

## Genetic Genealogy: Getting the Most from DNA Test Results in 2011

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Texas State Genealogical Society (TSGS) administers a group project at Family Tree DNA allowing any interested person to join the project and order a test at the discounted project rate. There are several good reasons to have your DNA tested through the TSGS project. Some of those reasons will be discussed here along with suggestions for things to do with your DNA test results to maximize the chance of furthering your genealogical research. Information on the TSGS DNA Project and a link to order tests can be found on the TSGS website.<sup>1</sup>

### DNA TESTS FOR GENEALOGICAL PURPOSES

Several types of DNA tests are now being offered for genealogical purposes. The three most common are discussed below. See the pedigree chart in figure 1 for lines of inheritance.

1. Y-chromosome (Y-DNA) tests are used for the direct paternal line. The Y chromosome is passed from father to son to grandson and so on. Y-DNA traces the top line of the pedigree chart. This test is very popular because Y-DNA follows the paternal line. This is the surname line in most western cultures and can support conclusions about links in the paternal line. This test can only be performed

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1 The new TSGS website is at <http://txsgs.org/> and the DNA link should soon be available on that site. The interim link is available at [http://debbiewayne.com/tsgs\\_dna/](http://debbiewayne.com/tsgs_dna/). [Published citation was: Scroll to the bottom of the TSGS home page then click on the spinning DNA strand (<http://www.rootsweb.ancestry.com/~txsgs/>: accessed 7 August 2011). A link to order a test from Family Tree DNA using the TSGS affiliate link will be displayed. The page also includes some basic information to help you determine which test is appropriate as well as links to additional information.]

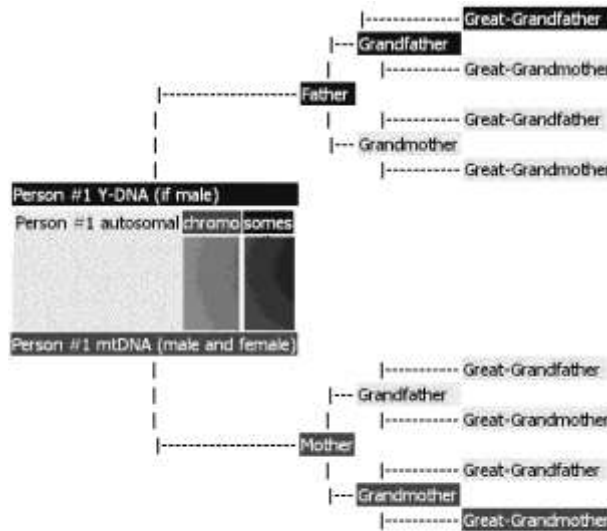
on men, but many female genealogists recruit brothers, uncles, and cousins in the line of interest to take the test. Y-DNA tests are offered with a varying number of markers tested—12, 25, 37, 67, or 111 markers. Today most genetic genealogists recommend testing a minimum of 37 markers. Unless the DNA sequence is a rare one, more information can be learned from testing more markers.

2. Mitochondrial (mtDNA) tests are used for the direct maternal line. Mitochondrial DNA is passed from a mother to all her children, but only the daughters pass it to the next generation of children. Mitochondrial DNA tests trace the bottom line of the pedigree chart. In western cultures this line can be more difficult to trace because a woman's surname usually changes upon marriage. This test can be performed on men and women, but there must be an unbroken maternal line from the tester to the woman of interest. Mitochondrial DNA mutates less often than Y-DNA often making it necessary to trace the maternal line back further to find the common ancestor between two testers. Because of this, many people choose not to test mtDNA. But don't your female ancestors deserve as much of your time and research dollars as do the male ancestors who are easier to find? As more people test mtDNA and more people test the full mitochondrial sequence we will learn more about how to use these test results to help find our female ancestors. Three mtDNA tests are available: HVR1 (a small segment of the non-coding section), HVR2 (a second small segment of the non-coding section), and the full mtDNA sequence. The full sequence is the most expensive, but is also the one most likely to provide genealogical information unless you have a rare mtDNA sequence. When testing only HVR1, the common ancestor could be 53 generations back. When both HVR1 and HVR2 are tested, the common ancestor still may be 28 generations back. No statistics are available yet for matches on the full mtDNA sequence.<sup>2</sup>

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<sup>2</sup> Terry Barton, "Exploring Our Maternal Ancestries with Mitochondrial DNA (mtDNA)," Federation of Genealogical Societies, Rediscovering America's First Frontier, 2010 Conference Syllabus (Knoxville, Tennessee), 126–129.

