



# BASIC DNA TESTING (FOR GENEALOGY AND .....)

- Sponsored by Genealogy SIG of Computer Club
- Presented by David J Kirk

# Outline

- What is DNA and how is it passed from parent to child?
- Testing
  - What tests are available?
  - What companies do it?
  - How is the sample collected?
  - How much does it cost?

# Outline

- Results
  - Genealogy
  - Solving cold cases
  - Finding adoptee's biological parents
  - Ethnicity

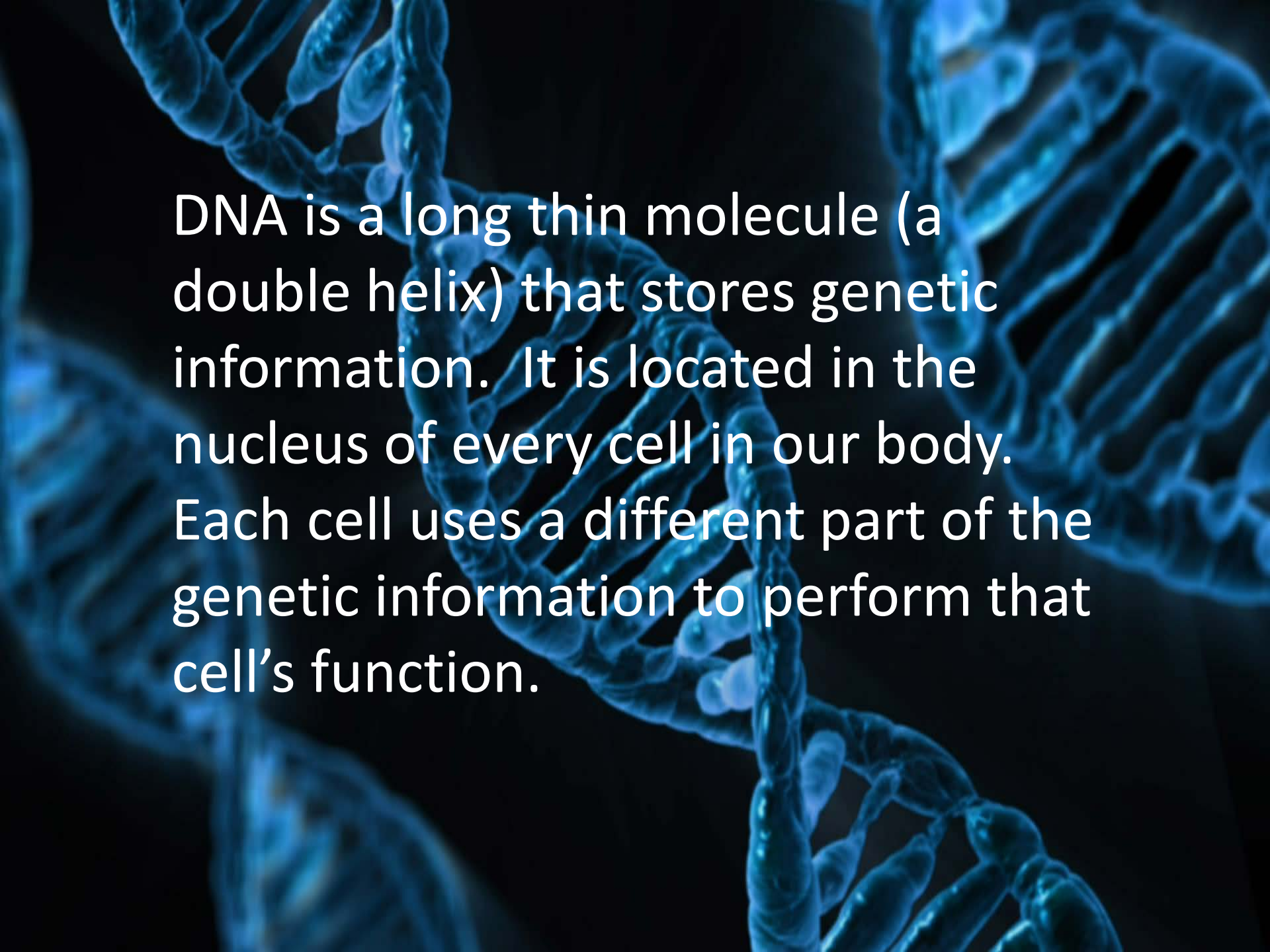
# CAUTION

Geni-allergy is VERY contagious  
and extremely difficult to treat.



DNA

DeoxyriboNucleic  
Acid

A glowing blue DNA double helix structure is shown against a dark background. The helix is composed of two intertwined strands connected by horizontal rungs, representing the base pairs. The structure is illuminated from within, giving it a translucent, ethereal appearance. The text is overlaid on the central part of the helix.

