Genealogy Tools & Tests

- Comparison of Alternatives

BIFHSGO – DNA SIG

Mar 2, 2019

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Disclaimer

I have no commercial connection with any of the companies mentioned in this presentation, except as a customer.

R.E. Butler

Genealogy Tools & Tests

Origin of Presentation

- North Lanark Historical Society

  Annual Genealogy Worshop since 2012

  Recently 4 days at 2-3 hours/day

  - Review of Conventional Genealogy
  - Demo tree start on Ancestry.ca
  - Attendees work on their own trees
  - DNA presentation

Presentation Mar 2, 2019

- Conventional Genealogy 3 slides
  - Objectives & Data Base Alternatives
  - Comparison of On Line Services
- DNA Testing 22 slides
  - Basics
  - Comparison of Autosomal Testing Services

Genealogy Objectives

- Build Family Tree
  - Where did I come from?
  - Who are my cousins?
  - Legacy for your children.
- Publish
  - Record your family's accomplishments.
  - Help other researchers.
- Contact Distant Relatives
  - Shared information
  - Travel Interest
- Cost

Family Tree Location
- On PC or On-line ?

	On Personal Computer	On the Internet
	PC Genealogy Programs	On-Line Genealogy Services
Features		
Searching Records or Other Trees	From Tree & browser	From Tree
Hint System	Possibly while on-line	Yes, Even when logged off
Common Ancestors from DNA	Manual tree searching	Part of hint system
Documenting sources	Manual or Web copying	Attaching records more efficient
Graphs and Reports	Very Good	Very Limited
Publication	Separate – When?	Automatic - Incremental
Contacting Distant Relatives	Identify common individuals	Identify and Contact
Others Find & Contact you	No	Yes
Privacy	Yes	Private or Public (not living people)
Backup	User File Copy	Automatic by Service Company
Cost	One Time Cdn$40 to 100	Ongoing - Cdn$10 to $25/month
Access after stop paying	Complete	Very Limited

On-Line Genealogy Services

Jan 2018

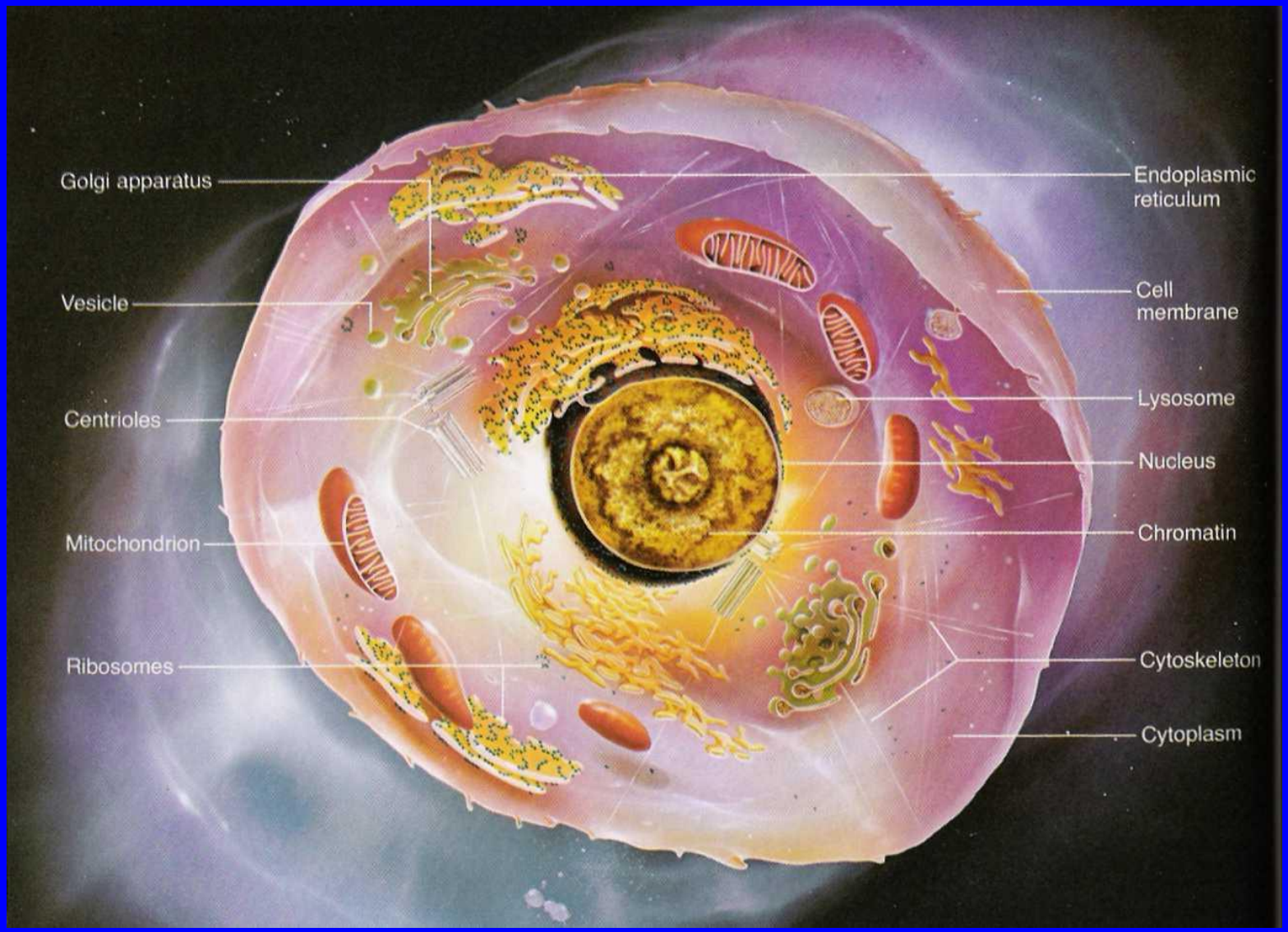
http://genealogy-search-review.toptenreviews.com/

