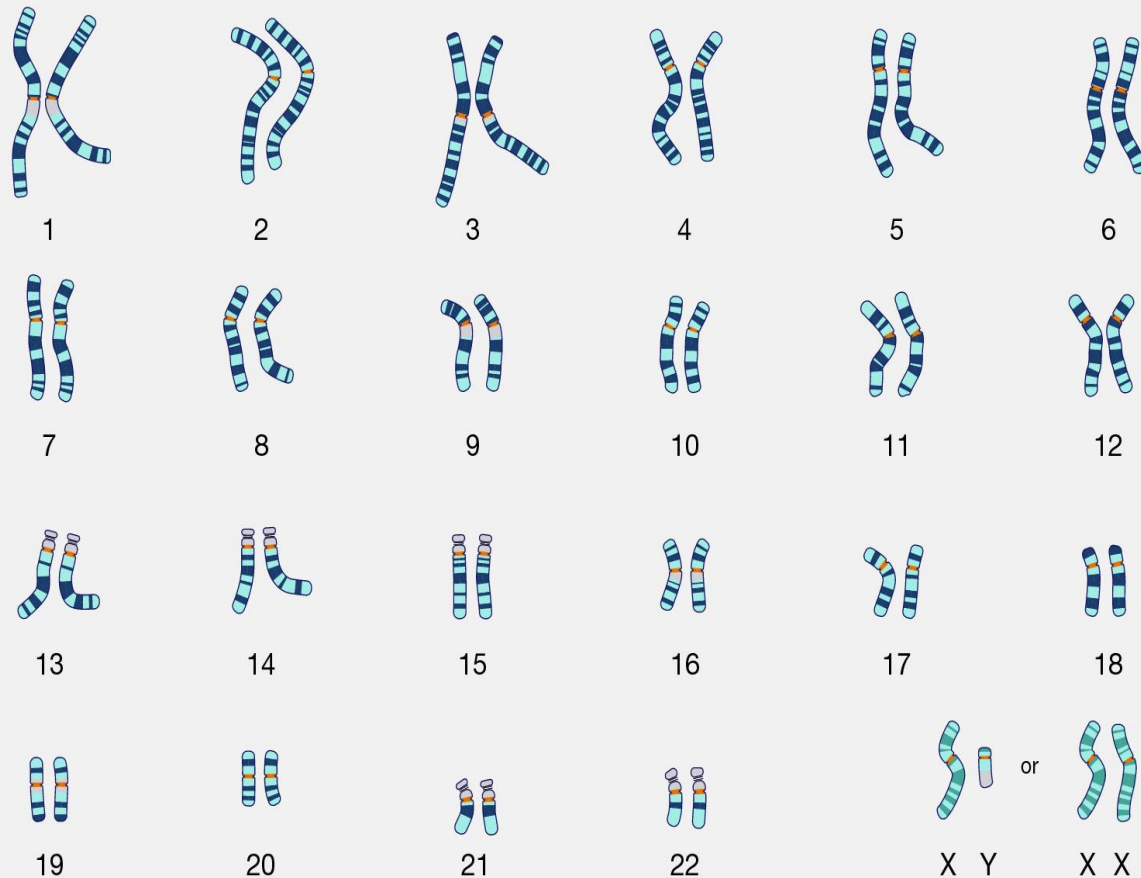
We will cover some high-level basics as DNA relates to genealogy and some commercially available tests.

Exercise caution and pause before taking (or asking someone to take) a DNA test. DNA can reveal emotionally sensitive information about family and ancestors. In addition, some DNA tests could disclose health information that could create unwarranted concerns. Privacy for DNA test-takers is paramount. Even if you have arranged and paid for a DNA test for someone else, the results still belong to them.



What is DNA Testing?

