

Forensic Investigative Genetic Genealogy (FIGG)

Dr. Claire L. Glynn

Professor of Forensic Science
Founding Director- FIGG Program
Executive Director - Lee Institute



University of New Haven

HENRY C. LEE COLLEGE OF
CRIMINAL JUSTICE AND FORENSIC SCIENCES

Department of Forensic Science

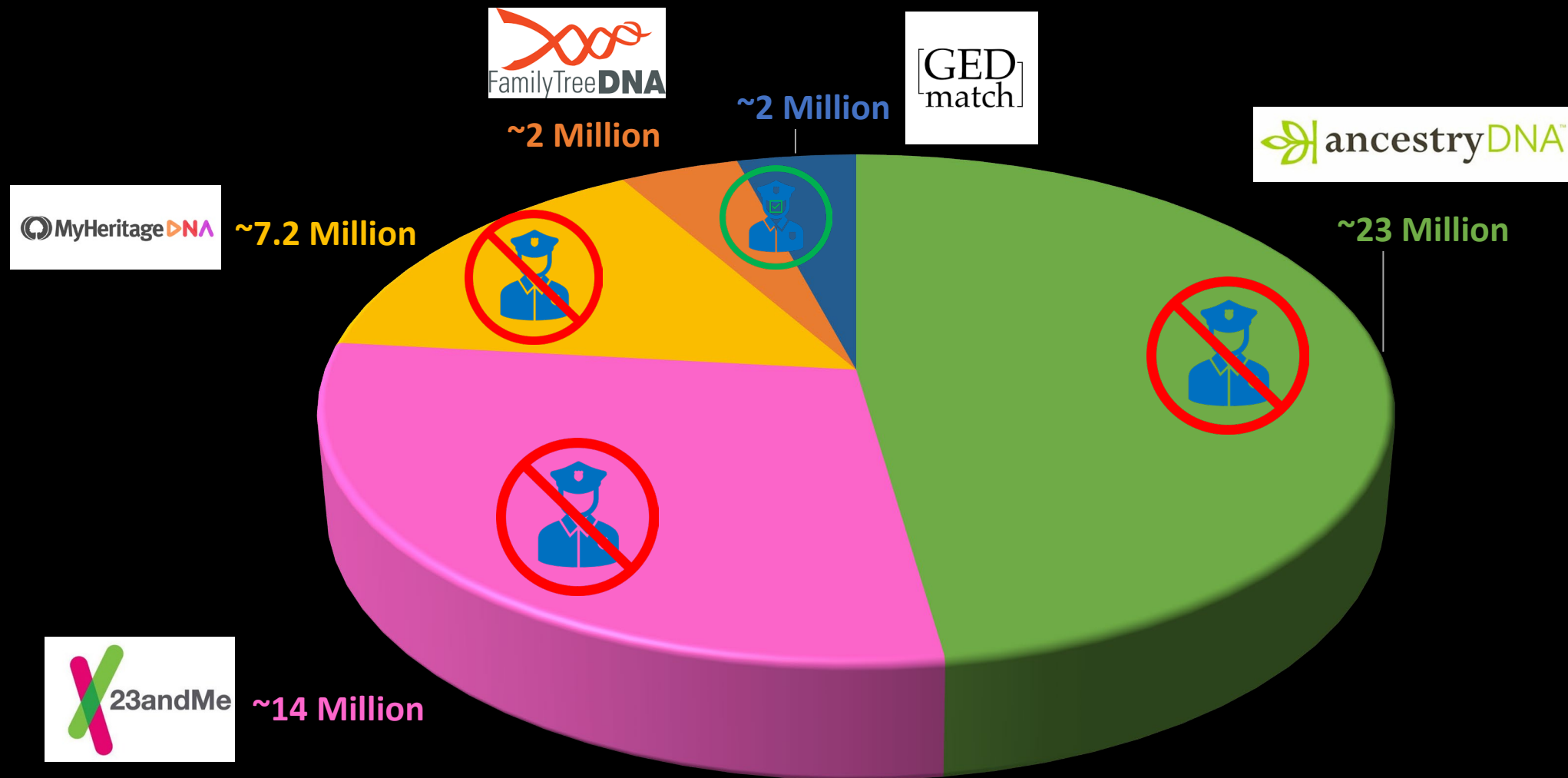


THE HENRY C. LEE
INSTITUTE OF
FORENSIC SCIENCE
AT THE UNIVERSITY OF NEW HAVEN

FORENSIC INVESTIGATIVE GENETIC GENEALOGY



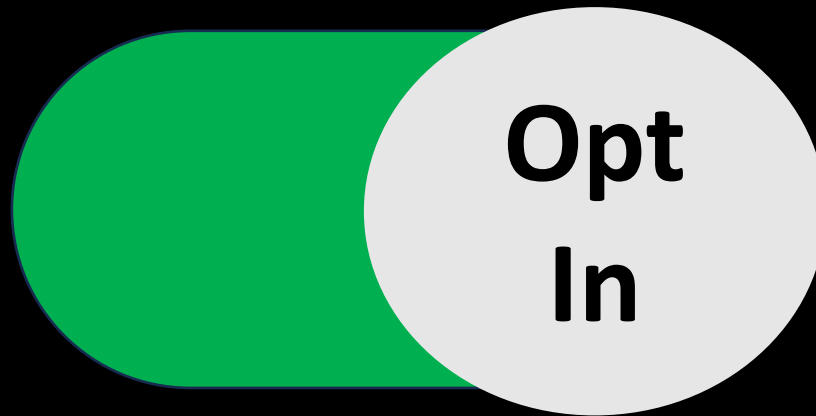
FIGG



Consumer DNA: >48 MILLION PEOPLE
FIGG Databases: <4 MILLION PEOPLE



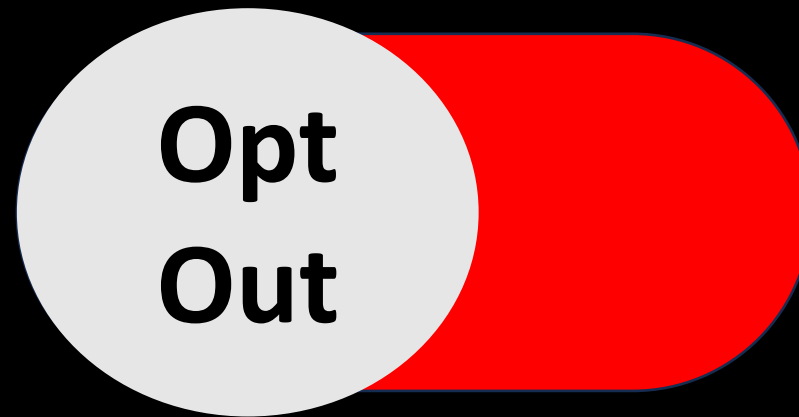
All users can :



for Law Enforcement Comparisons



All users can :



for Law Enforcement Comparisons

FIGG Case File



Case Assessment

1.

SNP Sequencing

2.

Genetic Genealogy

Family Trees

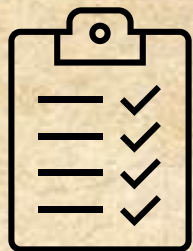
3.

Review/Report

4.

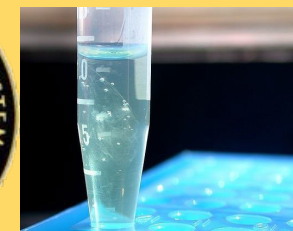
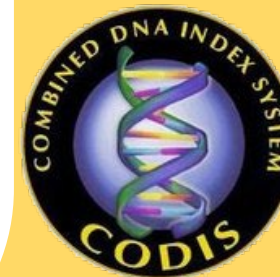
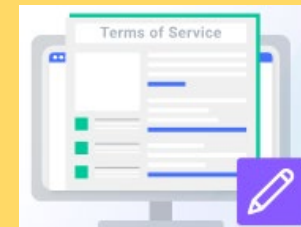
5.

Case Assessment



FIGG Checklist:

- ✓ Case Criteria/Type meets:
 - ✓ DOJ Interim Guidelines
 - ✓ Individual State Laws
 - ✓ Database Terms of Service/Use
- ✓ Forensic STR Profile Developed:
 - ✓ Uploaded to CODIS
 - ✓ State-level Familial Search (if permitted)
- ✓ Sufficient DNA Remaining (Quantity & Quality)
