

So you have taken the plunge and tested your DNA. For the purposes of this discussion I am assuming you took an autosomal DNA test at one or more of Family Tree DNA, 23andMe and/or Ancestry.com DNA – and you have received your results back. What do you do with the information you received and how can you use it?

There are two main ways to use the results.

1. **U.S. citizens in particular are interested in their ethnic makeup.**

The United States is a melting pot of diverse populations and even families who have only been here for two or three generations are likely to have more than one ethnic culture as part of their background. Europeans, who may know where all their great grandparents were born, tend to think they know their ethnic background, but even then there are some surprises. I have between 5% and 10% Ashkenazi Jewish ethnicity even though I have no known Jewish ancestry. This is likely a real result because I have a prediction of Jewish Ancestry at all 3 companies and I have Jewish matches. So how are ethnicity predictions made by these three companies?

The predictions of ethnicity are made using reference populations. The reference populations used at the companies differ and the testing methods also differ. Some early testers at Ancestry.com have been confused because their ethnicity prediction has changed as Ancestry.com has refined their ethnicity testing method. Currently Ancestry.com computes your ethnicity from testing random samples of your DNA 40 times, and finding a statistical average compared to the reference population consisting of over 4,000 people whose ancestry is from one ethnicity and region.¹ Family Tree DNA uses a similar method to Ancestry.com in that they analyze the DNA as a whole for admix or ethnicity. They have compiled a propriety database which is described on their website.² In contrast 23andMe analyzes segment by segment. However, whatever method is used a specific marker must be assigned a geographical location, and some markers are more strongly associated than others. 23andMe goes into great detail on their website about how they phase the DNA before assigning ethnicity to the different segments then they smooth out the numbers to get an overall result. They give more information than most people wish to know. At the 23andMe website you can see a Countries of Ancestry chart which can be quite informative when all 4 grandparents are from the same location.

Ethnicity predictions are fairly accurate at the continental level – they can tell you the percentage of European, African or Asian ethnicity but the estimates for within the groups is not as accurate. Within European ancestry, Great Britain, Ireland, Western European and Scandinavian DNA are not terribly different. Two groups that do stand out are Finnish and Ashkenazi Jews because these have historically been isolated populations. If you see an ethnicity that is part Spanish, part Native American and part African then you are most likely looking at a person of Mexican or possibly Central American descent as there is no specific marker for Mexican ethnicity. People with predominantly Italian or southern European ancestry also have difficulty with accurate ethnicity predictions. And you can see from my three ethnicity predictions that the different companies give different results at the sub-regional level.

1 “How the Ethnicity Estimates are determined,” *Ancestry.com*, (<http://dna.ancestry.com/ethnicity/3693F4E5-7DCA-4F84-8754-C0AC30FE520E> : accessed 6 July 2016.)

2 Razib Kahn, “Population Clusters in MyOrigins,” *Family Tree DNA*, (<https://www.familytreedna.com/learn/ftdna/myorigins-population-clusters/> : accessed 6 July 2016.)

2. Proving family relationships and finding “new” cousins

First some definitions

IBD – Identical by descent – means you share DNA because you have common ancestors

IBS – Identical by state – means you share DNA but the pieces that you share are small in length and these cannot be traced to a recent common ancestor. IBS segments are usually less than 5cM in length. Because IBS segments are small it is best to set a threshold of 7cm or 10cm for the longest shared segment before you spend time trying to work out the relationship between two testers.

Endogamous population – A population where there is significant pedigree collapse because of intermarriage. Found among Ashkenazi Jews, Southern US populations and isolated populations on small islands like Puerto Rico.

Centimorgan - is a unit used to measure genetic linkage. One **centimorgan** equals a one percent chance that a marker on a chromosome will become separated from a second marker on the same chromosome due to crossing over in a single generation.

