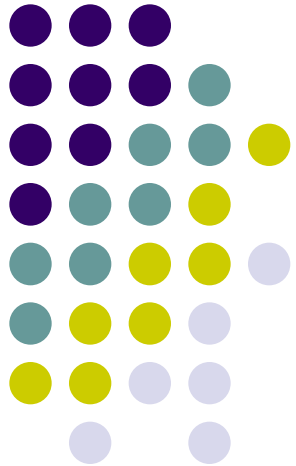
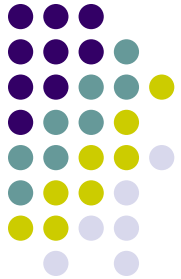
Family History Research Using Genetic Genealogy



Genetic Genealogy



- DNA Testing Companies
- Three most common types of testing using DNA
  - Y-DNA
  - mtDNA
  - Autosomal DNA (atDNA) (including X-dna)
- DNA Analysis Tools

Genetic Genealogy

- Main testing companies to choose from:

- Family Tree DNA - www.familytreedna.com
  - Y-dna ($139USD), mtDNA ($79-199USD), atDNA ($79, includes ethnicity, not medically focussed)
  - Accepts transfers from some other testing companies (possibly free, or ~$19USD)
- 23 and ME – www.23andme.com
  - atDNA ($249CDN, includes ethnicity, medically focussed)
- Ancestry – www.dna.ancestry.com
  - atDNA ($149CDN, includes ethnicity, not medically focussed)
- MyHeritage - www.myheritage.com
  - atDNA $79USD, accepts dna transfers for free
- LivingDNA - www.livingdna.com
  - atDNA $143CDN, plans to accept transfers in the near future

- ***https://isogg.org/wiki/Autosomal_DNA_testing_comparison_chart (comparison details)**

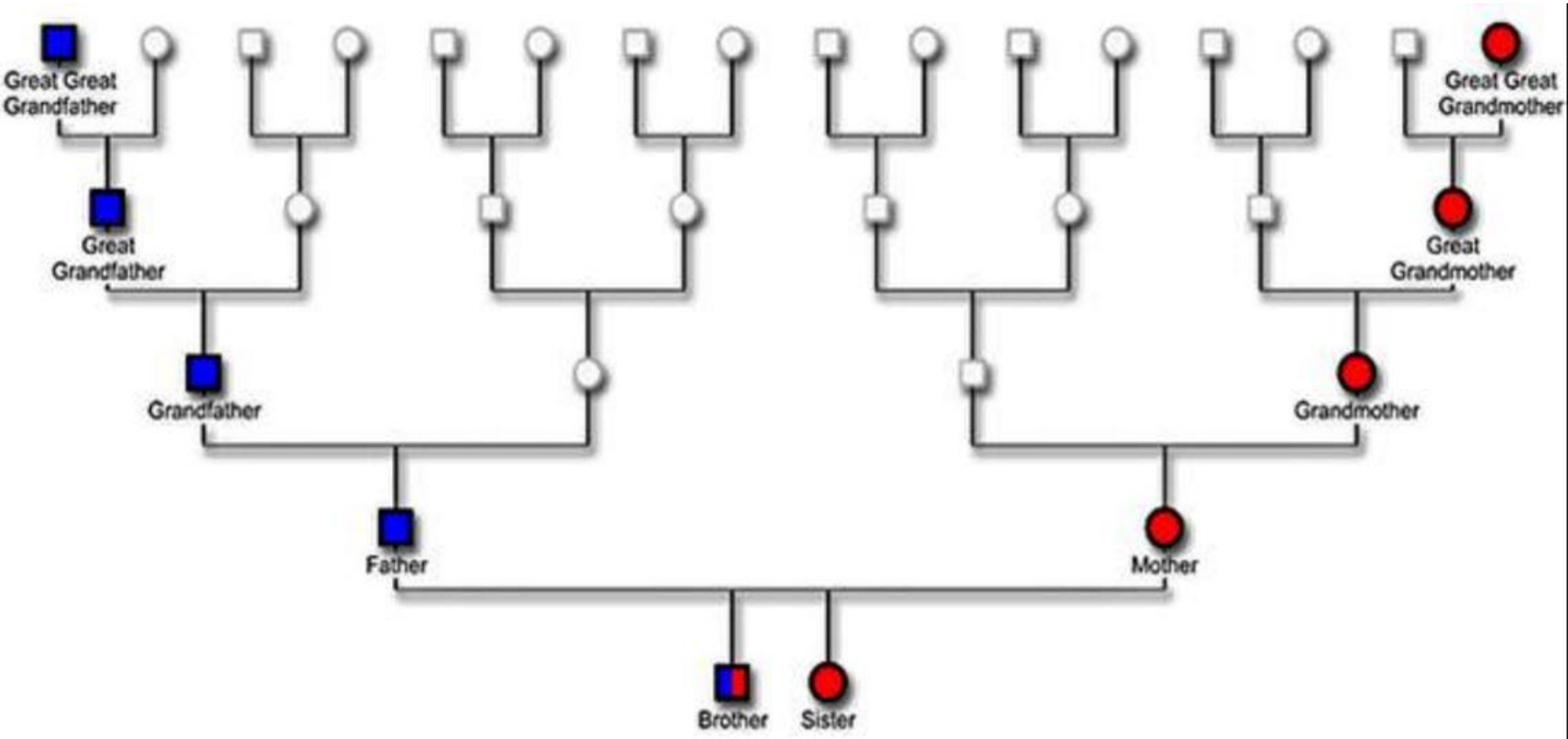
Genetic Genealogy

- Three most common types of testing using DNA
  - Y-DNA
  - mtDNA
  - Autosomal DNA (atDNA) (including X-dna)

  - Each tests a different type of dna and they CANNOT be compared to each other ! Don't compare apples to oranges!

Genetic Genealogy

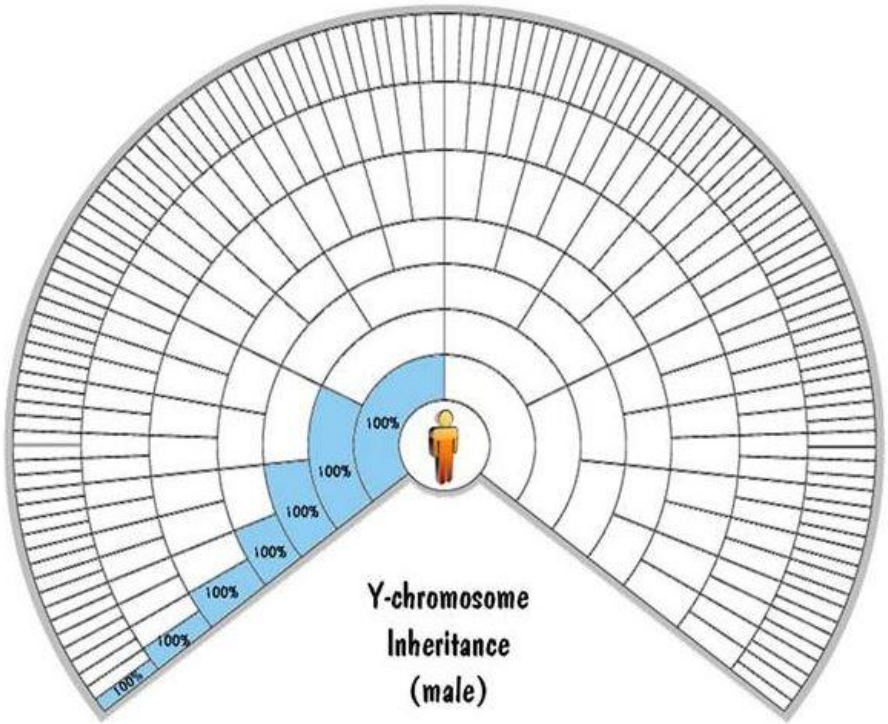
- Y-DNA for direct male line (test for men only)
- mtDNA for direct female line (test for men and women)

