



Evolution in Crime-Solving: The Impact of Investigative Genetic Genealogy

Ramapo College of New Jersey
Investigative Genetic Genealogy Center

About This Presentation

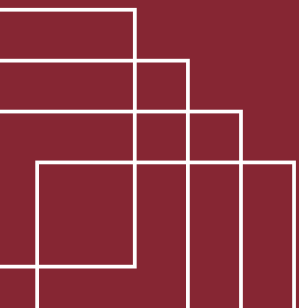
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Ramapo College Investigative Genetic Genealogy Center provides pro bono IGG services, delivers innovative IGG education programs, and performs research to advance the field of IGG.



What is Investigative Genetic Genealogy?



What is Investigative Genetic Genealogy (IGG)?

- Also called Forensic Genetic Genealogy (FGG) or Forensic and Investigative Genetic Genealogy (FIGG)
- Utilization of advanced DNA profile development and traditional genealogy and genetic genealogy research to develop investigative leads in violent crimes and unidentified human remains cases

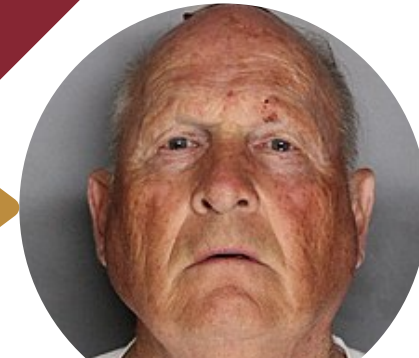
History of IGG



2017: IGG Begins



April 9, 2018: Marcia King Identified



April 24, 2018: Joseph DeAngelo Arrested



July 15, 2018: John D. Miller Arrested



July 17, 2019 Christopher Tapp Exonerated

Since 2018, More than 800 violent crime and UHR cases have been resolved with an investigative lead generated by SNP testing and IGG. (Dowdeswell, 2024)

STR Testing vs. SNP Testing

(Short Tandem
Repeat)

(Single Nucleotide
Polymorphism)



STR (traditional) DNA testing

- Uses tens or dozens of markers
- Used to identify direct relatives

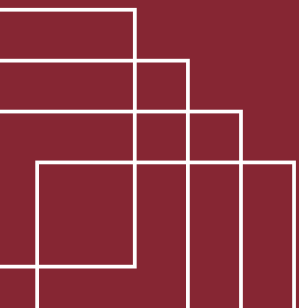


SNP DNA testing

- Uses hundreds of thousands or millions of markers
- Used to identify very distant relatives (3rd, 4th, 5th cousins)