- Autosomal or admixture DNA (atDNA or aDNA) testing analyzes the DNA inherited from all of your ancestors including your direct paternal and maternal lines. This test does not check Y-DNA or mtDNA, but looks at the nuclear DNA in the 22 pairs of chromosomes that contain DNA potentially from any of your ancestors. During the last few years great strides have been made in using atDNA for genealogical purposes. Today an atDNA test can reliably match third cousins. The test can sometimes match fourth or fifth cousins depending on how much DNA was actually inherited from the common ancestor. This test can be performed on men and women. This is one of the tests where it is better to test the oldest living person in the line of interest because some of the DNA is lost in each generation. A person probably has more DNA from his or her progenitor grandparents (two generations away) than that person's grandchild will have (four generations away from the progenitors). The more DNA that is present in the tested generation, the better chance of matching cousins who inherited that same DNA segment.



DNA Inheritance Pedigree Chart  
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## TSGS PROJECT BENEFITS

By ordering your ancestral DNA test through TSGS you will automatically be contributing toward the preservation of Texas records. A very small percentage of your test price goes to TSGS where it is used to preserve those records we all need. In recent years TSGS has donated thousands of dollars to the Texas General Land Office, the Portal to Texas History at the University of North Texas, and the East Texas Research Center at Stephen F. Austin State University. Those funds are used to digitize records and make them freely available to all on the Internet. Grants are also made to genealogical societies for local preservation projects. Information on grant programs is periodically printed in *Stirpes*.

In addition to contributing to record preservation, you can also benefit from the advice of the TSGS DNA Project Administrators. We can help you find other projects to join where you may find cousins. It's easy to find a surname project to join. In addition to the surname projects there are other projects where your potential cousins may be waiting to find you:

- Y-DNA geographical projects such as Anglo-Saxon, Arabian, Alsace, Benelux, Cumberland Gap, Germany, Ireland, Isle of Man, Iberian, Ibrahim Sons, Japan, Kohen, Lost Colony of Roanoke, Melungeon, Mexico and Southwest US Native, Palatine, Scandinavian, Viking, and others.
- mtDNA geographical projects such as Colonial Sudbury, Cumberland Gap, Germany, Ireland, Lost Colony of Roanoke, Mothers of Acadia, Sicilian, Union County South Carolina, and others.
- Haplogroup projects such as the U5b mtDNA project or the R1b Y-DNA project. A haplogroup prediction or assignment will be one of the pieces of information you receive as part of your DNA test results. A haplogroup places you within a large group with a common ancestor many thousands of years ago—your deep ancestry, not ancestors within a genealogical timeframe. But the more we learn about the migration routes of our early ancestors the more it may help us understand ourselves.
- mtDNA lineage projects such as U5a1a1 Full mtDNA Genome Sequence (for those who have tested their entire mtDNA sequence and are in the U5a1a1 haplogroup) and some projects tracing the matrilineal descendants of specific women such as VanCouwenhoven tracing the descendants of Aeltie Cornelis (Cool) (Van Couwenhoven) Stoothoff, and other projects.
- Dual geographical projects for both Y-DNA and mtDNA members such as Adopted, African, Assyrian, Bahamas, Black Potomac Valley, Early Chesapeake, East Anglia, Greek, Guam, Macedonia,

MacGregor, Mississippi Valley Project, Romania, Russia, Turkey, UAE, Ukraine, and others.<sup>3</sup>

Another benefit of testing with TSGS and Family Tree DNA is that you can elect to have the DNA sample stored so future test upgrades can be ordered without the need for an additional DNA sample. Sometimes the DNA sample may degrade making it necessary to obtain a new sample, but more often the original sample is still viable and can be used for newly discovered tests or when finances allow a more detailed test to be ordered.

#### DATABASE SIZE AND DNA MATCHES

Genetic genealogy is a matching game. Once you get your DNA test results you must compare to others to find others with similar results. Those with whom you have close DNA matches are likely relatives. The bigger the database of those being compared the better chance of finding a match.

Many companies do not publish the size of their database making it difficult to compare. Family Tree DNA claims to have the largest database, believed to be several times larger than the combined results of other test companies. As of 7 August 2011 Family Tree DNA has 6,547 surname projects, over 211,000 Y-DNA records, and over 130,000 mtDNA records with over 15,000 of those being the entire mtDNA sequence. Statistics on atDNA results are not yet publicly available.