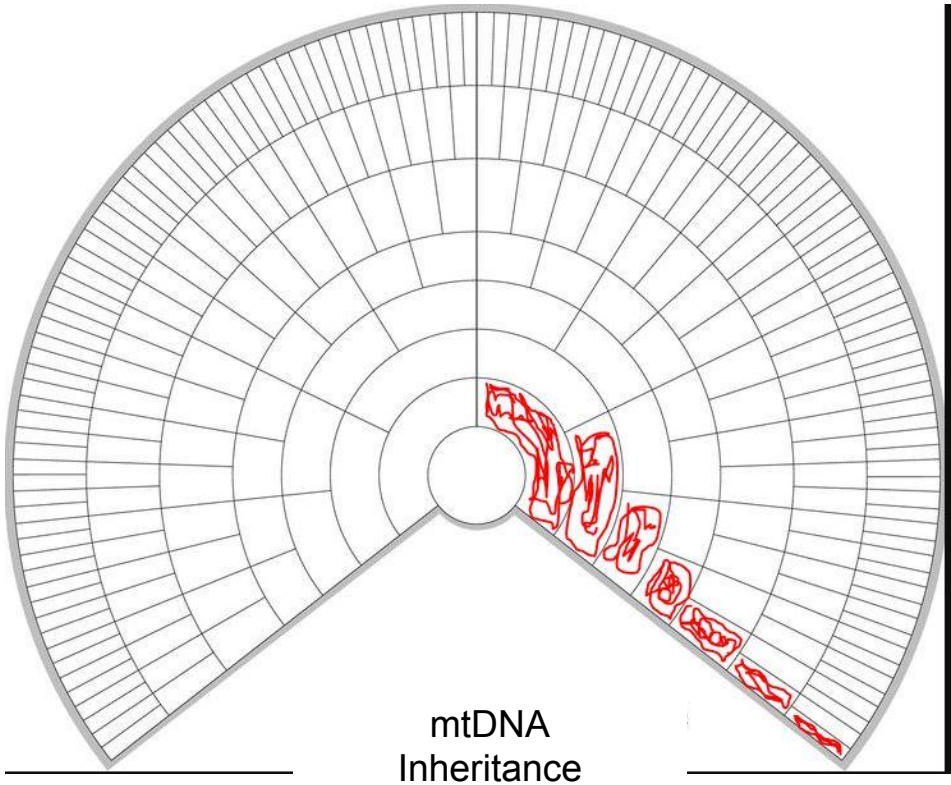


Genetic Genealogy

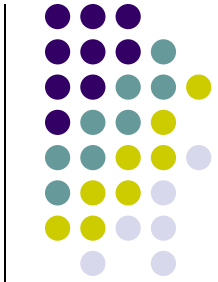
- Y-DNA

mtDNA



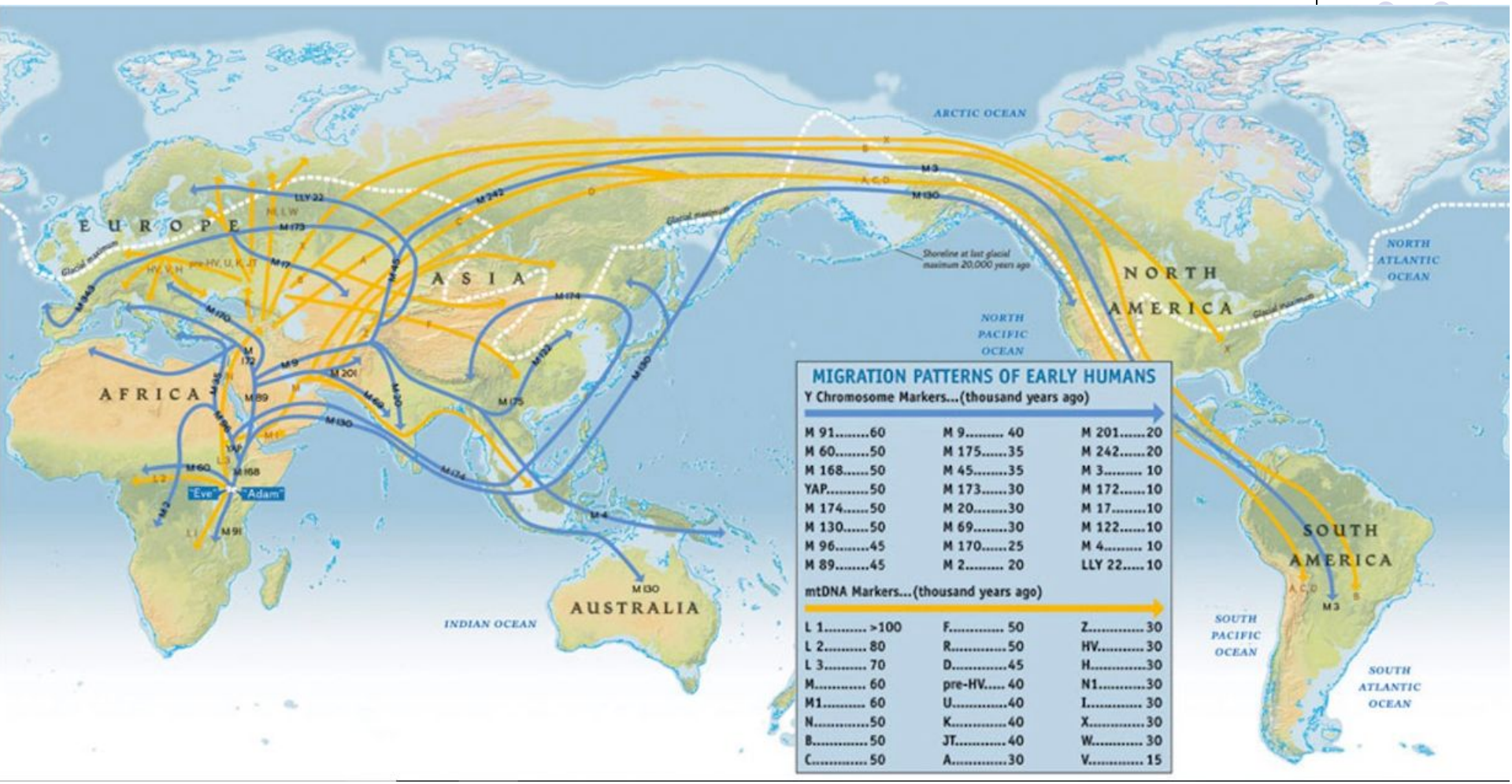


Genetic Genealogy

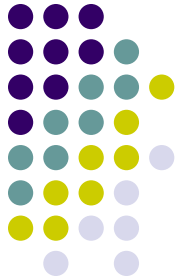


- Y-DNA genetic testing
  - The y chromosome is only passed down from a man to his son.
  - Every man has a y chromosome that has been passed down to him from thousands and thousands of generations of fathers to sons going back into the dawn of humanity (National Genographic Project).
  - Since the start of the use of surnames fathers have tended to pass on their surname along with a y chromosome
  - “Surname” projects have become very popular as people try to link together groups of men with a certain surname.

Genographic Project



Genetic Genealogy



- Y-DNA genetic testing
  - Matching y-dna results on top of a similar surname indicates that two individuals almost certainly share a common ancestor.
  - The number of mutations that exist between two “matching” individuals gives a measure of the amount of time going back until the two individuals link up to the same male ancestor whose y chromosome they both inherited.
  - Matching with a person who has a more “proven” family tree can give you a good idea on your own family line (focussed research)
  - Y-dna will only give info on your one direct line back along your father to father ancestry.

Genetic Genealogy

- Y-DNA genetic testing
  - Because there are different levels of tesing the y-dna, the number of differences between two individuals must be considered in conjunction with the amount of markers. The number of markers tested can be 12, 25, 37, 67, and 111 markers. For useful results at least 37 markers is recommended.

TMRCA at 90% Confidence for Y-chromosome Tests*

Number of Markers	Genetic Distance											
	0	1	2	3	4	5	6	7	8	9	10	11+
111	4	7	9	11	14	16	18	20	22	24	26	
67	6	10	13	17	20	23	26	29	32	34		
37	8	12	17	21	24	28						
25	18	29	39	49								
12	48	78	103									

* Data derived using J. D. McDonald's TMRCA Calculator (http://dna-project.clan-donald-usa.org/tmrca.htm)

Probably not related	Possibly related	Probably related	Related	Tightly related	Very tightly related

Genetic Genealogy

Y-DNA TiP Report

In comparing Y-DNA 111 marker results, the probability that **Mr. I** **Porteous** and **Mr. J. Porteous** share a common ancestor within the last...

COMPARISON CHART	
Generations	**Percentage**
4	12.11%
8	60.43%
12	90.12%
16	98.28%
20	99.76%
24	99.97%

Refine your results with paper trail input

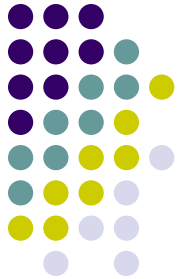
If traditional genealogical records indicate that a common ancestor between you and your match could not have lived in a certain number of past generations, your TiP results can be refined. Note, if you are not sure of this information, you should not change the value of "1" below.

Mr. I **Porteous** and **Mr. J. Porteous** did not share a common ancestor in the last 1 generation(s).