What is DNA? (Deoxyribonucleic Acid)



Shown here are human chromosomes

- DNA controls most aspects of human cellular biology. DNA is organized into 22 chromosome pairs and a single pair of sex chromosomes.
- Our chromosomes comprise about 3 billion DNA base pairs (6 billion altogether).
- DNA Strands of varying lengths make up genes (between 20,000 and 25,000 genes).
- DNA is made up of repeating sequences of adenine (A), thymine (T), guanine (G), and cytosine (C). The sequencing of A, T, G, and C is the specific code for the Gene.
- The complete set of DNA is called a Genome.
- Humans share 99.9% identical DNA.
- Genealogically speaking, we are interested in the .1% that may not be identical

Courtesy: National Human Genome Research Institute (<https://www.genome.gov/>)

Types of DNA Testing.

Types of Tests:

Autosomal DNA (atDNA) – testing of the 22 non-sexual chromosomes. One copy of each chromosome is inherited from each parent.

Y-chromosomal DNA (Y-DNA) – testing of the Y chromosome, which only is seen in males and is passed from father to son.

X-chromosomal DNA (X-DNA) – Women have two X chromosomes, one from their father and one from their mother. Men have one X chromosome inherited from their mother.

Mitochondrial DNA (mtDNA) – is a small circular piece of DNA found in large numbers outside the nucleus of most cells and passed unchanged from a mother to her children. Men do not pass on any mtDNA to their children.

Uses of DNA Testing.

Types of Tests:

Autosomal DNA (atDNA) – is the primary test to determine genealogical matches in commercial DNA testing. **We will discuss this type of test.**

Y-chromosomal DNA (Y-DNA) – will determine whether two testers share the same paternal line. The mutation rate of Y DNA also allows the generational relationship to be estimated.

X-chromosomal DNA (X-DNA) – can help indicate maternal relationships if matches are found, but it is challenging to evaluate without other matching info.

Mitochondrial DNA (mtDNA) – because mtDNA is passed unchanged, a maternal relationship can be established, but not the age of the relationship.

Genealogical DNA Testing Companies*.



Database = 20 million+ More Genealogical Tools and Largest Database. Thru-Lines, Traits, Matches, Ethnicity, family tree integration. [Best for Genealogical and Genetic tree integration]



Database = 12 million+ Deeper health information but not a genealogical research site. Health Info, Matches, Ethnicity, Traits. [Best for deeper health analysis]



Database = 1.7 million+ Deeper DNA analysis but not a genealogical research site. Ethnicity, DNA Matches, Y-DNA, Group Projects, free DNA uploads, family tree integration. [Best for deep DNA analysis]



