Connecting with Cousins through Autosomal DNA

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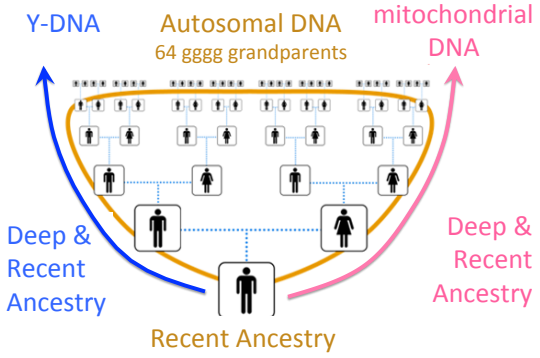
BIFHSGO, Ottawa
10th Sep 2016

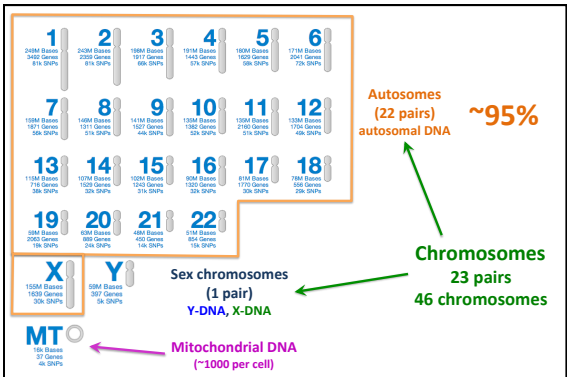
Handout: http://tinyurl.com/z7b4u8t
YouTube: DNA and Family Tree Research

The various goals of atDNA testing

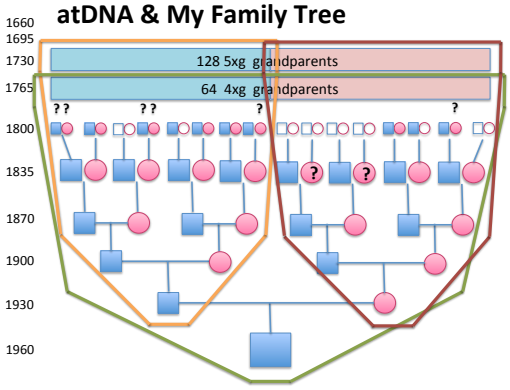
1) To determine your ethnic makeup
2) To confirm known or suspected relationships in your draft Family Tree
3) To break through Brick Walls by connecting with unknown distant cousins & using what they know about their Family Tree to supplement yours
4) To simply connect with long lost relatives & (re-)establish relationships

4 types of DNA, 3 types of test

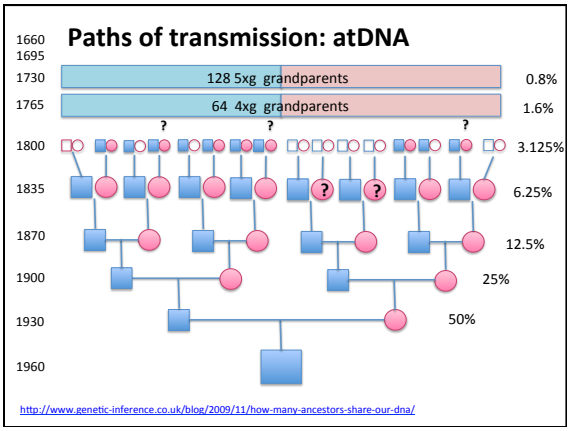




atDNA & My Family Tree



Paths of transmission: atDNA

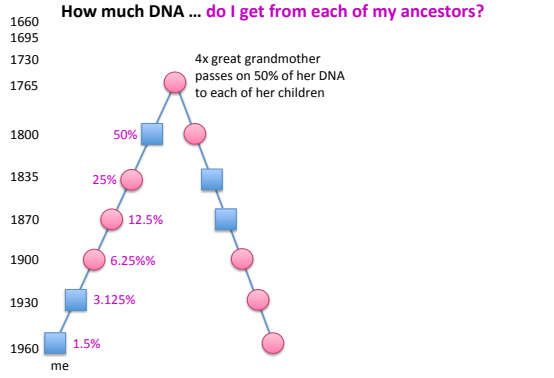


http://www.genetic-inference.co.uk/blog/2009/11/how-many-ancestors-share-our-dna/

