Use of DNA in Genealogy

Why would someone want to use DNA for genealogy?

- To learn more about one's ancestry.
- To confirm that one's family tree reflects one's actual ancestry.
- To confirm the relationship between two people.
- To validate a theory of where people came from.
- To break down a brick wall in one's genealogy research.
- To find relatives for those that were adopted, gave up a child for adoption or otherwise do not know their ancestry.

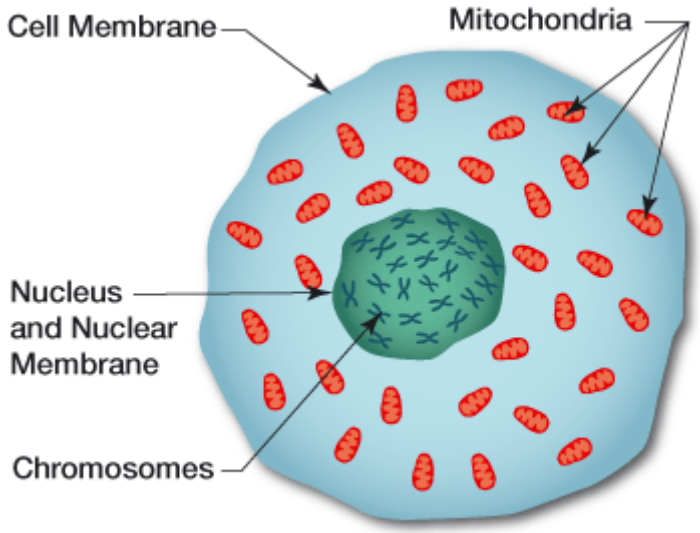
DNA adds to traditional genealogical research, it can not replace it.

DNA

- DNA is the molecule that encodes the genetic instructions for building and operating all living things.
- Humans are 99.9% genetically identical. That is a very important concept to remember.
- All the differences we see in the way people look, what diseases they may be prone to etc. come from the .1% difference.
- There are about THREE BILLION base pairs in which those differences may be expressed. The human genome is the complete set of human genetic information.

DNA

- It is located within the 23 pairs of chromosomes. Each half of the pair represents our mother or our father.
- These 23 chromosomes reside within the nucleus of our cells. There is also a small DNA molecule found within individual parts called mitochondria.



DNA

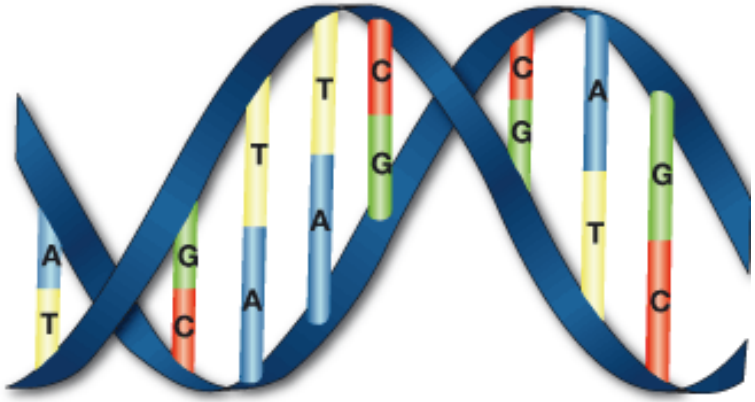
- DNA is the carrier of our genetic information, and is passed down from generation to generation. All of the cells in our bodies, except red blood cells, contain a copy of our DNA.
- At conception, a person receives DNA from both the father and mother. We each have 23 pairs of chromosomes. Of each pair, one was received from the father and one was received from the mother. These 23 pairs of chromosomes are known as nuclear DNA because, with the exception of red blood cells, they reside in the nucleus of every cell in our body.