http://www.exploringlifesmysteries.com/myheritage-vs-ancestry-vs-findmypast/

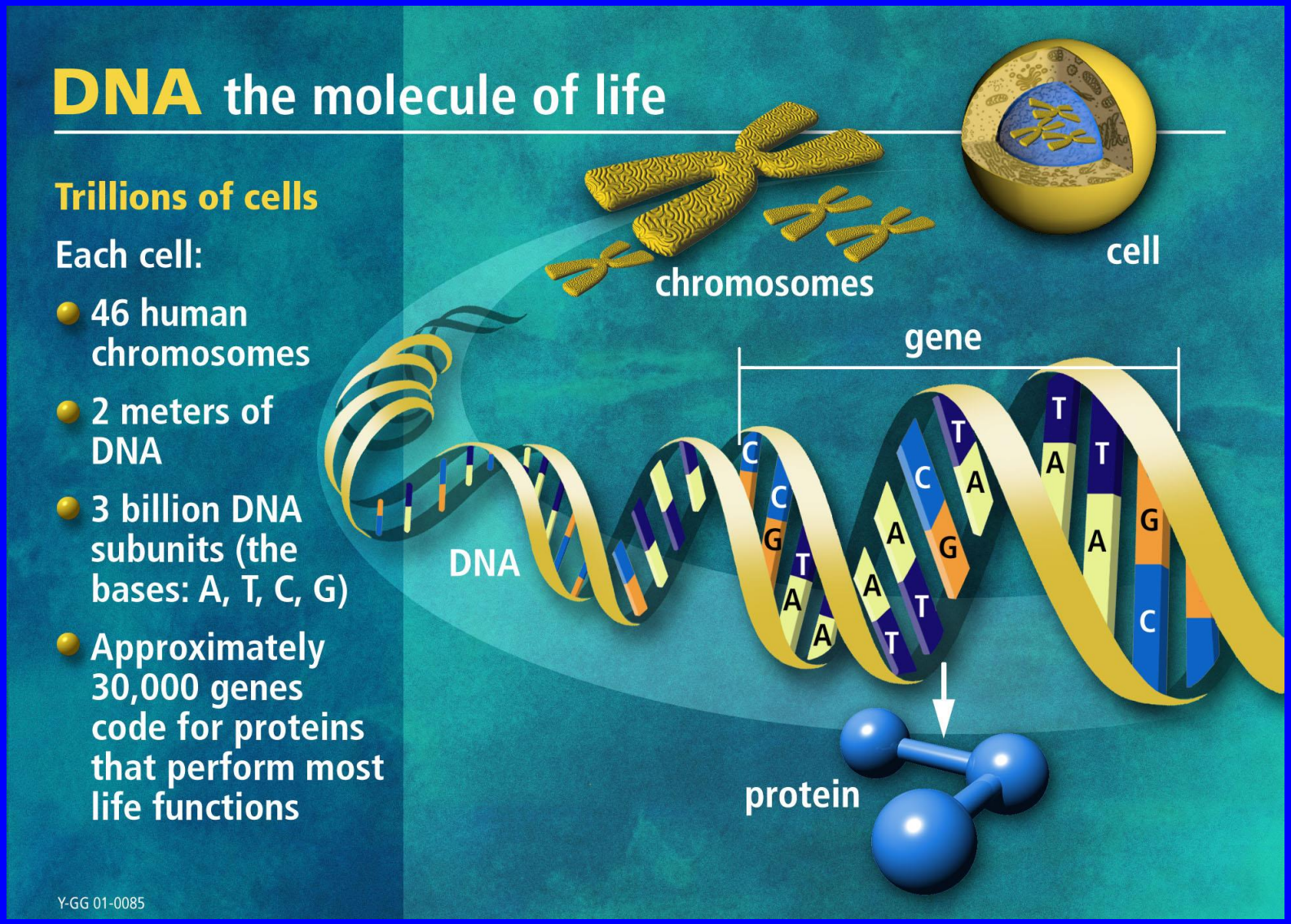
Top Ten Reviews - Ranking	Gold Award	2	3	4	5
Company	Ancestry	MyHeritage	FamilySearch	Archives	Findmypast
Top Ten Reviews - Rating	9.8	9.3	8.7	7.0	6.8
Exploring Lifes Mysteries - Rank	1	2		-	3
Searchable Records	20 Billion	7 Billion	15 Billion	7.4 Billion	1.6 Billion - UK
Countries Documented	200	200	134	7	6
Canadian Record Sets	1420	17 (2 BMD)	Many		Few
Hint System	Good	Slow, Trees			Yes
Family Trees On-Line	> 34 million	39 million	Many - Shared	Yes	Yes
Customers, excluding DNA	2.6 million paid	90 million regist.			
DNA Testing	AncestryDNA	MyHeritageDNA	No	AncestryDNA	FamilyTreeDNA
Cost Canadian $/year					
- Worldwide/Premium	$264	$239	Free	1/3 Ancestry?	$272
	2 weeks free	trees free (250)			pay as you go
	monthly rates	only annual			other starters

DNA Basics

Human Cell DNA
Nuclear and Mitochondrial



Chomosomes and Base Pairs
Double Helix with Bases A,T,C,G



Autosomal DNA Measurements

SNPs (pronounced SNIPS)

- Base pairs = Nucleotide pairs
  - » 3 billion for each set of 23 chromosomes
- Single Nucleotide Polymorphisms (SNPs)
  - » 10 million for each set of 23 chromosomes
  - » 0.33% of genome
- SNPs Measured for Genealogy Purposes
  - » 600 to 960 thousand for each set of 23 chromosomes
  - » 6 to 9.6% of SNPs.

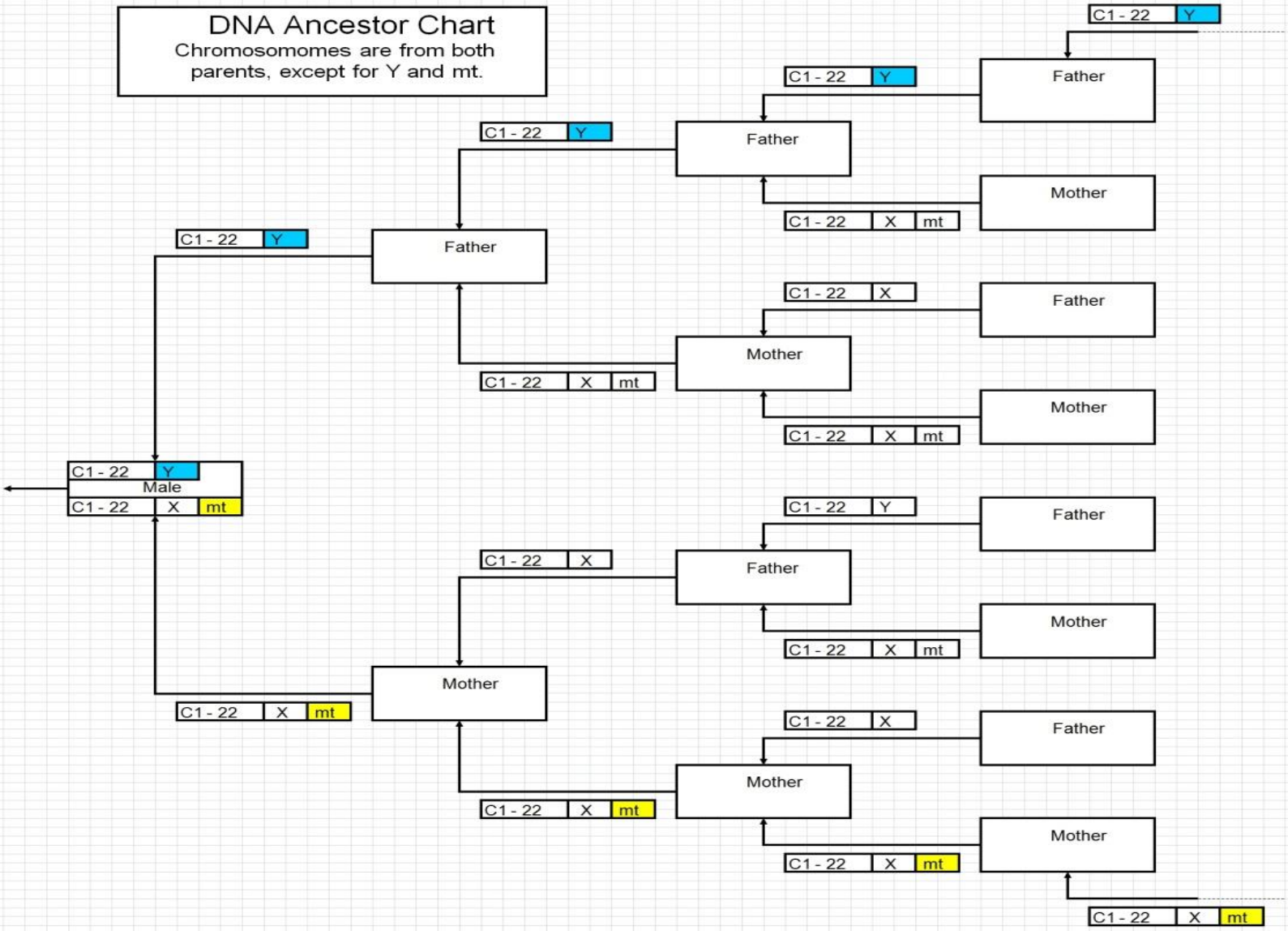
Sample Raw DNA Data

Both chromosomes measured at the same time.