In order to get an approximate percentage of shared DNA from a [Family Tree DNA Family Finder](#) test, take all of the segments above 5 cM, add them together and then divide by 71.³

Genetic Family Tree

Everyone has two family trees, a genealogy family tree and a genetic family tree. Your genealogical family tree goes back to the mists of time but after about 6 generations some ancestors start falling off the genetic family tree because of the random nature of DNA inheritance. We each have..

50% of the DNA of each of our parents

Approximately 25% of each of our grandparents' DNA

Approximately 12.5% of each of our great-grandparents; DNA

Approximately 6.25% of each of our g-g-grandparents' DNA

Approximately 3.125 of each of our g-g-g-grandparents' DNA

Approximately 1.563% of each of our g-g-g-g-grandparents' DNA and further back than that the random nature of inheritance means genealogical ancestors have an increased probability of not being genetic ancestors. Looking at this another way – if you and a relative share a common ancestor more than 4 generations back there is a probability that you will not have any shared genome. There is a high probability of finding specific “new” 3rd cousins in a DNA database, but that for 4th cousins or further back the chances start to get smaller. You can still find 5th or 6th cousins, you just can't find ALL your 5th and 6th cousins because the chance that the two of you shared a significantly large DNA segment decreases as the degree of kinship decreases.

These relationships are easier to understand when you view a chart or a table. I am introducing you to the ISOGG Wiki (International Society of Genetic Genealogists.) If you are at all interested in DNA Testing you should join this society. It's free. There's an excellent chart and a table in the Wiki and rather than try to reproduce them here, look them up in the ISOGG Wiki.⁴ There is a note in addition to the chart that gives ranges for some of the relationships.

³ “ISOGG Wiki,” (<http://www.isogg.org/wiki/CentiMorgan> : accessed 1 July 2016)

⁴ “Distribution of Shared DNA for Given Relationships,” ISOGG Wiki (http://isogg.org/wiki/Autosomal_DNA_statistics : accessed 6 July 2016.)

X Chromosome Inheritance

The X chromosome is tested as part of the autosomal test but it is unique in that it is passed down from a mother to all her children but the father's X chromosome is only passed to his daughters not to his sons. This means that if you and your DNA match have overlapping segments on the X chromosome the pattern of inheritance is more limited because the DNA "cousin" is excluded from some of your lines. There are two excellent charts in the following blog by Blaine Bettinger that show graphically that the X chromosome cannot be inherited when there are two consecutive males in a line.⁵

Testing known ancestors and descendants

You can design a testing plan if you have inconclusive evidence that a person is related to you based on a paper trail alone. To date this is not something I have done, because I have paper trails on collateral relatives who stayed in the UK (and even some that didn't.) However testing known relatives on some of my "ag lab" lines might allow me to extend the ancestry back to before 1750. Methodology entails mapping a hypothetical family tree and see who is available for testing and who might be willing to test to help you in your research. If you approach a relative and ask them to test then be prepared to pay for the test. Not all relatives will take you up on the offer fortunately. Within the last couple of years there are articles in the National Genealogical Society Quarterly where autosomal DNA analysis has been used, in conjunction with mitochondrial DNA and/or Y DNA tests as just one tool in the analysis. I have listed two articles in the bibliography.

Finding "New" Cousins

What I have tried to do is find relatives who disappeared from the UK .

A. 23andMe

I found a third cousin on 23andMe. I was given information that we shared 0.97% of our DNA which turned out to be 4 segments. My cousin's name is George and he lives in the bay area. He gave me really good information for a non-genealogist and I was able to determine our connection in about an hour by matching trees, or rather by building out a collateral branch of my tree to include him. I would not have been able to find the match so quickly if I hadn't routinely recorded information on collateral lines – in this case the family of my great-grandmother's sister Emma Whitmill.

