itgroup@u3abrisbane

familyCircuitree

catching up with genealogy today

b4uc.xyz

1

## What is "genealogy"?

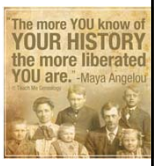
- The Webster dictionary defines genealogy as:

the account of the **descent** of a person, family or group from an **ancestor** or older forms, or the study of **family pedigrees**

4

## Some genealogy adages

- When we were young, we weren't really interested in our roots. . . But now that we are interested, there is really no one left to ask.
- "The more YOU know of your history, the more liberated you are." – Maya Angelou
- "History remembers only the celebrated, genealogy remembers them all." – Laurence Overmire

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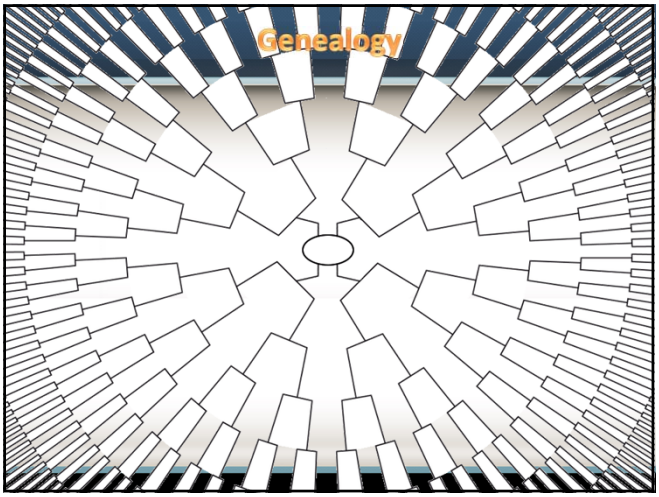
## Genealogy



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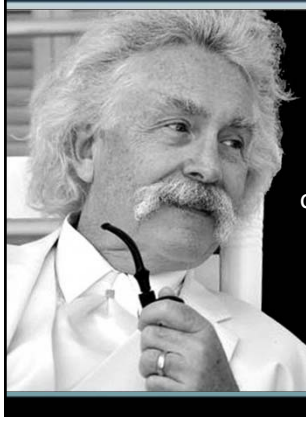
## Some genealogy adages



"Why waste money looking into your family tree? Go into politics and your opponents will do it for you."

Mark Twain

3

## Generation 0


6


Generation 1
1
MUM DAD
MOTHER - FATHER

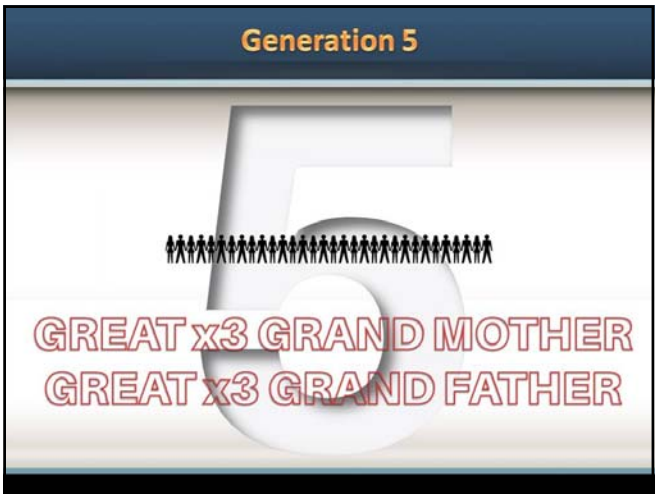
7


Generation 4
4
GREAT GREAT GRAND MOTHER
GREAT GREAT GRAND FATHER

10


Generation 2
2
MUM'S MUM
DAD'S MUM
MUM'S DAD
DAD'S DAD
GRAND MOTHER
GRAND FATHER

8


Generation 5
5
GREAT x3 GRAND MOTHER
GREAT x3 GRAND FATHER

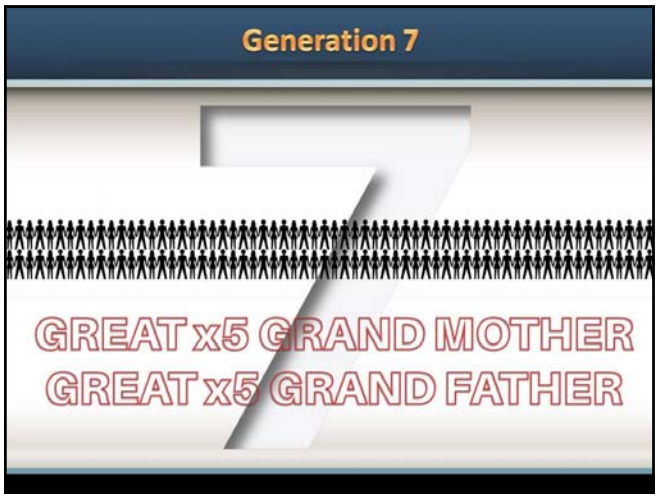
11


Generation 3
3
GREAT GRAND MOTHER
GREAT GRAND FATHER

9


Generation 6
6
GREAT x4 GRAND MOTHER
GREAT x4 GRAND FATHER

12

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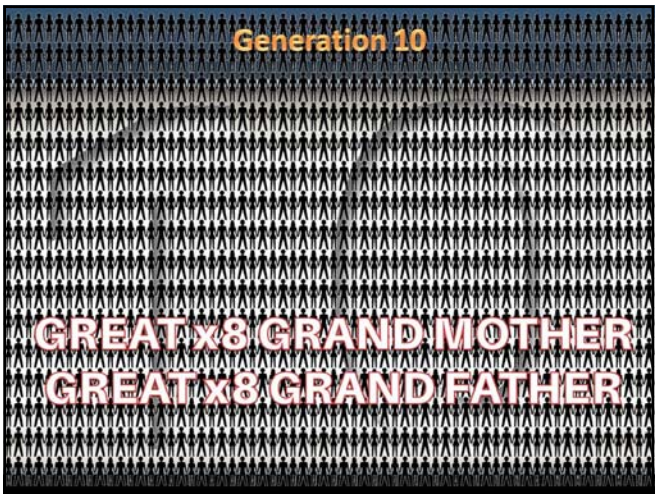


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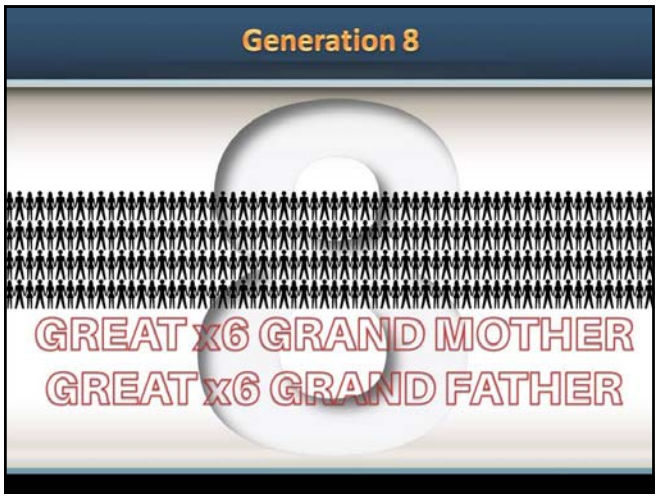