This data file generated by 23andMe at: Sat Jun 29 13:46:20 2013
Each line corresponds to a single SNP. For each SNP, we provide its identifier
(an rsid or an internal id), its location on the reference human genome, and the
genotype call oriented with respect to the plus strand on the human reference sequence.
#

# rsid	chromosome	position	genotype
rs4477212	1	82154	AA
rs3094315	1	752566	AG
rs3131972	1	752721	AG
Rs12124819	1	776546	AG
Rs11240777	1	798959	AG
rs6681049	1	800007	CC
rs4970383	1	838555	AC

…. 960,000 rows of data. …. 24 MB


DNA Ancestor Chart
Chromosomomes are from both parents, except for Y and mt.
C1 - 22 Y
Male
C1 - 22 X mt
C1 - 22 Y
Father
C1 - 22 X mt
Mother
C1 - 22 Y
Father
C1 - 22 X mt
Mother
C1 - 22 Y
Father
C1 - 22 X
Father
C1 - 22 X mt
Mother
C1 - 22 X
Father
C1 - 22 X mt
Mother
C1 - 22 Y
Father
C1 - 22 X
Father
C1 - 22 X mt
Mother
C1 - 22 X
Father
C1 - 22 X mt
Mother
C1 - 22 X mt

3 Types of DNA Tests

- Y Chromosome Test
  - Men inherit from fathers - Surname Studies
  - Most extensive test - perfect match - Kinship 5 gens +
- Mitochondrial DNA Test
  - Everyone inherits from mothers - Maternal Groups
  - Most extensive test - perfect match - Kinship 22 gens +
- Autosomal DNA Test – All chromosomes
  - Everyone inherits from all ancestors - Ethnicity Estimates
  - Routine test – many matches - Kinship 1 to 5 gens +

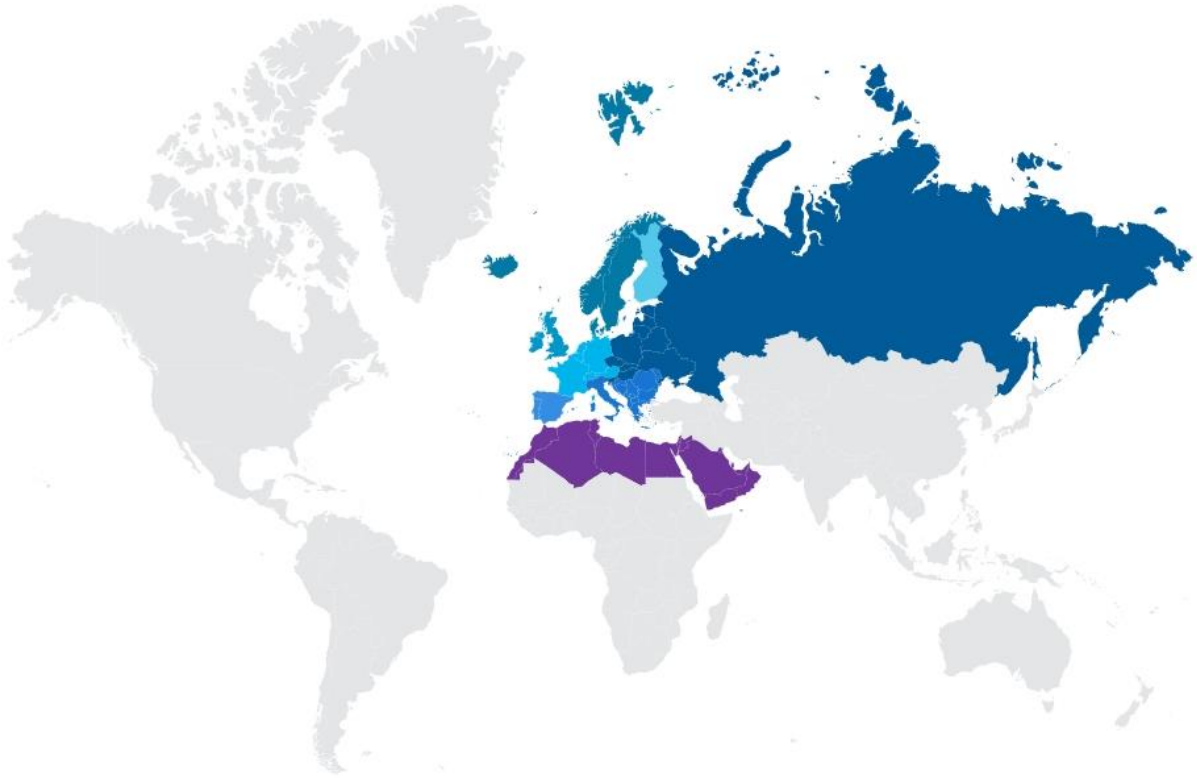
Autosomal Ethnicity Tests

Autosomal Ethnicity Estimates

- 23andMe

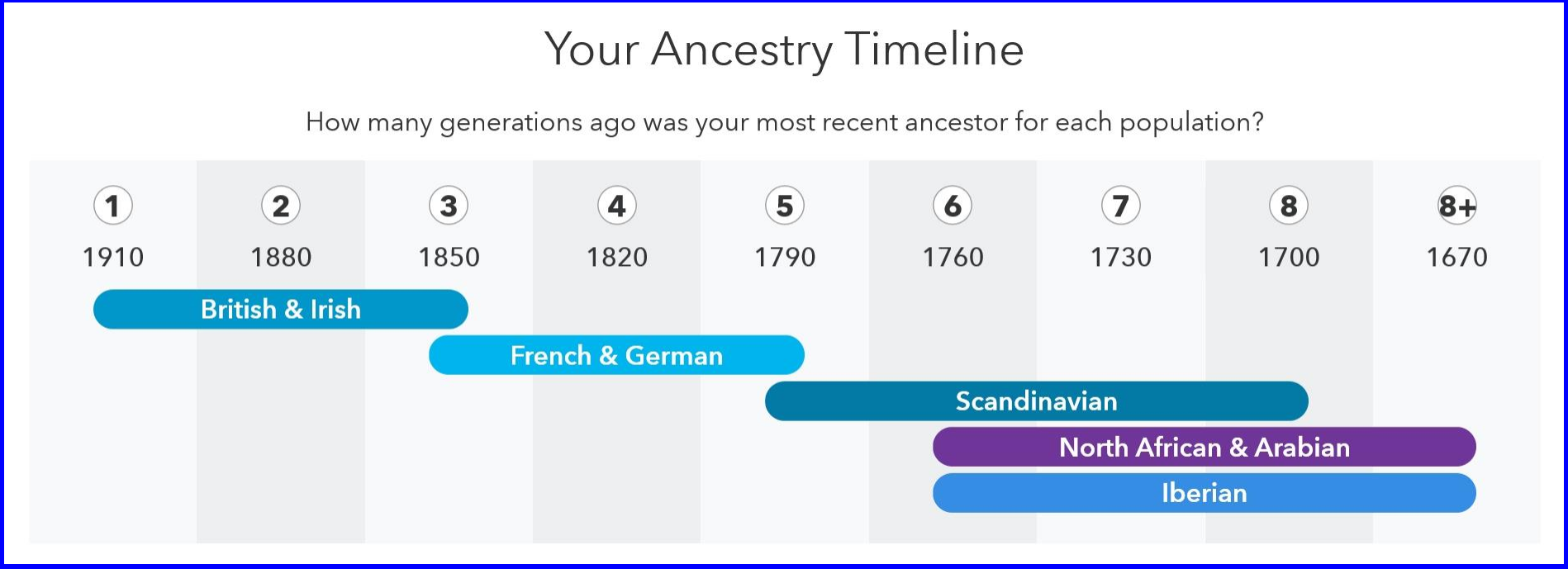
Robert Ewart Butler **100%**

European	**99.9%**
British & Irish (United Kingdom, Ireland)	67.5%
French & German	7.5%
Scandinavian	3.7%
Iberian	0.3%
Broadly Northwestern European	19.6%
Broadly Southern European	1.0%
Broadly European	0.3%
Western Asian & North African	**0.1%**
North African & Arabian	0.1%