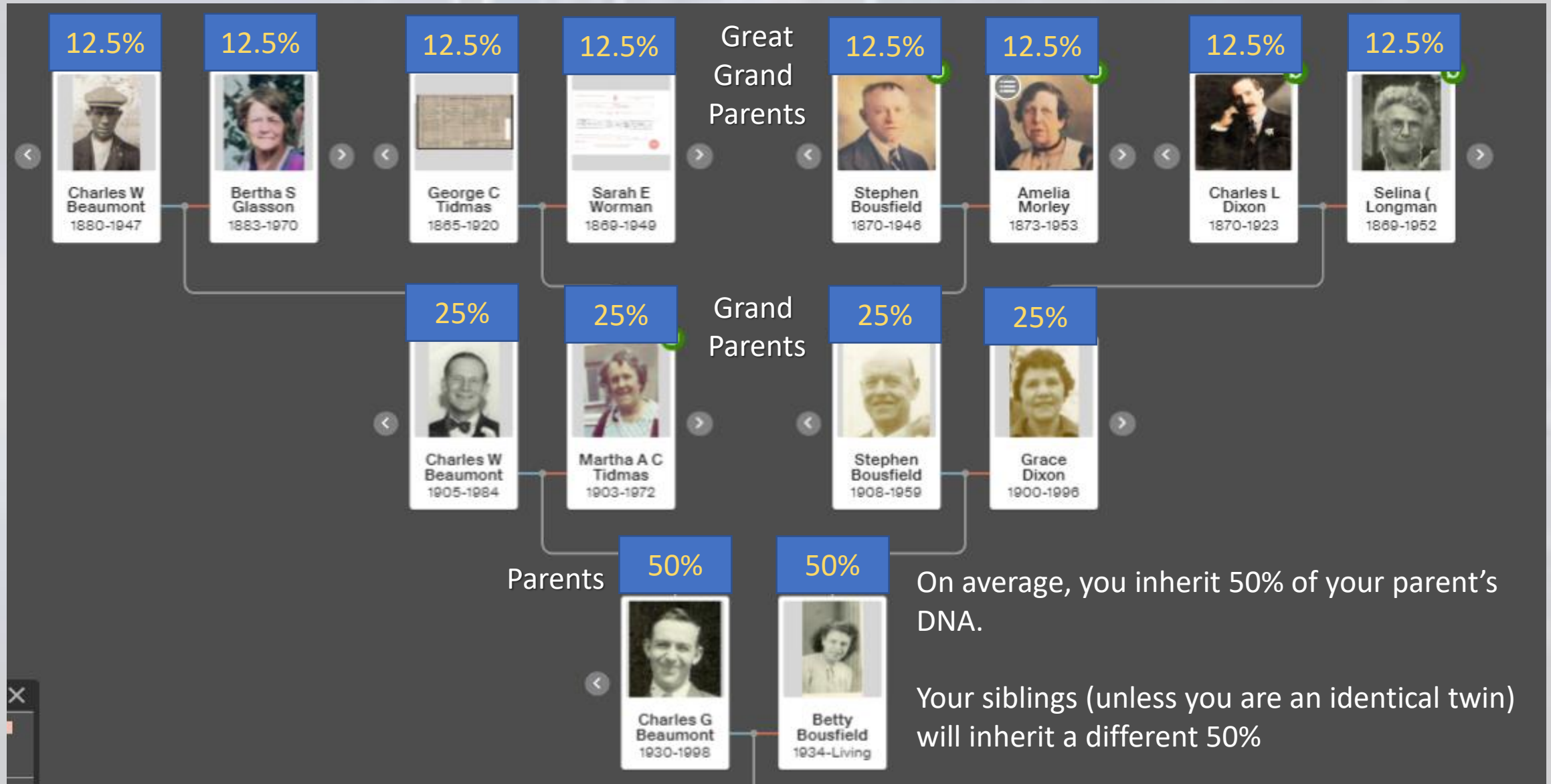
Database = 5 million+ Some unique Genealogy Tools and Free to start. DNA Matches, Ethnicity, free DNA uploads, family tree integration. [Good for Genealogical and Genetic tree integration]

* Other Companies available. Data As of July 2022.