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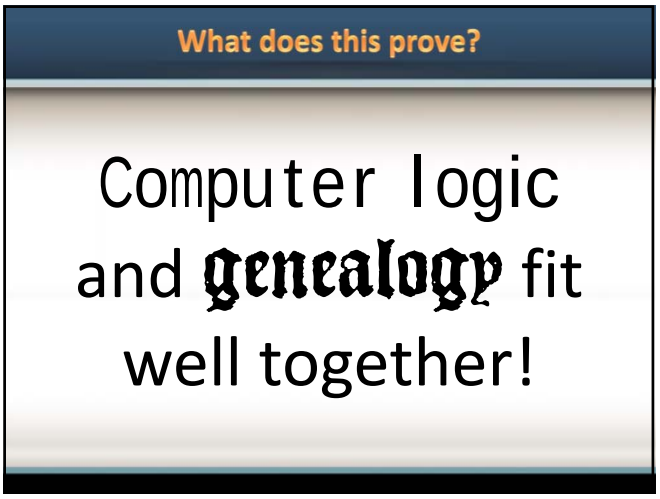


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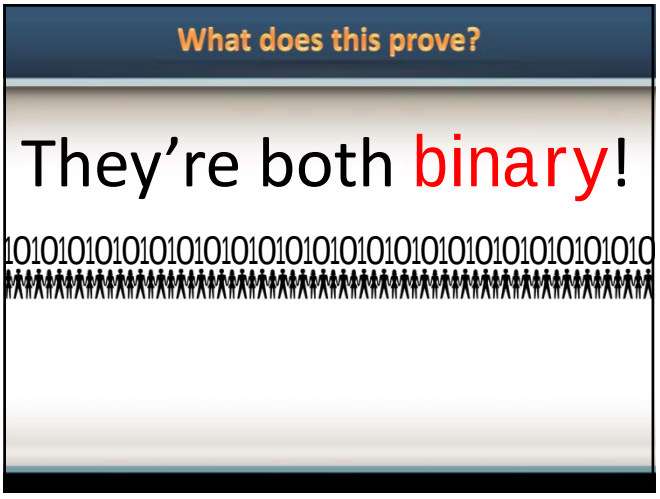


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## What does this prove?

They're both binary!

Although we might argue about who's the "1" and who's the "0".

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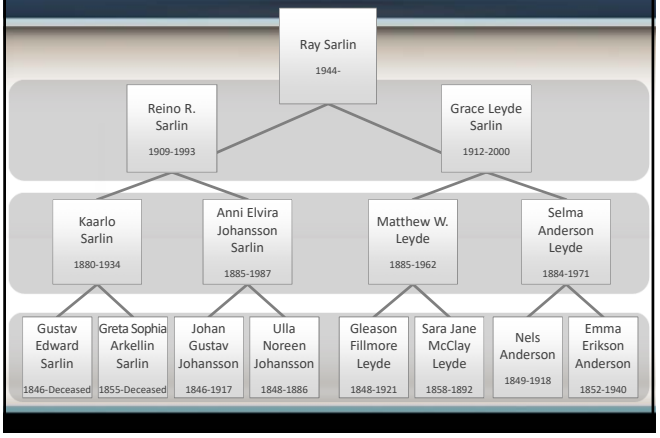
## Genealogy



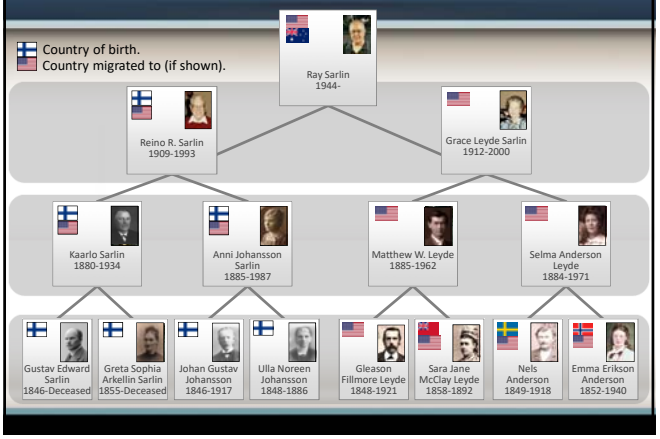

22

## Genealogy

| | | Lineage |
|---|---|---|
| Generation 00: | *Moi* or , 1 each | 1 |
| Generation 01: | 2 parents | 3 |
| Generation 02: | 4 grandparents | 7 |
| Generation 03: | 8 great grandparents | 15 |
| Generation 04: | 16 great great grandparents | 31 |
| Generation 05: | 32 great (x3) grandparents | 63 |
| Generation 06: | 64 great (x4) grandparents | 127 |
| Generation 07: | 128 great (x5) grandparents | 255 |
| Generation 08: | 256 great (x6) grandparents | 511 |
| Generation 09: | 512 great (x7) grandparents | 1,023 |
| Generation 10: | 1,024 great (x8) grandparents | 2,047 |

20

## Family History

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## What is "family history"?

- Family history may be defined as:

an **extension** to genealogy in which the **life and times** of the **people** concerned are investigated

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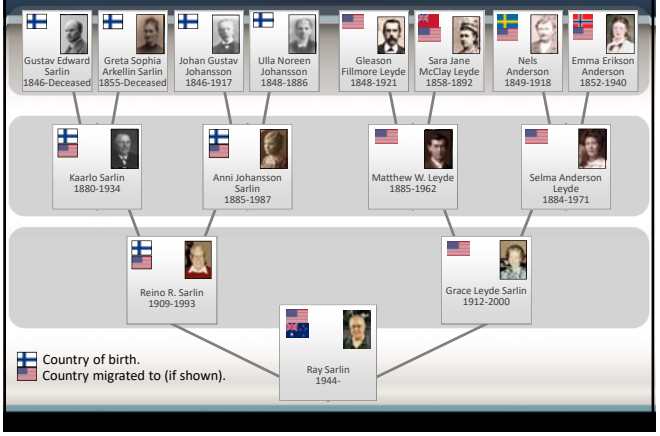
## Family Tree

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## The subjects of this course

- **Gene**alogy is the study of **genes**!
- Family hi**story** adds study of the **people** and their **stories**.
- World history puts both into **context**. It can help answer the illusive question "**why?**"
- Computers are just a **useful tool**.

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## Reasons for family research

- Identify family origins and experiences
- Pass down family information from one generation to the next
- Keep records of important family information
- Medical history ("A summary of diseases present in immediate blood relatives, which may be linked to heritable DNA mutations." medspeak-US)
- Help determine financial interests
- Personal therapy
- Personal satisfaction and pleasure

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## How do I start?

- Realise you already know many relevant facts!
- Gather the information you have:
  - Names of your family up to grandparents
  - Dates of their births, marriages and deaths
  - Their photographs
  - Places where these folks live/lived
  - Records – such as news articles, postcards, school reports, birth certificates, wills, obituaries, etc.
  - Other family heirlooms (e.g. Bibles, etc.)

