MID-CONTINENT PUBLIC LIBRARY | MIDWEST GENEALOGY CENTER
midwestgenealogycenter.org

Introduction to Genetic Genealogy: DNA Basics

Before You Test

- What test is best for your research?
- Does the test taker consent?
- Are you prepared for unexpected news?
- What if someone contacts you?
- How do you want your DNA to be used?
    - **Genetic Information Nondiscrimination Act (GINA) –** protects Americans from discrimination based on their genetic information in both health insurance and employment.

      – National Human Genome Research Institute
    - **Learn More About GINA**
        - https://www.genome.gov/about-genomics/policy-issues/Genetic-Discrimination#gina
        - https://www.eeoc.gov/statutes/genetic-information-nondiscrimination-act-2008
        - https://www.hhs.gov/hipaa/for-professionals/special-topics/genetic-information/index.html

Understand Relationships

- Get comfortable with determining relationships and their abbreviations.
- MGC's Extended Family Relationship Chart and other forms can be found at https://www.mymcpl.org/genealogy/resources/family-history-forms

Historical Context

- In 1994, mtDNA was used to identify the Russian royal family
- In 1998, Y-DNA was used to confirm the relationship on Eston Hemings and Thomas Jefferson

Terminology

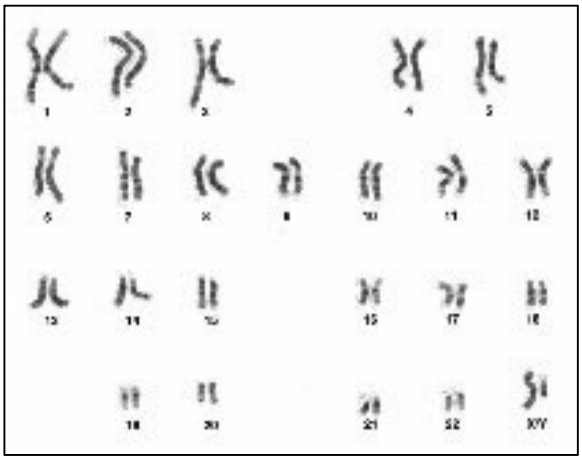

Figure 1: Image courtesy of National Human Genome Research Institute, Public domain, via Wikimedia

- **Genetics –** the study of heredity and the variation of inherited characteristics.
- **Deoxyribonucleic acid (DNA) –** carries the genetic instructions for all living things.
- **Chromosome –** a long DNA molecule that carries genetic information.
    - Humans have 23 pairs of chromosomes: 22 pairs autosomal and 1 pair sex chromosomes
- **Recombination –** the exchange of genetic information between chromosomes.
    - You receive 50% of your DNA from your father and 50% from your mother.

DNA Inheritance Patterns

- Siblings inherit different pieces of DNA. Because of **recombination**, the 50% of DNA you receive from each parent is random.
- On average, DNA is cut in half every generation.
- Everyone has a **genealogical family tree** and a **genetic family tree.**
    - After 5-7 generations, ancestors start to fall off your genetic family tree.

Generation	% DNA Inherited on Average
Parents	50%
Grandparents	25%
Great-Grandparents	12.5%
Second-Great-Grandparents	6.25%
Third-Great-Grandparents	3.125%
Fourth-Great-Grandparents	1.5625%
Fifth-Great-Grandparents	0.78125%

Figure 2: Percentage of DNA Inherited on Average

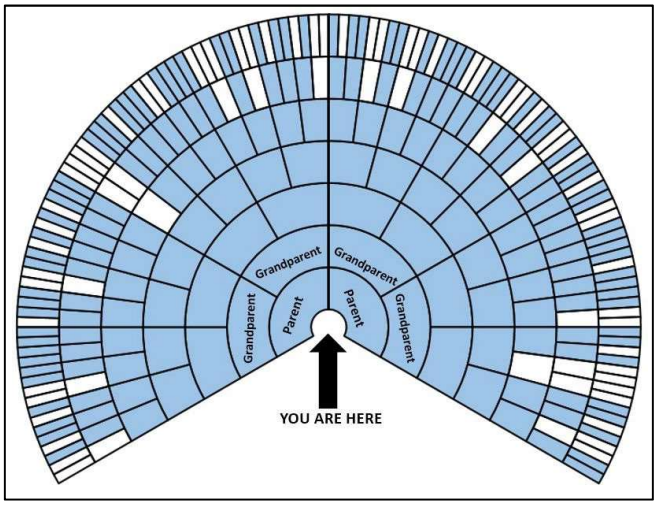

Figure 3: Genetic Family Tree

Autosomal DNA (atDNA) Testing

- Most popular test with the largest reference population.
- Evaluates the first 22 chromosome pairs.
- There are no limitations on who can test.
- Use this test to find genetic cousins.
- **To find the atDNA testing company that is right for you,** see the testing comparison charts available from the International Society of Genetic Genealogy at https://isogg.org/wiki/.