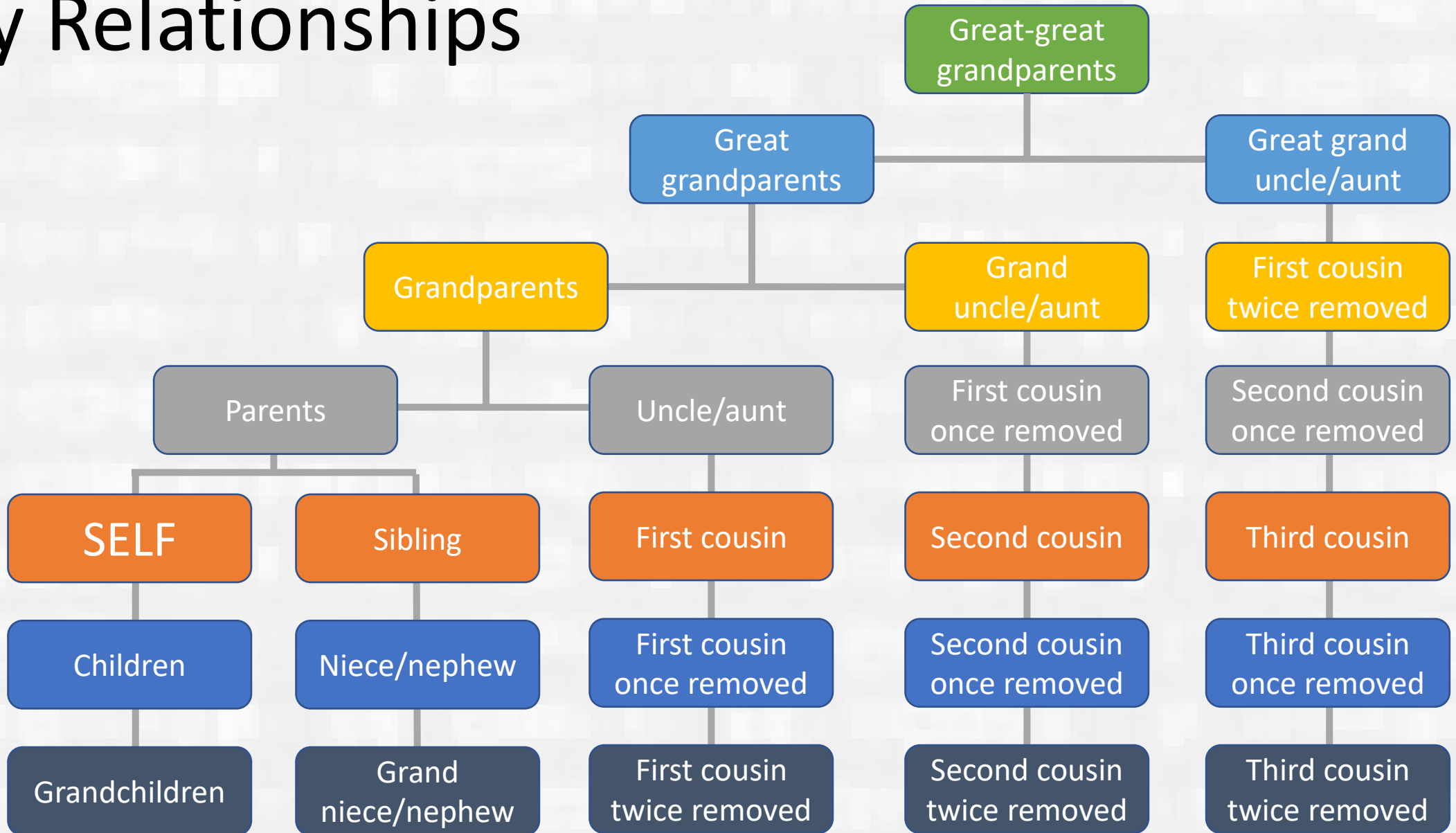


Autosomal DNA Testing

Autosomal DNA inheritance.