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## Focus on key information

- For immediate family, extract the following facts:
  - **Name**
  - **Date of birth**
  - Place of birth (useful)
  - Marriage partner, date, place (useful)
  - **Date of death** (where appropriate)
  - Place of death (useful)
  - Where buried (useful)

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## Get organised

| | Direct Lineage | Family Lineage |
|---|---|---|
| Looking backward | A direct lineage, alternately called a pedigree or ascendant tree, begins with a single person (yourself?) and then follows a single surname or bloodline back through several generations in a direct line. This can also be expanded to include multiple direct lines, both of your parents, both of their parents, and so on. This is what most people think of when they refer to a **family tree**. | Take the direct lineage family tree and throw in siblings; the siblings of your parents (your aunts and uncles), the siblings of your grandparents (your great-aunts and -uncles), and so on. This type of genealogy provides a more complete picture of the "family" going back through generations, rather than focusing only on the individuals from whom you directly descend. |
| Looking forward | **Descendant Tree**<br>A descendant tree is the reverse of the family tree. It starts with an ancestor far back in the family tree and works forward to the present, attempting to account for all known descendants in all lines, both male and female. This is popular for published family histories or those looking to find relatives to plan a family reunion. | **Collateral Genealogy**<br>Basically an extension of the direct lineage, a collateral genealogy includes additional relatives who descend from the same common ancestor through lines other than your direct line, such as the spouses and children of siblings. Many people use collateral genealogy to help get around a brick wall in certain areas of their family tree. |
| | Direct ancestors only | Includes other relatives |

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## How many years in a generation?

- The average person (middle child in a family) is born to a 34 year old father and 29 year old mother. The median is (34+29)/2 or 31.5 years.
- A 2019 baby's great$^8$ grandfather would have been born in 2019-(10*34)=1,679
- A 2019 baby's great$^8$ grandmother would have been born in 2019-(10*29)=1,729

**50 years**

When ancestors repeat in your family tree or cousins marry, they're not always in the same generation.

30

## Here's a weird example

**Electress Sophia of Hanover** (1630-1714) is a 10th generation ancestor of **Queen Elizabeth II** (b. 1926) *7 separate times,* and also her 9th generation ancestor *2 separate times.*

Granddaughter of James I, Sophia became heir presumptive to the crowns of the Kingdoms of England and Ireland under the *Act of Settlement 1701*. After the *Acts of Union 1707*, she became heir presumptive to the unified throne of the Kingdom of Great Britain. She died less than two months before she would have become queen succeeding her first cousin once removed, Queen Anne, and her claim to the throne passed on to her eldest son, George Louis, Elector of Hanover, who ascended as George I on 1 August 1714.

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## Another weird example (personal)

Stratford-upon-Avon, Warwickshire, England




William Shakespeare's maternal and paternal grandmothers are sisters.

Alexander Webb, Jr. and family emigrated to America in 1626. One son, Richard Sr. (1580-1676), who landed in 1626 is my great great great great great great great great great great great great great grandfather.

NOTE: Only maiden names are shown for clarity.

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## The Great Puritan Migration

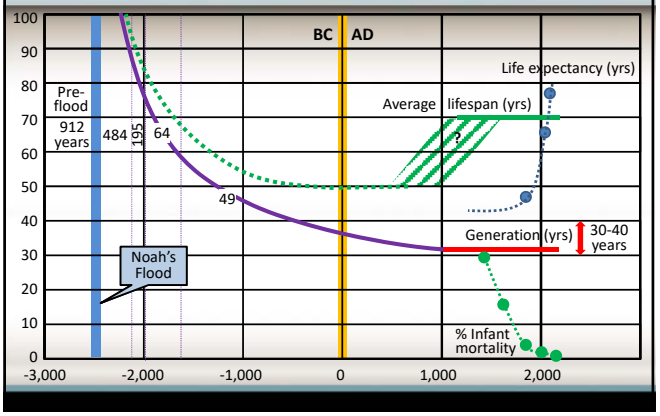
33

## The Great Puritan Migration

- The Webb family were among several hundred English puritans who migrated to America and the West Indies in the 1620s. They were joined between 1630 and 1640 by another 20,000.
- Pilgrims primarily left England due to religious persecution from Charles I (b 1600, r. 1625-1449) (staunch High Church, possibly "popish," and married to Henrietta Maria, a French Roman Catholic) and, after 1633, Archbishop of Canterbury Laud.
- Many also migrated for economic reasons. Most Puritans were prosperous, literate and skilled middle-class families.
- A second migrant stream was comprised of single, young men.
- Migration abruptly ended with the English Civil War (1642-1651)

34

## The length of a generation

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## The Genealogy Products and Services Market


36

## Genealogy products and services market

- Genealogy
- DNA Testing
- Ethnicity Testing
- Paternal Lineage Testing
- Ancestry Testing

US$12 billion per annum (1/4 in the USA)

11.3% per annum

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## Recent innovations

- To capitalize on the surging demand for home DNA testing, MyHeritage signed an agreement with WHSmith, giving latter the right to sell and distribute its DNA kits in the UK. The agreement is the first of its kind in the UK and will allow MyHeritage to extend its network.
- 23andMe, Inc., became the first company in the USA to receive an authorization for conducting direct-to-consumer test estimating the risks of cancer in the country. The authorization allows 23andMe to provide consumers with a report on BRCA1 and BRCA2 genes which are closely associated with higher risks of ovarian, breast, and prostate cancer.
- Ancestry.com, a leading player in the genealogy products & services market, recently released 94 new and updated genetic communities specifically for African Americans to help them learn about their lineage and heritage.
- To ensure precise and extensive results, FamilySearch announced it will be redesigning its database to include data about same-sex families. The company claims it will finish redesigning its system this year.

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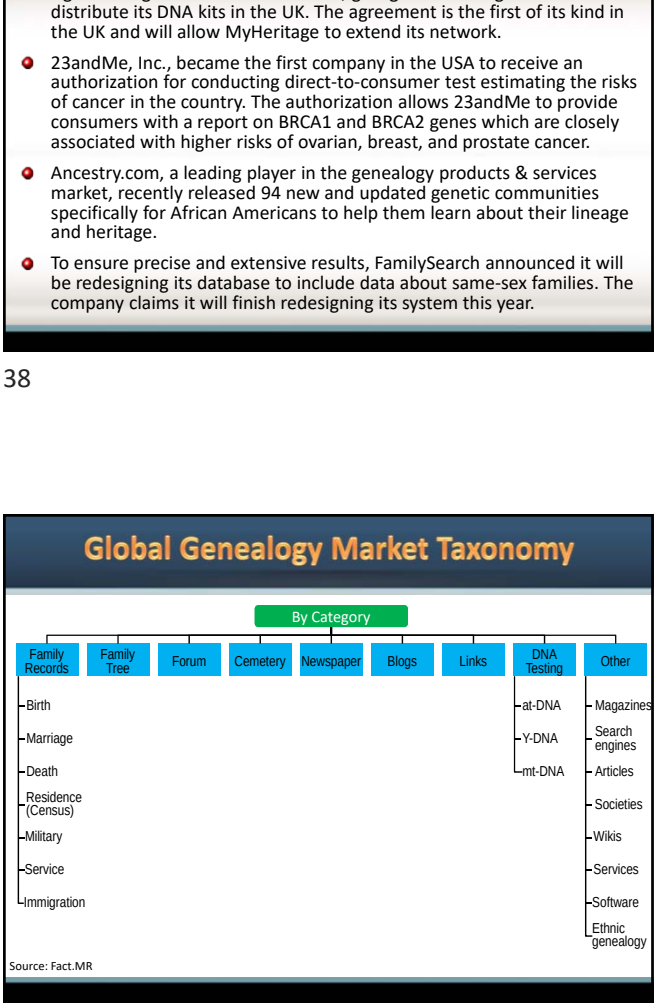
## Global Genealogy Market Taxonomy