The Genetic Lottery

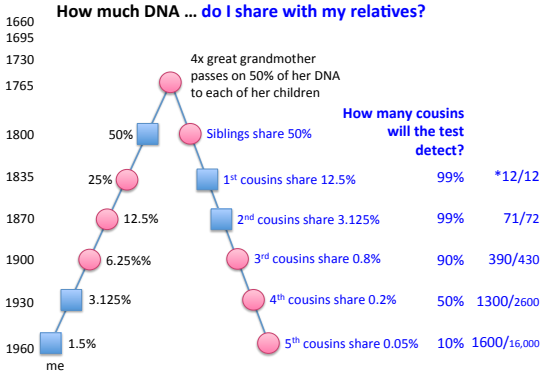
- **Independent Assortment** shuffles up whole chromosomes
  - Only half get passed on to an egg or sperm cell
- **Recombination** breaks up individual chromosomes and recombines them to form new chromosomes that are completely different to those of the parent
  - You get Grandpa with a bit of Grandma (or vice versa)
- Both processes start from scratch each time an egg is formed
- Each cell division produces a completely new random assortment of DNA – this is why siblings are not the same
- X gets shuffled (only with another X), Y does not

How much DNA … do I get from each of my ancestors?



http://www.familytreedna.com/faq/answers.aspx?id=17#624

How much DNA … do I share with my relatives?



* Assumes 3 children per generation

http://www.familytreedna.com/faq/answers.aspx?id=17#624
http://www.familytreedna.com/faq/answers.aspx?id=17#628

Two approaches to atDNA testing

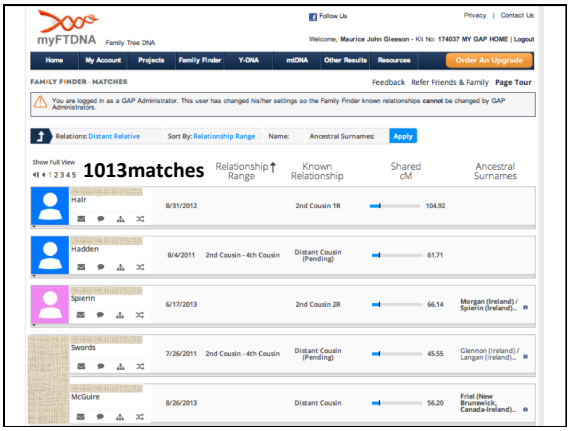
- Specific Question
  - I'm sure we're related to that crowd …
  - You and someone else need to take the test
- Fishing Trip
  - See what you catch in the database!
  - Only you need to take the test

The Fishing Trip

How to use
a step-by-step approach
to assess
your atDNA matches

FamilyTreeDNA 23andMe ancestryDNA

On YouTube at … https://www.youtube.com/watch?v=Jtpe6u2J5ps

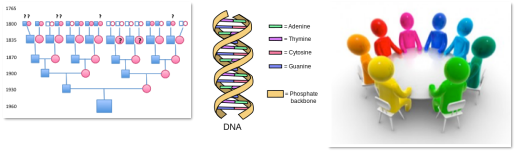


The Nature of Matches

- Most matches will be more distant relatives
- I have 1013 matches in all …
  - 0 close relatives (other than those I tested myself)
  - 9x 2nd-4th cousins (2%)
  - 58x 3rd-5th cousins (8%)
  - 166x ≥4th cousins (15%)
  - 766x ≥5th cousins (75%) … many of them "false positives"
- Collaborate & reconstruct family trees if necessary
- Most Irish family trees can only go back to 1800
  - This limits the possibility of connecting with >3rd cousins