- ✓ All other Investigative Leads Exhausted



SNP Sequencing



Forensic DNA Analysis

Short Tandem Repeats (STRs)

CODIS 20 Core (US) / DNA17/23+ (Europe)

Person 1: ACTGTC GATA GATA GATA GATA GATA GATA GATA ACTGTCAACTGTC

Person 2: ACTGTC GATA GATA GATA GATA GATA GATA GATA GATA GATA ACTGTC

SNP Sequencing

Single Nucleotide Polymorphisms (SNPs)

600,000 – >1,000,000 markers

Person 1 : GCTGTATGAC T AGAAGATCGAT

Person 2 : GCTGTATGAC G AGAAGATCGAT

SNP Sequencing



SNP Microarray
(~600,000 SNPs)

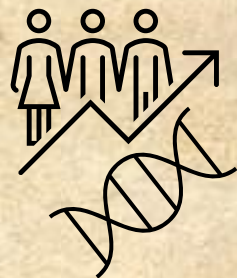


Targeted SNP Kit –
Kintelligence
(~10,000 SNPs)



Whole Genome
Sequencing
(~1 million SNPs)

Genetic Genealogy



raw DNA data

rsID	chromosome	position	allele 1	allele 2
rs4477212	1	72017	A	A
rs3094315	1	742429	G	A
rs3131972	1	742584	G	G
rs12124819	1	766409	G	G
rs12564807	1	734462	A	A

Upload DNA Data to FIGG
Approved Databases

GEDmatch PRO™

Number of Upload Credits: 0 | Genealogist | Hi Claire

UPLOAD DNA | PRO TOOLS | YOUR KITS | YOUR PROJECTS

Dashboard > Upload DNA Data

UPLOAD A FORENSEQ® KINTELLIGENCE KIT

UPLOAD A THIRD-PARTY DNA KIT

UPLOAD AN EVALUATION DNA KIT

VEROGEN

About GEDmatch PRO™ | Privacy Policy | Support Request | Terms of Service | Cookies Settings

Web site and contents ©Copyright 2011-2023 by Verogen, Inc.