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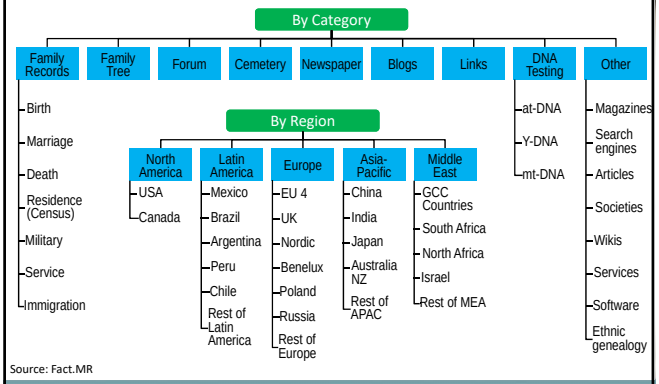
## Global Genealogy Market Taxonomy

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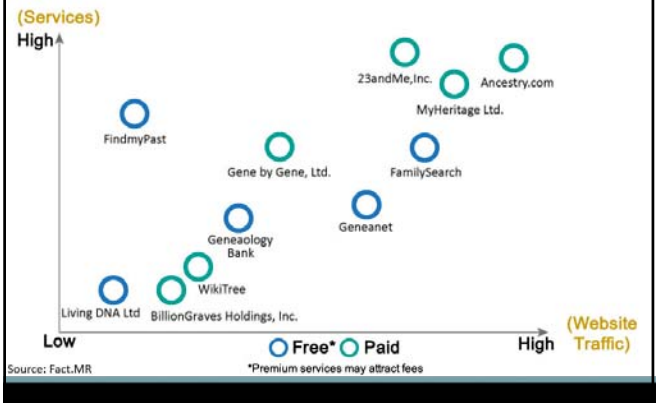
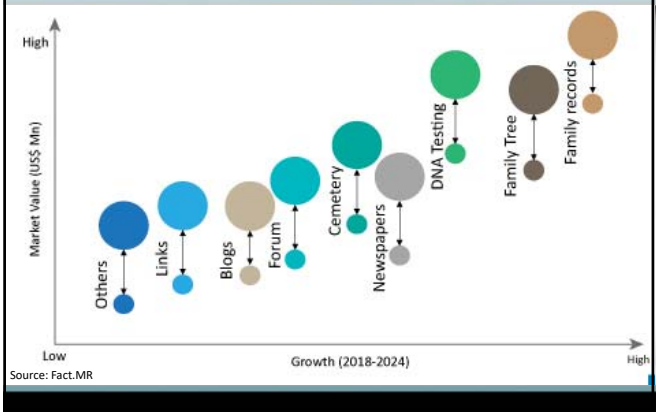
## Global Market - Perceptual Mapping




41

## Growth Analysis by Category

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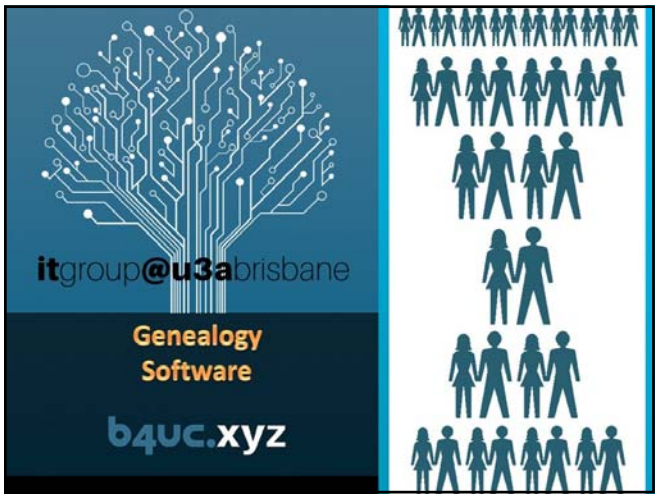


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## Introduction to Genealogy Software

1. **Search engines** (general vs. specialised)
2. **Client-based Genealogy Software**: information stored on your computer (or your own media or cloud space), but can assess internet.
3. **Web-based Genealogy Software**: information stored on internet website but owned by you.
4. **Commercial Online Genealogy Applications**: information stored on internet website owned by software company, you have rights to use.
5. **Collaborative Online Family Trees**: information stored on internet website, whatever is posted they have full rights to use.

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## Search engines


45

## Computer Search Engine

| PRO | CON |
|---|---|
| • Search engines are useful tools to help you find leads to useful data.<br>• Some search engines still maintain your privacy, like DuckDuckGo and StartPage.<br>• There are hundreds of genealogy specific engines. Some may even be useful.<br>• When all else fails, try searching.<br>• If you're clever with key words and persistent, search engines can work for you. | • Paid search space is 'top-heavy'. Ads may shove meaningful results way down (making you work).<br>• Major search engines like Google track your internet usage and use algorithms to serve you ads (and who knows what else).<br>• Your personal online history is stored and may be on sold.<br>• Major tech companies are now so politically left that trust is an issue. |

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## A few specialised search engines

- GenealogyInTime Magazine
- https://www.myheritage.com/research
- https://www.archives.com/
- http://www.ancestorhunt.com/
- https://home.rootsweb.com/
- https://www.cyndislist.com/
  23 genealogy search engine links

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## Client-based Genealogy Software


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## Client-based Genealogy Software

| PRO | CON |
|---|---|
| • Free or discrete one-time cost (some have free + fee versions)<br>• Your data is stored on your computer (or cloud space)<br>• Many now query bigger online genealogy websites<br>• Can transfer data to online sites via GEDCOM files. | • Proprietary, shareware or GNU GPL* software license.<br>• Refer to terms & conditions.<br>• Hard drive crash, you My lose all your work.<br>• May make you work harder (and smarter) to find data.<br>• Fewer security updates, etc. |

* GNU General Public License = end users may run, study, share and modify the software.