Autosomal Ethnicity -Timeline

- 23andMe



Autosomal Ethnicity Estimates

- same person, different companies

	Great Great Grandparents	
	Number	%
English	11	68.8
Irish	2	12.5
Scottish	2	12.5
Welsh	0	0.0
Irish, Scottish & Welsh	4	25.0
Great Britain & Ireland	15	93.8
Northwest & Central Europe	1	6.3
German & Franch		
Scandinavian		
South & East Europe		
European Jewish		
Total	16	100

Autosomal Ethnicity Estimates

- same person, different companies Jan 2018

	Great Great Grandparents		23andMe	FamilyTreeDNA
	Number	%		
English	11	68.8		
Irish	2	12.5		
Scottish	2	12.5		
Welsh	0	0.0		
Irish, Scottish & Welsh	4	25.0		
Great Britain & Ireland	15	93.8	67.5	69
Northwest & Central Europe	1	6.3	19.6	17
German & Franch			7.5	
Scandinavian			3.7	
South & East Europe			1.6	11
European Jewish				
Total	16	100	100	97

Autosomal Ethnicity Estimates

- same person, different companies Jan 2018

	Great Great Grandparents		23andMe	FamilyTreeDNA	ancestryDNA	MyHeritageDNA
	Number	%				
English	11	68.8			40	11.4
Irish	2	12.5				
Scottish	2	12.5				
Welsh	0	0.0				
Irish, Scottish & Welsh	4	25.0			19	0
Great Britain & Ireland	15	93.8	67.5	69	59	11.4
Northwest & Central Europe	1	6.3	19.6	17	29	88.6
German & Franch			7.5			
Scandinavian			3.7		6	0
South & East Europe			1.6	11	2	0
European Jewish					4	0
Total	16	100	100	97	100	100

Autosomal Ethnicity Estimates

- same person, different companies 2018 & 2019

	Great Great Grandparents		23andMe	FamilyTreeDNA	ancestryDNA		MyHeritage DNA
	Number	%	2018 & 2019	2018 & 2019	2018	2019	2018
English	11	68.8			40	87	11.4
Irish	2	12.5					
Scottish	2	12.5					
Welsh	0	0.0					
Irish, Scottish & Welsh	4	25.0			19	13	0
Great Britain & Ireland	15	93.8	67.5	69	59	100	11.4
Northwest & Central Europe	1	6.3	19.6	17	29	with English	88.6
German & Franch			7.5				
Scandinavian			3.7		6		0
South & East Europe			1.6	11	2		0
European Jewish					4		0
Total	16	100	100	97	100	100	100

Marketplace - CBC

Marketplace **DNA Ancestry Tests** R.E. Butler

Following is a set of averages of the ethnicity estimates presented Jan 18. Jan 19, 2019

Reported Areas	**Expected**	**23&Me**		**Ancestry**		**FTDNA**		**My Heritage**		**Living DNA**	
		Charlsie/Carly		Charlsie/Carly		Charlsie/Carly		Charlsie/Carly		Charlsie/Carly	
Italian		38	37	27	29			3	3	40	24
Southeast Europe						43	40				
Iberian						6	8				
Europe South										4	3
Balkan & Greek		15	14	23	23			80	81		
Total Southern Europe	**Sicily**	**52**	**51**	**50**	**52**	**49**	**48**	**83**	**84**	**44**	**27**
Eastern European		28	25			36	35			3	2
Eastern Europe & Russia				39	38						
Broadly European		3	13							7	2
Northeast Europe										41	47
Total East & NE Europe	**Ukraine**	**31**	**38**	**39**	**38**	**36**	**35**	**0**	**0**	**50**	**51**
North & West Europe								13	14	2	16
Baltic				9	9						
French&German		3									
Middle East						13	14	4	3		
Others		13	12	2	1	2	3			3	6
Total		**99**	**101**	**100**	**100**	**100**	**100**	**100**	**101**	**100**	**100**

