GENETIC GENEALOGY: Fracturing Brick Walls

James M. Freed, August 21, 2004, Di1lman Family Reunion, Hebron, Kentucky

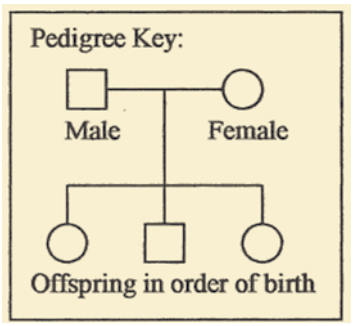
OUTLINE

Introduction:
Pursue DNA studies ONL Y after traditional genealogical research
Develop a hypothesis (educated guess) to test with DNA Analysis

I. DNA Success Stories
A. Jefferson-Hemings DNA Story
B. Finding the father of an orphan (McCabe family)
C. Confirming an immigrant's hometown in Germany (Lawrence Family)
D. Finding descendants of a Rev. War soldier, supposedly KIA in 1776 (Dillman/Stil1man Family)

II. Details of DNA Testing (Y chromosome)
A. Basic DNA and the Y chromosome
1. DNA is located within chromosomes
2. Males have one X and one Y chromosome; females have two X chromosomes, no Y chromosome
3. Taking samples for DNA analysis, companies and costs of DNA analysis

B. Markers are used in the analysis, NOT genes
1. Markers on the Y chromosome consist of repeated segments of DNA bases; short tandem repeats (STR)
2. Mutations occur at an average of 0.002 mutations per marker per transmission event (father to son)
3. If three or more differences between males, the males are probably not related
4. Results are portrayed in a chart listing 12, 25, or more markers
5. Review and application of this information to the Lawrence family and to the Dillman/StiIlman Family



III. Other types of DNA testing and other questions to be asked
A. Mitochondrial studies
1. Mitochondria (very small organelles within cells) have a ring of DNA, mtDNA
2. mtDNA has genes and markers that are valuable in comparing studies over thousands of years or in specific cases in shorter periods of time; always inherited through the mother's line; males or females can be tested
3. Y chromosome studies are of value in genealogical studies over hundreds of years; surname studies; only males can be tested
4. Native American and African American DNA tests are available

B. Challenges and problems
1. Lack of 100% certainty; the more markers used the greater the percentage of certainty
2. Cultural heritage vs. genetic heritage and kits for saving DNA for future study

QUESTIONS and Additional Comments Encouraged.

Companies Performing DNA Analysis for Genealogists.

Some of these web sites provide basic information on DNA and DNA testing procedures. (All websites operable in August 2004)

Family Tree DNA, www.familytreedna.com 12,25 & 37-marker Y-DNA tests, ($99, $169, $229 surname group studies); Native American tests, Y-DNA or mtDNA. Tutorials on DNA collection and analysis and other topics.
Oxford Ancestors, www.oxfordancestors.com Maternal line test (mtDNA) to trace European roots; 10-marker Y-DNA test.
Relative Genetics, http://66.235.201.45:8085/relativegenetics/ 26-marker Y-DNA test; mitochondrial DNA test; Native American test; excellent glossary of DNA terms under "Learn about DNA".
Gene Tree DNA, www.genetree.com Partners with Relative Genetics; paternity testing.
Ancestry by DNA, www.ancestrybydna.com DNAPrint test. Autosomal DNA markers to identify ancestry in terms of major populations groups ("deep ancestry").
African Ancestry, www.africanancestry.com Y-chromosome and mtDNA testing. Uses an extensive African database to suggest present-day geographic region of Africa where the DNA lineage is found.
Trace Genetics, www.tracegenetics.com Extracts degraded DNA from bone, teeth, hair, envelopes and stamps; also has Y-DNA, mtDNA and autosomal tests available.
DNA Heritage, www.dnaheritage.com 43-marker Y-chromosome test.
Web sites that provide background and comparison information about DNA testing companies:
www.duerinck.com/dnalabs.html www.dnalist.net/Flyer/index.html

Online References and Assistance (operable as of August 2004):