Markers 111 ▾ Display every 4 generations. ▾ RECALCULATE

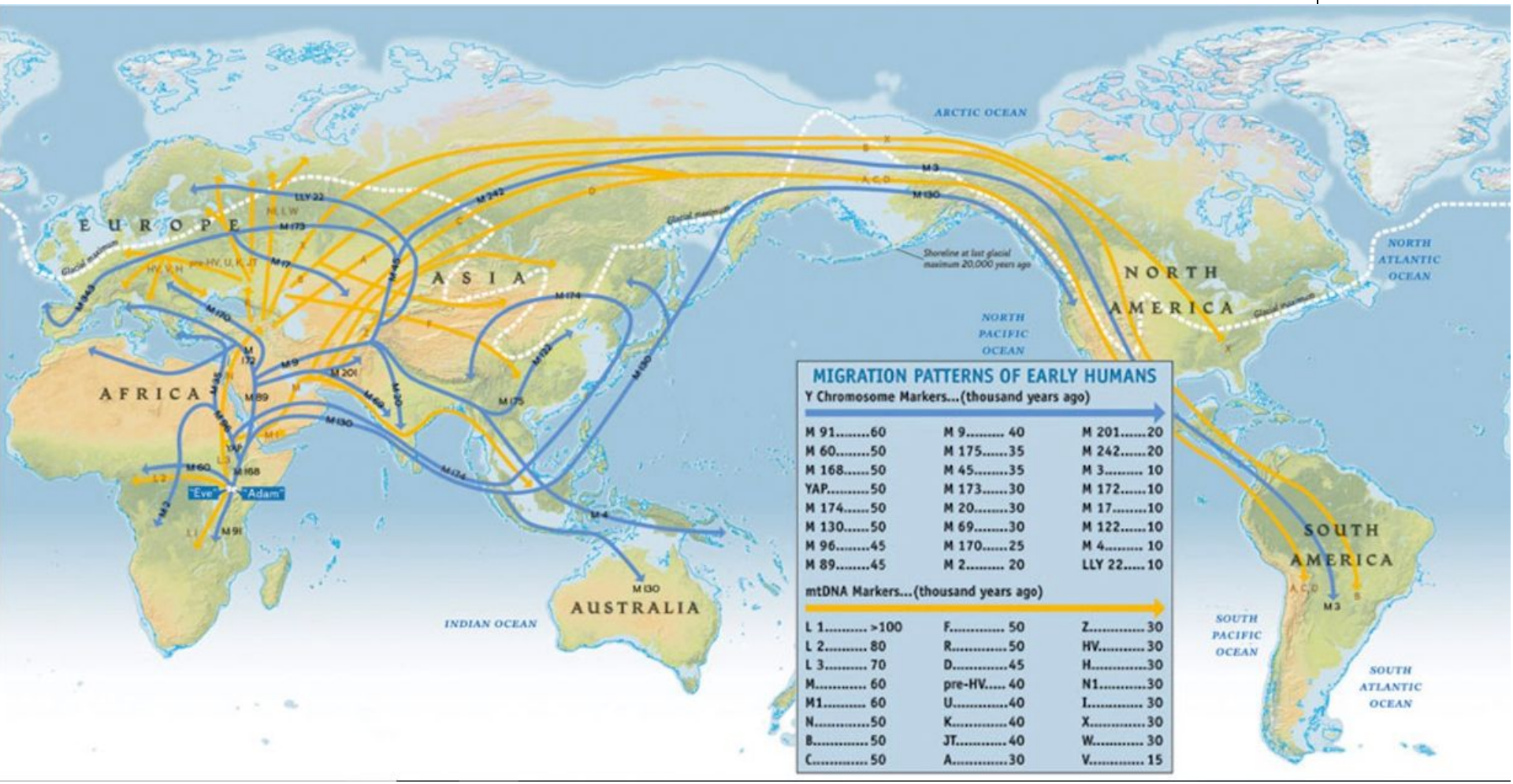
Since each marker has a different mutation rate, identical Genetic Distances will not necessarily yield the same probabilities. In other words, even though **Mr. J. Porteous** has a Genetic Distance‡ of 6 from **Mr. I** **Porteous**, someone else with the same Genetic Distance may have different probabilities, because the distance o was prompted by mutations in different markers, with different mutation rates.

Genetic Genealogy

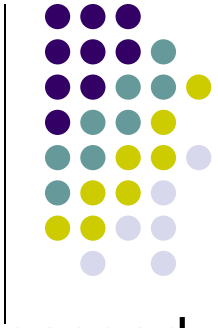


- mtDNA genetic testing
  - Mitochondria are part of the make up of every cell in our bodies and help in the generation of energy.
  - They possess their own dna or mtDNA
  - mtDNA is only inherited from your mother

Genographic Project

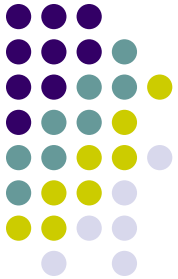


Genetic Genealogy



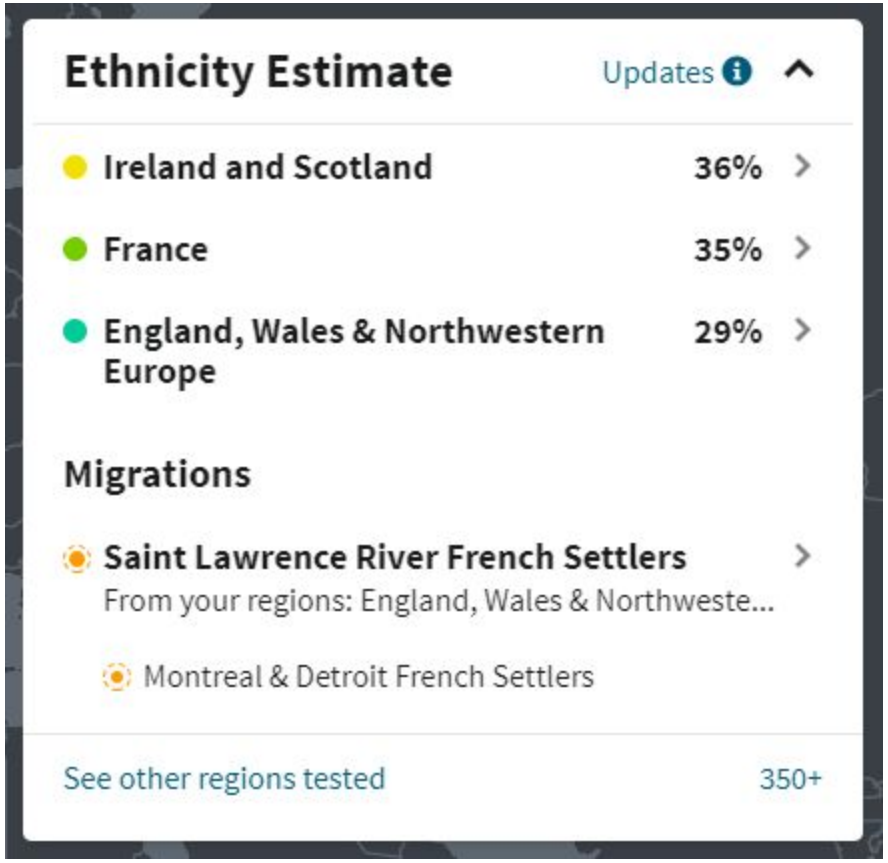
- mtDNA genetic testing
  - This means that each of us has mtDNA that has been passed on unbroken going back along a mother to child for thousands of years
  - mtDNA projects, similar to y-dna surname projects, are being created to link together people possessing the same mtDNA.
  - The number of mutations between “matching” persons indicates the time back to a common ancestor.
  - Less common than surname projects as mtDNA “matches” will not share any common surname. Getting back to the common female ancestor requires figuring out the name of each successive generation of direct female ancestors.
  - Can be used to confirm “relatedness” if direct female descent from a common female ancestor is suspected.

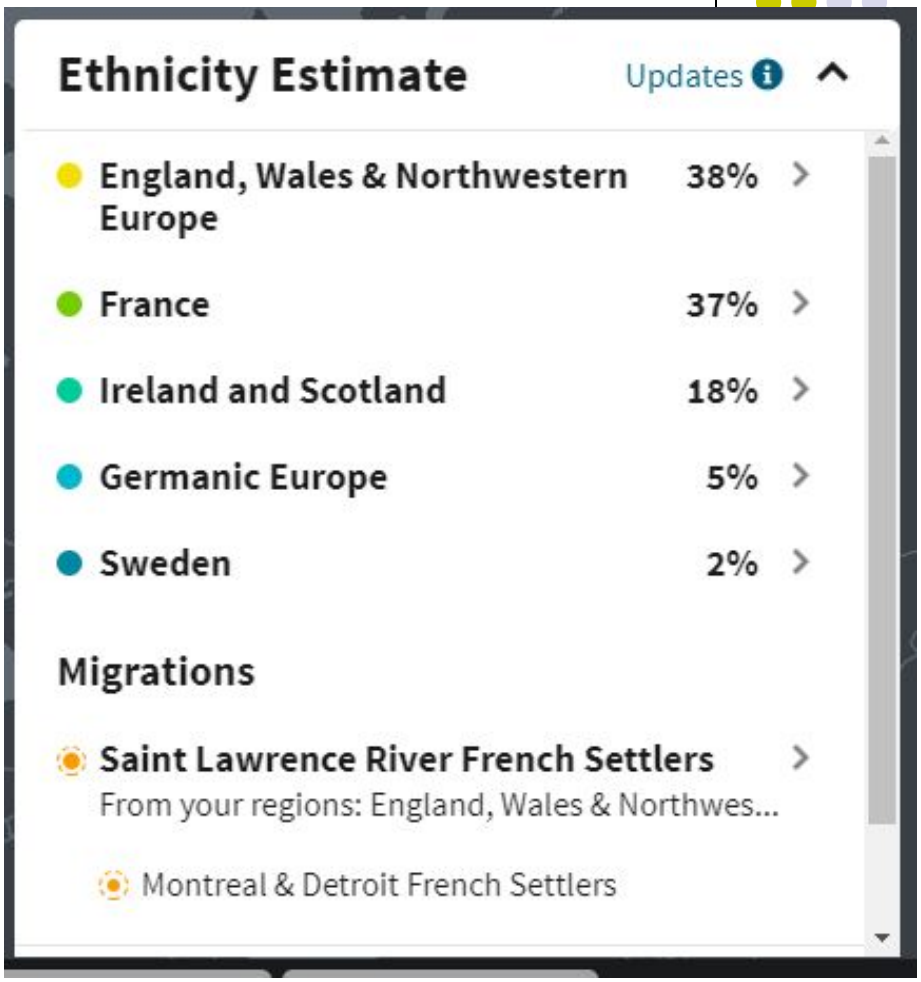
Genetic Genealogy



- Autosomal DNA genetic
  - Unlike the previous two types of testing that can allow connections back hundreds of years in the past, autosomal dna testing is for trying to make a “recent” genetic connection
  - “matches” through this testing can find relatives out to ~ 5th cousins, which would be for people who share 4x great grandparents. For us that’s back to ~1750-1800
  - very popular with non-genealogist for their “ethnicity” reports (AncestryDNA commercials). I don’t spend much time on this AT ALL!