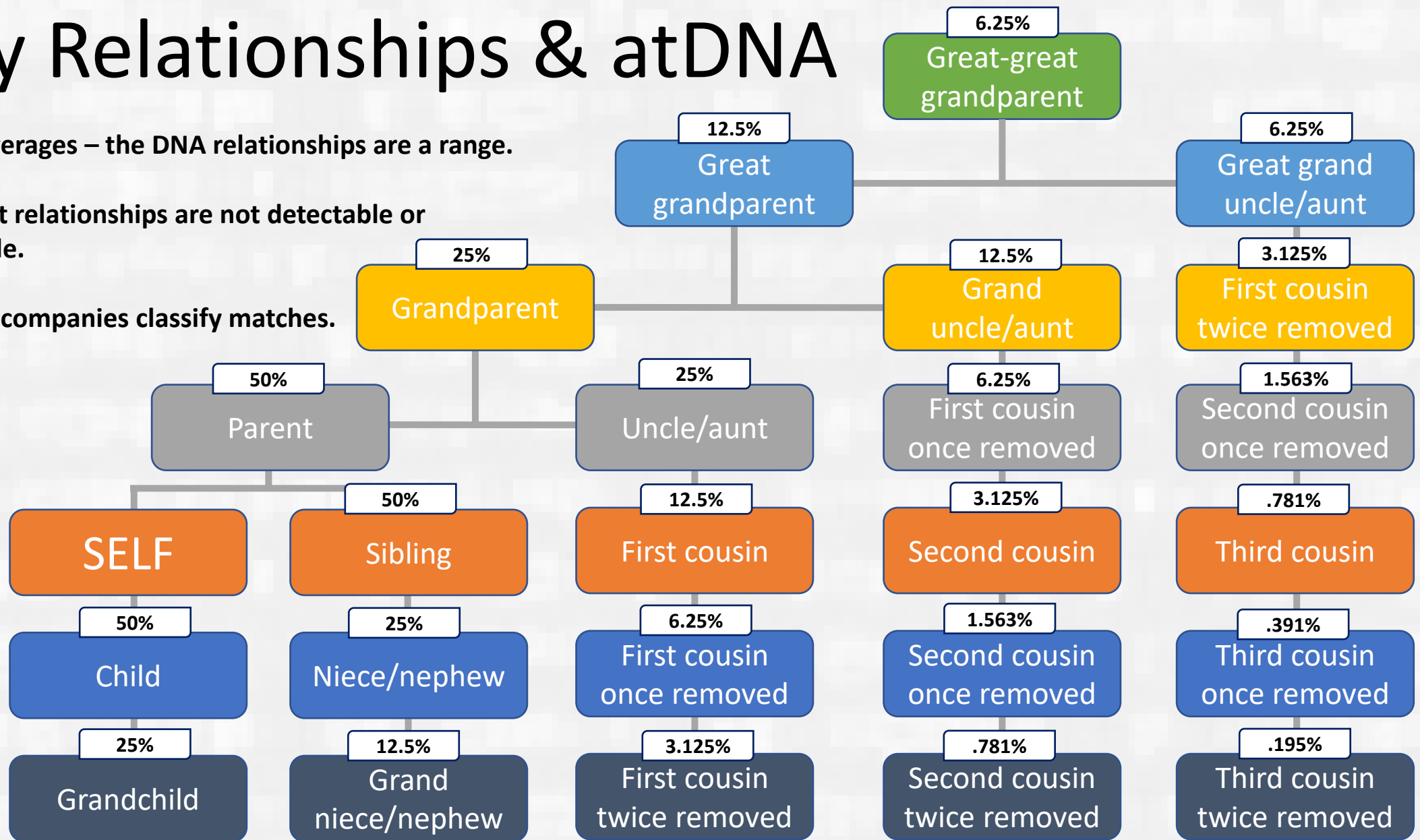
Family Relationships



Data from The International Society of Genetic Genealogy (ISOGG) Wiki ([https://isogg.org/wiki/International Society of Genetic Genealogy](https://isogg.org/wiki/International_Society_of_Genetic_Genealogy))

Family Relationships & atDNA

- These are averages – the DNA relationships are a range.
- Some distant relationships are not detectable or are unreliable.
- DNA testing companies classify matches.



Data from The International Society of Genetic Genealogy (ISOGG) Wiki (https://isogg.org/wiki/International_Society_of_Genetic_Genealogy)



Autosomal DNA Matches

DNA Matches : Approach

- **Start with your best matches and work down.**
- **Use the relationship calculator to estimate where you might share a match in your tree.**
- **If the person has created a tree, look to see if you can see a shared relative, common location, or familiar last name.**
- **The hints or suggestions given by the DNA company are not necessarily correct but are always worth exploring.**
- **Remember that you may share more than one relative**
- **Triangulate the relationship using shared matches.**
- **Make notes**
- **You can filter your matches.**
- **Send the person a message, but don't be too disappointed if they don't reply.**
- **If they have used their real name in their results, you could use social media (Google, Facebook, LinkedIn, etc.) to look for more clues.**

DNA Matches : MyHeritage

The screenshot displays the MyHeritage DNA matches interface. At the top, navigation tabs include Home, Family tree, Discoveries, Photos, DNA (highlighted), and Research. Three match profiles are listed:

- Thomas Charles**: Age: 70's, DNA managed by Sandra. Estimated relationships: 1st cousin once removed - 2nd cousin. DNA Match quality: Shared DNA: 5.0% (354.9 cM), Shared segments: 15, Largest segment: 72.2 cM.
- Lesley**: Age: 40's, From: United Kingdom. Estimated relationships: 1st cousin twice removed - 2nd cousin once removed. DNA Match quality: Shared DNA: 2.2% (157.7 cM), Shared segments: 9, Largest segment: 39.2 cM.
- Steve**: Age: 60's, From: United Kingdom. Estimated relationships: 2nd cousin - 2nd cousin once removed. DNA Match quality: Shared DNA: 2.0% (144.7 cM), Shared segments: 7, Largest segment: 37.5 cM.