Step-by-step Approach

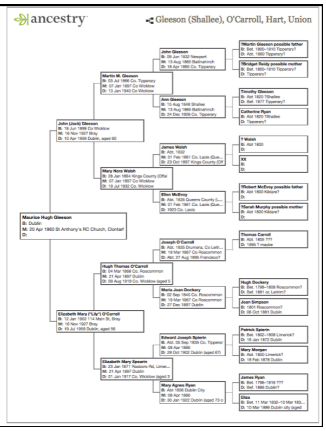
- Step 1 – where does the Common Ancestor sit?
- Step 2 – is the Common Ancestor obvious?
- Step 3 – eliminate non-contenders
- Step 4 – work with small Triangulated Groups



On YouTube at … https://www.youtube.com/watch?v=Jtpe6u2J5ps

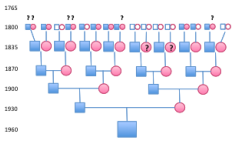
Skip it all !!

- Send them your **pedigree** & ask …
  - Any common **locations**?
  - Any common **surnames**?
  - Any common **individuals**?



Secrets to Success

Start with your closest matches
Share your tree
Develop a relationship with your matches
Keep track of what you've done



1

Step 1 – where does the Common Ancestor sit?

Positioning the Common Ancestor on your family tree

Where does the Common Ancestor (CA) sit on your tree? 1

1660
1695
1730
1765 — 64 4x gGP's in 32 couples
1800
1835 — 16 ggGP's in 8 couples
1870
1900
1930
1960 — me; my match

3rd cousins share x2 g GP

1

Connection is further back than it seems!

- Especially if cousins intermarrying
  - More DNA persists than is usual
  - "Pedigree collapse"
  - More relevant in small isolated communities
- Especially if endogamous populations
  - Ashkenazi Jews
  - Romani people
  - Hindu castes
  - Jehovah Witnesses

http://www.isogg.org/wiki/Pedigree_collapse
http://www.familytreedna.com/faq/answers.aspx?id=17#622
Lachance et al 2009 - http://www.ncbi.nlm.nih.gov/pubmed/19679139

Relationship	#	Total Shared cM		Longest Segment	
		Average	Range	Average	Range
1C	660	881	83 - 1559	83	41 - 306
1C1R	606	440	54 - 903	62	13 - 164
1C2R	134	240	27 - 413	49	11 - 145
2C	597	246	47 - 760	49	16 - 282
2C1R	590	140	0 - 466	37	0 - 115
2C2R	101	94	0 - 575	31	0 - 117
3C	517	89	0 - 334	30	0 - 135
3C1R	263	76	0 - 332	27	0 - 71
3C2R	36	52	16 - 122	22	8 - 50
Aunt/Uncle	722	1703	121 - 2227	126	40 - 254
Grandparent/Grandchild	195	1760	875 - 2365	170	82 - 282
Great Aunt/Uncle	123	844	236 - 1301	86	35 - 140
Great Grandparent/Grandchild	25	856	547 - 1110	102	65 - 171
Half 1C	56	458	262 - 1194	75	29 - 145
Half 1C1R	33	223	99 - 518	46	28 - 96
Half 2C	44	123	17 - 264	34	12 - 83
Half Aunt/Uncle	43	892	540 - 1348	100	43 - 176
Half Siblings	125	1731	787 - 2134	127	62 - 254

http://thegeneticgenealogist.com/2015/05/25/the-shared-cm-project-an-update/

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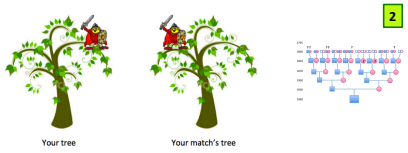


Step 2 - is the Common Ancestor obvious?

Compare trees
Best to share link to online trees
Is your tree up-to-date?