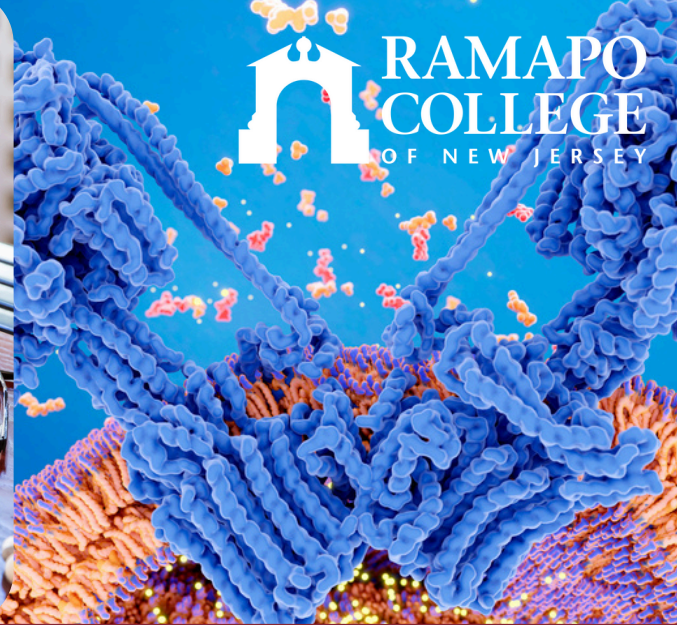
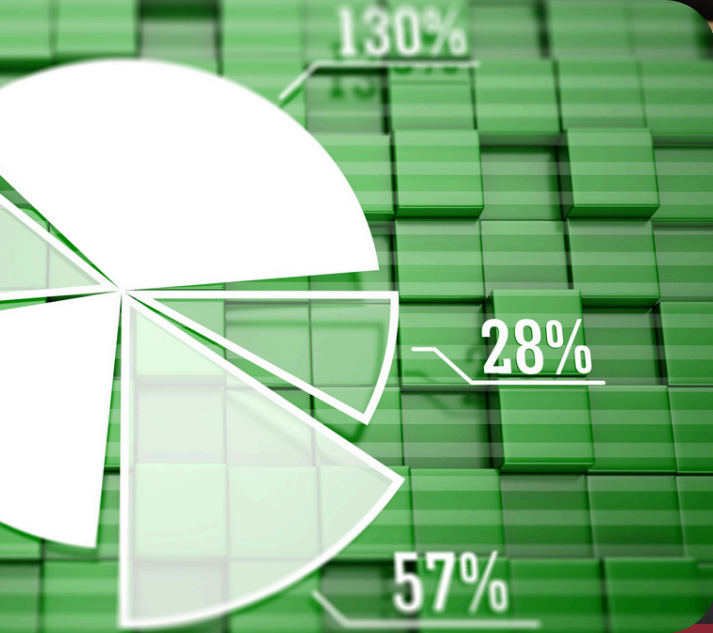


The Laboratory Process: Development of a SNP Profile

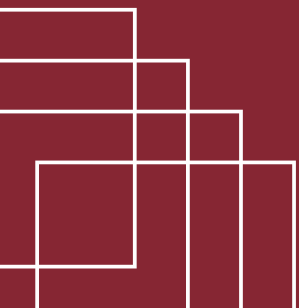


The IGG Lab Process

- Specimen Selection
 - Specimens commonly used for profile development in IGG include existing DNA extract, bone, teeth, hair (including rootless hair), blood, semen, and more.
- Extraction
 - DNA is extracted from the selected specimen.
- Genotyping
 - The individual's DNA sequence is analyzed to develop a genetic profile.
- Bioinformatics
 - A file compatible with IGG databases is developed.



The Profile is Complete - What Happens Next?



Outputs Examined

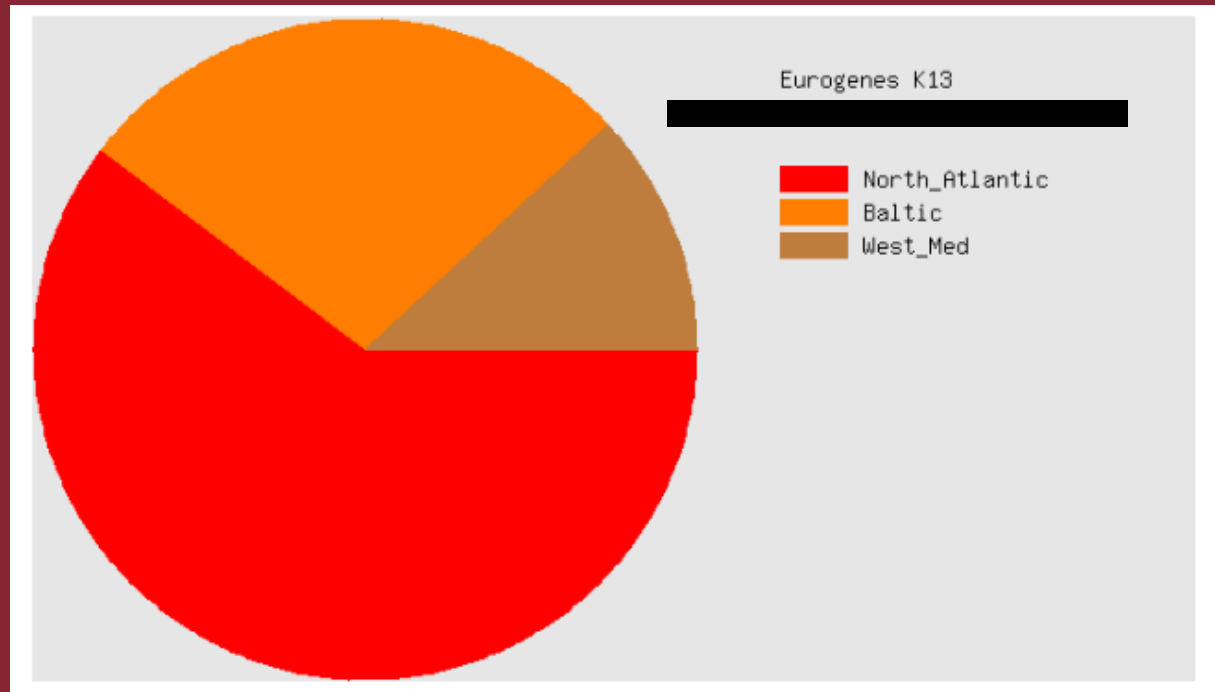
- Bioancestry Report / Ethnicity Estimate
 - Provided by databases
- Genetic Match List and Associated Tools
 - Provided by databases
- Mitochondrial DNA Haplogroup estimate
 - Provided by laboratory or bioinformatics provider in some cases
- Y-DNA haplogroup estimate (in male subject)
 - Provided by laboratory or bioinformatics provider in some cases