Each profile includes a 'Review DNA Match' button and a 'View tree' button. Arrows from the text on the right point to the 'Largest segment' values for Thomas Charles and Lesley.

A **centimorgan (cM)** is a unit used to measure the probability that a section of DNA will be passed on to a descendant intact (rather than being split into separate segments).

Centimorgans are not units of physical distance, but rather, units of probability. Generally, the more centimorgans two people share, the more closely related they are. (Ancestry.com – “How We Measure Relationships between AncestryDNA® Matches”)

Typically, the larger the largest **segment** the closer the relationship.

DNA Matches : Ancestry

List Map

Filter by:

Unviewed

Common ancestors

Messaged

Notes

Trees

Shared DNA

Groups

Search | Sort

Parent/Child



Betty Beaumont

Mother
3,473 cM | 50% shared DNA
Mother's side

Public linked tree
3,337 People
Common ancestor

View match



Close Family



John L.

1st cousin 1x removed
457 cM | 7% shared DNA
Father's side

Unlinked Tree

View in tree

View match

Tidmas/Worman - no response to messages. Not logged in for a while



John B.

2nd - 3rd Cousin
215 cM | 3% shared DNA

No Trees

Do you recognize them?

Yes

Learn more

sent message on 24Jan21 - not logged in for a year



Primrose

2nd cousin
208 cM | 3% shared DNA
Father's side

Public linked tree
117 People
Common ancestor

View in tree

View match

Contacted 4 Jan 2021 - Alfred Worman (1847)/Sarah Hunt (1846)

Notice that I have different matches with the different testing companies

No tree so review shared matches

DNA Shared Matches : Ancestry

The screenshot shows the Ancestry DNA interface for a user named John L. The main header displays "You and John L" with a relationship of "1st cousin 1x removed | Father's side" and "7% shared DNA: 457 cM across 24 segments". Below this are buttons for "View in tree", "Message", and "Edit Relationship". There are also options to "Add/edit groups" and a note "Tidmas/Worman - no response to ...".

The "Shared Matches" section is active, showing a list of matches. The first match is Primrose, a "2nd cousin" with "208 cM | 3% shared DNA" on the "Father's side". She is linked to a "Public linked tree" with "117 People" and is a "Common ancestor". A "View in tree" button is present. A note indicates she was "Contacted 4 Jan 2021 - Alfred Worman (1847)/Sarah Hunt (1846)".

The second match is Rachel, a "4th - 6th Cousin" with "55 cM | < 1% shared DNA". She has "No Trees" and a "Do you recognize them?" prompt with "Yes" and "Learn more" buttons.

John L and I both share Primrose as a match and Primrose has both a shared tree and a common ancestor

- **Shared matches are matches that you and your match both share**
- **Shared matches are a powerful tool to triangulate where this person belongs in your tree**
- **In this example, the primary match does not have a family tree uploaded to Ancestry, but the shared match allows me to start resolving the relationship**

DNA Mapped Matches : Ancestry

john beaumont's DNA Matches

View Beaumont/Bousfield/Dinsdale Family

List Map



- An interesting tool in Ancestry allows you to map “close” matches
- This does not tell you definitively where your relatives have relocated to.
- Rather it tells you where Ancestry has the most DNA test takers.

The background features a central DNA double helix structure rendered in a light blue and white color scheme. Surrounding the helix are various data visualization elements, including small rectangular boxes and lines, suggesting a scientific or genetic data context. The overall aesthetic is clean and modern, with a light blue and white color palette.

Ethnicity Estimates

Ethnicity Estimates.