2

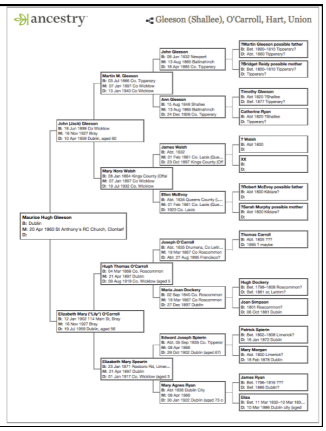
Characterise each of your Brick Walls

- MDKA (earliest known ancestor) +/- spouse
  - BMD records? Address / Location?
- Witnesses (possible brothers & sisters)
  - at their wedding
  - at baptism of their children (godparents / sponsors)
  - at weddings of their children
  - informants on death certificates
- Locations (on BMDs)

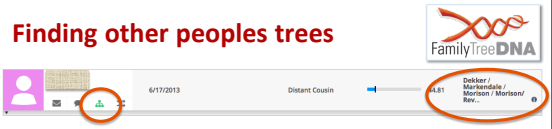
… all give clues to look out for in your match's tree

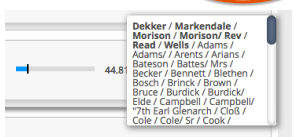
Skip it all !!

- Send them your **pedigree** & ask …
  - Any common **locations**?
  - Any common **surnames**?
  - Any common **individuals**?