DNA is a long thin molecule (a double helix) that stores genetic information. It is located in the nucleus of every cell in our body. Each cell uses a different part of the genetic information to perform that cell's function.

# The DNA We Look At

- DNA within chromosomes
  - There are 23 pairs of chromosomes.
    - 22 pairs that do not determine sex (autosomal)
    - Plus either an X/Y pair (for males) or an X/X pair (for females)
    - Y DNA can be used to follow the male line
- Mitochondrial DNA (mtDNA)
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- DNA is passed from parents to a child in a different manner for each type of DNA



# How Is DNA Passed To A Child?

*(X/Y and mtDNA)*

- Male child gets an X chromosome from his mother and his father's Y chromosome.
  - This means that typically the Y chromosome follows a surname. It mutates slowly.

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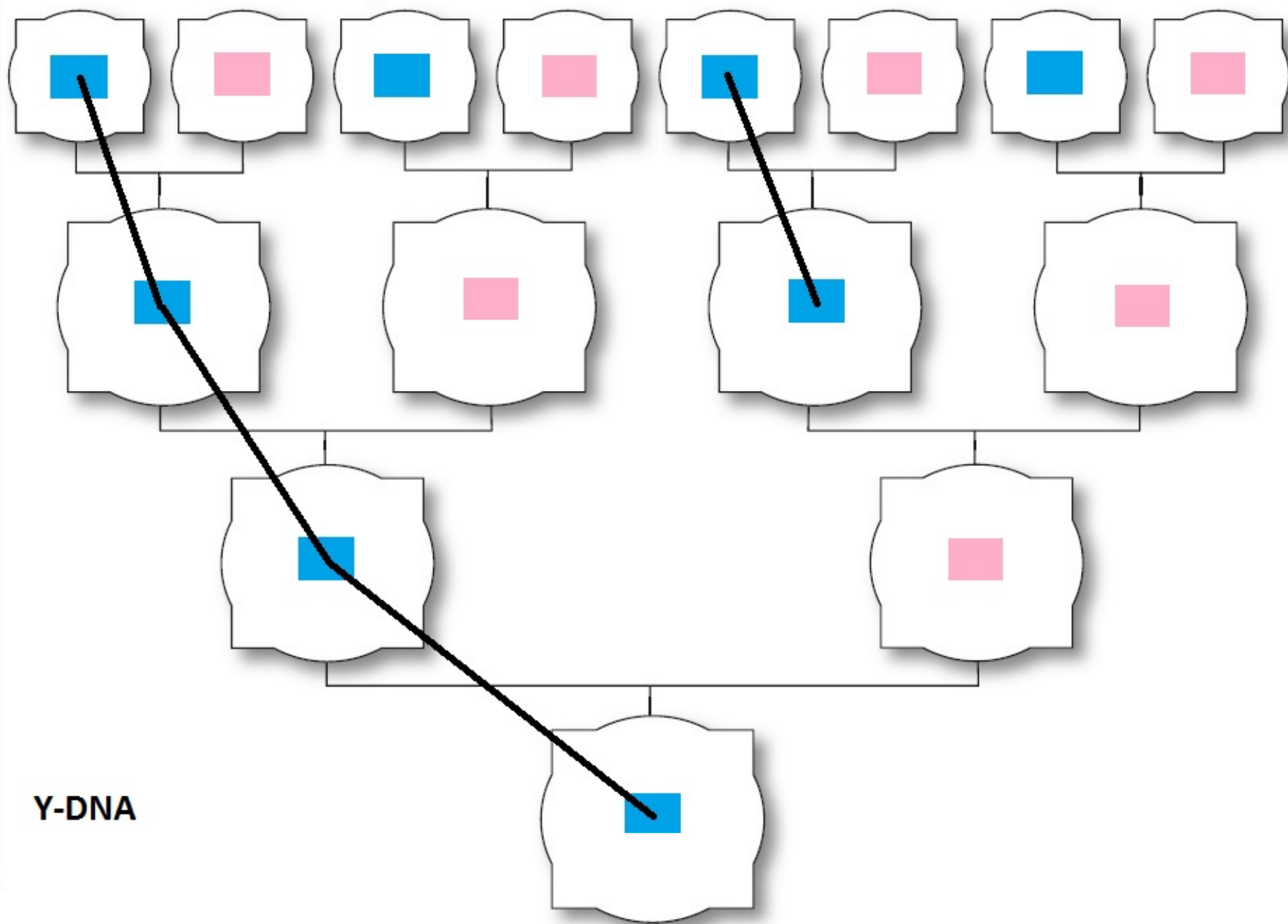
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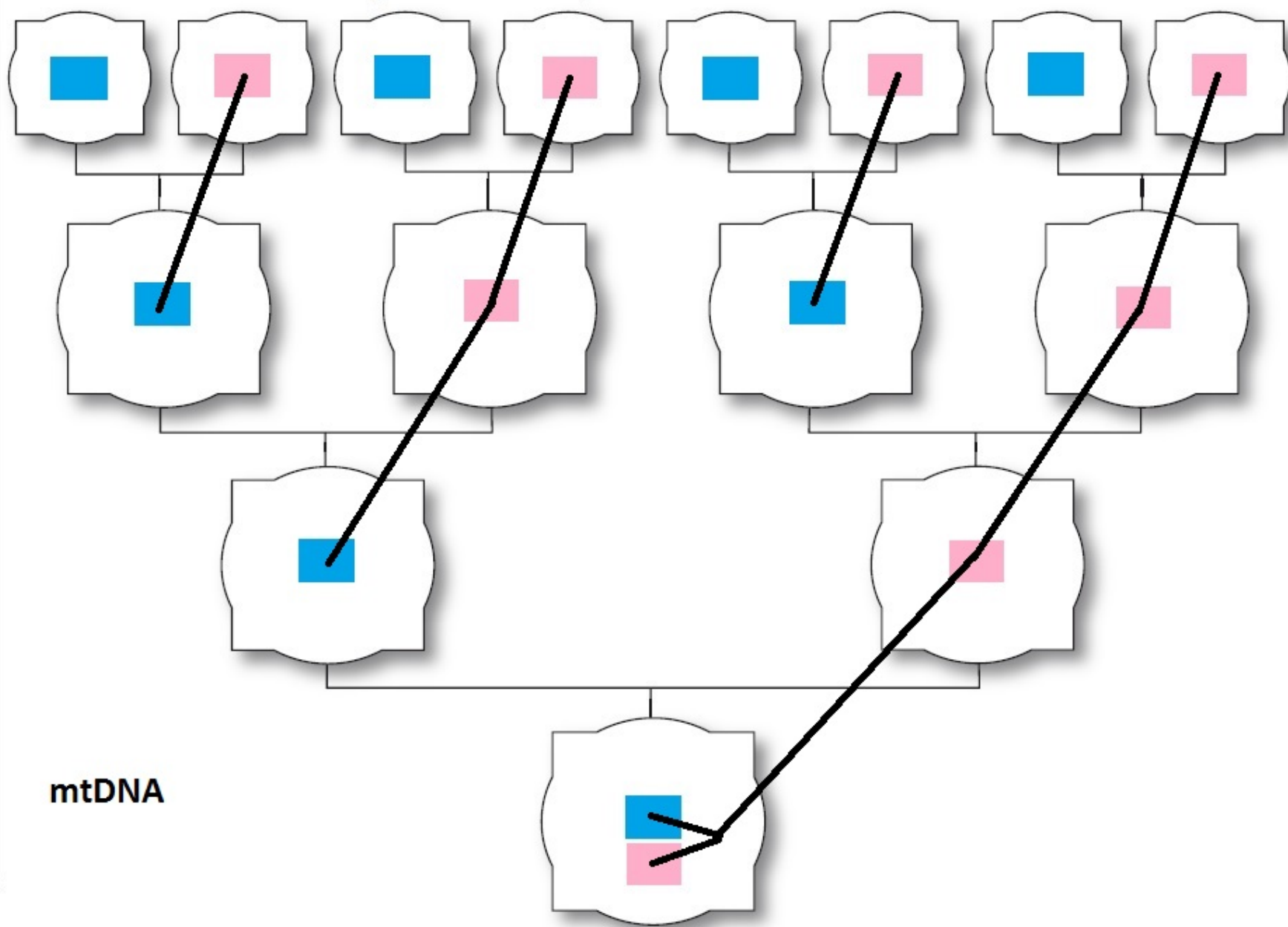
# How Is DNA Passed To A Child?