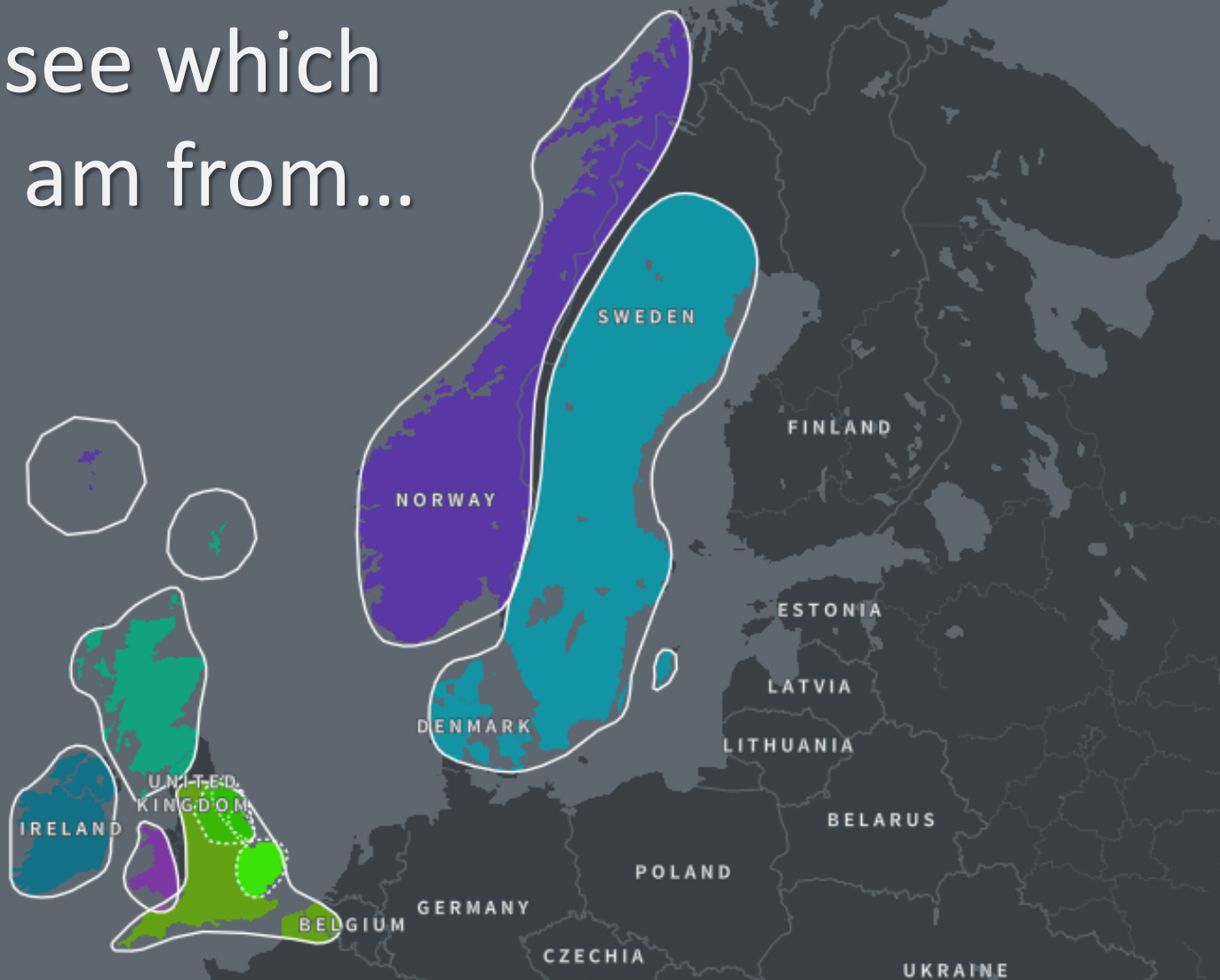


FLASHPOP/GETTY IMAGES

- Your DNA testing company compares your DNA with that of worldwide reference populations.
- Your percentage match indicates a shared heritage with the reference DNA pool.
- Each DNA testing company has different reference populations, and they are constantly refining and updating them so your ethnicity can change over time.
- Ethnicity is not nationality or race.
- Ethnicity does not necessarily show immigration history.
- Because of the way we inherit DNA from our family (recombination), family members can have different DNA ethnicity results.
- Equally, because we don't inherit all of our parent's DNA, ethnicity markers may be missing from the results.