How Does the IGG Practitioner Utilize the Outputs?

- Bioancestry Report / Ethnicity Estimate
 - Provides a rough estimate of the subject's bioancestry/ethnicity/heritage
- Genetic Match List and Associated Tools
 - The primary focus of the IGG practitioner's work
 - Allows the IGG practitioner to reverse engineer the family tree of the subject
- Mitochondrial DNA Haplogroup estimate
 - Provides a rough idea of the subject's direct maternal line ancestry
- Y-DNA haplogroup estimate (in male subject)
 - Provides a rough idea of the subject's direct paternal line ancestry

Ethnicity Estimate

Europe	100%
Western Europe	
● Ireland	57%
● Central Europe	17%
● England, Wales, and Scotland	15%
● Scandinavia	9%
Baltic	
● Baltic ⓘ	<2%
Southern Europe	
● Italian Peninsula ⓘ	<1%



This Jane Doe is believed to be 1/2 Irish, 1/2 American (European)

Match List

Shared DNA 70 cM	Longest Block 70 cM
Shared DNA 59 cM	Longest Block 46 cM
Shared DNA 59 cM	Longest Block 40 cM
Shared DNA 54 cM	Longest Block 28 cM

**Top match is approximately 3rd cousin -
will share 2nd-great-grandparents with
subject**

**Top match is approximately
1st cousin - will share
grandparents with the
subject**

Autosomal	
Total cM ↑	Largest ↑
738.4	61.8 Q
534.6	58.3 Q
32.8	32.8 Q
32.5	22.4 Q
31.7	20.9 Q
31.4	18.4 Q

The Investigative Lead

Lead
generated by
IGG
practitioner



Lead
investigated
by
investigating
agency



Confirmatory testing
(family member
reference sample,
surreptitious DNA
sampling)



Confirmation of lead
(death certificate
issued, arrest made,
etc.)



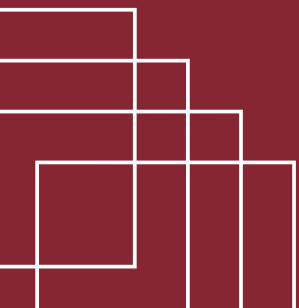
The Investigative Lead



Investigative genetic genealogy produces a lead which must be further investigated and confirmed with secondary means.



Implementing IGG



What are the Costs?