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- Female child gets an X chromosome from her mother and her father's X chromosome.
- All children get their mtDNA from their mother.
  - This means that both males and females have their mother's mtDNA, but only the females can pass it on to the next generation. It mutates extremely slowly.



Y-DNA



Generation 2 - 2 parents

Generation 3 - 4 grandparents

Generation 4 - 8 gr-grandparents

Generation 5 - 16 gr-gr-grandparents

Generation 6 - 32 gr-gr-gr-grandparents

Generation 7 - 64 gr-gr-gr-gr-grandparents

Generation 8 - 128 gr-gr-gr-gr-gr-grandparents

Generation 9 - 256 gr-gr-gr-gr-gr-gr-grandparents

Generation 10 - 512 gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 11 - 1,024 gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 12 - 2,048 gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 13 - 4,096 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 14 - 8,192 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 15 - 16,384 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 16 - 32,768 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 17 - 65,536 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

Generation 18 - 131,072 gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-gr-grandparents

**And you want to know if I am *finished* with my family tree?**

# How Is DNA Passed To A Child?

## *(Autosomal)*

- Chromosomes 1 to 22 are called the autosomal chromosomes.
- For each of the 22 chromosomes, a child (regardless of sex) will receive 50% of that chromosome from the mother and 50% of that chromosome from the father.  
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- Siblings and fraternal twins have different recombinations of each chromosome.
- Identical twins have the same recombination.

