The Calkins Y-DNA

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We have received the first Y-chromosome DNA testing information on a Calkins DNA sample. Our purpose here is to explain what the Y-DNA and Y-DNA project are, differentiate it from other genetic projects, indicate what the results suggest, and how to learn more.

I volunteered this article to Calkins World soon after receiving our Y-DNA results summer 2005. However, as the deadline loomed, the dread increased. It seems the tension between the teachings of my church for which I also work and my training as a scientist increased every time I discussed this subject. Rest assured that the information presented here has a very strong scientific basis.

DNA testing has a recent history with an early emphasis on solving certain crimes and resolving paternity suits. More recently, genealogists and those interested in early human migration have gotten involved. Although all humans are more than 99.9% similar in their DNA (about 98% similar to chimpanzees), some are more alike than others and these differences reveal patterns.

About 2004 National Geographic, `http://www.nationalgeographic.com` in cooperation with IBM and the Waitt Family Foundation, started a large five year project, called the Genographic Project, designed to study indigious populations and the early migration of people groups. This was largely after the 1987 "Out of Africa" Hypothesis which grew out of human mitochondria DNA studies. Mitochondria DNA is passed down only from the mother and has a fairly rapid rate of mutation. It appears that the mitochondria DNA from one woman ("Eve") living about 200,000 years ago was passed down to all humans. Due to similarities among all people with origins outside African and the great diversity of people within Africa, it appears this woman lived in Africa.

National Geographic contracts out the actual DNA testing to those already serving the genealogical community. Family Tree DNA is a prime example, but hardly the only contender in this field. Family Tree DNA gives the option of having your National Geographic results transferred into their database which we have done.

Human genetic information is contained in 23 chromosome pairs. Chromosomes are long DNA molecules which encode the information necessary to make proteins, enzymes, and other chemical information which regulates the life of each cell. Each chromosome is composed of a double helix of complementary strands of four sugar molecules known as C, A, T, and G. Each normal body cell contains these 23 pairs which came from the parents' germ cells. Germ cells, more typically known as sperm and eggs, contain 23 unpaired chromosomes. Each human embryo is the result of these 23 unpaired chromosomes coming together. Men and women differ in chromosome 23 which is often called the sex chromosome. The two types are called X and Y. Women have 2 X chromosomes whereas men have an X and a Y chromosome. Each sperm has about a 50-50 chance of having an X or a Y and thus each embryo has about a 50-50 chance of becoming a girl or a boy. The Y chromosome thus contains specific information for maleness. The Y chromosome is passed almost unchanged from father to son.

Before cells divide, two copies of each chromosome are made with one copy going to each cell. Transcription errors sometimes occur and these errors can propagate into subsequent generations. During cell division, the opportunity arises for DNA to recombine. However, this does not happen with the unpaired portion of the Y chromosome. The Y chromosome thus provides a good trail, occasionally distorted, leading back to earlier generations.

These transciption errors also lead back to Africa consistent with the fossil record and mitochondria DNA. About 75,000 years ago, a huge volcano on the island of Sumatra erupted spewing ash into the atmosphere which caused several years of "winter" with poor plant growth. This time period corresponds with the early migration out of Africa. Basically, six different transcription errors have been identified in much of the western European population. Up to 70% of men in England,

and 90% in parts of Ireland and Spain share the characteristic known as M343 or the R1b **Haplogroup.** Specifically, the M343 binary polymorphism is a change from C to A in position 402 of a specific 424 base pair DNA fragment. This mutation arose about 35,000 years ago in what has also been called Cro-Magnon man. As we go back in time, more groups share other transcription errors. The next one back is called M173 and is shared with eastern Europeans. Transcription error M45 came up from northern India, M9 from the Middle East, M89 and M168 from eastern Africa. Most residents of the Northern Hemisphere have the M9 mutation. 90–95% of every non-African has the M89 mutation, whereas M168 is shared by every non-African living today. It spread all across Asia at a time when glaciers limited northern migration.

Another type of change which occurs in the Y chromosome is called Short Tandem Repeats or STRs. These are specific locations or loci in the chromosome which have a variable number of repeats. Many years ago about 10 of these were recommended for use by law enforcement and the most common genetic testing costing about $100 checks 12 of these markers. For definitive genetic testing more expensive 25 or 37 marker tests are now routinely performed. The number of repeats changes quicker than the haplogroups indicated above and provides further relatedness information. The specific number of repeats is called your **haplotype** and is useful to genealogists. Some of these STRs change faster than others. These STRs have numeric labels associated with them and tend to be presented in differing orders depending on who is reporting them. To make matters worse, a slight change in label can have a drastic change in meaning. Specifically, STR 389-1 and 389-2 used to be reported as 389i and 389ii where 389i is the same as 389-1 but 389ii is the sum of 389-1 and 389-2.

The specific numbers reported for a close Calkins relative of mine are given in Table 1. `http://yhrd.org` is a web site where many organizations have pooled their Y-DNA information. There you can find more information about where certain STRs are located on the Y chromosome, common repeat counts, and how these counts correlate with various people groups. An early search of their site yielded thirteen individuals with a 10 out of 10 STR match. Twelve were from western Europe and one was from Latin America.

`http://www.familytreedna.com` is another web site where searches and comparisons can be made. They have projects there by surname and by location. You will find there that the results in Table 1 are consistent with a Cheshire origin and Celtic background. The results differ from what the Vikings might have contributed. There are 40 individuals listed which match 12 out of the 12 markers.

Where do we go from here? Several other Calkins surnamed descendants have recently ordered test kits through Family Tree DNA and submitted their DNA for the Y-DNA test. Unless "non-paternal" events have occurred, we expect their results to be very similar to our own. Some variation is expected since some of these STRs commonly mutate within 5 to 10 generations. For linking an unknown Calkins relative onto the family tree through a "Most Recent Common Ancestor," more expensive 25 or 37 marker testing might be necessary. Stay tuned as this technology revolutionizes the field of genealogy.

Table 1: The Twelve Short Tandem Repeat outcomes for a Calkins Descendant.

STR	Count	Comments
393	13	
390	24	
19	14	
391	11	
385a	11	
385b	15	
426	12	
388	12	
439	12	
389-1=389i	14	
392	13	
389-2	16	or 389ii 30=14+16

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