Finding other peoples trees

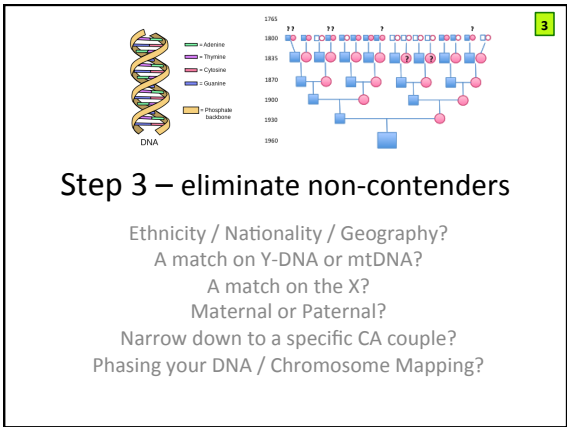




20% have trees
71/355

My Dad has 1185 matches …

66% have (some) surnames
234/355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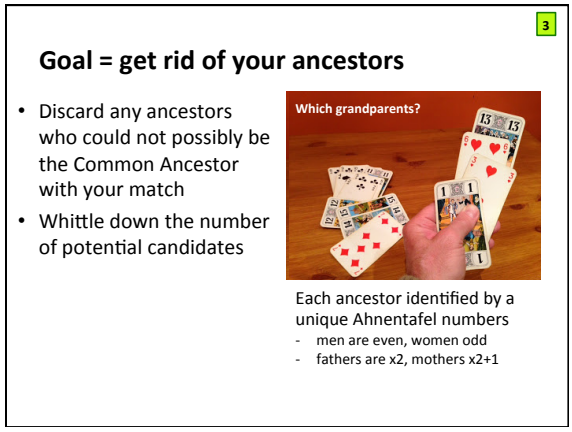
DNA
Step 3 – eliminate non-contenders
Ethnicity / Nationality / Geography?
A match on Y-DNA or mtDNA?
A match on the X?
Maternal or Paternal?
Narrow down to a specific CA couple?
Phasing your DNA / Chromosome Mapping?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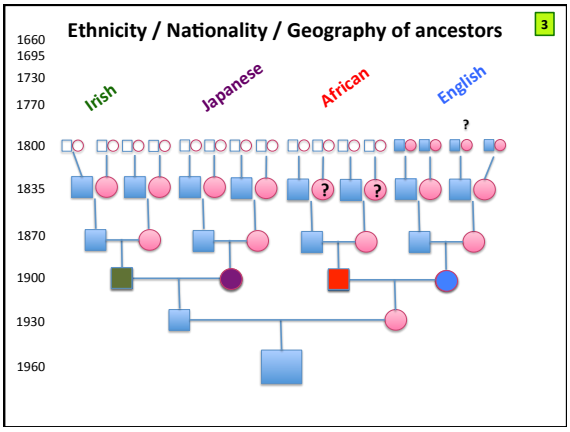
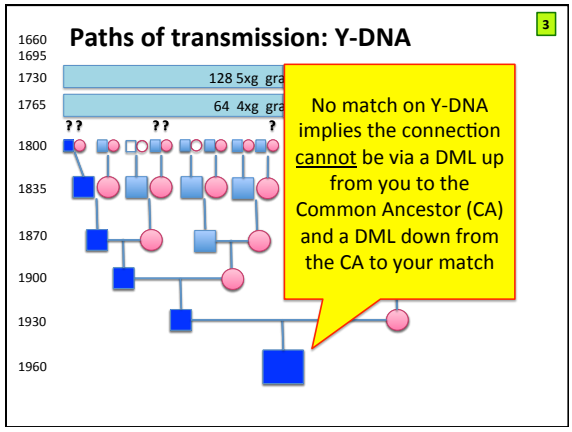
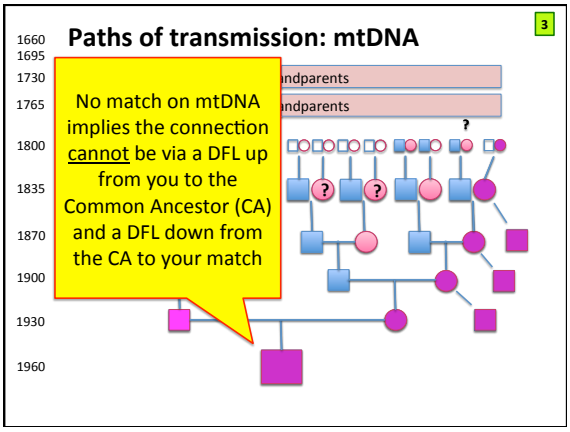
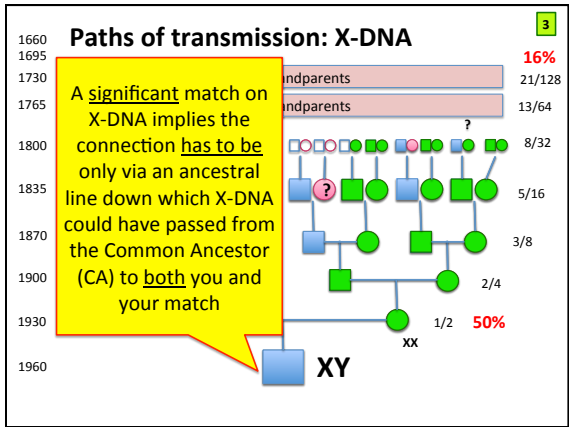
Goal = get rid of your ancestors
Discard any ancestors who could not possibly be the Common Ancestor with your match
Whittle down the number of potential candidates
Which grandparents?
Each ancestor identified by a unique Ahnentafel numbers
men are even, women odd
fathers are x2, mothers x2+1


3
Ethnicity / Nationality / Geography of ancestors
Irish
Japanese
African
English
1660
1695
1730
1770
1800
1835
1870
1900
1930
1960


3
Paths of transmission: Y-DNA
No match on Y-DNA implies the connection cannot be via a DML up from you to the Common Ancestor (CA) and a DML down from the CA to your match
1660
1695
1730
1765
1800
1835
1870
1900
1930
1960


3
Paths of transmission: mtDNA
No match on mtDNA implies the connection cannot be via a DFL up from you to the Common Ancestor (CA) and a DFL down from the CA to your match
1660
1695
1730
1765
1800
1835
1870
1900
1930
1960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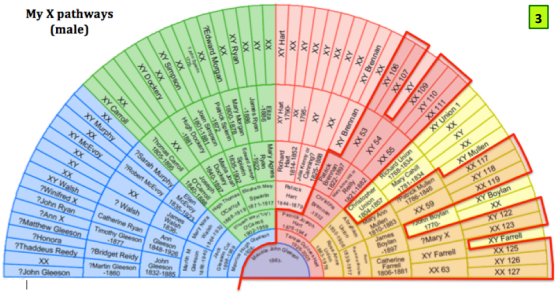
Paths of transmission: X-DNA
A significant match on X-DNA implies the connection has to be only via an ancestral line down which X-DNA could have passed from the Common Ancestor (CA) to both you and your match
16%
21/128
13/64
8/32
5/16
3/8
2/4
1/2
50%
XX
XY
1660
1695
1730
1765
1800
1835
1870
1900
1930
1960