# Autosomal DNA Amounts

Common Ancestors	Average Amount of DNA	Relationship
Grandparents	25%	1 <sup>st</sup> Cousin
Great-Grandparents	12.5%	2 <sup>nd</sup> Cousin
2 <sup>nd</sup> Gt-Grandparents	6.3%	3 <sup>rd</sup> Cousin
3 <sup>rd</sup> Gt-Grandparents	3.1%	4 <sup>th</sup> Cousin
4 <sup>th</sup> Gt-Grandparents	1.6%	5 <sup>th</sup> Cousin

# What DNA Tests Will NOT Do

A single DNA test will NOT tell you exactly where a potential match fits in your family tree.

- This still requires confirming the common ancestor using standard genealogy research by you and the person matched.

# DNA Testing for Genealogy

Major companies providing services:

- Family Tree DNA (FTDNA)
- Ancestry DNA
- MyHeritage DNA
- 23andMe (originally health oriented)

# Available Tests

- Y-DNA
  - Only available at FTDNA
- mtDNA
  - Only available at FTDNA
- Autosomal (includes X)
  - Available at all companies
  - Known as “Family Finder” at FTDNA
  - Identifies relatives who have tested
  - **Generates ethnicity estimates**

# Cost of Autosomal Tests


<u>Company</u>	<u>Price*</u>
Ancestry	\$69
Family Tree DNA	\$79
My Heritage	\$59
23andMe	\$99 (more for health info)

\*As of Jan 26, 2019. Shipping not included. There are frequent sales.

# Testing Process

- Order kit
- Register
- Collect sample
  - Ancestry and 23andMe use saliva.
  - FTDNA and MyHeritage use a cheek swab.
- Send sample to lab
- Get email saying results are ready
- Go online to view results

# FTDNA Autosomal Results - Jack

All (227)			
 Paternal (2)			
 Maternal (69)			
 Both (2)			
Name	Relationship Range	Shared Centimorgans	Linked Relationship
<u>Janet</u>	Full Sister	2,460	Sister
   			
<u>Judy</u>	Half Sister, Grandmother/ Granddaughter, Aunt, Niece	1,812	Niece
   			
<u>Jill</u>	Half Sister, Grandmother/ Granddaughter, Aunt, Niece	1,511	Half Sister
   			
<u>Jim</u>	1st Cousin - 2nd Cousin	469	1st Cousin 1R
   			
<u>Joe</u>	2nd Cousin - 3rd Cousin	195	2nd Cousin
   			
<u>Julia</u>	2nd Cousin - 4th Cousin	77	
  			



# Finding Matches Between Companies

- Many testing companies (not Ancestry) now accept raw data from another company.
- There are Internet sites (e.g., GEDmatch) that allow you to upload your raw data from most testing companies.

# Testing Multiple Family Members

This can be advantageous for several reasons.

- Testing siblings helps because of issues of “recombination” – two siblings will get some different parts of their parents’ DNA.
- Testing close relatives helps because it may provide insight as to which side of the family to look for the common ancestor.

# Warning

- Delving into DNA waters can put you face to face with something you may find difficult to accept.
- “The Stranger in My Genes” – Bill Griffeth

## DNA in the News

The Sacramento County District Attorney says the arrest made in the **Golden State Killer** case was largely in thanks to “genealogy and very dogged detective work”.

*April 27, 2018 – AP*

# ABC News – Dec 20, 2018

- "In a genetic genealogy database we can reverse engineer the [suspect's family] tree from their distant relatives who have submitted DNA", CeCe Moore said.
- The new technique, started this year with the "Golden State Killer", has identified suspects in over two dozen cases.

# Solving Cold Cases

- Analyze DNA kept from old crime scene
- Convert data into form for GEDmatch and load
- Analyze close matches and develop their trees
- Find suspect who is common to those trees
- Verify

# Solving Cold Cases

## Finding Biological Parents

- Analyze DNA from old crime scene
- Convert data into form for GEDmatch and load
- Analyze close matches and develop their trees
- Find suspect who is common to those trees
- Verify
- Test DNA of adoptee
- Upload to all sites including GEDmatch
- Analyze close matches and develop their trees
- Find potential parent who is common to those trees