B. Ancestry.com

Before I had members of my immediate family tested, my closest matches at Ancestry.com were 20 people shown to be 4th-6th cousins. Some of these matches had trees on Ancestry.com. One such person (R.A.) had a couple in her ancestry Richard Hall and Mary Ann Aspinall, who had the same names as my great-grandfather Henry Aspinall's sister and her husband. The couple were born in England and had 2 sons there before immigrating to New York state and eventually Ohio. The children John Hall (baptized 10 March 1853 in Doncaster) and George Hall (baptized 9 September 1855 in Doncaster) were likely the children of my collateral relative, who disappeared from England prior to the 1861 UK census. R.A. on her tree has two English-born sons of Richard and Mary Ann Hall, John born February 1853 and George born 17th March 1855. No marriage date is given for this couple who almost certainly married in England. Searching the FreeBMD.co.uk database from 1849 through 1852 for a Hall-Aspinall marriage

⁵ "Unlocking the Genealogical Secrets of the X Chromosome," The Genetic Genealogist, ([http://thegeneticgenealogist.com/2008/12/21/unlocking-the-genealogical-secrets-of-the-x-chromosom e/](http://thegeneticgenealogist.com/2008/12/21/unlocking-the-genealogical-secrets-of-the-x-chromosom-e/) : accessed 6 July 2016)

resulted in just one – the union in Richard Hall son of John Hall and Mary Ann Aspinall daughter of George Aspinall, tailor in Balby near Doncaster. The names of the parents of Richard Hall and Mary Ann Aspinall in RA's original tree were incorrect except for John Hall. Richard Hall's 1906 Ohio death certificate names Elizabeth Shilleter as his mother, but I believe Mary Ann's mother was named Elizabeth or Betty Shillato and this was an error. Betty was the wife of George Aspinall, a tailor who lived in Doncaster. If my analysis is correct then R.A. and I are 3rd cousins once removed. We should share approximately 0.39% DNA but it's not possible to determine that at Ancestry.com without uploading the data to Family Tree DNA or using a third party tool.

Now Ancestry.com has "shaky leaf hints" that will draw these relationship links for you, provided both testers have family trees on line.

Those of you who are still thinking about testing – all three companies have their strengths and weaknesses.

Ancestry.com has over 2 million testers in their data base, the family trees online help build relationships between testers but they don't have a chromosome browser. To match segments with Ancestry testers you need to either upload the segments to Family Tree DNA for \$39 or work with a 3rd party tool.

23andMe has a database of over a million testers but their cost, \$199 vs. \$99 (or less if on sale) for Ancestry and Family Tree DNA test makes it expensive unless you value the health results. Also many test there for health reasons and have no interest in genealogy so ignore e-mails.

Family Tree DNA has the smallest database (c 200,000) but it has a good chromosome browser, uses cheek scrapings not spit for a sample (good for elderly) and they save samples for up to 25 years. And the testers are interested in genealogy!

References:

DNA Blogs:

1. **DNA Explained** - a blog by Roberta Estes (straightforward explanations)
2. **The Genetic Genealogist** - Blaine Bettinger examines the intersection of traditional genealogical techniques and modern genetic research. The blog also explores the latest news and developments in the related field of personal genomics
3. **Your Genetic Genealogist** - A genetic genealogy blog by CeCe Moore "helping you to discover and understand the fascinating world of genetic genealogy".
4. **The Legal Genealogist** - A blog by Judy Russell which often includes posts on the subject of DNA testing (usually on Sunday)

Books:

1. Blaine Bettinger and Debbie Parker Wayne *Genetic Genealogy in Practice*. US National Genealogical Society, to be published in the summer of 2016.

Journal Articles using DNA as a Tool:

1. Mills, Elizabeth Shown CG, CGL, FNGS, FASG, "Testing the FAN Principal Against DNA: Zilphy (Watts) Price Cooksey Cooksey of Georgia and Mississippi," *National Genealogical Society Quarterly* 102 (June 2014): 129-152
2. Jones, Thomas W. CG, CGL, FASG, FNGS, "Too Few Sources to Solve a Family Mystery? Some Greenfields in Central and Western New York," *National Genealogical Society Quarterly* 103 (June 2015): 85-103