Genetic “Ethnicity” (Ancestry)

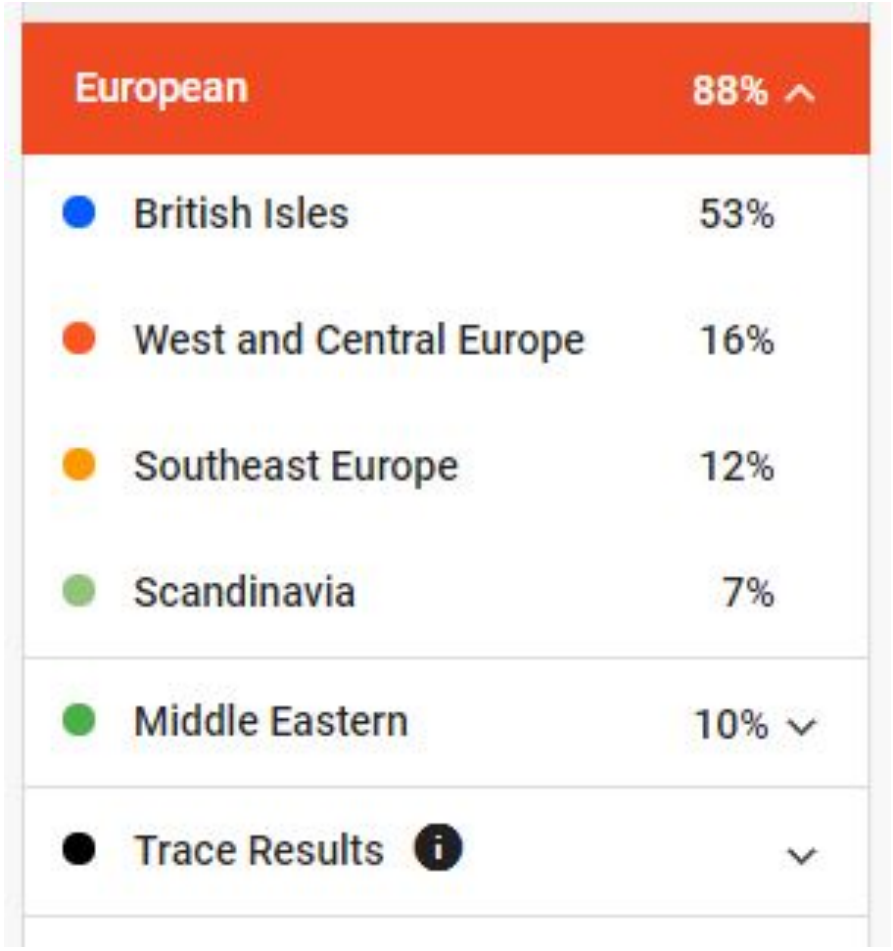


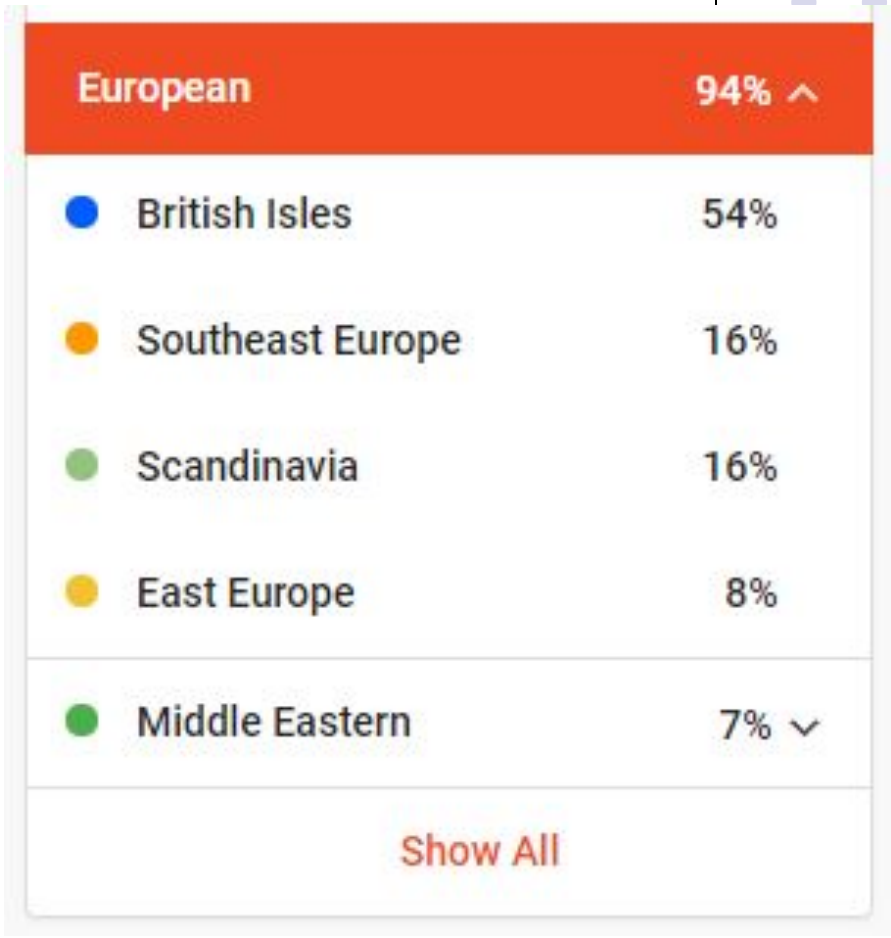


my brother

me

Genetic “Ethnicity” (FTDNA)