DNA

- The 23rd chromosome is known as the sex chromosome. As with the other chromosomes, one is inherited from the father, and one from the mother.
- The 23rd chromosome from the mother is always an X.
- From the father, a person either inherits an X chromosome or a Y chromosome.
- The chromosome inherited from the father determines their gender.
- An X from the father would result in an XX combination, which is a female. A Y from the father would result in an XY combination, which is a male.

DNA

- We also inherit our mitochondrial DNA, mtDNA, from our mother, and none from our father. Mitochondrial DNA is located outside the nucleus of the cell.
- DNA is made up of four bases: adenine (A), cytosine (C), thymine (T), and guanine (G). The order of these bases is called the DNA sequence.

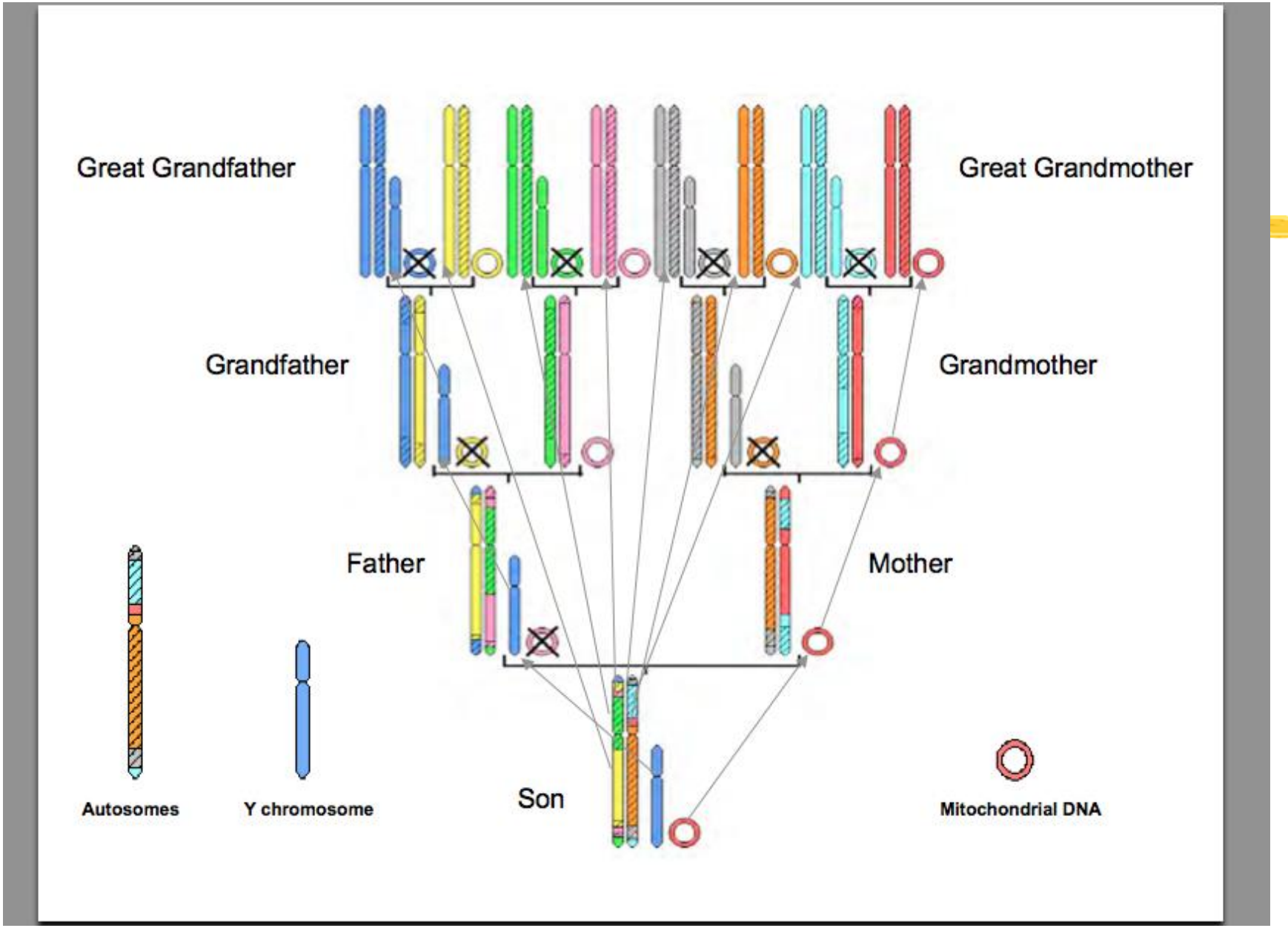


Thymine (Yellow) = T Guanine (Green) = G

Adenine (Blue) = A Cytosine (Red) = C

Autosomes

- Autosomal DNA is a term used in genetic genealogy to describe DNA which is inherited from the autosomal chromosomes.
- An autosome is any of the numbered chromosomes, as opposed to the sex chromosomes.
- Autosomes are numbered roughly in relation to their sizes. That is, Chromosome 1 has approximately 2,800 genes, while chromosome 22 has approximately 750 genes.
- There is no established abbreviation for autosomal DNA: atDNA (more common) and auDNA are used.
- As a general rule, the more autosomal DNA that you share in common with another person, the more closely related you are to that person