When you have your DNA test done at Family Tree DNA your test results will be compared to all those in the company database for matches. You will be notified of the matches and can choose whether to make contact with those with similar test results. If you don't make contact you may never learn anything new about your lineage from your investment in DNA testing.

Family Tree DNA recently implemented a process to allow those who tested at other companies (for example, Ancestry.com, GeneTree, Sorenson) to transfer test results to Family Tree DNA for a small fee. This will allow project administrators to include those results from other companies. Matches from the Family Tree database are not provided with this transfer as some of the markers tested by Family Tree DNA are not tested by those other companies. For a slightly higher but still nominal fee, Family Tree DNA will then test those additional markers adding the results to the values transferred allowing a full comparison of results to the contents of the Family Tree DNA database.<sup>4</sup>

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<sup>3</sup> "Family Tree DNA Surname, Lineage and Geographical Projects," *Family Tree DNA* (<http://www.familytreedna.com/projects.aspx> : accessed 7 August 2011).

<sup>4</sup> "Products and Pricing: Third Party," *Family Tree DNA* (<http://www.familytreedna.com/products.aspx> : accessed 7 August 2011).

## PUBLIC DATABASES

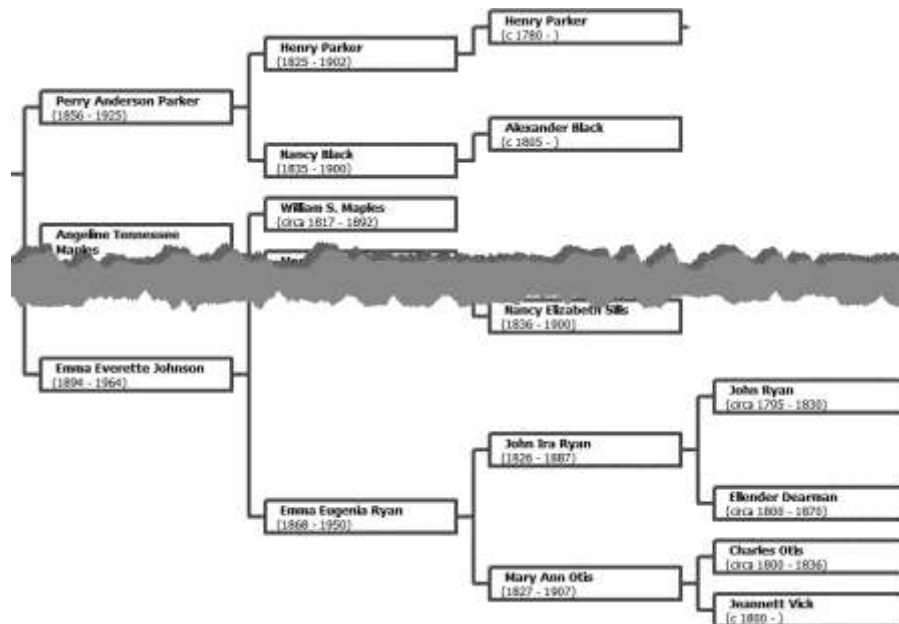
Because using DNA as a genealogical research tool is a matching game—find potential matches and compare pedigrees to find your common link—your results should be compared in as many databases as possible to find the maximum number of potential cousins. You should revisit the public databases periodically and rerun your comparisons to see if new matches have been found. In addition to finding DNA matches in the Family Tree DNA database, test results can be uploaded into any of several publicly available databases. This can locate more potential cousins.

Family Tree DNA provides resources for two of the public databases and provide a one-click button to make it easy for your test results to be uploaded from Family Tree DNA. These publicly available databases are Ysearch (<http://www.ysearch.org/>) and MitoSearch (<http://www.mitosearch.org/>). Even though the data is publicly available the names of the DNA sample submitters are not revealed publicly. The tools on the website provide a way for a person to locate matching results and send a message to the contact person without revealing personal information you don't wish to reveal or e-mail addresses.

Other publicly available databases provided by other companies may not reveal matches you can contact, but can be used by knowledgeable genetic genealogists to analyze DNA results. Sorenson Molecular Genealogy Group has a database of both YDNA and mtDNA results (<http://www.smgf.org/>). The Y-Chromosome Haplotype Reference Database (<http://www.yhrd.org/>) and Human Mitochondrial Genome Database (<http://www.genpat.uu.se/mtDB/>) are used by the forensic and scientific community. HvrBase++ has mtDNA and autosomal DNA sequences for primates including humans and tools for analyzing those results (<http://www.hvrbase.org/>).