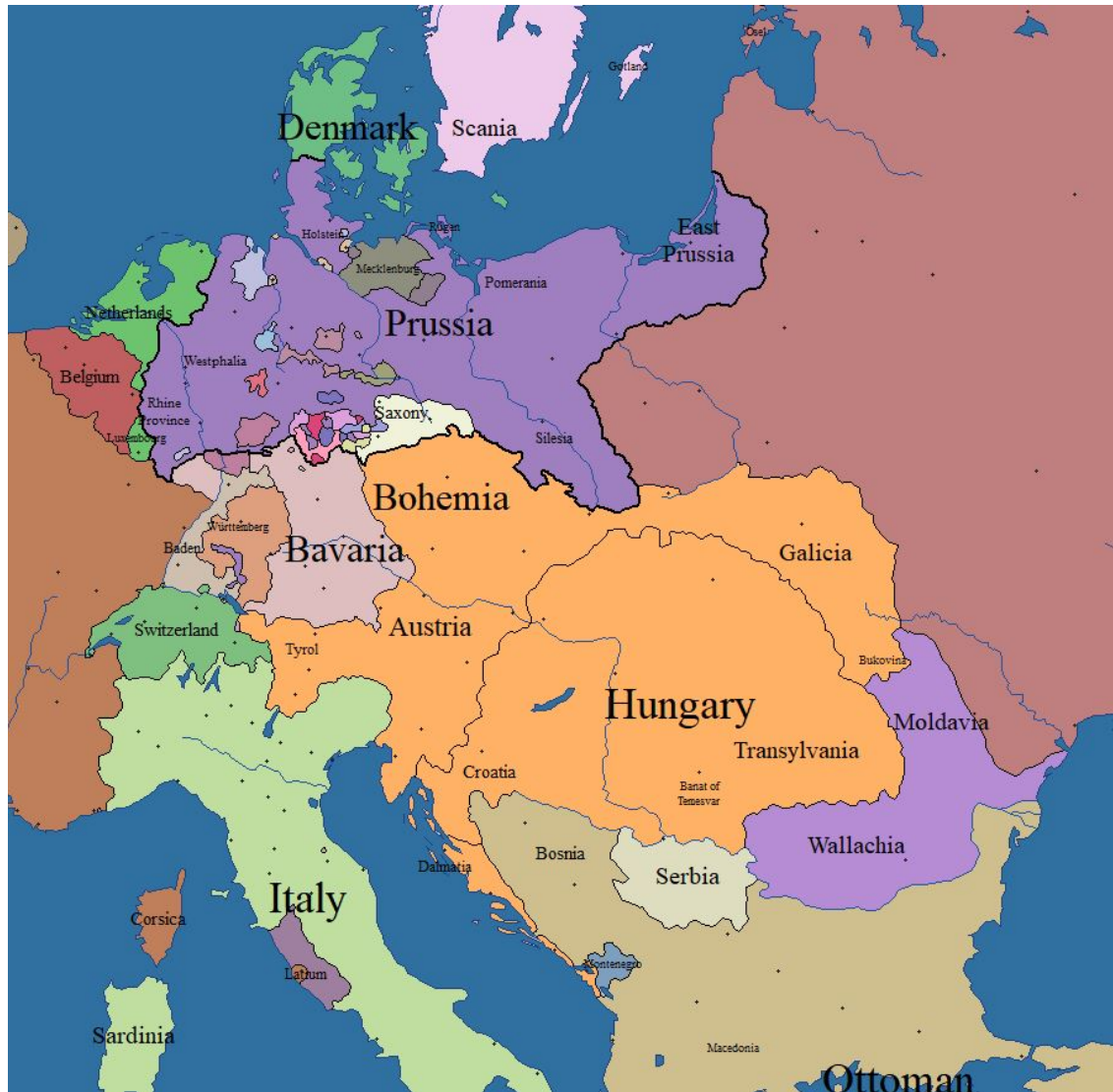
# DNA Ethnicity

- This gets a lot of interest, if for no other reason than AncestryDNA's TV ads.
- It is one of the lesser accurate areas of results.



# Definition

- ethnic: of or relating to large groups of people classed according to common racial, national, tribal, religious, linguistic, or cultural origin or background (*Merriam-Webster*)
  - No reference to how long ago this commonality existed
  - No requirement for the individual to currently exhibit those same commonalities



**Ca 1869 – Centennia Historical Atlas**

# DNA Ethnicity

- Each of the testing companies has divided the world into different groupings – mostly geographic areas.
- Each company has developed their own representative DNA pattern for each group.
- Each company has their own algorithm which compares your DNA against those “typical” DNA patterns to determine in which groups you likely belong.