Great Grandfather
Great Grandmother
Grandfather
Grandmother
Father
Mother
Son
Autosomes
Y chromosome
Mitochondrial DNA

Autosomal sharing

- It is also important to have some understanding about the percentage of autosomal DNA that siblings, first cousins, and other more-closely related relatives share in common with one other.
- Generally speaking, siblings share 50% of their DNA, and first cousins share about 12.5% of their DNA, on average.
- However, these percentages can vary somewhat widely with some siblings having 60% or more of their DNA in common, while other siblings only share 40% or less. Similarly, first cousins can share as little as 7% of their autosomal DNA or as much as 15%.

DNA Testing

- AncestryDNA has more than 16 million DNA testers in its database (Jan 2020), so it certainly has the largest autosomal DNA matching database. The number of matches from Australia, New Zealand, UK and Ireland has grown rapidly so results are very productive for many testers.
- 23andMe's database contained more than 12 million testers as at 31 May 2020. Many testers use 23andMe primarily for health reports, so not all will opt-in to the genealogy results.
- MyHeritage DNA's database was reported at 3.9 million testers at the Rootstech conference in Feb 2020.
- Family Tree DNA's autosomal DNA database had exceeded 1 million testers (1,021,774) as at 31 January 2019 and was estimated at 1.8 million in February 2020.

