Ewing Surname Y-DNA Project Article 1

We have now started a Ewing surname Y-DNA project. We plan to begin including a regular column on the background and progress of this project in each issue of the *Journal of Clan Ewing*.

What is Y-DNA?

Every human cell contains the genetic recipe for making a human being. This recipe is spelled out in DNA, which is arranged to form 23 pairs of "chromosomes." A chromosome is just a long string of DNA that is wrapped up into a neat little bundle. In women each of the two members of a chromosome pair contains a slightly different version of exactly the same information. In men, the same thing is true of 22 pairs, but the 23rd pair consists of two dissimilar chromosomes, each with different information than the other. The chromosomes in the 23rd pair in men are called the "X chromosome" and the "Y chromosome." The Y chromosome contains instructions for just those proteins that determine that a fertilized egg will develop into a boy and mature into a man. In women, the corresponding 23rd pair consists of two very similar X chromosomes.

When eggs and sperm are formed, the chromosome pairs are split apart, and each egg or sperm gets only one chromosome from each pair. Then when egg and sperm join, the new cell again has 23 pairs—one member of each pair from the sperm and one member from the egg. Interestingly, once the new person who grows from this union has matured, every time sperm or eggs are made the two members of each chromosome pair line up side by side and swap pieces of themselves with one another before separating and making the new sperm or eggs. This results in a new "patchwork" chromosome, which is different from any in the individual who made the sperm or egg and different from any in his or her parents. So although we get one chromosome from each pair from each of our parents, these chromosomes are unique mixtures of the corresponding pair of chromosomes; they are not the same as either of the chromosomes that swapped parts to make them. I don't want to be ribald, but it's as if our chromosomes have sex with each other before we have sex with each other. This assures that the genes really get mixed up well and each new individual has a unique mixture that has never occurred before. This is amazing and wonderful, no?

When a man makes sperm, his chromosome pairs line up to swap pieces of themselves with one another, but since the 23rd pair consists of dissimilar chromosomes (the X and the Y chromosome), they can't swap pieces in the large area where they differ. Sperm will receive either an X chromosome or a Y chromosome. If a sperm with an X chromosome fertilizes an egg, the resulting embryo will be female; if a sperm with a Y chromosome fertilizes an egg, the resulting embryo will be male. Now, get ready!—here comes the part of genealogical interest. Since there was no swapping of pieces in the part of the Y chromosome that codes for the "male-making" proteins, that part of the Y chromosome in the sperm is exactly like the Y chromosome in the father, which is exactly like the Y chromosome in his father,

which is exactly like the Y chromosome in his father…clear back to Adam, almost. I say "almost" because very rarely, mutations occur, and herein hangs the tale.

Mutations

If a mutation amounts to much, and the mutated sperm fertilizes an egg, most likely the embryo will die. As a result, most of the mutations that are found in living people don't amount to much, but they can be identified and used for historical or genealogical purposes. Once a non-fatal mutation occurs, it is passed on to subsequent generations forever, or rather until another mutation occurs. Non-fatal mutations are of two kinds. One kind, single nucleotide polymorphisms (SNPs), happen so infrequently that they give no genealogic information, but they can be useful in distinguishing the ethnic origins of remote ancestors. I'll say no more about them here. The other kind, errors of addition or deletion of "microsatellite repeats," are still not frequent, but happen often enough to distinguish families and family lines.

Hooboy. I don't want this to get too technical, but some of this stuff is important to understanding what we are doing, and I don't want to leave it out. You probably know that chromosomes contain genes—stretches of DNA that code for proteins. You may not know that chromosomes also contain long stretches of DNA that don't seem to code for anything, and may not have any purpose. One sort of DNA code that doesn't get translated into a protein is a sequence of repeats, as if the machinery making the DNA just got stuck on stutter and repeated itself a number of times. When DNA is being copied it is relatively easy for an extra repeat to get stuck in or for one to be left out. Extra or fewer repeats in these regions don't make any difference to the functioning of the DNA or the organism that builds itself by referring to it. Some of these regions are called "microsatellites." Someday, I'd like to find out WHY they are called microsatellites, but up to now, I haven't learned that. What I have learned is that we can count the number of repeats in several different microsatellite regions and this is what we use to trace family lines in genetic genealogy. "Microsatellite regions" is unwieldy terminology, so we call these simply "markers" instead.

The Test

We have arranged with a company to test DNA samples from our members to see how many repeats are at each of several markers. DNA samples are obtained by rubbing a little brush on the inside of the cheek. Testing more markers gives us more information, but also costs the participant a little more money. We have arranged a discount for members of the surname project. Getting 12 markers tested costs $99, a 25-marker test costs $169, and a 37-marker test costs $229. If you want to learn more about Y-DNA testing or the company that does it for us, go to www.familytreedna.com and follow the links.

Results

So far, we have eight participants and have results back on seven of them. The seven Ewing men on whom we have results include two pairs of men who are known to be related. One pair is our Chancellor, George W. Ewing and his 4th cousin, Roger Ewing. George's 12-marker test differs from Roger's by one repeat at one marker.

The other pair of relatives also differ from one another by one repeat, but at a different marker. George has results on all 37 markers, and so do I. George and I are not known on conventional genealogical grounds to be related—he is descended from John Ewing of Carnshanaugh; I am descended from James Ewing of Inch Island. We have speculated that these two ancestors may be related, but we have no proof of this. So how do our 37-marker tests compare? They are exactly the same at all 37 markers!

This makes it sound like he and I are more closely related than he and his 4th cousin. Indeed, I have been teasing him by suggesting that he must be my granddad and ought to be putting me in his will. But mutations don't work like that. Because mutations are rare events that occur at random, it is possible for brothers to have a slight difference at one marker and for one of them to have exactly the same profile as his 10th great grandfather. George is not my granddad, but based only on these Y-DNA results, the odds of him and me having a common male ancestor within the last 300 years are nearly 100%.

So how about the other results? One Ewing man differs at several markers—enough that we have concluded his Ewing family is not related to the other Ewing families in the project so far. George and I are the same; we differ from three of the other men by one repeat at one marker each on the 12-marker test, but at a different marker for each man. We differ from the remaining man by one repeat at each of two markers, but he is known to be a relative of one of the other three on conventional genealogic grounds. But so what?

"So what" is that we are developing a list of DNA profiles that we will be able to link to individual branches of the Ewing family tree. If we get enough participants from enough branches, a Ewing man who does not know which branch of the tree he came from can get a DNA profile done and get a pretty good idea! Or a Ewing woman can get the same information by persuading her brother or uncle or cousin or another male who is a known close relative to be tested.

To Join or Get More Information

If you are ready to join the project, go to

http://www.familytreedna.com/public/ewing,

then click on "Join this group" at the top of the blue section on the left of the page. You can also see a table of our results there if you will scroll down to the bottom of the page. If you want to ask me questions, e-mail me at

davidewing93 at gmail.com.

I'm especially interested to learn what wasn't clear in this article and what aspect of the topic I should address in my next column.

David Neal Ewing
Albuquerque, NM