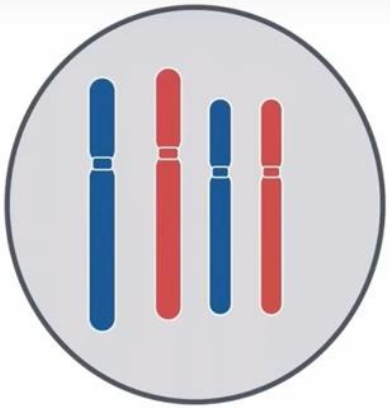
Autosomal Matches

Autosomal DNA Inheritance

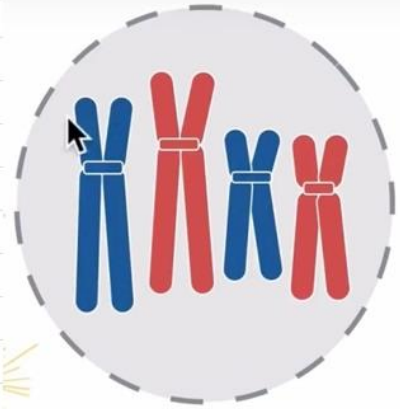
Meiosis – Formation of Sperm & Egg

https://www.youtube.com/watch?v=16enC385R0w

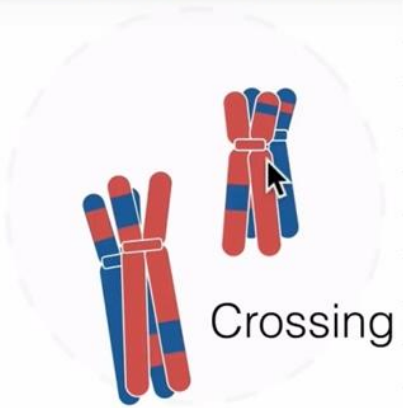
A. Two Copies of Each Chromosome



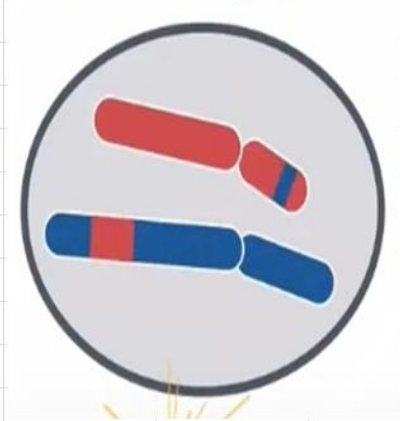
B. Chromosomes Duplicated



C. Chromosome Crossover

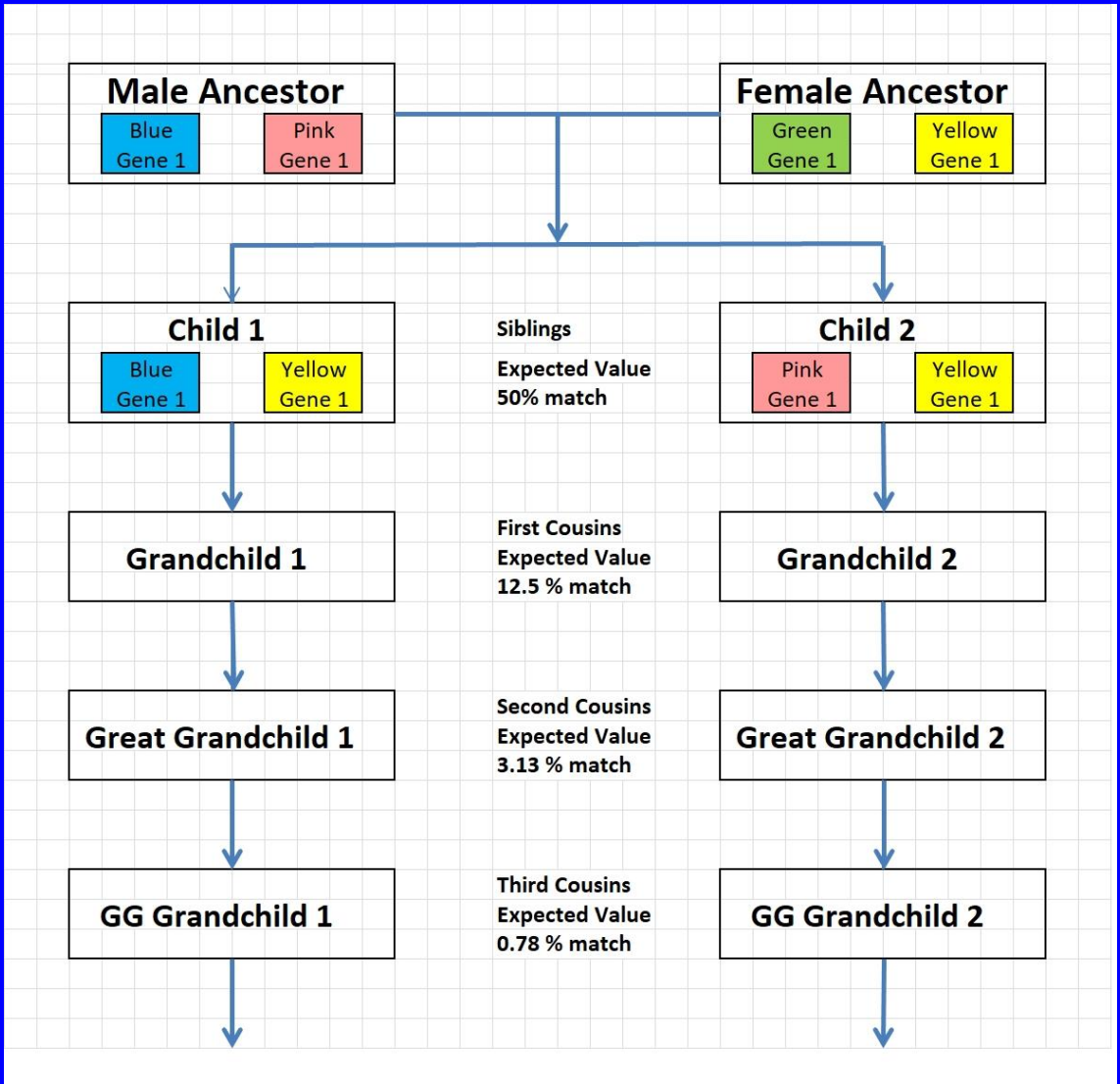


D. One of Four Sperm



Autosomal DNA Inheritance

Expected % Match vs Kinship



Autosomal DNA Matches

centiMorgan Match vs Kinship

Relationship	Expected Average DNA %	Expected Average DNA cM	Measured Average DNA cM *	Common Ancestors	Gens Back To Common Ancestors	Common Ancestor Possible Birth Year
Parent	**50**	**3400**	**3487**			
Sibling	**50**	**3400**		**Parents**	**1**	**1940**
Sibling (Excluding Doubles)	**37.5**	**2550**	**2629**	**Parents**	**1**	**1940**
Nephew or Niece	25	1700	1750	Parents/Grandparents	1.5	
Uncle or Aunt	25	1700	1750	Parents/Grandparents	1.5	
First Cousin	**12.5**	**850**	**874**	**Grandparents**	**2**	**1910**
First Cousin once removed	6.25	425	439		2.5	
Second Cousin	**3.13**	**213**	**233**	**Great Grandparents**	**3**	**1880**
Second Cousin once removed	1.56	106	123		3.5	
Third Cousin	**0.78**	**53**	**74**	**GG Grandparents**	**4**	**1850**
Third Cousin once removed	0.39	27	48		4.5	
Fourth Cousin	**0.19**	**13**	**35**	**GGG Grands**	**5**	**1820**
Fourth Cousin once removed	0.1	7	28		5.5	
Fifith Cousin	**unreliable**	**3**	**25**	**GGGG Grandparents**	**6**	**1790**

* Shared cM Project

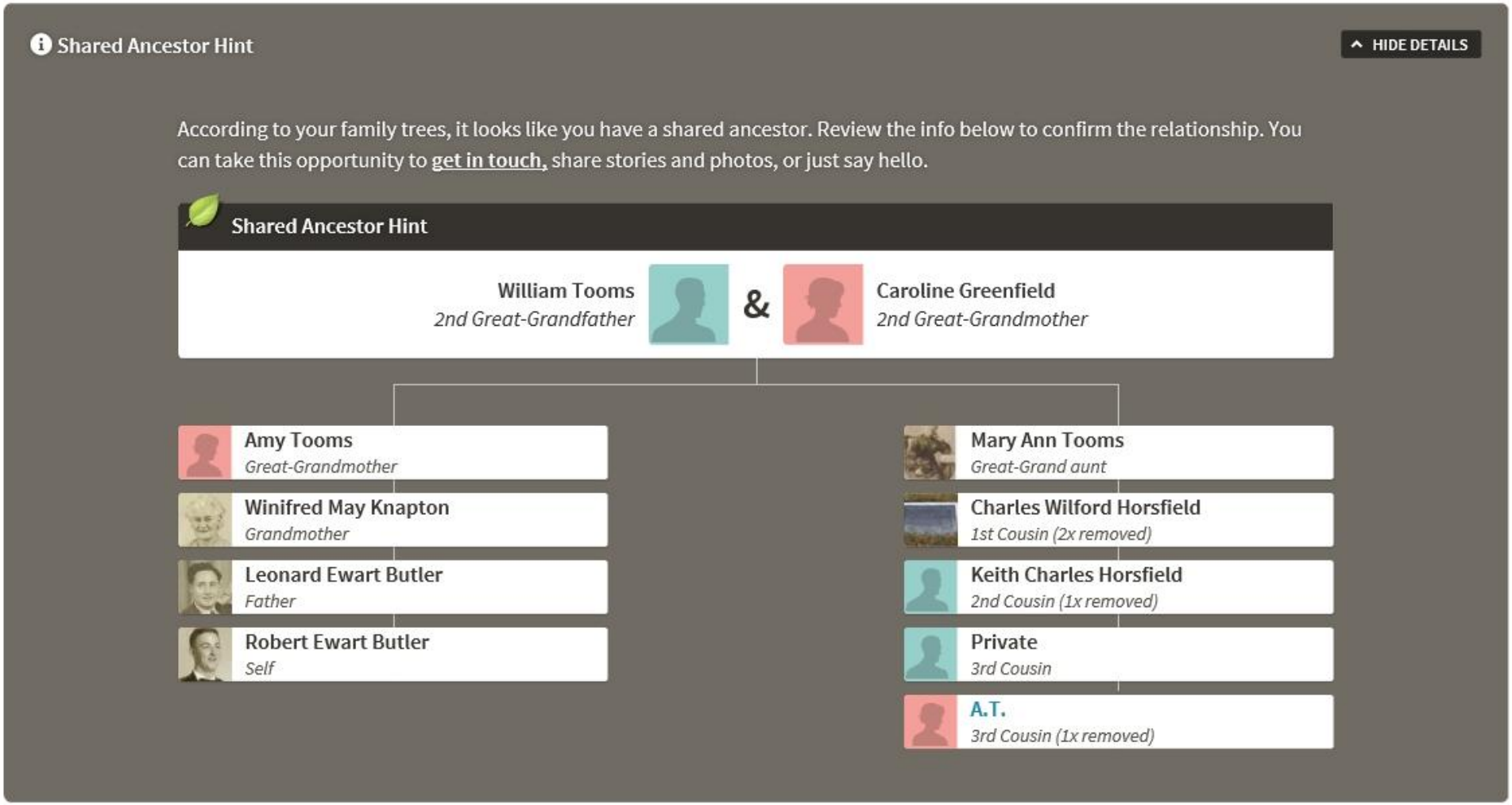
Autosomal DNA Matches

- FamilyTreeDNA

	Name	Match Date	Relationship Range	Shared Centimorgans	Longest Block
☐	 Ms. Trish Short Lewis	03/11/2016	2nd Cousin - 4th Cousin	108	35
☐	Noreen Grice	03/11/2016	2nd Cousin - 4th Cousin	84	45
☐	georgine cleem-whalen	03/22/2016	2nd Cousin - 4th Cousin	82	19
☐	 Eric Dennis	03/11/2016	2nd Cousin - 4th Cousin	69	31