Ethnicity Estimates

- Your DNA is compared to a reference panel. The reference panel is comprised of people with DNA typical to a certain place and a paper trail tying them to the region.
- Ethnicity is broken down by region and then by genetic communities.
- If you see an ethnicity you are not expecting, read the description of the ethnicity. Follow the migration paths. Take time to learn about the region, and it may answer your questions.

Possible Pitfalls

- **Endogamy –** marrying within a community.
- **Pedigree Collapse –** when the same people appear in your tree multiple times.
- There are not enough test takers.
    - Who can you ask to test? Do traditional genealogy research to identify possible relatives, hypothesize a relationship, and test.

Applications

- Get past your genealogy brick wall.
- Solve adoption and other unknown parentage cases.
- Solve cold cases.

Helpful Tips

- Get all of your paper research organized.
- Focus on your best matches first.
- Test family members as far back in your family tree as possible.
- Test your DNA with multiple companies.
- Check back often. New matches may pop up.

X-DNA Testing

- X-DNA is not a stand-alone DNA test. It is often included, but hidden, in atDNA tests.
- X-DNA is passed down from mothers to their children and fathers to their daughters.
- X-DNA is NOT passed down from father to son.

Y-DNA Testing

- Y-DNA is passed down from father to son unchanged.
- Only those born with a Y chromosome can take a Y-DNA test.
- Y-DNA follows the surname line.
- Y-DNA reveals ancient heritage.

Mitochondrial DNA (mtDNA) Testing

- mtDNA is a circular piece of DNA found in the mitochondria of the cell.
- It is passed down from mothers to their children unchanged.
- mtDNA reveals ancient heritage.

Online Resources

- https://isogg.org/
- https://thegeneticgenealogist.com/
- https://dnaadoption.org/
- https://thednageek.com/
- https://www.yourdnaguide.com/
- https://dna-explained.com/
- https://www.legalgenealogist.com/category/dna/
- www.mymcpl.org/sites/default/files/06-0395_ExtendedFamilyChart.pdf

MGC Resources

Advanced Genetic Genealogy: Techniques and Case Studies	**929.1072 AD95**
An Introduction to Genetics for Kids	**599.935 Z19**
DNA for Native American Genealogy	**929.1072073 ES85**
Finding You Roots: The Official Companion to the PBS Series	**929.1 G2232**
Genetic Genealogy in Practice	**929.1072 B4662G**
Research Like a Pro With DNA: A Genealogist's Guide to Finding and Confirming Ancestors with DNA Evidence	**929.1072 EL22R**
The Adoptee's Guide to DNA Testing: How to Use Genetic Genealogy to Discover Your Long-lost Family	**929.1 W43**
The Family Tree Guide to DNA Testing and Genetic Genealogy	**929.1072 B4662**
Your DNA Guide the Book: Step-by-Step Plans to Connect You With Your Family Using Your DNA	**929.1072 SO87**
Ready Reference Guides	
Citing Genetic Sources for History Research	**929.1072 M625CG**
Genetic Genealogy Basics	**929.1072 B963G 2nd**
Mitochondrial DNA for the Genealogist	**929.1072 SO87**
Next Steps: Working With Your Autosomal DNA Matches	**929.1072 SO87N**
Organizing Your DNA Matches: A Companion Guide	**929.1072 SO87O**
Understanding 23andMe: A Companion Guide to "Autosomal DNA for the Genealogist"	**929.1072 SO87AT**
Understanding Family Tree DNA: A Companion Guide to "Autosomal DNA for the Genealogist"	**929.1072 SO87AF**
Using DNA in Genealogy	**929.1072 C436U**
Y Chromosome DNA for the Genealogist	**929.1072 Y**

Extended Family Relationships Chart

Compiled By _____

Date _____

MID-CONTINENT PUBLIC LIBRARY | MIDWEST GENEALOGY CENTER