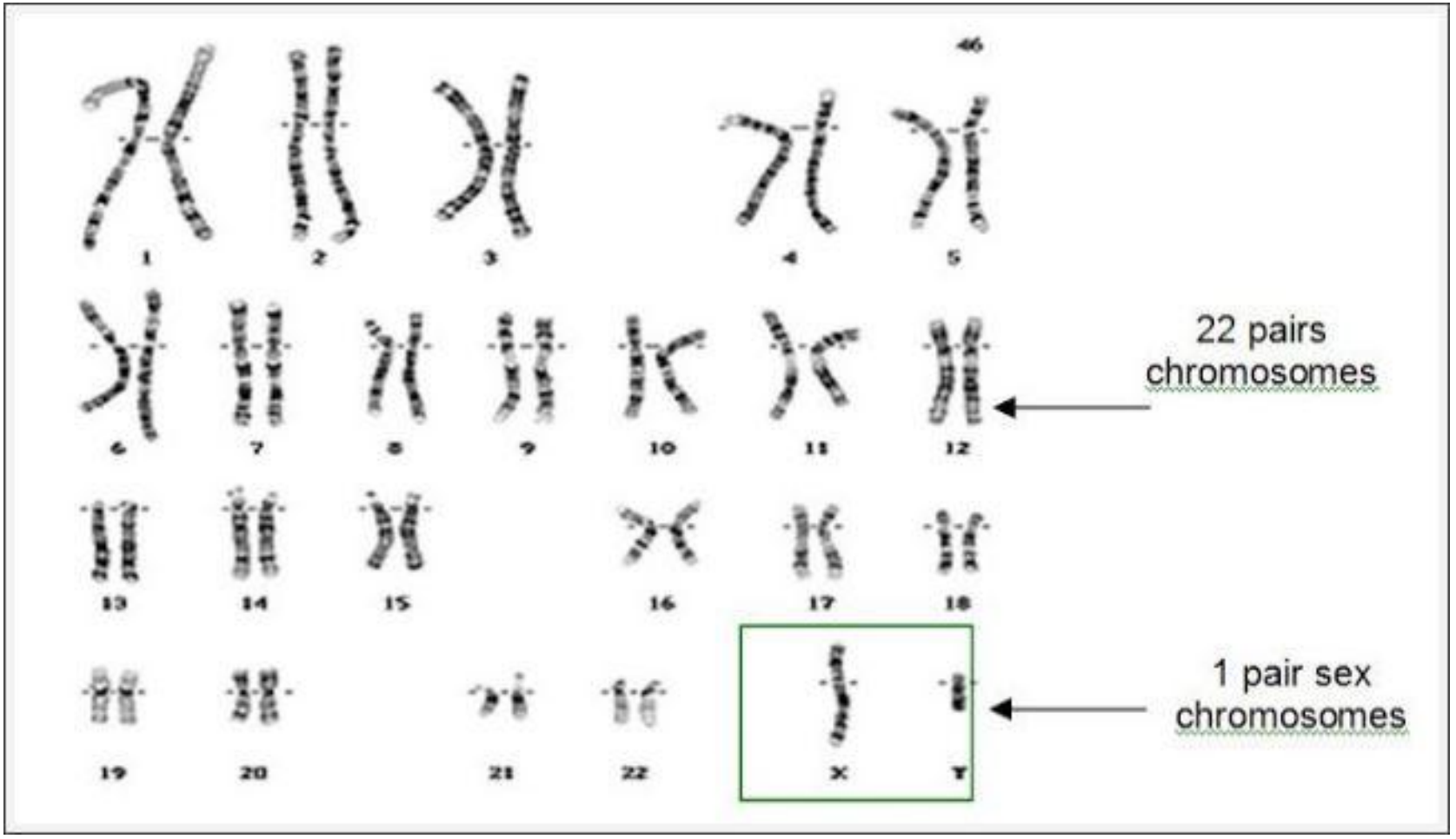




my sister **me**

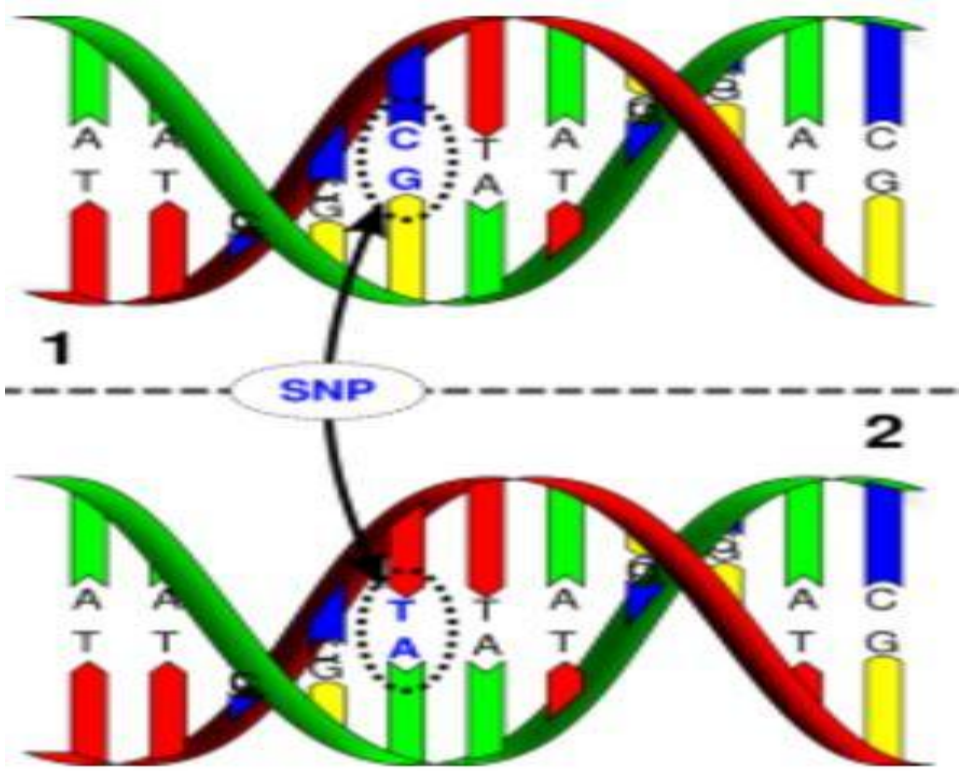
Genetic Genealogy

- Autosomal DNA (atDNA) (including X-dna)



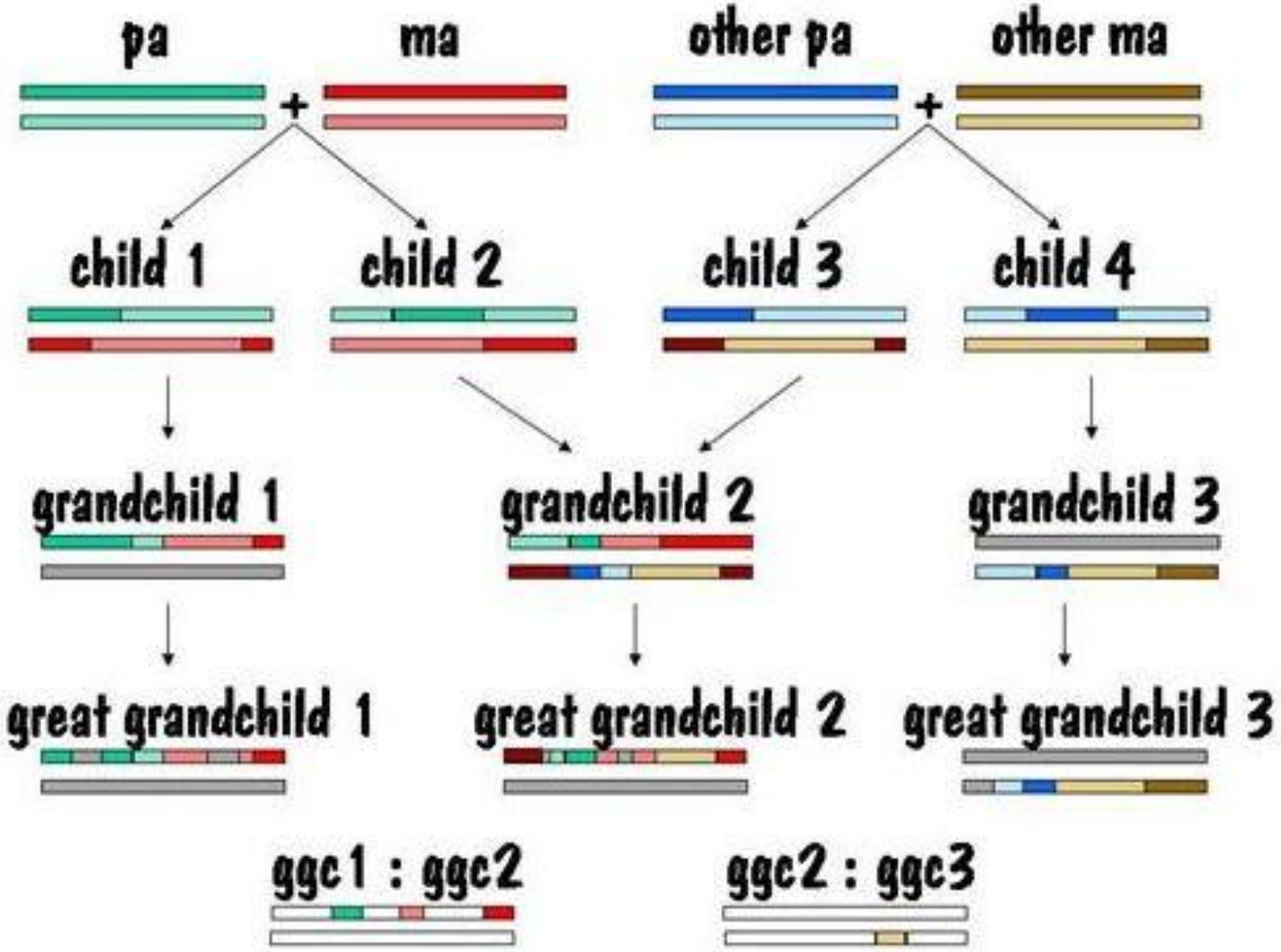
Genetic Genealogy

- Autosomal DNA
  - The vast majority of our DNA is identical, however when a mutation occurs or a Single Nucleotide Polymorphism or SNP, it makes that spot on our genome unique to us and to our offspring