The Rootsweb "DNA and Genealogy" Mailing List: GENEALOGY-DNA-L. This mailing list (initiated in October 2000) is very active and can be highly detailed. The best way to introduce yourself to the topic is to search the archived messages. Go to the following website for details, and for subscribing: http://lists.rootsweb.com/index/other/DNA/GENEALOGY-DNA.html . (This list had an average of 900 messages per month during the last six months of 2003; over 1100 per month for first seven months of 2004.)
Also consider http://genforum.genealogy.com/dna for another genetic genealogy discussion list.
Surname Project Web Sites and other General Sites (operable as of August 2004):
List of Y-DNA surname projects: www.dnalist.net
List of surname projects: www.familytreedna.com/surname.asp (over 1000 surnames as of 7/04)
Sorenson Molecular Genealogy website and database access: www.smgf.org
World Families Network "World's largest DNA project listing", http://worldfamilies.net/
Extensive Y chromosome database: www.yhrd.org Contains over 25,000 distinct haplotypes as of 5/04
Extensive list of web resources on genetic genealogy: www.cyndislist.com/dna.html
Why DNA Testing For Genealogy and How To Manage It: www.duerinck.com/mystory.html
Basic genetic genealogy: http://blairgenealogy.com/dna/dna101.html
Another web site with basic genetic genealogy: www.contexo.info/DNA_Basics/
Example of a well-planned genetic genealogy project: homepages.rootsweb.com/~blanch-l/bldna.html
DNA Preservation Kits: http://www.genetic-identity.com/DNA%20Archving/dnabanking.html
General information on preservation of DNA: www.duerinck.com/archvdna.html

Brief Glossary: Below are words and terms that are commonly used in genealogical studies involving DNA; words in **bold type** within a specific description are defined elsewhere in this glossary.

Alleles: Alternate forms of a **gene** (e.g., A, B, and O alleles of the ABO Blood typing system) or a DNA **marker**.

Bases of DNA: Four specific chemicals (nucleotides) that are a part of **DNA**, the number and arrangement of which determines the functions of specific **genes**. The four bases are Adenine (A), Guanine (G), Cytosine (C) and Thymine (T).

Chromosome: Structures containing protein and **DNA**, the latter of which carries the information (**genes**, arranged in a linear sequence on the chromosome) for the structure & function of the body and which information is passed to the next generation. Nuclear chromosomes, located in the nucleus of the cell,

include x, Y, and 22 pairs of autosomes (non sex-chromosomes); the mitochondrial chromosome is located in **mitochondria**.

DNA, Deoxyribonucleic Acid: The major component of **chromosomes** (the other component is protein), that carries the genetic information within **genes**.

DYS: Refers to **D**NA **Y** chromosome **S**egment; a specific **marker** on the Y chromosome, usually **STR'**s. (See **VNTR** below.) "DYS" is followed by an arbitrary number identifying a specific segment on the Y chromosome. **Gene**: A unit of heredity, occupying a specific location on a **chromosome** that codes for information essential for the development and function of the body.

Haplotype: The compilation of the results from a small number of **genes** or **markers** that are inherited together. The Atlantic Modal Haplotype (AMH), as seen in many individuals of European descent" consists of the following markers with the number of repeats in ( ): DYS388 (12), DYS390 (24), DYS391 (11), DYS392 (13), DYS393 (13), DYS394 (14) [DYS394 = DYS19]. Many haplotypes combined together make a haplogroup.

Marker: Sometimes referring to a **gene** with a known location on a **chromosome**; in genetic genealogy, more likely to refer to specific arrangements of **bases** on the **chromosome** with very little, if any, connection to a specific **gene**. See **VNTR** as an example of a marker.

Mitochondria: Components (organelles) of the cell closely related to energy metabolism; contain **DNA**.

MtDNA: **DNA** located in **mitochondria**.

Non-Paternity: A catch-all term for any kind of event that disconnects the surname from the Y -chromosome.

VNTR: Variable Number of tandem repeats. Refers to repeated sequences of **bases**, (e.g., ATAGATAGATAGATAG, etc.) which may be repeated in different amounts in different individuals. The closer the biological relationship, the more likely the number of repeats is the same in two individuals being compared. The term "microsatellite" (or STR, short tandem repeats) is used for repeated sequences that are from two to six bases in length, and are most commonly utilized in genetic genealogy.

For additional descriptions of terms used in Genetic Genealogy, see web sites below (operable in 8/04):

www.clanlindsay.com/genetic_dna_glossary.htm (note the underline in the two spaces)

www.kerchner.com/glossary.htm www.duerinck.com/define.html

Contact: jmfreed@midohio.net if questions.