My DNA Ethnicity: Ancestry

Easy to see which region I am from...



Your DNA looks most like DNA from these 6 world regions

We compare your DNA against a worldwide reference panel to see which populations your DNA looks most like.

[How do we calculate this?](#)

● England & Northwestern Europe	59%	>
Your communities with a connection to this ethnicity region ⓘ		
● Yorkshire & East Midlands, England		>
● North Yorkshire, East Riding & Lincolnshire		
● Lincolnshire		
● East of England		>
● Scotland	20%	>
● Sweden & Denmark	8%	>
● Ireland	7%	>
● Norway	3%	>
● Wales	3%	>

[View all 1,500+ regions tested](#)

Updated April 2022

On the other hand...

My wife not so much.



Your DNA looks most like DNA from these 15 world regions

We compare your DNA against a worldwide reference panel to see which populations your DNA looks most like.

[How do we calculate this?](#)

Spain	60%	>
Portugal	13%	>
Northern Africa	4%	>
Indigenous Cuba	4%	>
Basque	3%	>
Wales	3%	>
Senegal	2%	>
Anatolia & the Caucasus	2%	>
The Balkans	2%	>
England & Northwestern Europe	2%	>
Cameroon, Congo & Western Bantu Peoples	1%	>
Indigenous Puerto Rico	1%	>
Indigenous Americas—Bolivia & Peru	1%	>
Indigenous Eastern South America	1%	>
Ireland	1%	>

[View all 1,500+ regions tested](#)

Updated April 2022

[View previous estimate & FAQs](#)



Other “features”



Family Ancestry


Family Finder


Autosomal DNA Results & Tools


See the percentage breakdown of your origins as well as your ancient origins, and connect with your autosomal DNA relatives on all of your ancestral lines within the last 5 generations.

Results Completed: February 23, 2021


[? Helpful Information](#)

 **UPDATED**
Family Finder Matches

 myOrigins®

 Chromosome Browser

 Chromosome Painter

 See More



Chromosome Browser

A tool for viewing shared DNA segments between you and multiple DNA Matches, which can help point to a common ancestor.

[Explore](#)

AutoClusters

An automatic tool that organizes your DNA Matches into clusters that likely descended from common ancestors

[Explore](#)

Ethnicities Map

Discover the most common ethnicities in each country, and find out the top countries for each ethnicity, based on data from MyHeritage DNA users.

[Explore](#)



Now with new fitness traits and more nutrient traits

Traits await you, from how genetics influence your heart rate recovery after exercise to whether you sneeze in bright sunlight. See what else there is to learn about yourself—inside and out.

[Explore your traits](#)



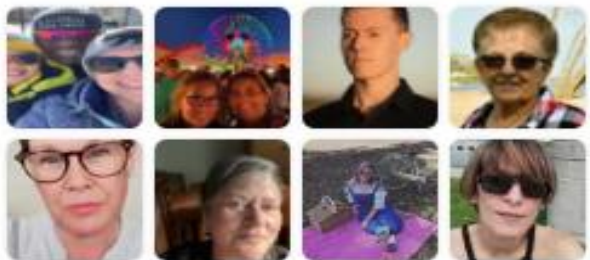
Ethnicity Estimate

- 59% England & Northwestern Europe
- 20% Scotland
- 4 Other regions

Discover the places, history, and cultures that shaped who you are today—using just your DNA.

[Discover Your DNA Story](#)

DNA Matches



★ 15 Starred matches
👥 269 4th cousins or closer

[View All DNA Matches](#)

ThruLines®



ThruLines uses Ancestry trees to suggest how you may be related to your DNA matches through common ancestors.

[Explore ThruLines](#)



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SIGN IN

ANCESTRY FEATURES

Know your personal story, in a whole new way.

- **Ancestry Composition**

Discover where in the world your DNA is from across 2000+ regions — in some cases down to the county level.

- **Family Tree**

- **DNA Relative Finder**

- **Ancestry Timeline**

[Learn more](#)





Questions?