Autosomal DNA Matches

- Ancestry.ca - Common Ancestors



Autosomal DNA Matches Jan 2018

- same person, different companies

	23andMe
Number of Customers	3 million
Number of Matches	
Minimum Match cM	7
Total Matches found	1220
Anonymous Matches	188
Matches >= 20 cM	384
Matches with known cousins	4
- including GEDmatch	11
Matches common ancestor hints	n/a
Genealogy (REB Rating - British & Irish)	3/10
- including GEDmatch	5/10
- including extra tests	

Autosomal DNA Matches Jan 2018

- same person, different companies

	23andMe	FamilyTreeDNA
Number of Customers	3 million	700 thousand
Number of Matches		
Minimum Match cM	7	9 (13 actual)
Total Matches found	1220	322
Anonymous Matches	188	
Matches >= 20 cM	384	86
Matches with known cousins	4	3
- including GEDmatch	11	10
Matches common ancestor hints	n/a	n/a
Genealogy (REB Rating - British & Irish)	3/10	4/10
- including GEDmatch	5/10	6/10
- including extra tests		6.5/10

Autosomal DNA Matches

Jan 2018

- same person, different companies

	23andMe	FamilyTreeDNA	ancestryDNA
Number of Customers	3 million	700 thousand	6 million
Number of Matches			
Minimum Match cM	7	9 (13 actual)	6
Total Matches found	1220	322	18,621
Anonymous Matches	188		
Matches >= 20 cM	384	86	538
Matches with known cousins	4	3	> 40
- including GEDmatch	11	10	>40
Matches common ancestor hints	n/a	n/a	33
Genealogy (REB Rating - British & Irish)	3/10	4/10	8/10
- including GEDmatch	5/10	6/10	8.5/10
- including extra tests		6.5/10	

Autosomal DNA Matches Jan 2018

- same person, different companies

	23andMe	FamilyTreeDNA	ancestryDNA	MyHeritage DNA
Number of Customers	3 million	700 thousand	6 million	1 million
Number of Matches				
Minimum Match cM	7	9 (13 actual)	6	12 (13 actual)
Total Matches found	1220	322	18,621	2616
Anonymous Matches	188			
Matches >= 20 cM	384	86	538	143
Matches with known cousins	4	3	> 40	1
- including GEDmatch	11	10	>40	8
Matches common ancestor hints	n/a	n/a	33	n/a
Genealogy (REB Rating - British & Irish)	3/10	4/10	8/10	2/10
- including GEDmatch	5/10	6/10	8.5/10	4/10
- including extra tests		6.5/10		

Autosomal DNA Matches Jan 2018

- same person, different companies

	23andMe	FamilyTreeDNA	ancestryDNA	MyHeritage DNA	GEDmatch
Number of Customers	3 million	700 thousand	6 million	1 million	
Number of Matches					
Minimum Match cM	7	9 (13 actual)	6	12 (13 actual)	7 (9.1 at 2000)
Total Matches found	1220	322	18,621	2616	2000
Anonymous Matches	188				
Matches >= 20 cM	384	86	538	143	87
Matches with known cousins	4	3	> 40	1	7 (from Ancestry)
- including GEDmatch	11	10	>40	8	
Matches common ancestor hints	n/a	n/a	33	n/a	n/a
Genealogy (REB Rating - British & Irish)	3/10	4/10	8/10	2/10	
- including GEDmatch	5/10	6/10	8.5/10	4/10	
- including extra tests		6.5/10			

Autosomal DNA Matches Jan 2019

- same person, different companies

	23andMe	FamilyTreeDNA	ancestryDNA	MyHeritage DNA	GEDmatch
				2019: 2.4 million Other data 2018	
Number of Customers	5 million	890 thousand	10 million	1 million	
Number of Matches					
Minimum Match cM	5	9 (13 actual)	6	12 (13 actual)	7 (10.5 at 2000)
Total Matches reported	1090	422	35,614	2616	2000
Anonymous Matches					
Matches >= 20 cM	352	422 / 117 (total / longest)	853	143	320 / 127
Matches with known cousins	6	4	> 60	1	9 (7 from Ancestry}
- including GEDmatch	14	11	>60	8	
Matches common ancestor hints	n/a	n/a	50	n/a	n/a
Genealogy (REB Rating)	3/10	4/10	8/10	2/10	
- including GEDmatch	5/10	6/10	8.5/10	4/10	
- including extra tests		6.5/10			

DNA Testing Companies

Jan 2018

https://isogg.org/wiki/Autosomal_DNA_testing_comparison_chart

	23andMe	FamilyTreeDNA	ancestryDNA	NATIONAL GEOGRAPHIC	MyHeritageDNA
Medical Reports	Health & Traits	n/a	n/a	n/a	n/a
Population Genetic Research	n/a	n/a	n/a	Worldwide	n/a
Person Ancestry/Ethnicity (ISOGG Rating)	7/10	3.5/10	4.5/10	2.5/10	4/10
Genealogy (REB Rating - British & Irish)	3/10	4/10	8/10	n/a	2/10
Genealogy, with GEDmatch	5/10	6/10	8.5/10	n/a	4/10
Genealogy, extra Tests	n/a	6.5/10	n/a	n/a	n/a
Number of Customers	3 million	700 thousand	6 million	230 thousand	1 million
Autosomal DNA Test Cost					
Cost	CDN $103	US $79	CDN $149	US $199.95	US $69
Cost including medical reports	CDN $199				
Shipping	+ CDN $19.95	+ US $12.99	+ CDN $19.95	+ US $10	+ US $12
Main Reason to Choose	Health & Trait Report Personal Ancestry	DNA Studies Extra Tests	Genealogy Matches	Population Research	-

DNA Testing Companies

Jan 2019

https://isogg.org/wiki/Autosomal_DNA_testing_comparison_chart

	23andMe	FamilyTreeDNA	ancestryDNA	NATIONAL GEOGRAPHIC	MyHeritage DNA
					2019: 2.4 million
					Other data 2018
Medical Reports	Health & Traits	n/a	n/a	n/a	n/a
Population Genetic Research	n/a	n/a	n/a	Worldwide	n/a
Person Ancestry/Ethnicity (ISOGG Rating)	7/10	3.5/10	5/10	2.5/10	4/10
Genealogy (REB Rating - British & Irish)	3/10	4/10	8/10	n/a	2/10
Genealogy, with GEDmatch	5/10	6/10	8.5/10	n/a	4/10
Genealogy, extra Tests	n/a	6.5/10	n/a	n/a	n/a
Number of Customers	5 million	890 thousand	10 million	230 thousand	1 million
Autosomal DNA Test Cost					
Cost	CDN $129	US $79	CDN $149	US $199.95	US $69
Cost including medical reports	CDN $249				
Shipping	+ CDN $19.95	+ US $12.95	+ CDN $19.95	+ US $10	+ US $12
Main Reason to Choose	Health & Trait Report	DNA Studies	Genealogy	Population Research	-
	Personal Ancestry	Extra Tests	Matches		

Presentation Summary

- Conventional Genealogy
  - On Line Trees for efficient research, publication, findable.
  - Canadian Records: Ancestry
- DNA Tests for Genealogy
  - Autosomal Ethnicity tests
  - Autosomal tests to search for common ancestors
    - Included Health: 23&Me
    - Common Ancestors: Ancestry
    - DNA Analysis: FT DNA

Legacy

Your DNA is your main legacy to your descendants.