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## Some Client-based Genealogy Programs

| | | | |
|---|---|---|---|
|  | Family Tree Maker 2017 | Ancestry (account required) and FamilySearch searches are integrated. Wide variety of charts and reports. | $114.95 |
|  | Family Historian 6 | Automatic data matching with MyHeritage. Web Clipping Capability to drag and drop. Map window. Citations. Unicode & accents. | A$79.95 |
|  | Gramps | Free, offers a professional genealogy program and a wiki open to all. Created, developed and governed by genealogists. Uses British English. | Free Open Source |
|  | Legacy Family Tree | Data matching with FindMyPast, FamilySearch, and MyHeritage. FindAGrave.com search. Add stories and hashtags. Charts. Source ID. | Free and deluxe versions A$79.95 |
|  | RootsMagic 7 | Web hints from FamilySearch & MyHeritage. Data clean. Multiple trees. Create and use groups. Import/export GEDCOM. Post DNA results. Edit person window. | Free and full versions A$49.50 |

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## Web-based Genealogy Software

TNG
GeneWeb
Geneotree
PhpGedView
Genealone
HuMo-gen
webtrees

51

## Web-based Genealogy Software

| PRO | CON |
|---|---|
| • Have your own website that your PC database updates.<br>• Search 20 billion records from sites like MyHeritage and Findmypast.<br>• Contains tools to research and build your family tree.<br>• Online Support.<br>• Full GEDCOM capability. | • Installed on a web server<br>• Co$t. You have to pay fees for the software (modest) and web-server space.<br>• Requires you to become a webmaster and run a website.<br>• May require learning new skills.<br>• If server is down, website is down. |

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## Commercial Online Genealogy Applications

23andMe.com
Findmypast.com
Ancestry.com
MyHeritage.com

53

## Commercial Online Genealogy Applications

| PRO | CON |
|---|---|
| • Massive search resources<br>• Easy setup<br>• Convenient (tips, etc.)<br>• Economy of scale<br>• Access from anywhere<br>• Edit, protect or remove data.<br>• Assurance that you'll still have your tree if your computer crashes. | • Cost<br>• Placing data online carries risk (e.g., malicious release)<br>• Must of the data is WIP or not 100% accurate<br>• Must trust external entity<br>• No control over how data is protected, used or shared<br>• May not be able to edit, protect or remove data. |

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## Collaborative Online Family Trees


55

## Collaborative Online Family Trees

| PRO | CON |
|---|---|
| Easy setup | Placing data online carries risk (e.g., malicious release) |
| Convenient | Research is shared online but cannot download |
| Economy of scale | Must of the data is WIP or not 100% accurate |
| Access from anywhere | Must trust external entity |
| Simple sharing | No control over how data is protected, used or shared |
| Assurance that you'll still have your tree if your computer crashes. | May not be able to edit, protect or remove data. |

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## The two main collaborative family trees

**Profiles connected by Geni's world family tree:**

**134,247,395**

Geni is creating one family tree for the entire world, built from the collaborative research of millions of genealogists.

Geni

FamilySearch **7.08** billion searchable names

**FamilySearch** is a genealogy organization operated by The Church of Jesus Christ of Latter-day Saints (aka LDS or Mormons). It was previously known as the Genealogical Society of Utah (or "GSU") and is the largest genealogy organization in the world.

Updated 29 July 2019

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## Comparison Chart – "Big 4"

### The Four Online Genealogy Giants

- Ancestry is a US company that began life as a LDS genealogical publisher.
- FamilySearch is a USA-based LDS-sponsored non-profit supporting global genealogy research.
- FindMyPast is a UK-based online genealogy service owned by Scottish publisher DC Thompson.
- MyHeritage began as a family tree website in Israel and has experienced strong growth in the USA, Europe, the Middle East and Africa.

| Feature | Ancestry | FamilySearch | Findmypast | MyHeritage |
|---|---|---|---|---|
| Founded | 1983 | 1999 | 2003 | 2003 |
| Names in historical records | 30 billion (includes an estimated number of names in unindexed records) | 5.6 billion | 8 billion (includes an estimated number of names in unindexed records) | 4.4 billion (includes estimated number of names in unindexed brackets) |
| Additional proprietary records and digital books | NA | 3.2 billion records and 343,000+ digital books | Census records, Parish records and Military records from England, Wales, Scotland and Ireland. | NA |
| Names in | 20 billion (in 100 | 4+ billion in one tree, | Not searchable | 2.6 billion (in 35 |

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## https://www.cyndislist.com/

Since 1996, *Cyndi's List* has provided a **free** starting point for online genealogy research. It contains:

Cyndi's List

- A categorized and cross-referenced index to genealogical resources on the Internet.
- Links that point you to genealogical research sites online.
- A **free** jumping-off point to use in your online research.
- A "card catalogue" to the genealogical collection in the immense library that is the Internet.
- A genealogical research portal onto the Internet.

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## The Secret Weapon

- **GEDCOM** stands for **GE**nealogical **D**ata **COM**munication, an open de facto specification to exchange genealogical data between different genealogy software.
- The specification was developed in 1985 by the Church of Jesus Christ of Latter-Day Saints.
- The file was meant to move data between programs.
- Because it is basically a (highly) structured TXT file, batch changes are possible. Several available editor apps allow you to inspect, create and modify Genealogy Data stored as GED or transfer it to/from CSV, HTML, PDF, etc to edit.

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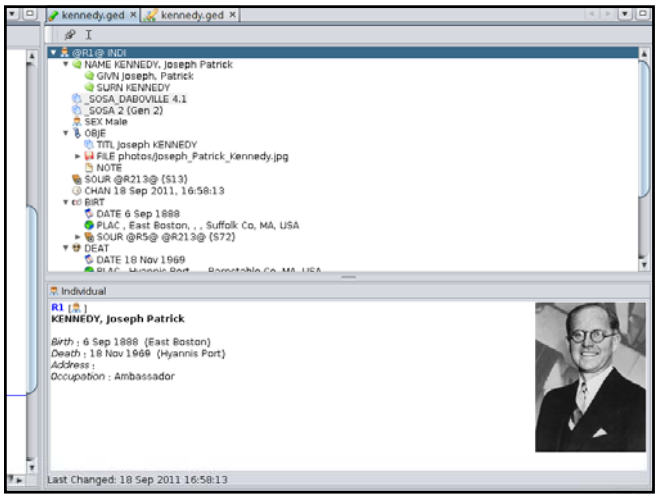


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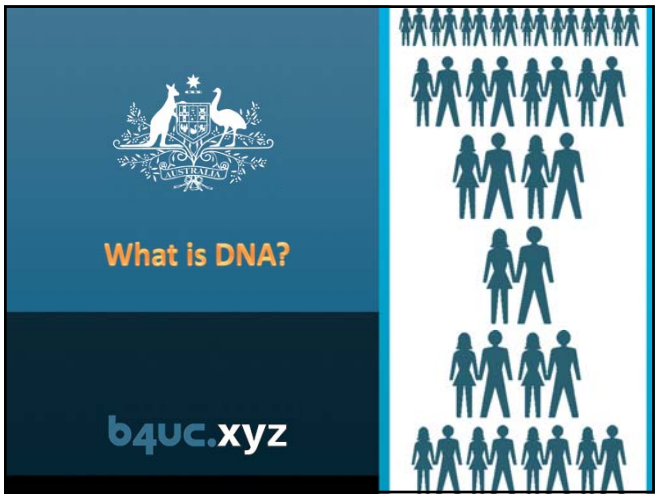