## FINDING THE COMMON ANCESTOR

The sites above that are designed for use by genealogists usually provide a way to contact your potential cousins without revealing e-mail addresses first. You should include enough information in your initial contact message to encourage the person to respond and compare genealogical information. Family Tree DNA allows testers to upload GEDCOM files with pedigree information. Some researchers place pedigree charts on their own websites, such as the example pedigree chart is shown in figure 2, or point to information in the RootsWeb WorldConnect database or on Ancestry.com trees. Information on living persons should not be shared or should be anonymized to protect privacy. After initial contact with a potential cousin you may decide to share contact information and work directly with each other.



If you can't find the common ancestor after comparing pedigree charts this may mean one or both of you need to fill some holes before you can find the common ancestor. This can be done by making charts such as the one in table 1. This is just one example of a chart and different project administrators use different charts and methods. Table 1 uses one column for each person in the group whose Y-DNA was tested. Rows place the known lineage of the tester into a general timeframe. The bottom row contains number for those in the surname project. To protect the privacy of the test subjects no names are used. If known, the number of generations from the last identified ancestor is included. The big cloud indicates the common ancestor is not yet identified, but the matching DNA results indicate he exists.

Such a chart allows a researcher to learn several things. In this example we can see that all of these lines existed in North Carolina (NC) between 1705 and the early 1800s. This might be a starting point for a search for the common ancestor. More detailed information on these lines would provide a county in which to start even though that is not shown on this example.

Notes can also be included to determine the generation during which a given mutation likely occurred. In the shaded portion in the center of the chart, four descendants of Henry Senior have been tested. One of those has the modal haplotype for this project leading us to conclude the common ancestor likely had the same modal haplotype. Three descendants all had mutations where marker 464C has a value of 16 and marker 607 has a value of 14. Those three were all descendants of Henry Junior whereas the person

with the modal haplotype was a descendant of Henry Junior's brother George-1836. This leads to the conclusion that Henry Junior likely had these two mutations.

Two mutations between father and son seems contradictory to the statistical odds used to determine when a common ancestor will likely be found. As more tests are done we are learning that it may be more common than we thought for multiple mutations to occur between father and son. Some researchers now believe some lines mutate more often than others. We've also learned some markers mutate more often than others. Detailed discussions on these facts take place every day on the mail lists and forums where genetic genealogists share information.

												Thomas 1 - 1641
												Thomas 2
												Thomas 3
												Thomas 4
												Isaac
												Lemuel
												Saul 1740
												David 1761
		Joseph 1750 NC										
			John 1810 NC	<b>Henry Sr NC SC IL AR</b>				Lemuel 1790 NC	Samuel 1792 NC			
				<b>Henry Jr SC IL AR TX 464C = 16 ## 607 = 14</b>			George 1836 AR KS OK					
				George 1854 *4 gen.*	<b>Perry</b> 1856 *4 gen.*	John 1862 *4 gen.*	*? gen. *					
P130-32 modal	P149-25 391=11	P100-37 modal	P102-32 449-1=32 ##	P20-25 449-1=30 ##	P63-67 <b>CDYA1=34 ##</b>	P17-37 <b>=Henry Jr</b>	P31-25 modal	P37-37 modal	P57-25 modal			

## = fast mutating markers

## CONCLUSION

This is an exciting field where non-scientists can make an impact. Genealogists are doing so many DNA tests nowadays that we are making a contribution to the science. We often test more markers and more individuals than an academic researcher can do with a restricted research grant. When we place our DNA results in public databases the information can then be used by academics as well as other genealogists. Some genealogists have tested so many family members they can determine which ancestor provided a specific



segment of DNA. If we could all afford that much testing think of what we might know by now.

In barely more than a decade genetic genealogy has grown from a dream and a theoretical exercise into a useful tool many of us use as another piece of evidence in our research toolbox. Don't be left behind. Test as much as you can afford as soon as you can. You never know when that person who's DNA holds the answer you are seeking may pass on and no longer be available. If you can't afford to do all the tests you want, order the least inexpensive test so you have a DNA sample in storage. Ask the DNA contributor to sign an agreement giving you permission to order additional tests on the sample if they are no longer living or capable of making such decisions.

For additional information and links to articles and videos that explain the DNA testing process see <http://debbiewayne.com/lectures.php>. New links are frequently added to the site.

Note added 2 September 2012: The new TSGS website is at <http://txsgs.org/> and the DNA link should soon be available on that site. The interim link is available at [http://debbiewayne.com/tsgs\\_dna/](http://debbiewayne.com/tsgs_dna/).