3

My X pathways (male)



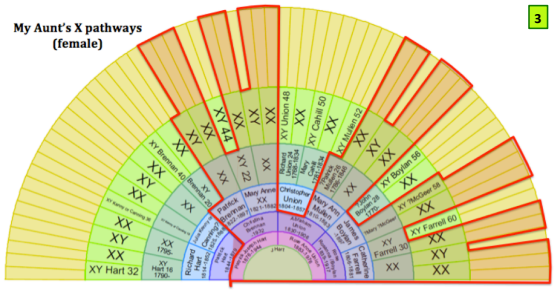
64	32	16	8	4	2	1	3	7	15	31	63	127
Ahnentafel number of ancestor above						Me	P	GP	g	ggg	gggg	ggggg
Relationship given shared ancestor							sib	1st	2nd	3rd	4th cousins	5th cousins
1770	1800	1840	1865	1900	'38	1960	'30	1880	1840	1810	1780	1750
Approximate year of birth			Generational Level			1	2	3	4	5	6	7

Generated using PAF & PAF Companion

http://www.dnaandfamilytreeresearch.blogspot.ie/2013/05/analysing-dna-matches-step-32-x-dna.html

3

My Aunt's X pathways (female)



64	32	16	8	4	2	1	3	7	15	31	63	127
Ahnentafel number of ancestor above						Maternal Aunt	P	GP	g	ggg	gggg	ggggg
Relationship given shared ancestor							sib	1st	2nd	3rd	4th cousins	5th cousins
1730	1760		1790		1820	1845	'75	1920	'80	1905	1805	1780	1750	1720
Approximate year of birth			Generational Level			1	2	3	4	5	6	7

Generated using PAF & PAF Companion

http://www.dnaandfamilytreeresearch.blogspot.ie/2013/05/analysing-dna-matches-step-32-x-dna.html

3

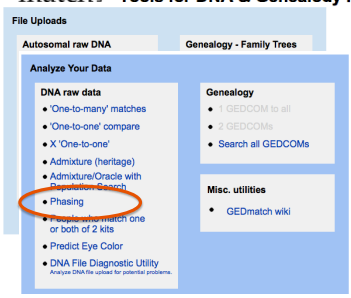
Paternal or Maternal?

1660
1695
1730
1765
1800
1835
1870
1900
1930
1960

If a person matches me but **NOT** my Dad
=> CA on maternal side

If a person matches me and my Dad
=> CA on paternal side

GED match **Tools for DNA & Genealogy Research**



- 90% drop in matches
- Many false positives
  - 34% or more?
  - Pile-up areas
- Characterisation ongoing

=> focus on the top 10% of your matches

www.gedmatch.com
http://isogg.org/wiki/Identical_by_descent
http://thegeneticgenealogist.com/2015/03/30/guest-post-what-a-difference-a-phase-makes

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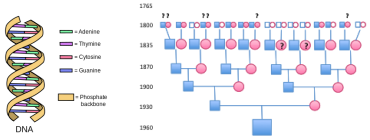


Step 3 – eliminate non-contenders

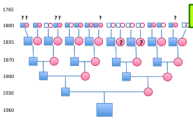
Ethnicity / Nationality / Geography? **3**
A match on Y-DNA or mtDNA?
A match on the X? **4**
Maternal or Paternal? **1**
Narrow down to a specific CA couple? **2**
Phasing your DNA / Chromosome Mapping?

3

At the End of Step 3 …

- Your hand of ancestral cards has been whittled down
  - May allow you to confine your research to just 1 line
- If your match does the same, that will whittle down the possibilities on their side too
  - Godparents? Witnesses?
  - Locations?

… but often the Brick Wall persists

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Step 4 – working with small related Triangulated Groups

Identify groups who are likely to have the same CA
Identify OLS (Overlapping Segments)
"In Common With" matches (ICW)

4

Step 4 = like playing a game of cards

Assemble your Common Matches
Identify Triangulated Groups
Repeat Steps 1-3
Compare trees at each stage

Simple!

Lost in Spreadsheets!