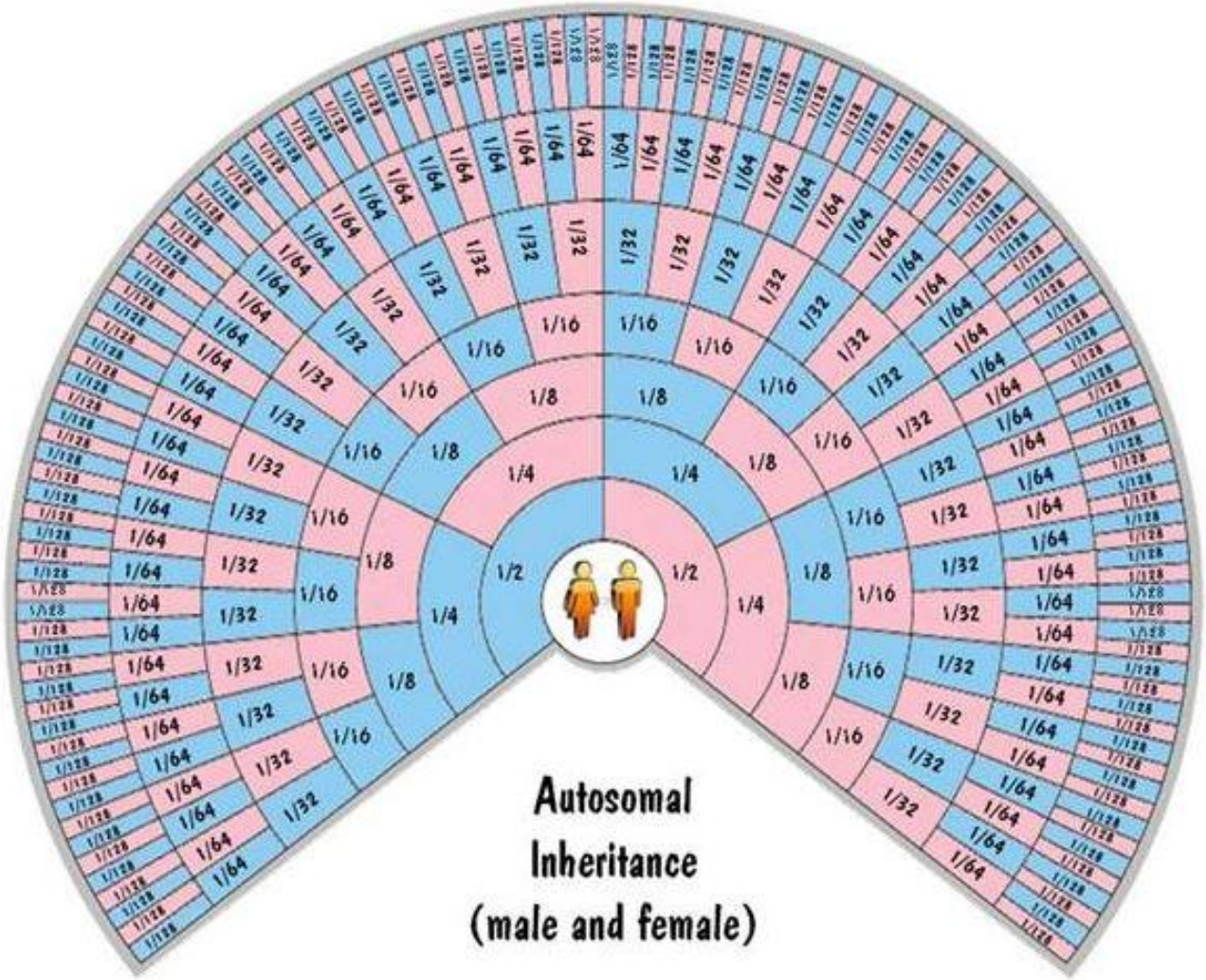
Genetic Genealogy

- Autosomal DNA



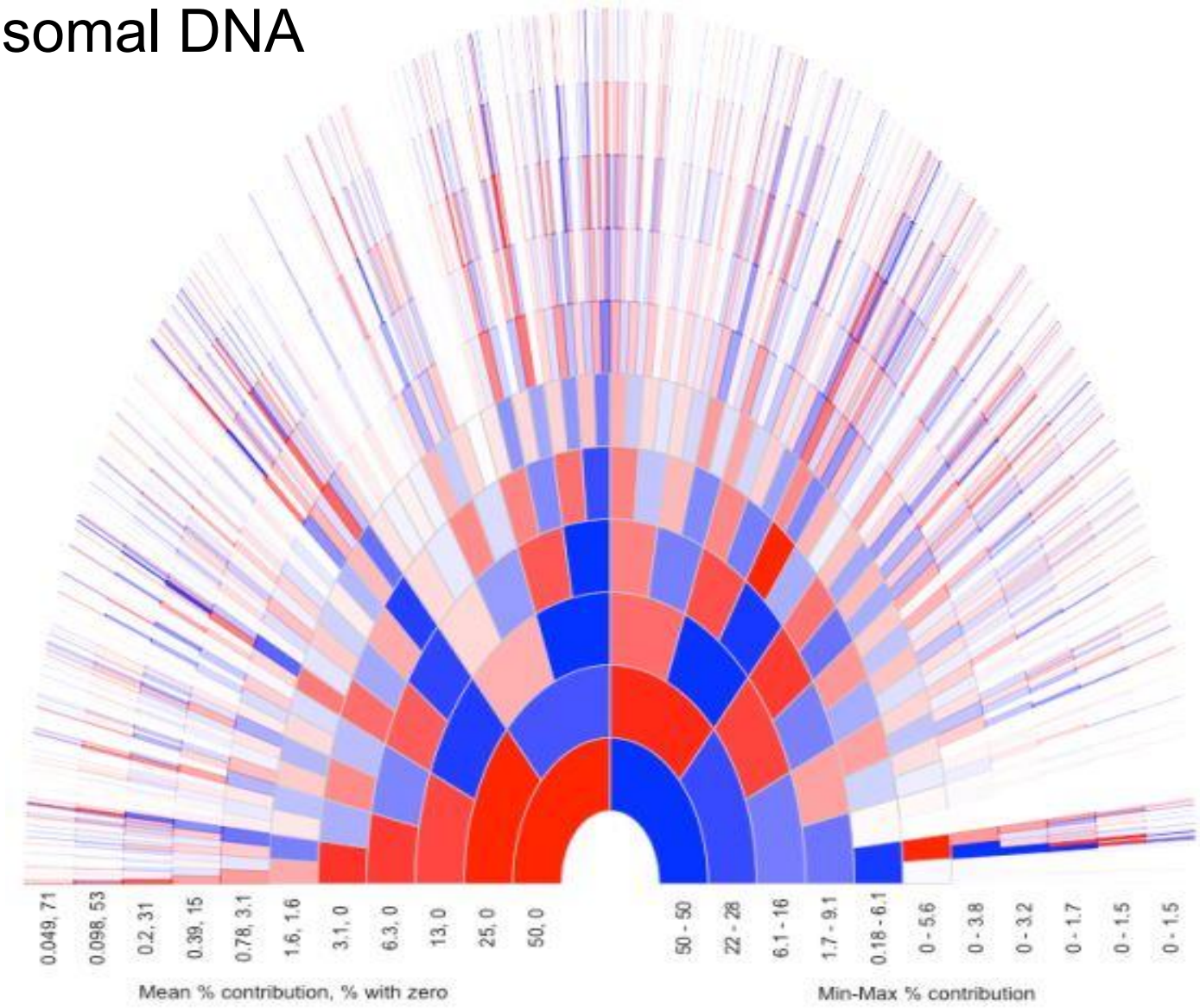
Genetic Genealogy

- Autosomal DNA



Genetic Genealogy

- Autosomal DNA



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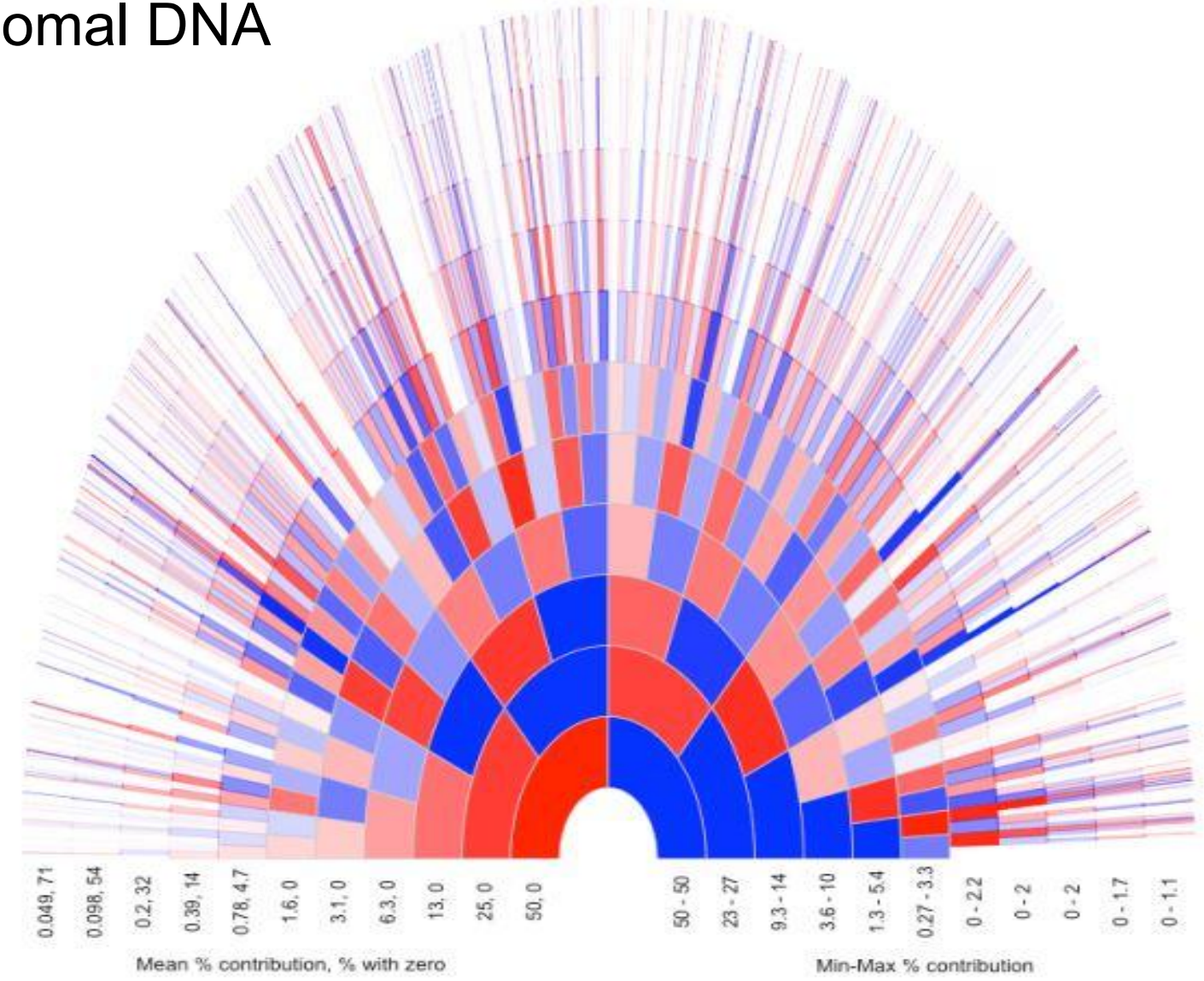
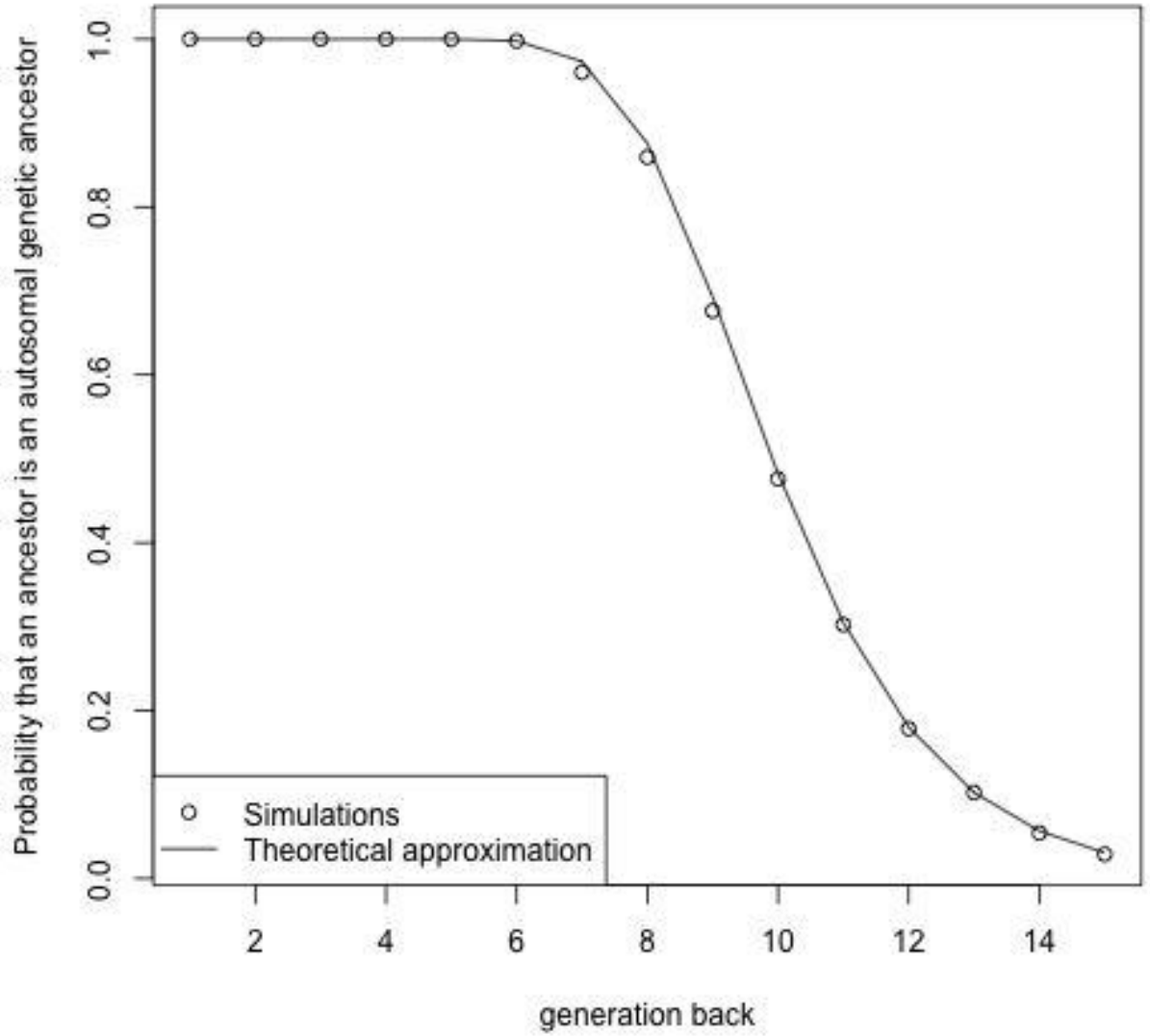
- Autosomal DNA



