


# Genetic Genealogy Investigations

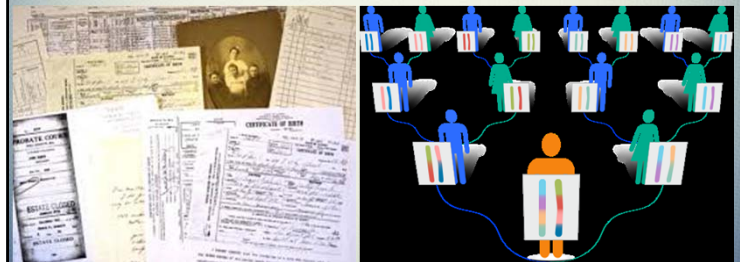
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## What is Genetic Genealogy?

The traditional practice of identifying ancestors using historical records...

Enhanced by testing living people and comparing how much DNA is shared between them



The Shared cM Project – Version 3.0 For MUCH more information (including histograms and company breakdowns) see: [goo.gl/ZiEcIQ](http://goo.gl/ZiEcIQ)  
August 2017


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How to read this chart:  
Relationship  
Average Range (low-high) (99% Percentile)  
Aunt/Uncle  
1759 - 2175

PEOPLE WE KNOW										GG MATCHES													
Grandparent 1766 1159 - 2311										Great-Great-Grandparent 427 251 - 2108													
Parent 3487 3330 - 3720					Aunt/Uncle 1759 1349 - 2175					Great-Great-Aunt/Uncle 427 151 - 885					GGG-Aunt/Uncle								
Half 3c 64 0 - 178		Half 2c 117 9 - 397		Half 1c 437 137 - 856		Half-Sibling 1783 1337 - 2332		Sibling 2669 2209 - 3385		Child 3487 3330 - 3720		1cR 874 46 - 515		2c 233 0 - 217		3c 74 0 - 127		4c 35 0 - 94		5c 35 0 - 84		6cR 17 0 - 75	
Half 3c1R 42 0 - 165		Half 2c1R 73 0 - 353		Half 1c1R 255 57 - 530		Half Niece/Nephew 891 600 - 1446		Niece/Nephew 891 1349 - 2175		Grandchild 1487 3330 - 3720		1c2R 123 0 - 316		2c2R 48 0 - 173		3c2R 22 0 - 116		4c2R 22 0 - 109		5c2R 21 0 - 43		7cR 13 0 - 57	
Half 3c2R 34 0 - 96		Half 2c2R 61 0 - 353		Half 1c2R 145 37 - 360		Half Great Niece/Nephew 432 155 - 765		Great Niece/Nephew 910 291 - 2108		Grandchild 1766 1156 - 2311		1c3R 71 0 - 264		2c3R 35 0 - 116		3c3R 22 0 - 82		4c3R 29 0 - 44		5c3R 17 0 - 53		8c 12 0 - 56	
Half 3c3R 87 0 - 191		Half 2c3R 187 12 - 385		Half 1c3R 87 12 - 385		Half Great Niece/Nephew 187 12 - 385		Great Niece/Nephew 427 291 - 885		Grandchild 881 464 - 1486		1c4R 57 0 - 282		2c4R 22 0 - 139		3c4R 22 0 - 69		4c4R 29 0 - 82		5c4R 11 0 - 44		8c 12 0 - 56	

Minimum was automatically set to 0 cM for relationships more distant than Half 1c. All averages were determined only for submissions in which DNA was shared.


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## DNA Used in Genetic Genealogy

- Autosomal DNA – 22 pairs
  - STR Profile – Forensic/Crime Lab DNA profile
  - SNP Profile – Ancestral DNA profile
    - Direct To Consumer (DTC) Testing / Genetic Genealogy Cases
    - Ancestry.com / 23andMe / FamilyTree DNA / GG Vendor Labs
- Sex Chromosomes – 1 pair – X and Y DNA
  - Y DNA – males only / directly from father
  - X DNA – males and females
    - Males only get X DNA from their mother
    - Females get X DNA from their mother and father

## Two Types of DNA Profiles



<p>STR DNA Profile <b>Crime Lab</b></p> <p>CODIS</p> <p><b>Hits</b> to an individual</p> <p>Ends with crime lab STR comparison of a suspect's standard to the crime scene DNA profile!</p>	 $\neq$ $\neq$ $\neq$	<p>SNP DNA Profile <b>GG Vendor</b></p> <p><del>CODIS</del></p> <p><b>Leads</b> to relatives</p> <p>Ends with crime lab STR comparison of a suspect's standard to the crime scene DNA profile!</p>
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## Challenges for Local Agencies



A Genetic Genealogy case can be:

- expensive
- time-intensive
- resource-intensive
- requires specialized knowledge

## FDLE GGI Program

In the fall of 2018, FDLE began an initiative to help law enforcement agencies solve cold cases using genetic genealogy techniques by providing:

- Funding to pay for genetic genealogy testing at Parabon Nanolabs for cases that meet the existing **FDLE Familial Search Program** criteria 
- A Genetic Genealogy Investigations (GGI) team that can support the cases with the specialized skills needed to identify a suspect 




## Familial Search Program

<p>Florida DNA Offender/Arrestee Database Search</p> <p>Male suspect only (ySTR)</p> <p>Possible first-degree relatives such as father/son and possibly brother</p> <p>Must be a violent crime against a person or critical threat to public safety</p>	<p>Added GG testing by private lab if negative</p> <p>Male or female suspects (SNP)</p> <p>Close and long-range relatives, out to distant cousins</p> <p>Limited to offenses allowed by vendors (and resources)</p> <p>Unidentified crime victims may be considered later</p>
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## Program Requirements

Requires a formal request in writing

- Joint request by Sheriff/Chief and State Attorney
- Commitment to investigate and prosecute
- All leads must be exhausted
- Case narrative to indicate a probative sample source
- Samples evaluated by Biologist and Vendor

## Case Approval Process

Familial Search Review Committee Approval

- Forensic Services Director
- Crime Lab Chief
- DNA Database Supervisor
- State CODIS Administrator
- Biology Technical Leader
- General Counsel Attorney
- Special Agent In Charge



FDLE Commissioner Approval

## The Technical Specs

Preferably a single source DNA profile  
Some two-person mixtures possible  
Must have elimination standard

Preferably 20 ng of DNA  
Must have at least 1 ng

Preferably crime lab extract sent to vendor  
Original evidence can be sent

Each case must be evaluated individually  
Crime Lab Biologist  
Vendor representative

## The Results


Gender and Biogeographic Ancestry and possibly some phenotype predictions as to hair/eye/skin color and tone

Identification of top DNA matches to crime scene profile

May/May Not get:

- Recommendation as to possible suspect(s)
- Prediction where suspect might be on a family tree
- Suggested further investigative activity
- Recommendation to collect additional DNA
- Recommendation for more GG Analysis

## The GG Investigations Team




Genealogy   Analytical   Forensic   Investigative   Legal

- Works closely with local agency and vendor
- FDLE authorizes and pays for all costs of GG testing
- Helps resolve cases after vendor initial GG analysis
- Full and part-time assignments for personnel

## The Forensic DNA Lab

- STR testing to determine if someone is the:
  - Suspect
  - Parent of the suspect
  - Child of the suspect
- Y-STR testing of arrestee/offender samples or collected DNA and comparison to suspect Y-STR profile to eliminate people and narrow down the family tree
- This is critical to keep investigation focused on the right people on the right part of the family tree



## Questions?

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