3rd Party Tools

- Gedmatch – www.gedmatch.com
- ADSA spreadsheet – www.dnagedcom.com
- K Works & J Works – www.dnaadoption.com
- GenomeMate – www.genomemate.com
- The Swedish DNA Project

Matching Segments that are IBD ("true +ve) vs those that are IBS ("false +ve") - per John Walden analysis

- 11 cM or greater matching segment: >99% IBD, <1% IBS
- 10 cM matching segment: 99% IBD, 1% IBS ←
- 9 cM matching segment: 80% IBD, 20% IBS
- 8 cM matching segment: 50% IBD, 50% IBS ←
- 7 cM matching segment: 30% IBD, 70% IBS
- 6 cM matching segment: 20% IBD, 80% IBS
- 5 cM matching segment: 5% IBD, 95% IBS
- 4 cM matching segment: ca 1% IBD, ca 99% IBS ←

Tim Janzen - http://www.isogg.org/wiki/Chromosome_mapping

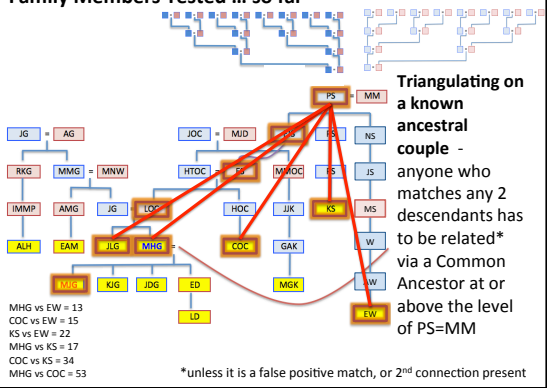
Finding the unknown parents - strategy for testing

Working with **known** cousins …

Triangulating on a **known** ancestral couple …

Family Members Tested … so far

IRL4-DUB1



MHG vs EW = 13
COC vs EW = 15
KS vs EW = 22
MHG vs KS = 17
COC vs KS = 34
MHG vs COC = 53

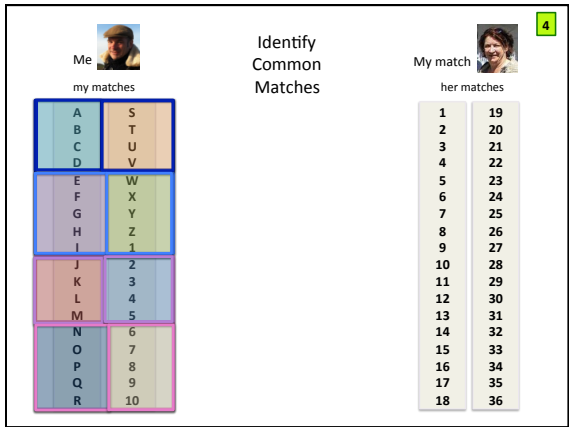
Triangulating on a known ancestral couple - anyone who matches any 2 descendants has to be related* via a Common Ancestor at or above the level of PS=MM

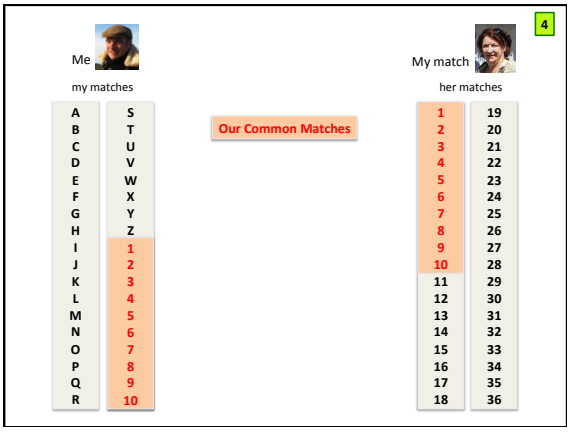
*unless it is a false positive match, or 2nd connection present