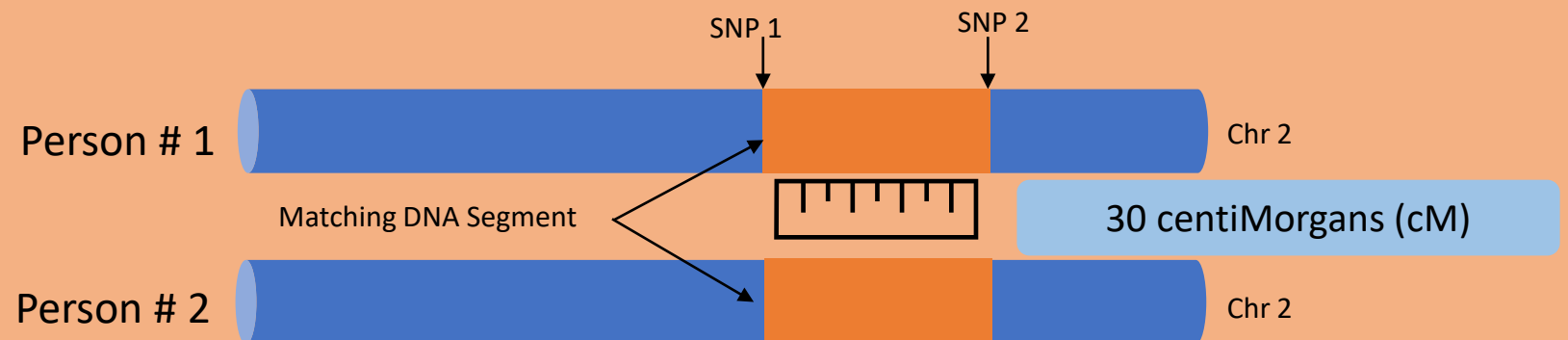
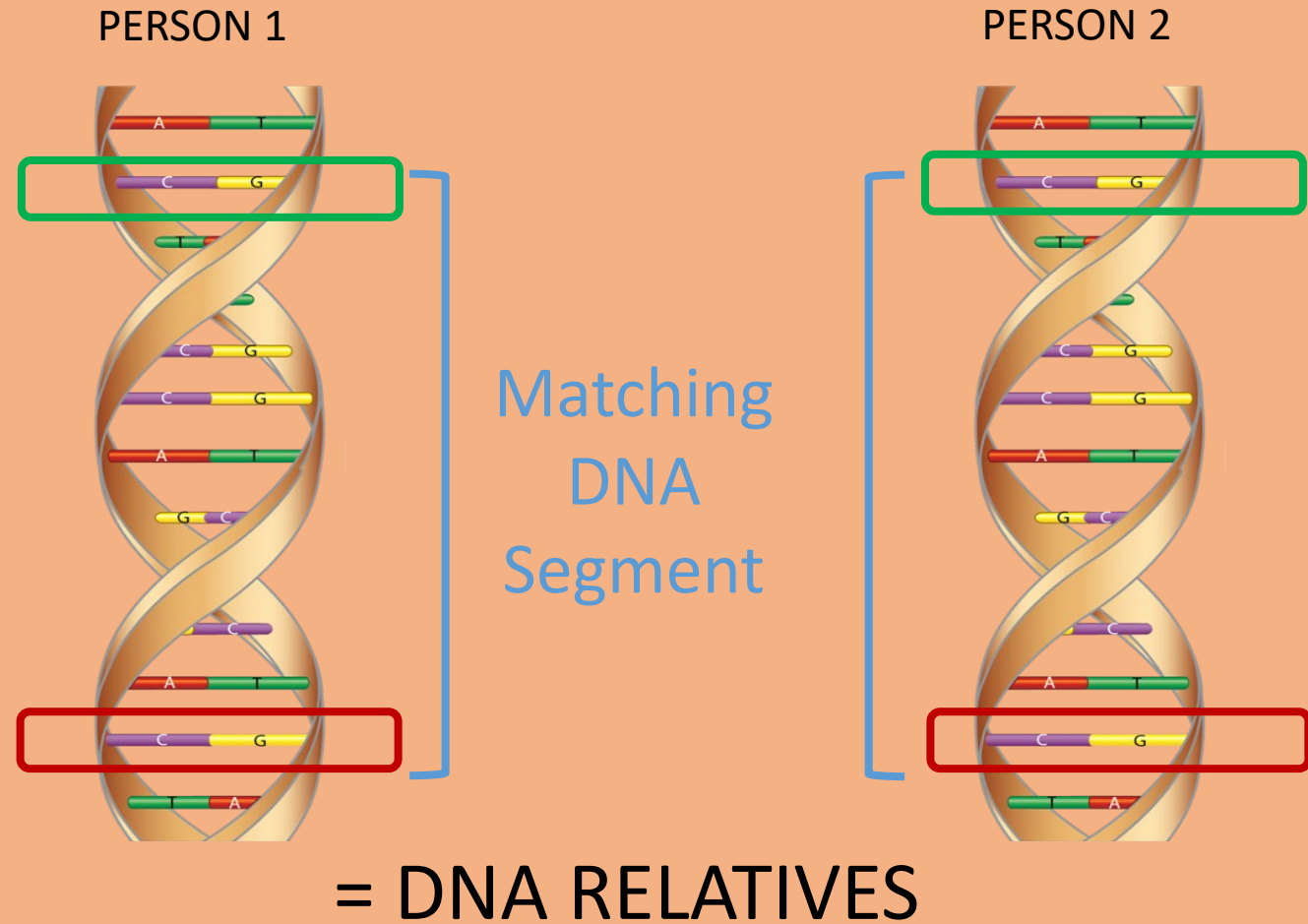
GENE BY GENE