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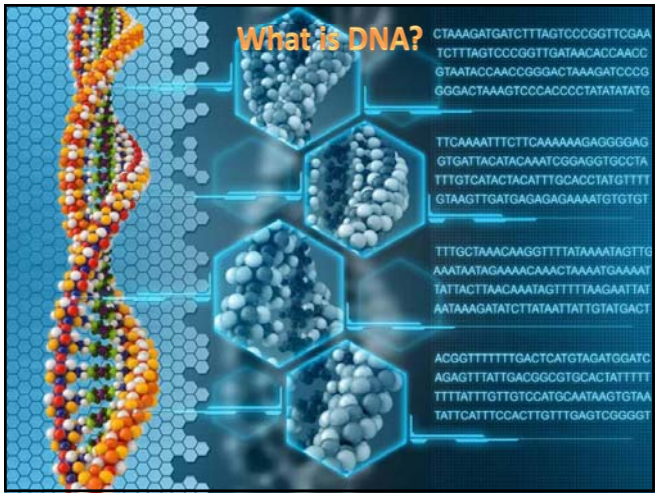


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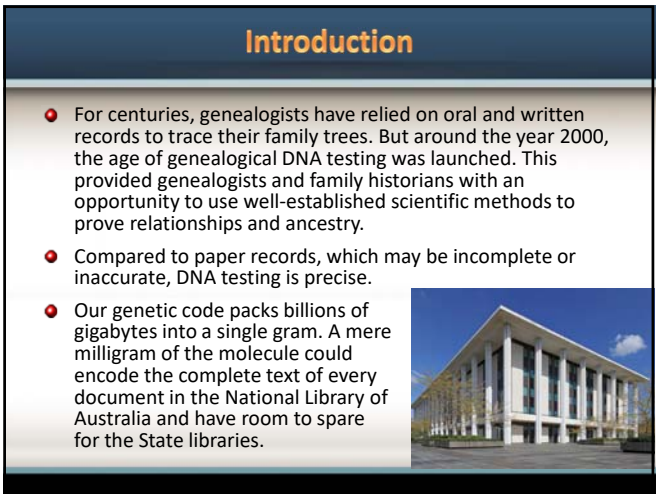


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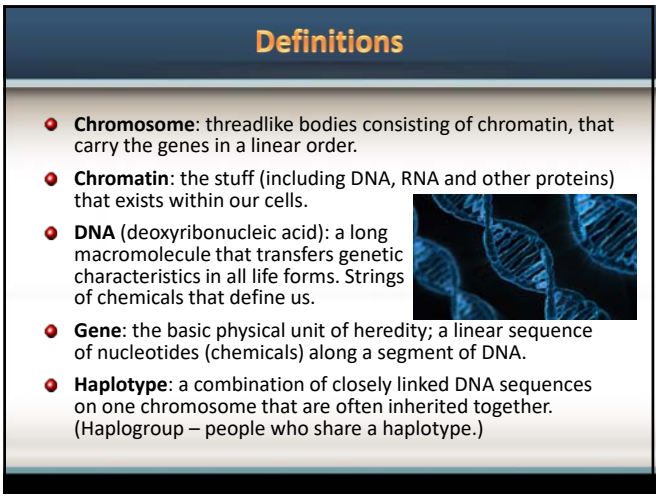


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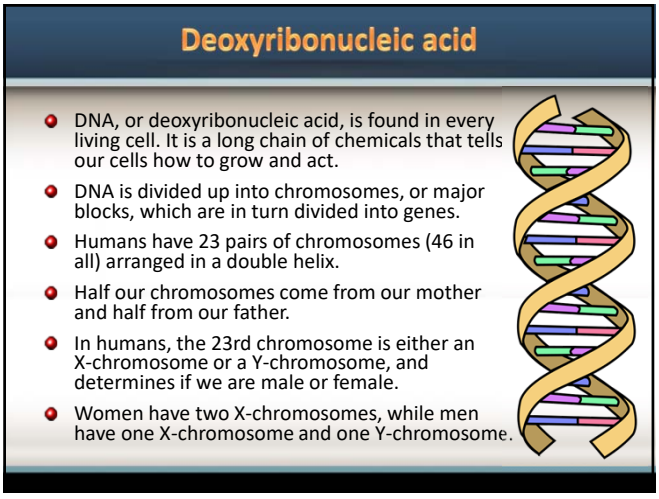


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## Chromosomes and Genes

- Within the nucleus of cells, DNA is arranged into structures called chromosomes.
- Humans cells contain 23 pairs of chromosomes, 46 chromosomes per cell.
  - 22 pair are **autosomes** that carry hereditary information.
  - One pair carries **sex chromosomes** (X or Y) that determine gender. Females have a X-X pair; males, a X-Y pair.

XX XY

- The mother will pass an X chromosome to her baby.
- If the father passes his X chromosome, the baby will be a girl (X-X).
- If the father passes his Y, the baby will be a boy (X-Y).

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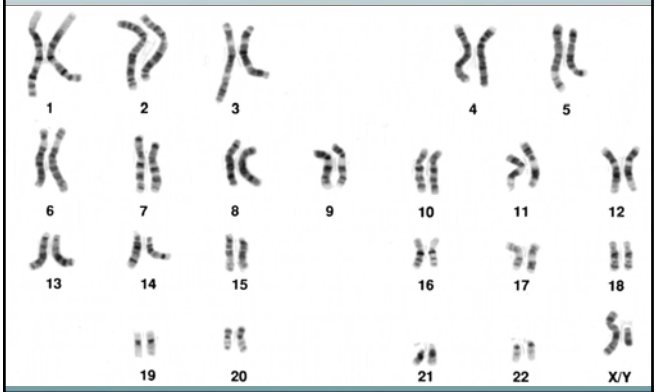
## Human cells contain 23 pairs of chromosomes

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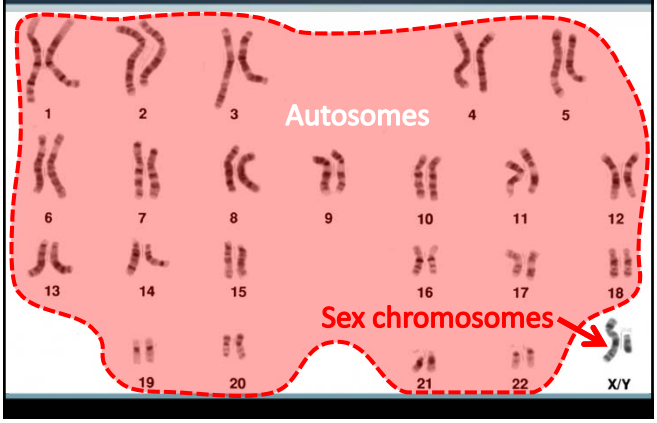
## Human cells contain 23 pairs of chromosomes