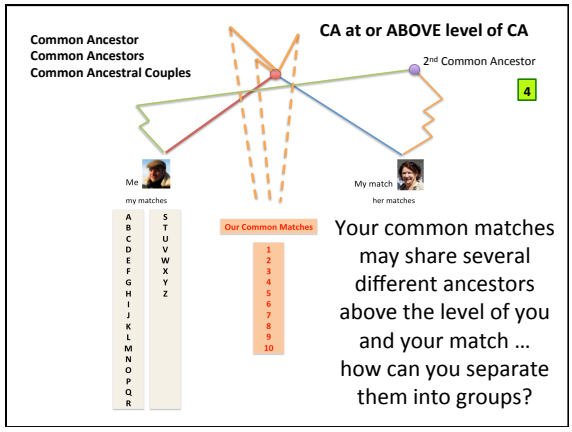
Finding the unknown parents - strategy for testing

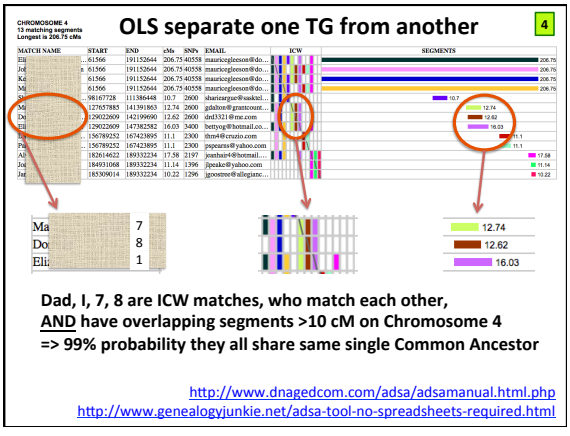
Working with **unknown** cousins …

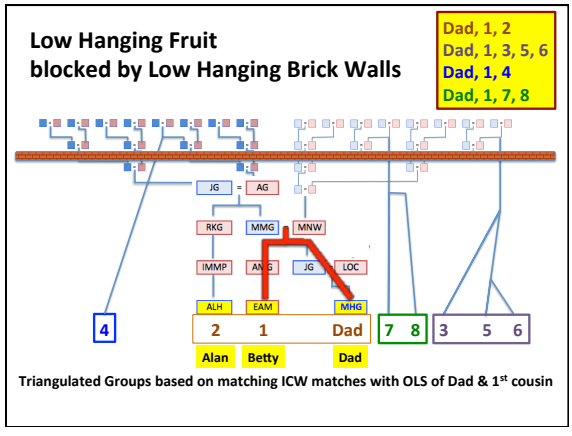
Triangulating on an **unknown** ancestral couple …











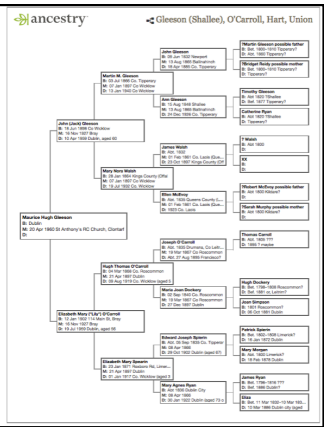
Triangulated Groups - Summary

- Many of your matches can be separated into distinct Triangulated Groups
  - Shared ICW (In Common With) status
  - Overlapping segments anchor each TG to a single Common Ancestor*
- Matches within a given TG should collaborate (i.e. share trees) to identify Common Ancestor
- This takes time … a lot of time … really …
- Always look for common …
  - locations, surnames, & individuals
- Keep track of who you talk to and what they say

* in 99.8% of cases

Skip it all !!

- Send them your **pedigree** & ask …
  - Any common **locations**?
  - Any common **surnames**?
  - Any common **individuals**?



Secrets to Success

- ✓ Develop your tree & share it
- ✓ Start with your closest matches
- ✓ Develop a relationship with them
- ✓ Keep track of what you've done
  => ADSA, GenomeMate, spreadsheets
- ✓ Y-DNA projects may be a useful anchor?
- ✓ Create more tools
  - Independent vs commercial development
  - Automate them
  - Commercial Companies incorporate tools into the service they provide their customers

4

Step 4 = like playing a game of cards

Identify your Triangulated Groups
Assemble each TG
Repeat Steps 1-3
Compare trees at each stage

Simple!

You only need to be lucky once!