Forensic Requisition Form for Sample Submission

Public Information Officer Contact Information (for Law enforcement only)	
Title	
First Name	
Last Name	
Agency/Organization	
Email	
Phone Number	


Billing Information	
Agency/Organization	
First Name	
Last Name	
Email	
Phone Number	
Address	
Address	
Additional Contacts?	
Notes	
Notes	

Genetic Genealogy



Genetic Genealogy



FamilyTreeDNA


[Home](#)[Results & Tools](#)[Family Tree](#)[Group Projects](#)

[Autosomal DNA](#)

[Matches](#)[myOrigins®](#)[ancientOrigins](#)[Chromosome Browser](#)[Chromosome Painter](#)[Matrix](#)

Begin Your DNA Journey

Explore the world of DNA a

Number of Upload Credits: 0 [Genealogist](#) | [Hi Claire](#)

[UPLOAD DNA](#)[PRO TOOLS ▾](#)[YOUR KITS](#)[YOUR PROJECTS](#)

GEDmatch PRO™ Dashboard

This is your GEDmatch PRO™ dashboard where you can quickly access your latest uploaded kits and projects you are a working on.

[Your Kits](#)[View All Kits](#)[Upload New Kit +](#)

[Featured](#)

[One-to-One Kinship DNA Comparison](#)[One-to-Many Segment-Based](#)[One-to-Many Kinship](#)[AutoKinship](#)

[Admixture \(Eurogenes/K13\)](#)[Are Your Parents Related?](#)[Kit Diagnostic Utility](#)[Kit Evaluation](#)[Multiple Kit Analysis](#)

[One-to-One Autosomal DNA Comparison](#)[One-to-One Q Matching](#)[Segment Search](#)[Triangulation](#)[User Lookup](#)

All Pro Tools

[A](#)[Admixture \(Eurogenes/K13\)](#)[Are Your Parents Related?](#)[AutoKinship](#)

[K](#)[Kit Diagnostic Utility](#)[Kit Evaluation](#)

[M](#)[Multiple Kit Analysis](#)

[O](#)[One-to-Many Kinship](#)

Genetic Genealogy



myOrigins® Version 3

Uncover the unique genetic assemblage that has been passed down to you from your ancestors, and see to which of our 90 reference populations from ... [Read more](#)