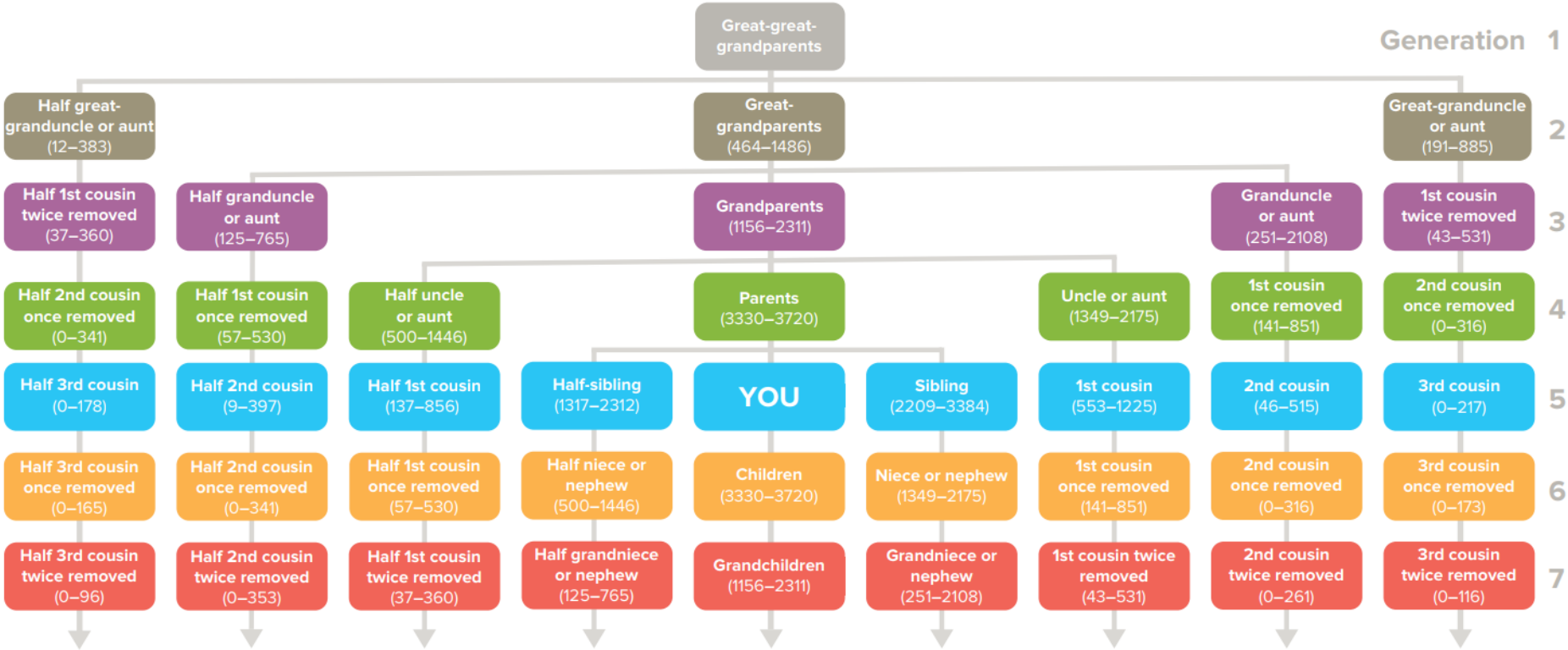
DNA test results

- Ethnicity estimates can vary from each testing body, and with time. No indication as to how far back in time.
- Results will usually show thousands of matches. Unlikely there will be many (if any) that are obvious.
- Degree of matching given in centimorgans (cM). See chart – next slide.
- Several techniques for making sense of the matches. A very good reference produced by Peter Calver, of the 'Lost Cousins' website. www.lostcousins.com/newsletters2/mar20news.htm

How Many Centimorgans Do You Share with Your Relatives?

How this chart works

Relationship
Centimorgan range
(low to high)



Combined Probus Club of
Wheelers Hill

Russell Cooper's DNA Matches

List | Map

Filter by: Unviewed | Common ancestors | Messaged | Notes | Trees | Shared DNA | Groups | Search | Sort

2nd Cousin

androbin60	2nd–3rd Cousin Shared DNA: 324 cM across 19 segments	642 People Common ancestor	Add to group
KayeLesley	2nd–3rd Cousin Shared DNA: 286 cM across 15 segments	465 People Common ancestor	Add to group
Sandra Masel	2nd–3rd Cousin Shared DNA: 215 cM across 13 segments	No Trees	Add to group

3rd Cousin

Sally Russell Managed by Stephen Russell	3rd–4th Cousin Shared DNA: 164 cM across 9 segments	No Trees	Add to group
Sally Plummer	3rd–4th Cousin Shared DNA: 163 cM across 9 segments	No Trees	Add to group
Lucy Robertson	3rd–4th Cousin Shared DNA: 149 cM across 9 segments	No Trees	Add to group

Credits

- Information contained in this presentation was sourced from the following sites:
  - https://www.familysearch.org/wiki/en/DNA_Basics
  - https://en.wikipedia.org/wiki/Genealogical_DNA_test
  - https://sites.google.com/site/wheatonsurname/beginners-guide-to-genetic-genealogy
  - https://www.lostcousins.com/newsletters2/mar20news.htm