Your raw DNA data is part of your legacy.

Backup Slides

Questions

- Why is DNA phasing not necessary to determine matches?
- Why are matches for siblings reported without taking account double matches on a single SNP?

Genetic Non-Discrimination Act

Bill S-201 Royal Assent May 2017

This enactment prohibits any person from requiring an individual to undergo a genetic test or disclose the results of a genetic test as a condition of providing goods or services to, entering into or continuing a contract or agreement with, or offering specific conditions in a contract or agreement with, the individual.

PC Genealogy Programs

Jan 2018

http://www.toptenreviews.com/software/home/best-genealogy-software

http://thegenealogyguide.com/best-genealogy-software-programs-your-top-5

Top Ten Ranking	Gold Award	2	3	6	9
	Legacy Family Tree	Family Historian	Family Tree Maker	RootsMagic	MyHeritage
Top Ten Rating	**9.7**	**9**	**8.9**	**8.3**	**6.8**
Program Version	Legacy 9	FH 6.2	FTM 2017	RM 7.5	FT Builder 8.0
Genealogy Guide Ranking	1	2	3 (FTM2014)	4	
Features for Stand Alone Use	**Fully Featured**	**Fully Featured**	**Fully Featured**	**Fully Featured**	
Charts & Reports	**45**	**34**	**37**	**39**	**16**
Tree Synch	**Family Search**	**Family Search**	**Ancestry (Full tree)**	**Ancestry (Indiv)**	**MyHeritage**
Web Hints (Number of Hints - Canadian Test - J. A. Gemmill, born 1888, Ontario.)					
Ancestry	-	-	**8 Rec + 6 Tr**	**8 Rec + 6 Tr**	-
MyHeritage	**1 Record + 3 Trees**	**1 Rec + 3 Tr**	-	**1 Rec + 3 Tr**	**1 Rec + 1 Tr + MyH**
Family Search	**0**	-	**4 Tr**	**6 R**	-
Findmypast (mainly UK)	**1 Rec**	**1 Rec**	-	**1 Rec**	-
Genealogy Bank (mainly USA)	**0**	-	-	-	-
Cost Full Version - US $	**40**	**50**	**80**	**30**	**Free**
	Free basic version	**30 day trial**		**Free basic version**	
Main Reason to Choose	**Charts & Reports**	**Ease of Use ?**	**Sync Ancestry Research**	**Research Indiv sync Anc.**	**Sync MyHeritage**

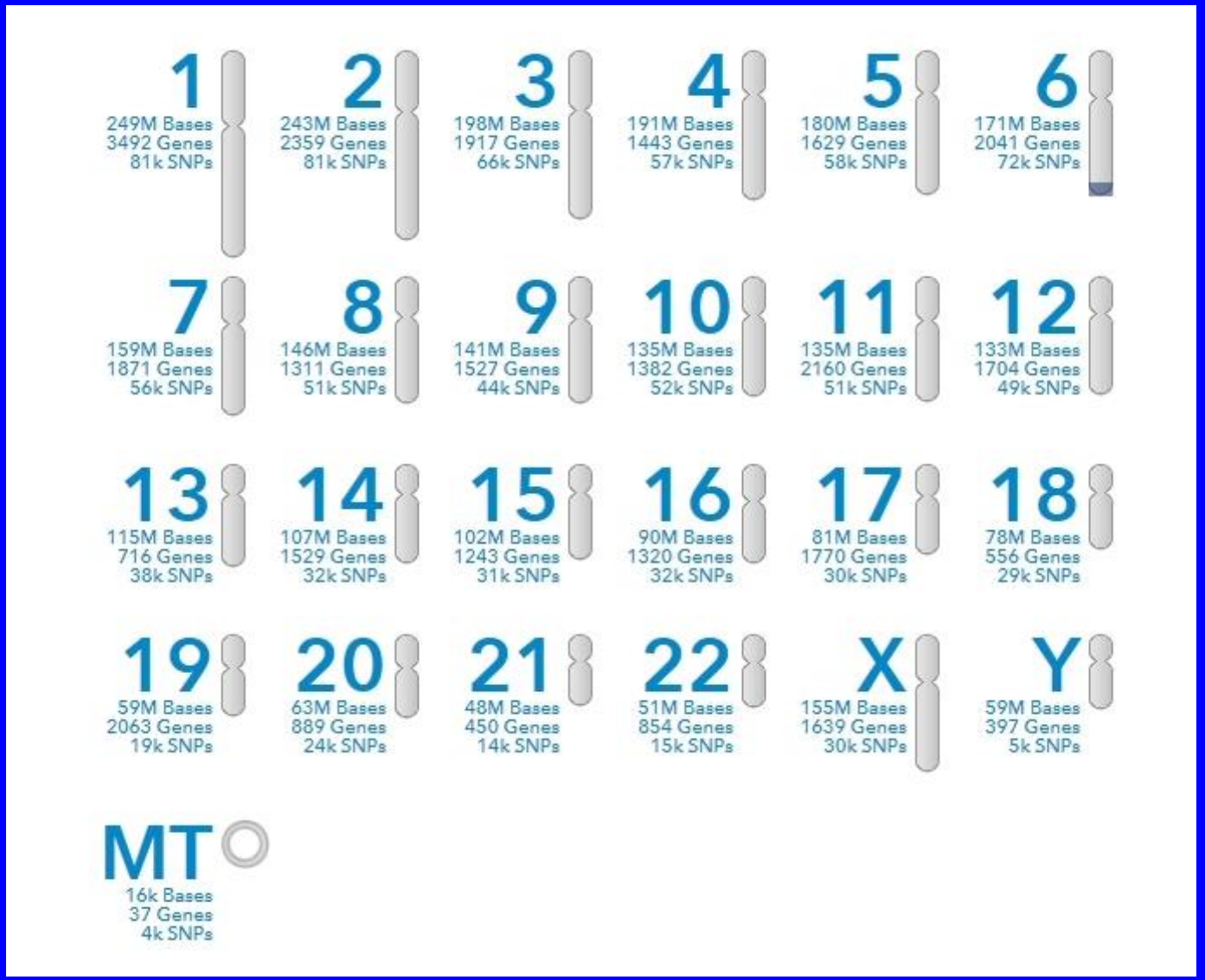
Recommended Computer Tools & Services

- Low Cost Starter – PC program, free Internet sources
  - Never on-line: Legacy
  - Some day on-line: Family Tree Maker or Roots Magic
- Mid Cost Starter – Ancestry, no PC Program
  - Local Ancestry Subscription & Free Internet
- Most Capable – Both PC & Ancestry - Synchronized
  - Ancestry World Wide Subscription,
    Family Tree Maker & Free Internet.

DNA Tests for Genealogy
- now routine

- DNA Basics
- DNA Ancestor Chart
- 3 Types of DNA Tests
- Autosomal DNA Tests
  - Ethnicity Reports
  - Genealogy Matches
  - Comparison of Testing Companies

Chromosomes, Base Pairs, Genes & SNPs measured



King Richard III ?

Mitochondrial DNA – U of Leicester

The DNA results showed a perfect whole-mitochondrial genome match between Skeleton 1 of the Greyfriars site and Michael Ibsen and a single base difference (mutation) with Wendy Duldig. This was not at all unexpected given the number of generations between them and is consistent with all three of them being related in the genealogical time span.

mtDNA Match Assessment

Generations to most recent common ancestor

Testing Level	Matching Level	Generations to Common Ancestor	
		50% Confidence Interval	95% Confidence Interval
mtDNA	HVR1	52 (about 1,300 years)	— *NA**
mtDNAPlus	HVR1 & HVR2	28 (about 700 years)	— *NA**
mtFullSequence	**HVR1, HVR2, & Coding Region**	**5 (about 125 years)**	**22 (about 550 years)**

*** The range of generations to a common ancestor at this level is too broad to calculate a 95% confidence period.**

King Richard III ?