myOrigins®

Compare Origins

Claire Glynn

Europe 100%

Western Europe

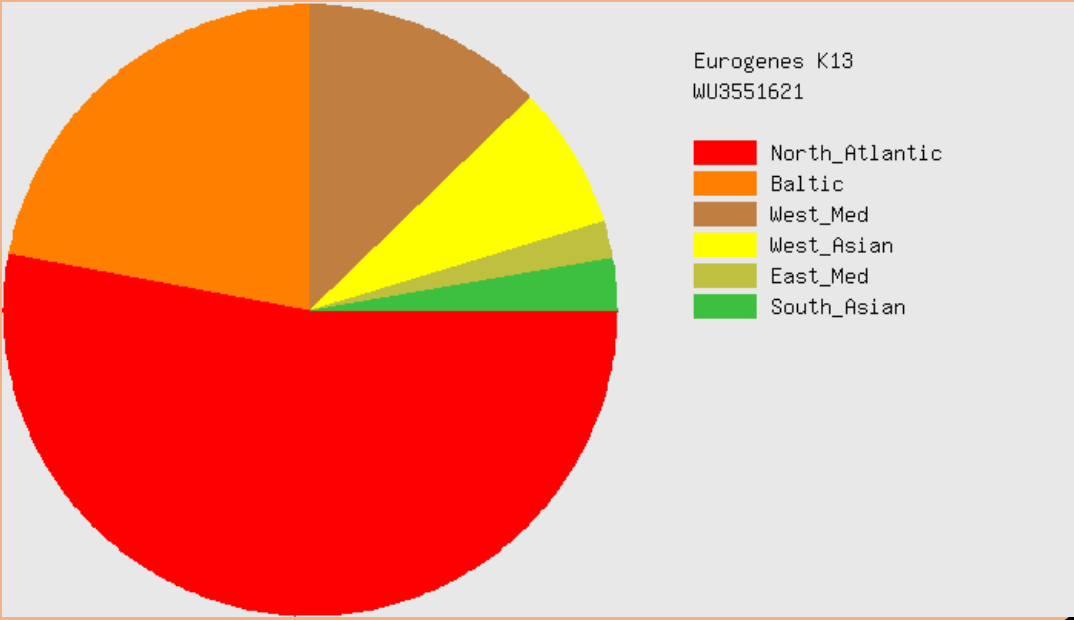
● Ireland 98%

Eastern Europe

● East Slavic ⓘ <2%



Biogeographic Ancestry Estimation



Genetic Genealogy

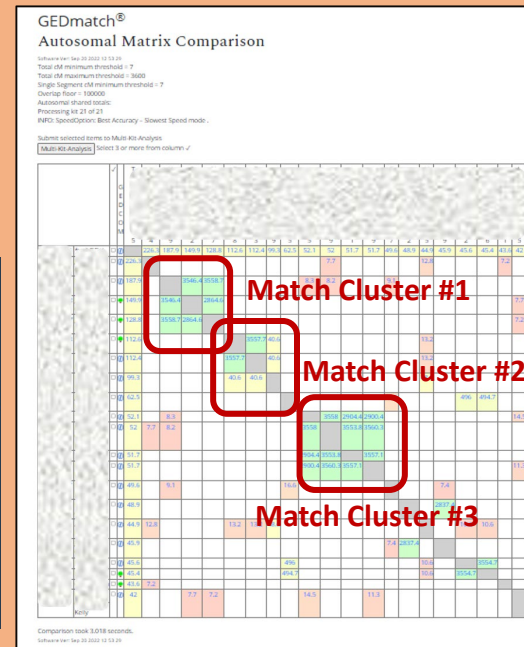


Shared
DNA

Visualization Options							Autosomal			Haplogroup		X-DNA		Source	Overlap
<input type="checkbox"/>	Kit ↑	Name (* => alias) ↑	Email ↑	GED WikiTree ↑	Age (days) ↑	Sex ↑	Total cM ↑	Largest ↑	Gen ↑	Mt ↑	Y ↑	Total cM ↑	Largest ↑		
<input type="checkbox"/>	12345	Cillian Murphy	peakyB@gmail.com		2594	M	115.3	29.9 Q	3.48			0	0	Migration - F2 - A	187790
<input type="checkbox"/>	54321	Ryan Gosling	ken@aol.com	GED	645	M	75.3	40.3 Q	3.79			0	0	MyHeritage	78376
<input type="checkbox"/>	23451	Al Pacino	thegodfather@gmail.com		3082	M	74.9	23.4 Q	3.79			0	0	Migration - F2 - F	197171
<input type="checkbox"/>	34512	Emma Stone	estone@outlook.com		645	F	74.8	39.7 Q	3.79			0	0	MyHeritage	79805
<input type="checkbox"/>	45123	Emily Blunt	eblunt@gmail.com		2344	F	74.7	21.6 Q	3.79			0	0	Migration - F2 - A	187542
<input type="checkbox"/>	543216	Robert Downy Jr	rdj@outlook.com		1907	M	65.8	47.7 Q	3.88			0	0	AncestryDNA V2	213355
<input type="checkbox"/>	13452	Christopher Nolan	cnolan@gmail.com		966	M	54.2	37.9 Q	4.02		I	0	0	FTDNA	79615

*Kit #, Names, and Emails altered for Privacy

Shared DNA Matches
i.e., Genetic Relatives



Relationship Probabilities for 115 total shared cM

Relationship Type	Probability	Group
2C1R Group		45.1%
2C1R, Half-2C, Half-1C2R, 1C3R	45.1%	
3C Group		32.3%
3C, 2C2R, Half-2C1R, Half-1C3R	32.3%	
2C Group		9.1%
2C, 1C2R, Half-1C1R, Half-2G-Aunt/Uncle/Niece	9.1%	
3C1R Group		8.9%
3C1R, Half-3C, Half-2C2R, 2C3R	8.9%	
4C Group		3.7%
4C, 3C2R, Half-3C1R, Half-2C3R	3.7%	
4C1R Group		0.5%
4C1R, Half-4C, Half-3C2R, 3C3R	0.5%	
5C Group		0.2%
5C, 4C2R, Half-4C1R, Half-3C3R	0.2%	