Genetic Genealogy

- Autosomal DNA



Genetic Genealogy

- Autosomal DNA

So in any given generation in the past, there are a set of people in your genealogy who we can trace the various sections of your genome back to (lets call them your genetic ancestors). The probability we inherit any autosomal DNA from a **specific** ancestor from 12 generations ago is small (18 %), because you have vast numbers of ancestors that far back (e.g. 12 generations ago you have 4096 ancestors) and your genetic ancestors are a very small subset of these people (on average around 700 people).

Reply

Genetic Genealogy

- Autosomal DNA

Relationship	Match Probability
2nd cousins or closer	> 99%
3rd cousin	> 90%
4th cousin	> 50%
5th cousin	> 10%
6th cousin and more distant	remote (typically less than a few percent)

Although it might appear that a genetic match with a distant cousin can't be made, the shear number of distant cousins that we have means that some will come up as a match. You might only have a 0.5% chance of matching an 8th cousins who we share atDNA with, but since we may have upwards of say 40,000 of these out there, that translates to 200 possible 8th cousin matches.

Genetic Genealogy

How we determine relatedness

Start	parent	grandparent	1st great-grandparent	2nd great-grandparent	3rd great-grandparent	4th great-grandparent	5th great-grandparent	6th great-grandparent	7th great-grandparent
parent	sibling	Aunt/Uncle	1st great-aunt/uncle	2nd great-aunt/uncle	3rd great-aunt/uncle	4th great-aunt/uncle	5th great-aunt/uncle	6th great-aunt/uncle	7th great-aunt/uncle
grandparent	Aunt/Uncle	1st cousin	1st cousin once removed	1st cousin twice removed	1st cousin thrice removed	1st cousin four times removed	1st cousin five times removed	1st cousin six times removed	1st cousin seven times removed
1st great-grandparent	1st great-aunt/uncle	1st cousin once removed	2nd cousin	2nd cousin once removed	2nd cousin twice removed	2nd cousin thrice removed	2nd cousin four times removed	2nd cousin five times removed	2nd cousin six times removed
2nd great-grandparent	2nd great-aunt/uncle	1st cousin twice removed	2nd cousin once removed	3rd cousin	3rd cousin once removed	3rd cousin twice removed	3rd cousin thrice removed	3rd cousin four times removed	3rd cousin five times removed
3rd great-grandparent	3rd great-aunt/uncle	1st cousin thrice removed	2nd cousin twice removed	3rd cousin once removed	4th cousin	4th cousin once removed	4th cousin twice removed	4th cousin thrice removed	4th cousin four times removed
4th great-grandparent	4th great-aunt/uncle	1st cousin four times removed	2nd cousin thrice removed	3rd cousin twice removed	4th cousin once removed	5th cousin	5th cousin once removed	5th cousin twice removed	5th cousin thrice removed
5th great-grandparent	5th great-aunt/uncle	1st cousin five times removed	2nd cousin four times removed	3rd cousin thrice removed	4th cousin twice removed	5th cousin once removed	6th cousin	6th cousin once removed	6th cousin twice removed
6th great-grandparent	6th great-aunt/uncle	1st cousin six times removed	2nd cousin five times removed	3rd cousin four times removed	4th cousin thrice removed	5th cousin twice removed	6th cousin once removed	7th cousin	7th cousin once removed
7th great-grandparent	7th great-aunt/uncle	1st cousin seven times removed	2nd cousin six times removed	3rd cousin five times removed	4th cousin four times removed	5th cousin thrice removed	6th cousin twice removed	7th cousin once removed	8th cousin

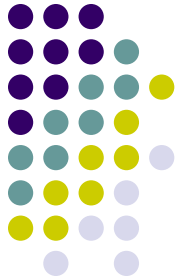
Genetic Genealogy

Predicted % of share atDNA

Start	parent	grandparent	1st great-grandparent	2nd great-grandparent	3rd great-grandparent	4th great-grandparent	5th great-grandparent	6th great-grandparent	7th great-grandparent
parent	Sibling 50.000%	25.000%	12.500%	6.250%	3.125%	1.563%	0.781%	0.391%	0.195%
grandparent	25.000%	1st Cousin 12.500%	6.250%	3.125%	1.563%	0.781%	0.391%	0.195%	0.098%
1st great-grandparent	12.500%	6.250%	2nd Cousin 3.125%	1.563%	0.781%	0.391%	0.195%	0.098%	0.049%
2nd great-grandparent	6.250%	3.125%	1.563%	3rd Cousin 0.781%	0.391%	0.195%	0.098%	0.049%	0.024%
3rd great-grandparent	3.125%	1.563%	0.781%	0.391%	4th Cousin 0.195%	0.098%	0.049%	0.024%	0.012%
4th great-grandparent	1.563%	0.781%	0.391%	0.195%	0.098%	5th Cousin 0.049%	0.024%	0.012%	0.006%
5th great-grandparent	0.781%	0.391%	0.195%	0.098%	0.049%	0.024%	6th Cousin 0.012%	0.006%	0.003%
6th great-grandparent	0.391%	0.195%	0.098%	0.049%	0.024%	0.012%	0.006%	7th Cousin 0.003%	0.002%
7th great-grandparent	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.003%	0.002%	8th Cousin 0.001%