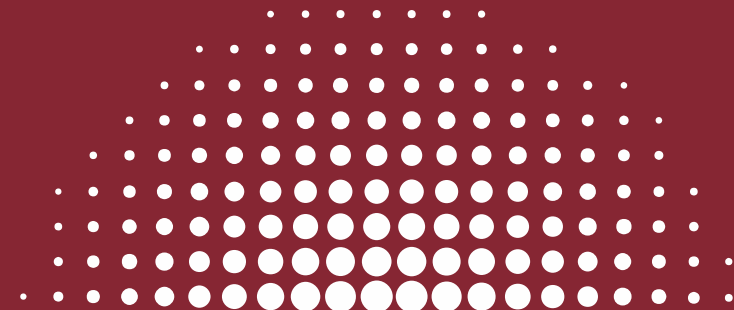
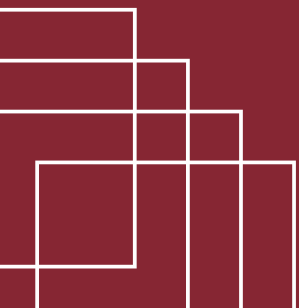
- Laboratory testing to develop SNP profile
 - Ranges by sample type and needs of a particular case or specimen
 - Approximately \$3,000-10,000 per case
- Database uploads
 - \$0-\$2400 depending on needs of a case
- Investigative Genetic Genealogy Research
 - Extremely variable
 - Some IGG practitioners offer a flat fee, while others offer hourly pricing
 - Some agencies have IGG practitioners in-house

Resources

- Ramapo College Investigative Genetic Genealogy Center
 - Offers pro bono IGG research and funding for laboratory costs
 - Educational programs also offered
 - Ramapo.edu/IGG
- Season of Justice
 - Provides funding (by application) for IGG for unsolved violent crimes
 - SeasonOfJustice.org
- National Center for Missing and Exploited Children (NCMEC)
 - Assistance available for qualifying youth cases
 - MissingKids.org

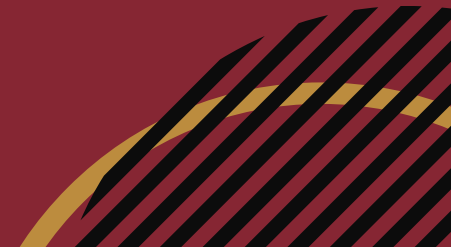


Barriers to Solving

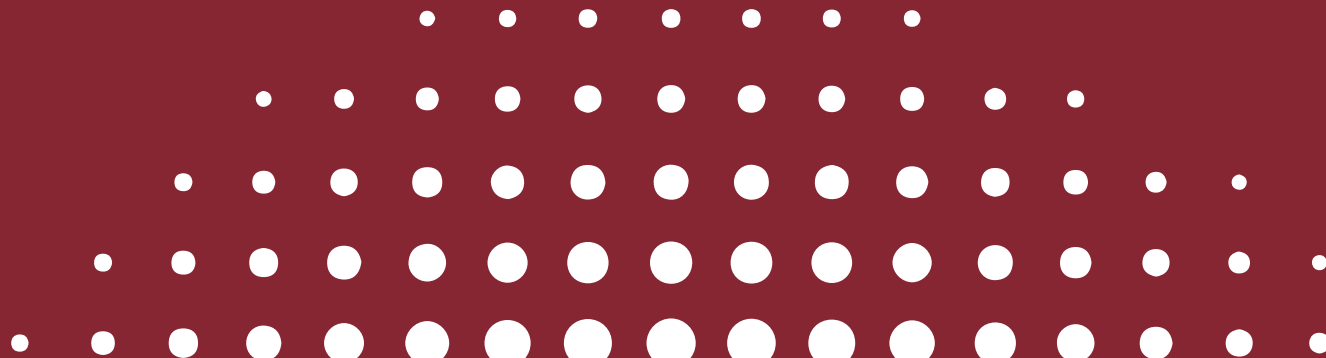




Barriers to Solving

- Ethnicity/Heritage
 - Underrepresented populations
 - Scarcity of genealogy records
 - Family Tree Anomalies
 - Adoption
 - Misattributed Parentage
- 

Questions?



Thank You!