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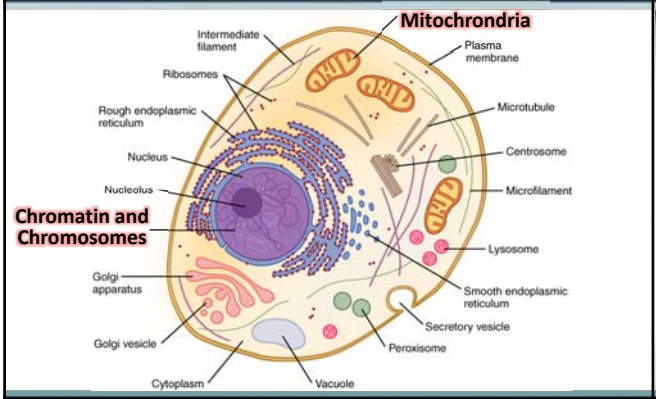
## The human cell

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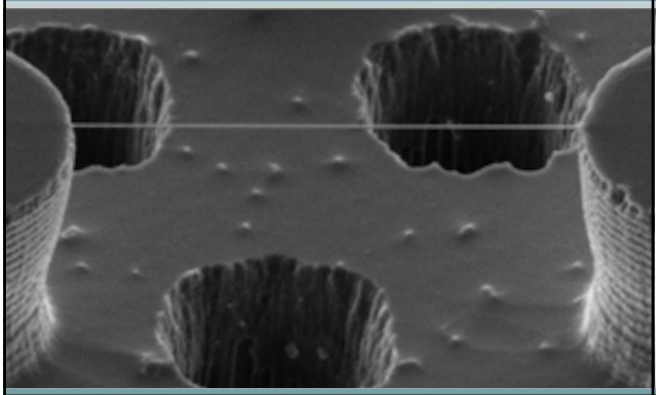
## Actual images of a DNA molecule



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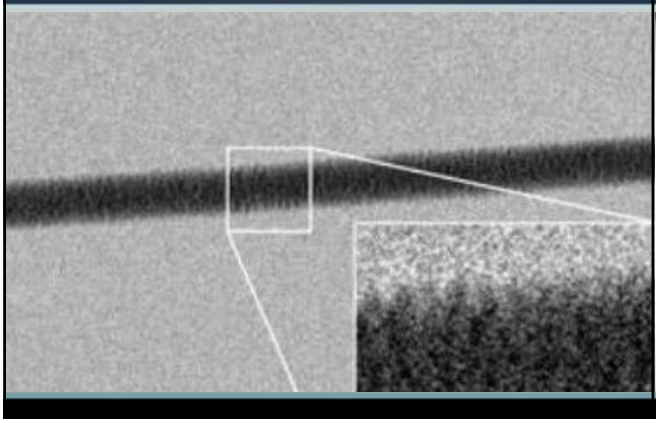
## Close-up of straightened DNA strand



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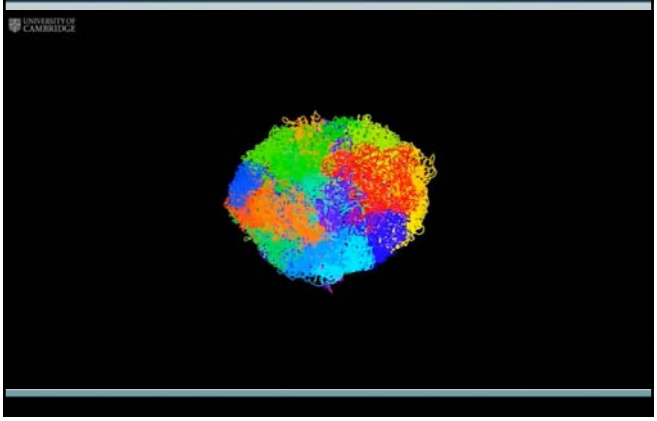
## How the chromosome pairs fit in the nucleus



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## Introduction to Molecular Genealogy

There are four types of DNA tests used in genealogy. Each one works a little differently, and tells you different things. Therefore, each one has its advantages and disadvantages.

- The Four Types of DNA tests for genealogists:
  - Autosomal DNA (by far the most common).
  - Y Chromosome DNA (Y-DNA) – paternal line.
  - Mitochondrial DNA (mtDNA) – maternal line.
  - Y-DNA and mtDNA – paternal and maternal lines.

https://learn.genetics.utah.edu/content/basics/molgen/

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## DNA Testing for Genealogy

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## Autosomal DNA Tests

- Autosomal DNA examines the **first 22 pair of chromosomes**.
- Since it doesn't rely on the 23rd chromosome, autosomal DNA tests can be done in **both men and women** equally.
- Autosomal DNA tests single-nucleotide polymorphisms (SNPs), or the different "shapes" of small chunks of DNA. They check about 700,000 SNPs to determine how closely related you are to someone else.
- The further you go back, the less DNA you inherit from a particular ancestor, so after 5+ generations it is less effective.
- It can also provide an estimate of your ethnicity, or the regions where your ancestors lived within the past few centuries.
- **Every genealogy DNA company** offers autosomal DNA tests.

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## Typical DNA Test Kits


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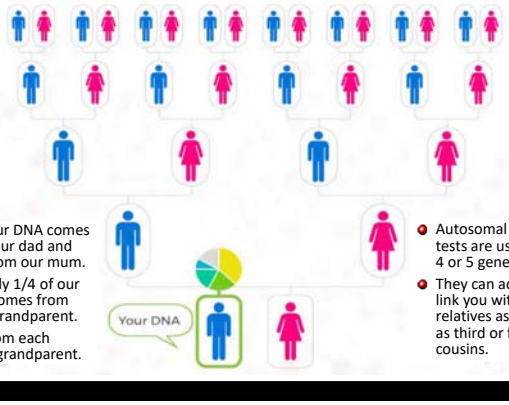
## Autosomal DNA

The DNA you inherit from ALL of your ancestors.




- Half our DNA comes from our dad and half from our mum.
- Roughly 1/4 of our DNA comes from each grandparent.
- 1/8 from each great-grandparent.

- Autosomal DNA tests are useful for 4 or 5 generations.
- They can accurately link you with relatives as distant as third or fourth cousins.

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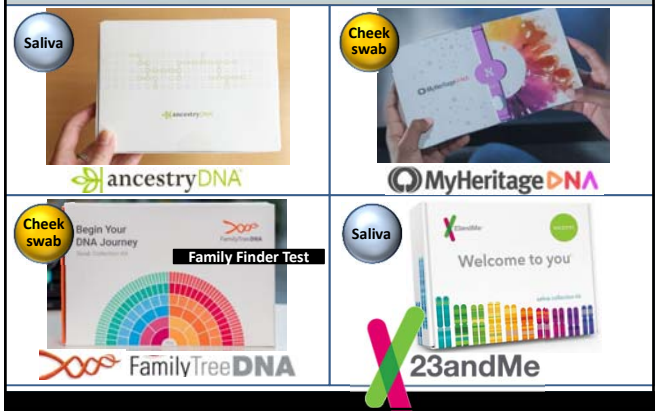
## Common Autosomal DNA test kits