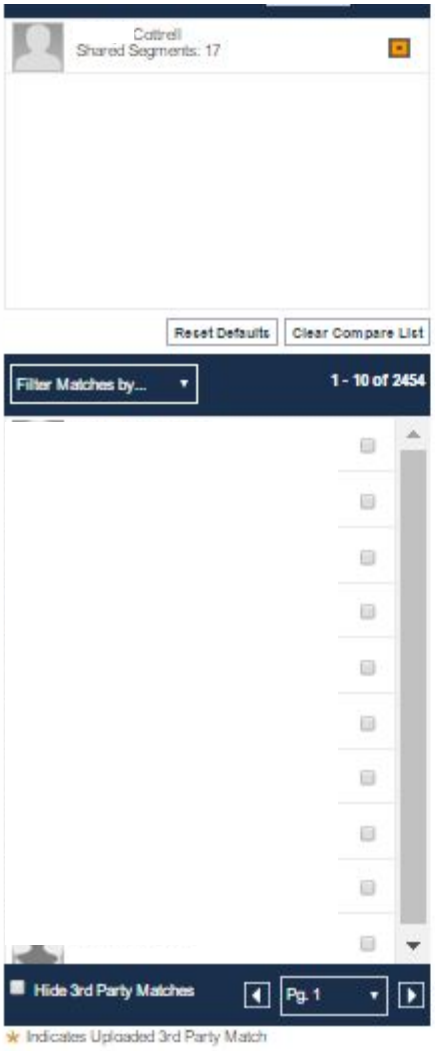
1% shared atDNA = ~ 74cM

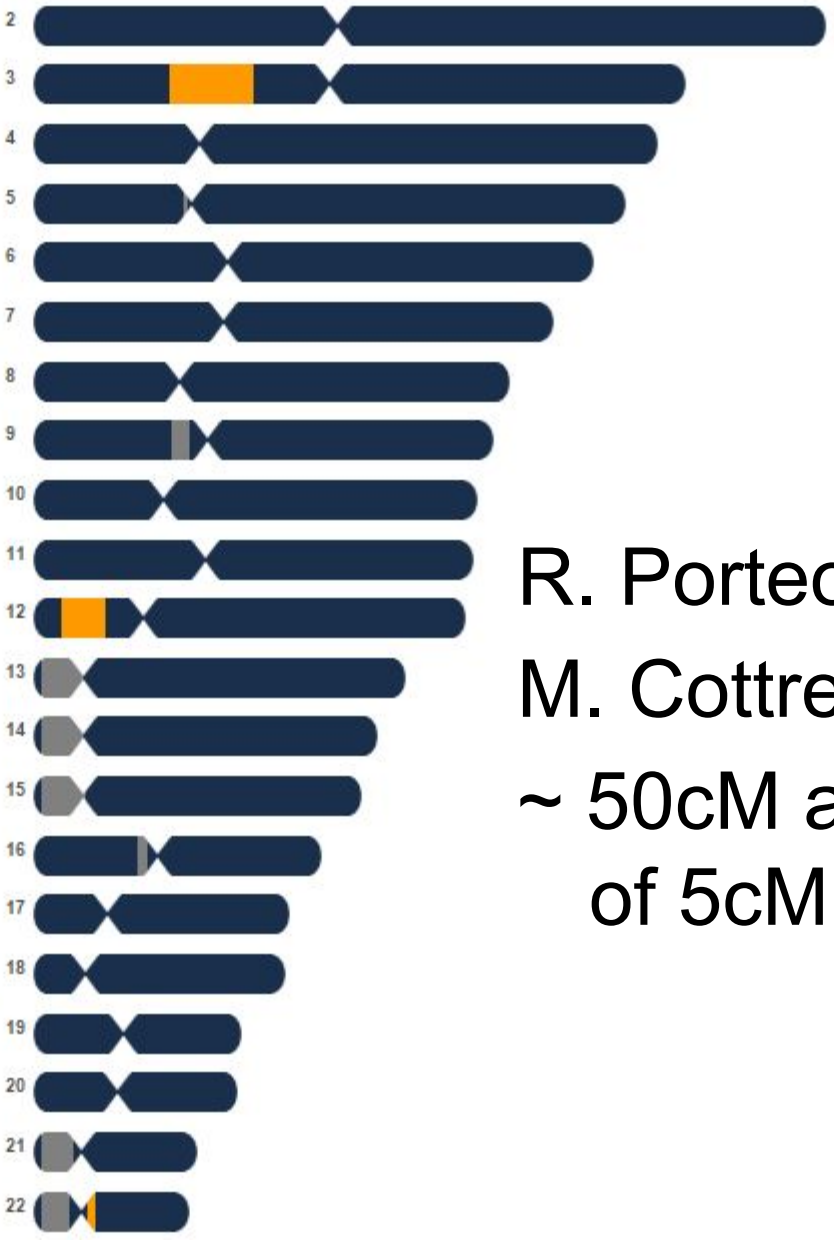
Genetic Genealogy



- Example of Genetic Match
  - R. Porteous and M. Cottrell
  - Suspected of being related through a common Lackey ancestor
  - Genetic testing indicated that the two individuals were genetic cousins which pointed to the common Lackey ancestor being in fact correct, making the two ladies 3rd Cousin's once removed.

Genetic Genealogy



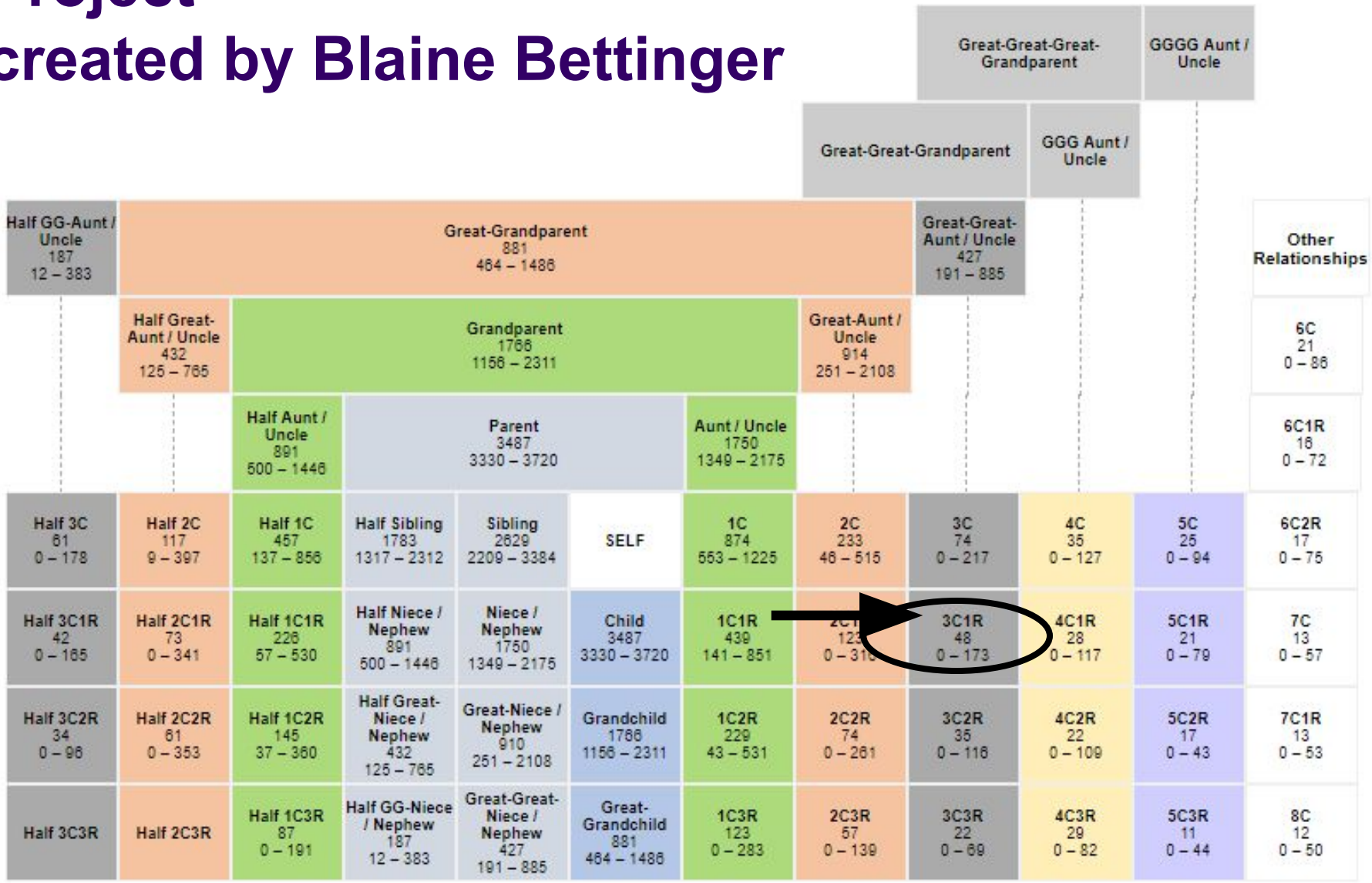


R. Porteous and

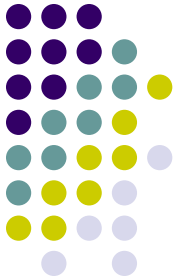
M. Cottrell share

~ 50cM and 3 segments of 5cM or greater

Predicted % of share atDNA The Shared CentiMorgan Project created by Blaine Bettinger

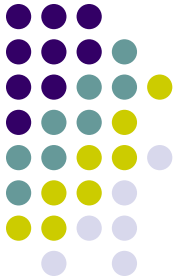


Genetic Genealogy



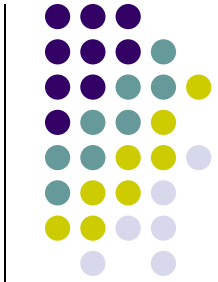
- Demonstration of the FTDNA site
  - Chromosome browser
  - “In Common With” tool
  - Surname search tool
  - x-DNA matches

Genetic Genealogy



- Demonstration of the Ancestry DNA site
  - searches
  - shared matches
  - trees
  - DNA circles
  - Chrome add ons
    - AncestryDNA Helper
    - DNA Match Labelling

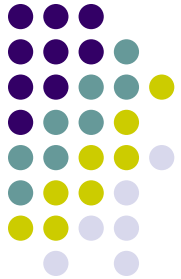
3rd Party Genetic Genealogy AnSites



- www.dnagedcom.com
- www.dnapainter.com
- www.gedmatch.com

  Allows comparison between two people regardless of their testing company and regardless of amounts of share atDNA (FTDNA only shows those meeting their definition of “genetic cousins” ie. min 7cM largest segment and min total of 20cM shared).
- Genome Mate Pro (GMP) (refer to Facebook group)

  Very powerful tool that uses a database of autosomal raw test results from any of the major test companies to analyse match information.



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