# My Ancestors

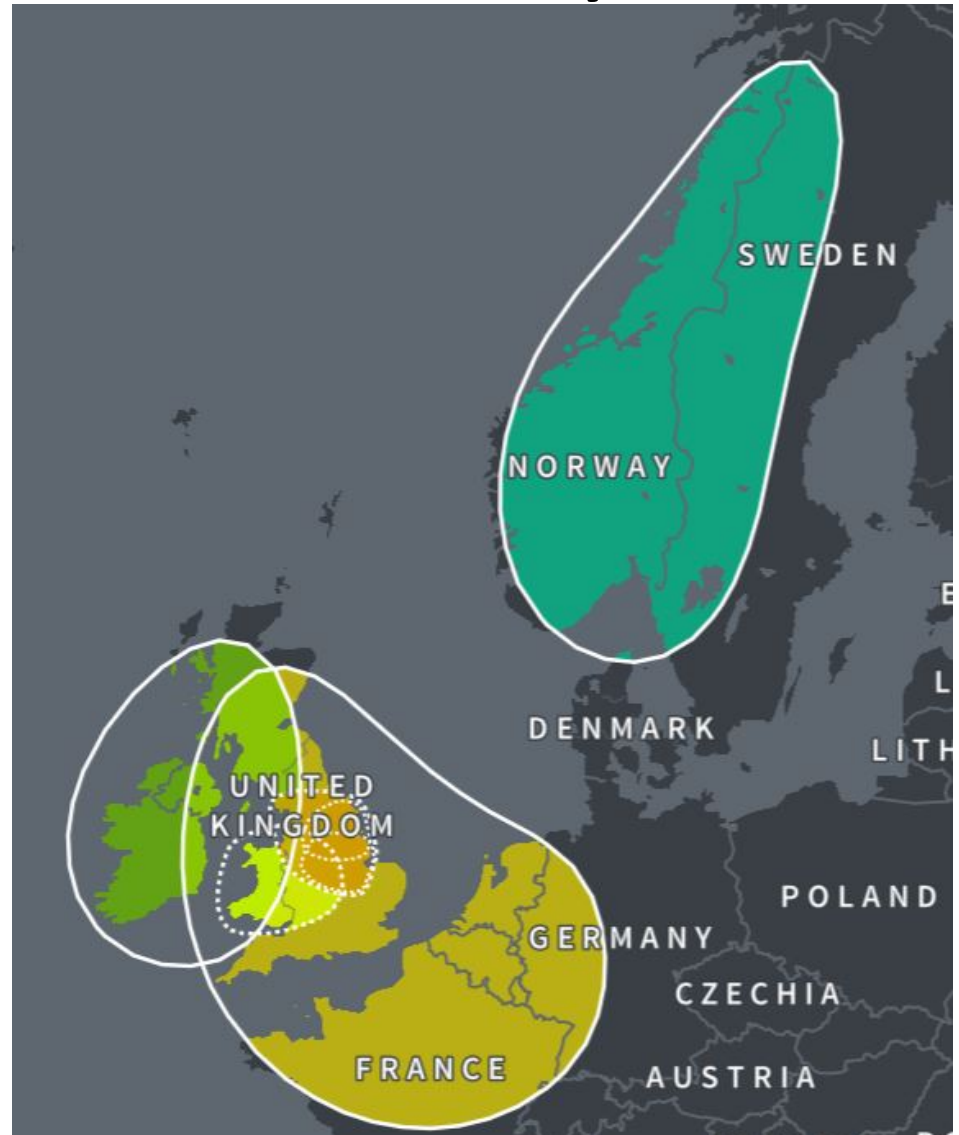
- I was born in England
- My genealogy research has found:
  - all 8 of my great-grandparents
  - 15 (of 16) 2<sup>nd</sup> great-grandparents
  - 27 (of 32) 3<sup>rd</sup> great-grandparents (births ca. 1800)  
(Some of the lines found back to early 1700's)
- Every ancestor found was born in England, almost all of them within 2 northern counties.

# Ancestry DNA Ethnicity

## Ethnicity Estimate

Updates [i](#)

● England, Wales & Northwestern Europe	93%
● Ireland and Scotland	5%
● Norway	2%



# Comparing Across Three Companies

AncestryDNA	FTDNA	MyHeritage
England, Wales and NW Europe -- 93%	British Isles -- 97%	English -- 69%
Ireland and Scotland -- 5%		North and West Europe -- 23%
Norway -- 2%		Iberia -- 7%

# England History

- 1<sup>st</sup> Century BC through 4<sup>th</sup> Century AD
  - Roman Empire
- 5<sup>th</sup> Century
  - Angles (northern Germany), Saxons (northern German plains), Jutes (Denmark), Frisians (coastal Germany and Netherlands)
- 8<sup>th</sup> and 9<sup>th</sup> Centuries
  - Viking invasions (Scandinavia)
- 1066
  - Norman Conquest (northern France)