Relationship prediction algorithm developed by Brit Nicholson. [Read the methodology here.](#)

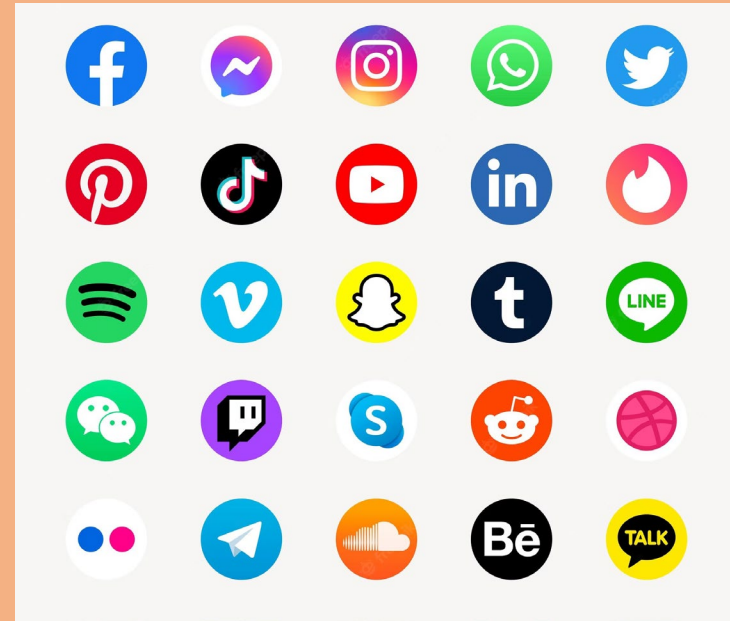
CLOSE

Genetic Genealogy

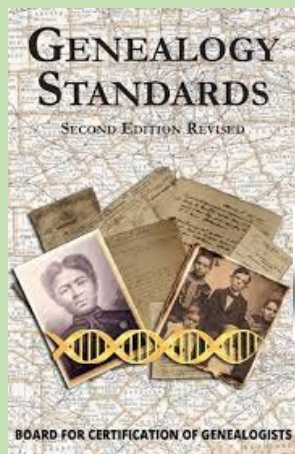
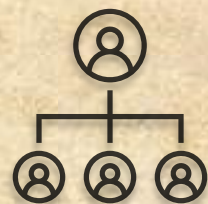


Verify identities of DNA matches:

- John Smith: johnsmith84@gmail.com
- Some use aliases

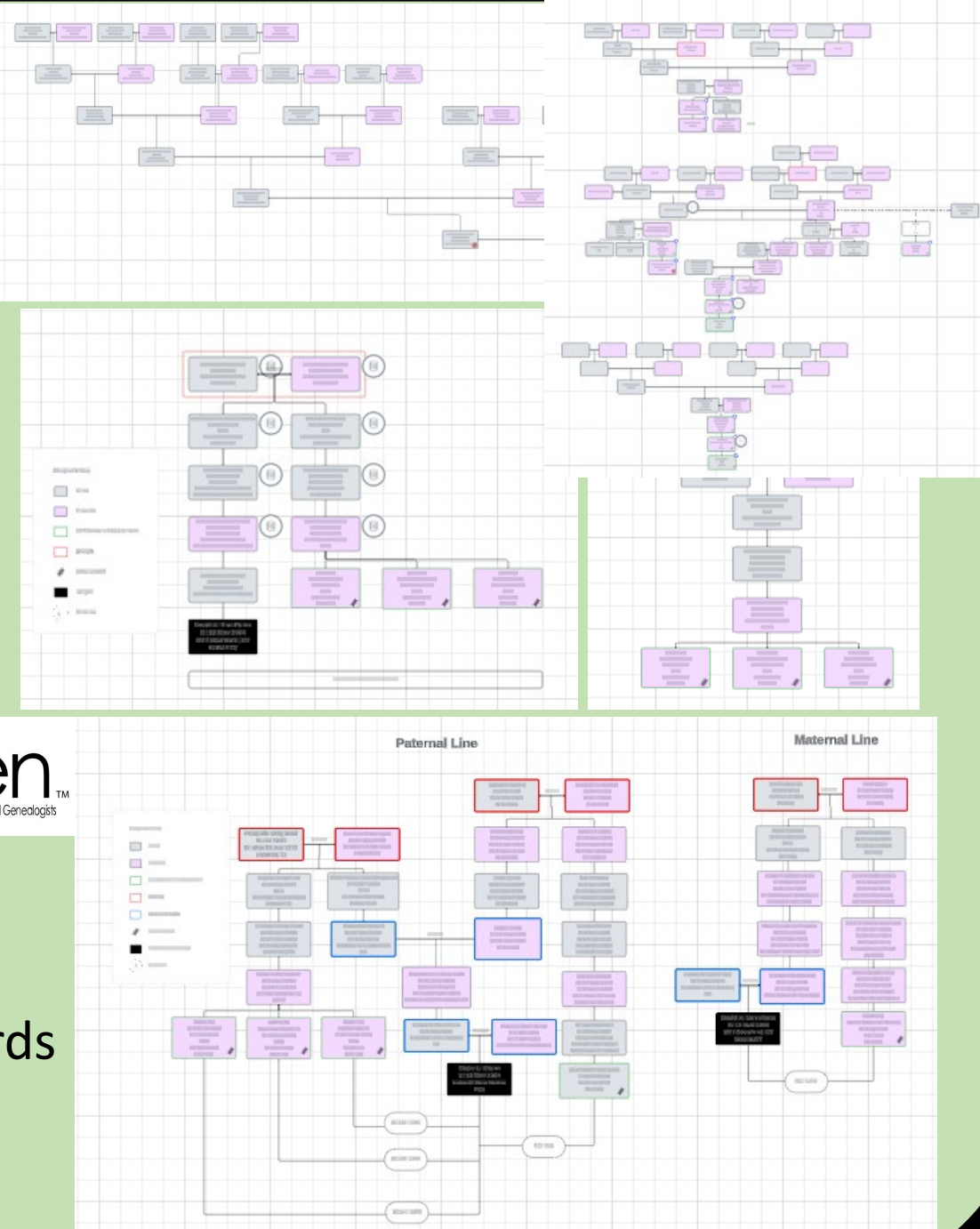


Family Trees

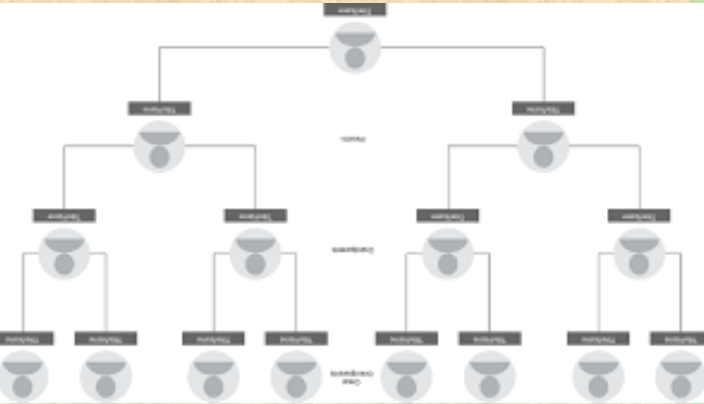


ICAPGenTM
The International Commission for the Accreditation of Professional Genealogists

Build Family Trees Backwards
from DNA Matches



Build back generations



Jane's Mom

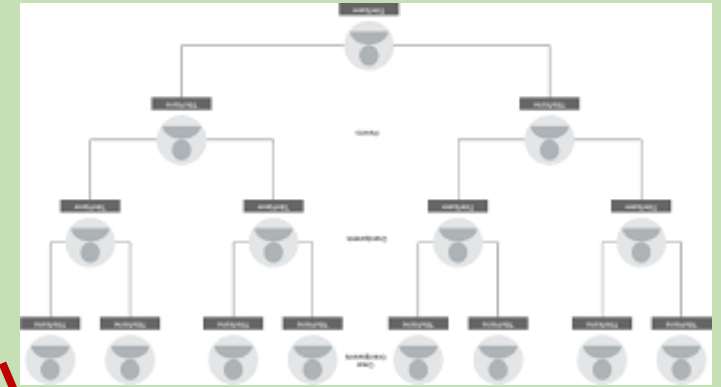
Jane's Dad

Jane Jones
3C

MRCA

MRCA

Build back generations

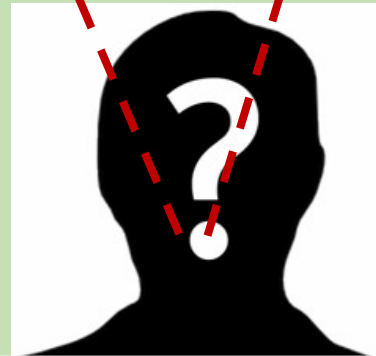


John's Mom

John's Dad

John Smith
3C1R

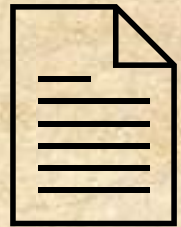
Build forward generations



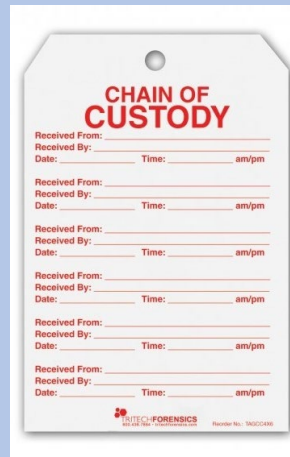
Proposed Person Of Interest

i.e., Investigative Lead

Review/ Report



- ✓ Every step of a FIGG investigation should be documented.
 - ✓ Every genetic genealogy tool performed
 - ✓ Genealogical records used to build family trees
- ✓ Final report detailing the FIGG analysis should be produced.
- ✓ Any other competent FIGG analyst should be able to interpret the findings and reach the same conclusion.
- ✓ Administrative and Technical Review