Y Chromosome - U of Leicester

Genealogical information showed that all five living male-line relatives of Richard III were descended from Henry Somerset, the 5th Duke of Beaufort and the Y chromosome data for four out of the five male-line relatives showed a match consistent with them being related as expected. However, one of the five had a very different Y chromosome type indicating that a false-paternity had occurred within the last few generations. The Y chromosome type of the Skeleton 1 did not match any of the living male-line relatives showing that a false-paternity event (or events) had also occurred somewhere in the 19 generations between Richard III and Henry Somerset, 5th Duke of Beaufort.

Y DNA Match Assessment

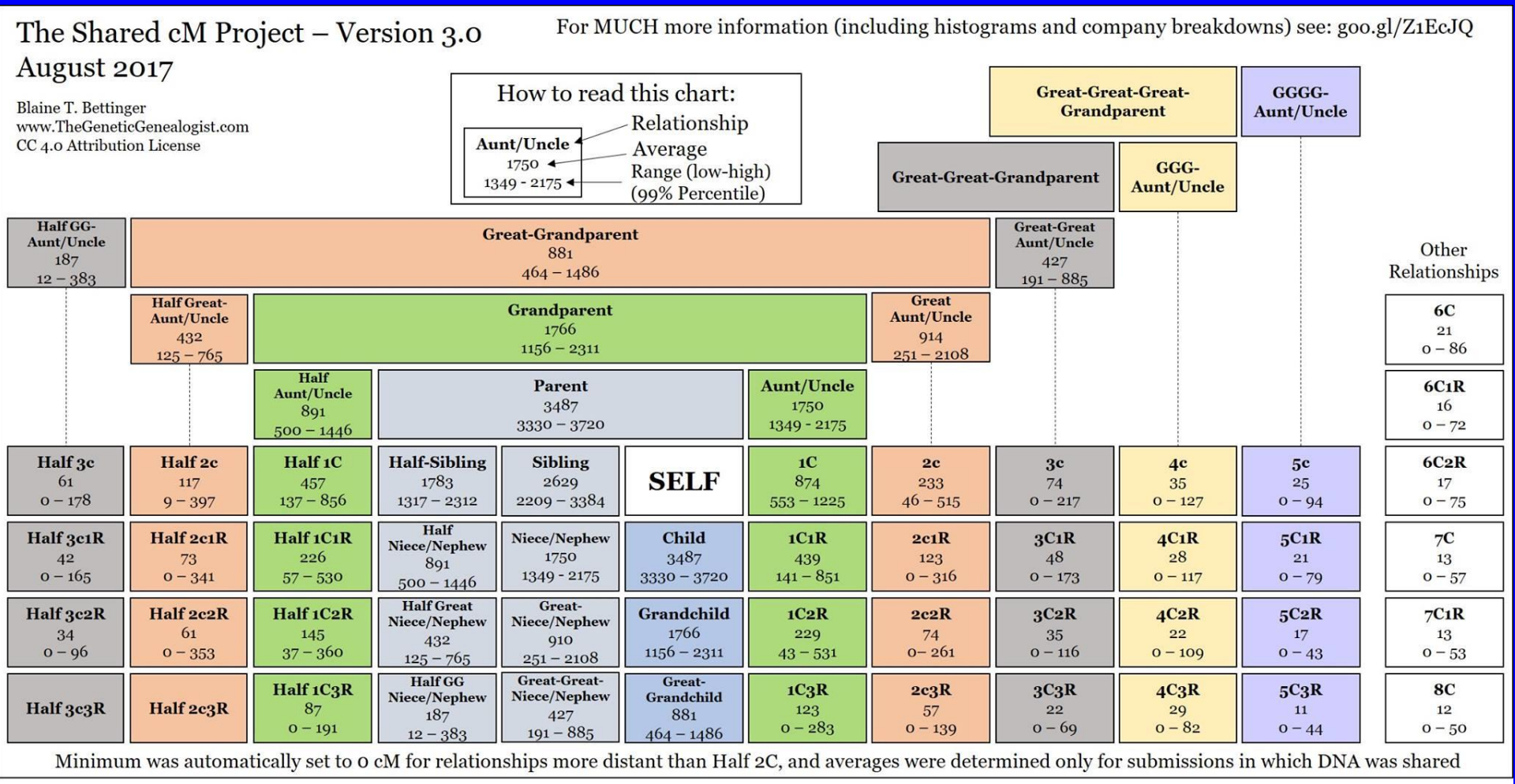
Generations to most recent common ancestor

Time to Most Recent Common Ancestor (MRCA)

Number of matching markers	Probability that the MRCA was not more than this number of generations ago		
	50%	90%	95%
10 of 10	16.5	56	72
11 of 12	17	39	47
12 of 12	7	23	29
23 of 25	11	23	27
24 of 25	7	16	20
25 of 25	3	10	13
35 of 37	6	12	14
36 of 37	4	8	10
37 of 37	2 to 3	5	7
65 of 67	6	12	14
66 of 67	4	8	9
67 of 67	2	4	6
107 of 111	7	11	13
108 of 111	5	10	11
109 of 111	4	8	9
110 of 111	2	6	7
111 of 111	1	3 to 4	5

Shared cM Project

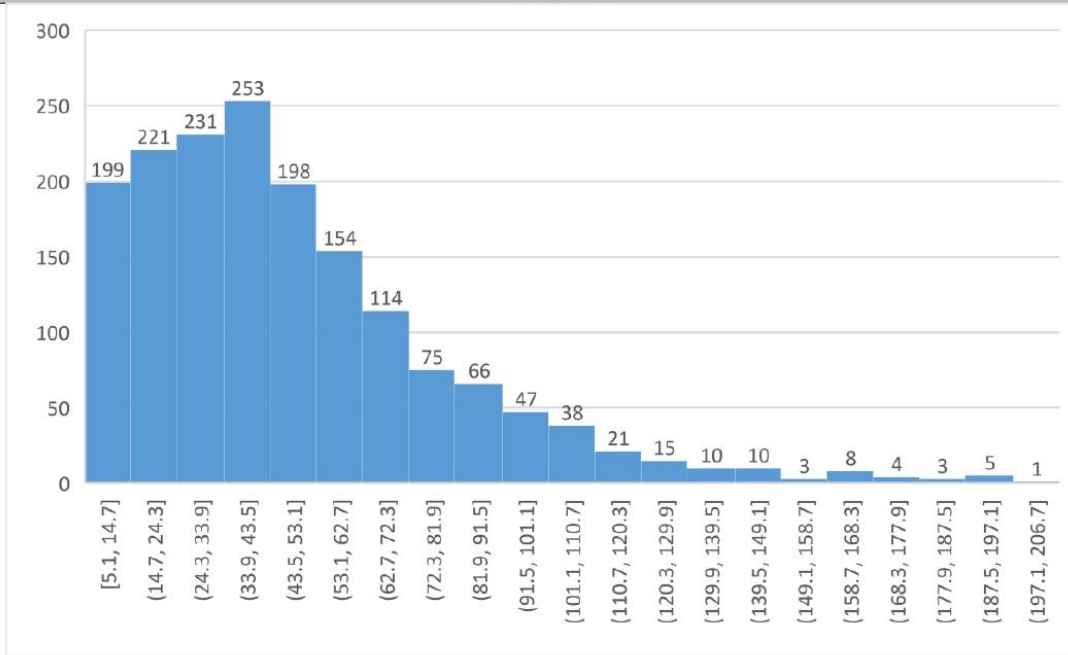
Match Averages



Shared cM Project

3rd Cousin Once Removed Histogram

The Shared cM Project – Version 3.0 (August 2017)

Relationship	#	Min	Average	Max	Histogram
3C1R (Cluster #8)	1736	0	48	173	

Chromosome 16
centiMorgans vs Base Pairs