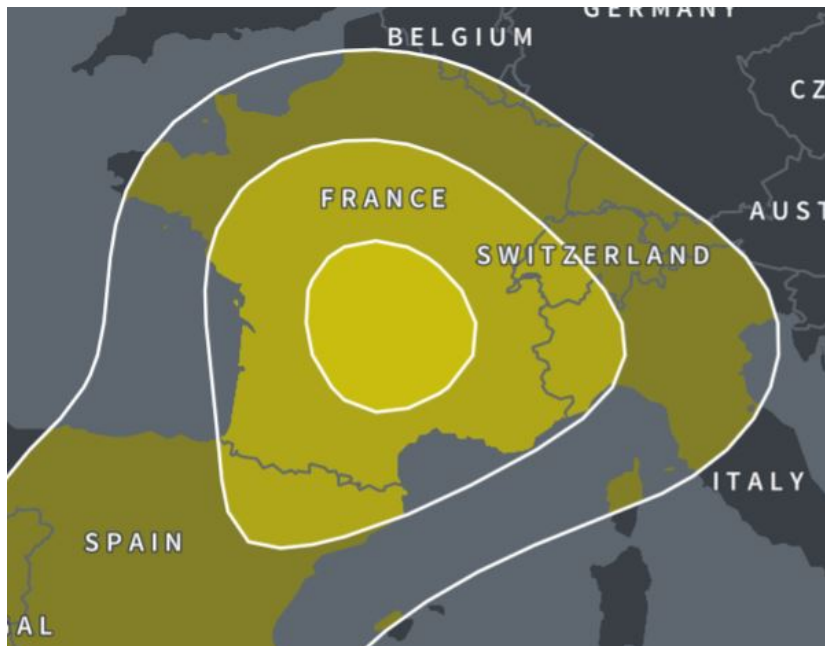
# Full Siblings Comparison

FTDNA	MyHeritage
Scandinavia-- 32%	Scandinavian -- 35%
British Isles -- 58%	Irish, Scottish, Welsh -- 44%
	North and West Europe -- 17%
Southeast Europe -- 9%	Iberia -- 3%
FTDNA	MyHeritage
Scandinavia -- 27%	Scandinavian -- 27%
British Isles -- 68%	English -- 14%
	North and West Europe -- 57%



# Ethnicity Perfection

- All 8 great-great grandparents on paternal side were born in Lower Canada (Quebec)
- Both grandparents on maternal side were born in Quebec