CHAIN OF CUSTODY

Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

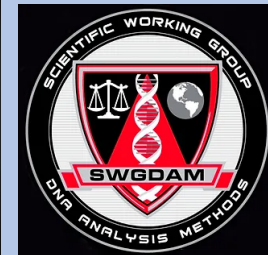
Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

Received From: _____
Received By: _____
Date: _____ Time: _____ am/pm

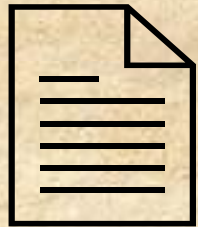
HITEC-FORENSICS
901 4th Ave. Ste. 1000
Boulder, CO 80502
Boulder No. 19022048



Quality Assurance
Standards Documents



Review/ Report



Investigative Lead
provided to
Law Enforcement Agency

Reference DNA Sample

Violent Crime Suspect:
Overt or Covert DNA Collection

Unidentified Human Remains:
Closest Living Relative DNA Collection

STR Profile Comparison

Locus	Forensic Unknown	Reference Known
D3	15, 16	15, 16
vWA	14, 16	14, 16
D16	9, 10	9, 10
D2S1	14, 15	14, 15
D8	12, 13	12, 13
D21	28, 31	28, 31
D18	12, 15	12, 15
D19	14, 15	14, 15

MATCH – INCLUDED ✓

FGA	24, 26	24, 26
D1	13, 16	13, 16

NO MATCH – EXCLUDED ✗

D12	18, 19	18, 19
D22	11, 16	11, 16
SE33	17, 25.2	17, 25.2
D7	7, 12	7, 12
CSF1PO	11, 12	11, 12
D13	11	11
TPOX	8	8
D5	11	11
Amelo	XY	XY
DYS391	11	11

2018 - 2024

>1,000



cases have benefited from
Forensic Investigative Genetic Genealogy
in the United States

FIGG: 2018 - 2024

Building the plane while flying it



National Technology Validation and Implementation Collaborative

Forensic Investigative Genetic Genealogy
(FIGG) Working Group





Forensic Science International: Synergy

Volume 7, 2023, 100446



National Technology Validation and Implementation Collaborative (NTVIC): Guidelines for establishing Forensic Investigative Genetic Genealogy (FIGG) programs

[Ray A. Wickenheiser](#)  , [Jennifer Naugle](#), [Brian Hoey](#), [Rylene Nowlin](#), [Swathi A. Kumar](#),
[Mark A. Kubinski](#), [Claire Glynn](#), [Raymond Valerio](#), [Lance Allen](#), [Stephanie Stoiloff](#),
[Jennifer Kochanski](#), [Christi Guerrini](#), [Anne Marie Schubert](#)



Increase # of people in FIGG Databases:



Increase # of cases solved



FIGG Potential:

Why wait until a case is cold?

- ✓ Prevent Serial Offenders
- ✓ Deter Potential Offenders
- ✓ Prevent Wrongful Convictions
- ✓ Clear All Backlogs/Cold Cases

1984

☒ Training & Education

☒ Method Validation

☒ Legislation

FIGG

☒ Genetic Privacy

☒ Standards & Best Practices

☒ Oversight & Auditing

2024



Key Takeaways

1.

Maintain Public Trust:

- ✓ Adhere to policies, laws, database terms of use, and best practices

2.

Follow Forensic & Criminal Justice Standards:

- ✓ Education & Training
- ✓ Documentation
- ✓ Chain of Custody
- ✓ Oversight

3.

Increase Awareness:

- ✓ Increase #'s in Databases = Increase #'s of Cases

Protecting:

Public
Safety



Individual
Privacy

Through the Responsible & Ethical use of FIGG



FORENSIC INVESTIGATIVE GENETIC GENEALOGY

UNIVERSITY OF NEW HAVEN

Scan Here to Learn about our
Graduate Certificate program in FIGG

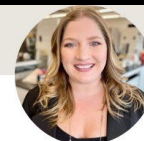


University of New Haven

HENRY C. LEE COLLEGE OF
CRIMINAL JUSTICE AND FORENSIC SCIENCES

Department of Forensic Science

Connect with me on



Claire Glynn

Professor - Forensic Expert - Forensic
Investigative Genetic Genealogy (FIGG)



THE HENRY C. LEE
— INSTITUTE OF —
FORENSIC SCIENCE
AT THE UNIVERSITY OF NEW HAVEN