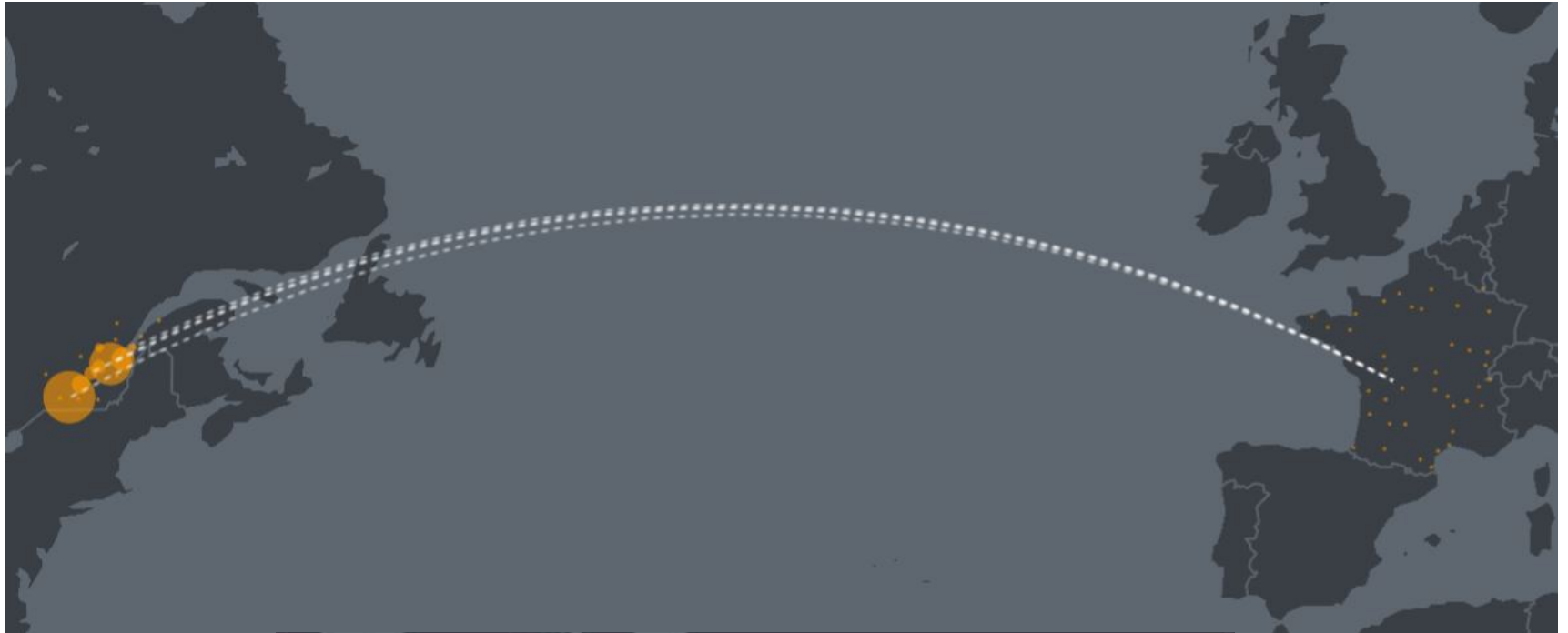
## < France

Primarily located in: **France**



Range: 97%—100%

# France to French Canada



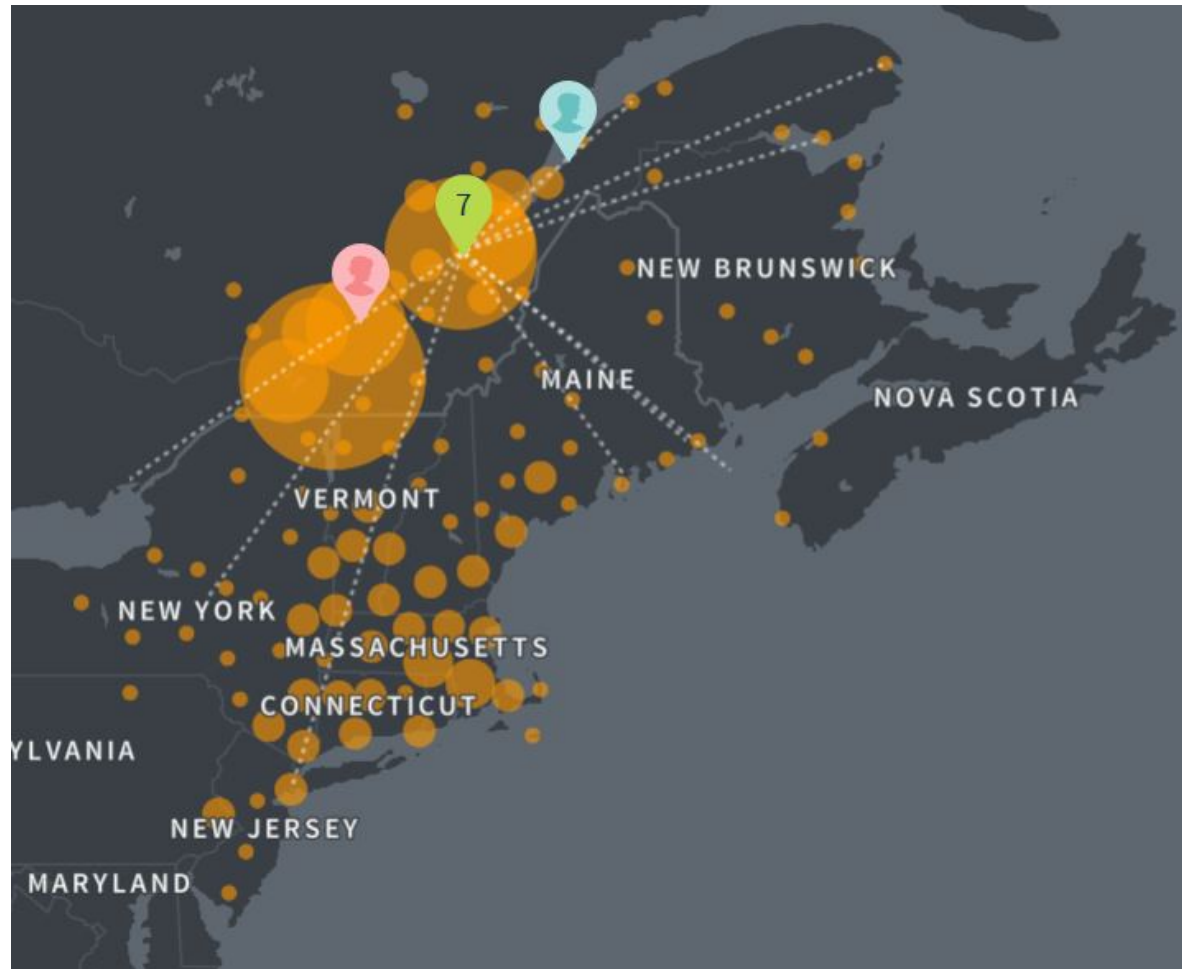
**1700–1750**



 **Saint Lawrence River French Settlers**

 Lonely Settlers in New France

# French Canada to USA



# Ethnicity – My Opinion

- In most cases, unless you do not know much about one or both of your parents, it is not going to show you anything you didn't already know.
- I suspect this will improve in the future, and you probably won't need to re-test.

# Summary

For genealogy studies:

- DNA testing is helpful but not a silver bullet.
- Decide what your goal is before choosing who to test and what tests to do.
- Do Autosomal on both sides of your tree.
- All other things being equal, test elderly people first.

*Thank you.*

And remember –

Old genealogists don't die ... they  
just lose their census.

A series of white lines of varying lengths and angles, located in the bottom right corner of the slide, creating a modern, abstract graphic element.