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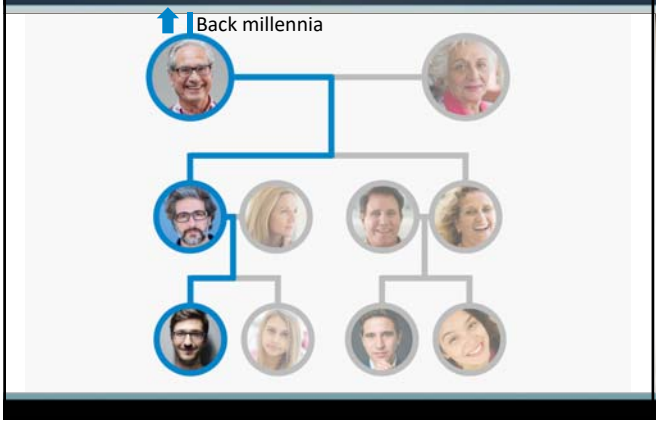
## What a Y-DNA test shows

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## Y-DNA Tests = Patriarchal Line ONLY

- Y-DNA tests examine only the Y-chromosome. For men only!
- Because you can only get a Y-chromosome from your father, and he from his father, that means it tends to change very little over time. Tests can go back thousands of years.
- There are actually two sub-tests with Y-DNA testing.
  - The short tandem repeat (STR) test categorizes sections of DNA according to how often a genetic pattern repeats.
  - The single-nucleotide polymorphism (SNP) test works like autosomal DNA testing, but only tests about 30,000 SNPs.
- **Only FamilyTreeDNA offers individual Y-DNA testing.**
- Y-DNA is useful for adoptees as well as Jewish ancestry.

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## Y-DNA test kits


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## Y-DNA

The DNA **only males** inherit from their **direct paternal line.**


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## mtDNA - Mitochondrial DNA Tests

- Mitochondrial DNA, or mtDNA, is genetic material inside mitochondria, small components found inside every cell and which have their own separate DNA strands.
- mtDNA is passed down **almost unchanged** from a mother to her children. Because it doesn't combine with anything, it does not change with every generation and might remain stable for 50 or more generations!
- mtDNA testing ignores the main DNA in a cell, and looks just at the DNA of the mitochondria instead so it only examines about 16,500 genetic base pairs
- mtDNA gives very precise and accurate ancestry results, but only for the maternal line.
- An mtDNA test will identify how closely related you are to a haplogroup (people with a common ancestor). A haplogroup is a group of people with a single common ancestor.

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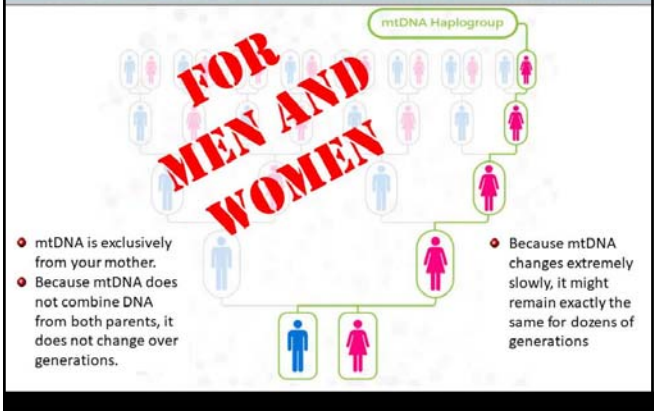
## mtDNA

The DNA **both males and females** inherit from their **maternal line**




- mtDNA is exclusively from your mother.
- Because mtDNA does not combine DNA from both parents, it does not change over generations.
- Because mtDNA changes extremely slowly, it might remain exactly the same for dozens of generations

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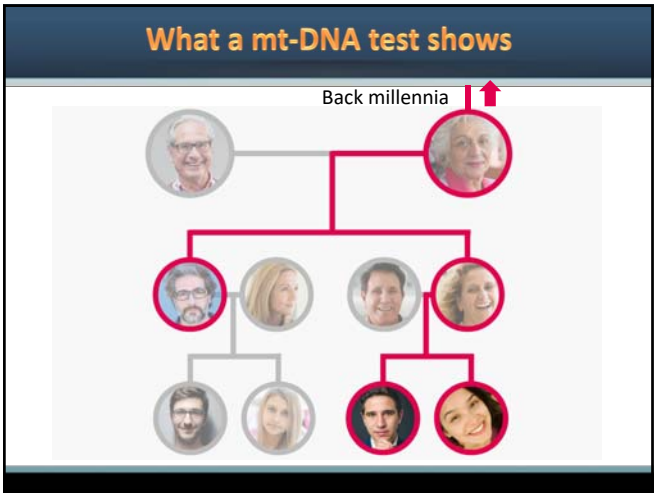
## What a mt-DNA test shows

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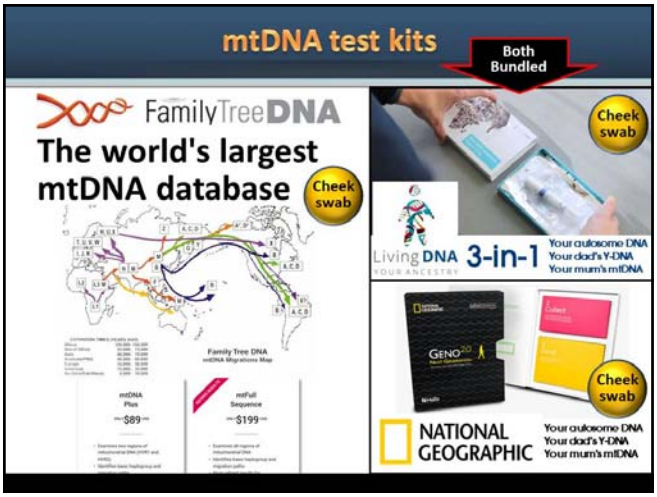
## mtDNA test kits

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## Specialised Y-DNA + mtDNA test kits

- In 2007, Ancestry.com introduced genetic genealogy testing by launching paternal Y-DNA and maternal mtDNA tests.
- In 2014, Ancestry.com discontinued both to focus solely on **autosomal DNA testing**.
- While Y-DNA and mtDNA results can have the benefit of tracking back 50 or more generations (in fact, to Adam and Eve), in practical terms family genealogy is mostly concerned with the last five to ten generations.
- For those who have valid reasons for researching deeper ancestry, FamilyTreeDNA offers a range of detailed mtDNA (2 options) and Y-DNA (4 options) testing.

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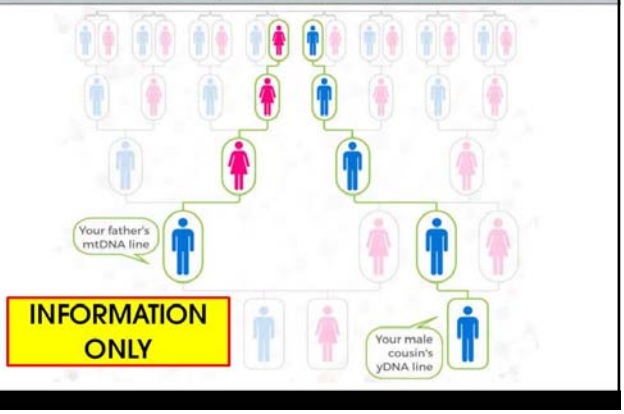
## Y-DNA and mtDNA

Test extended family members to complete a family tree

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## Taking a DNA Test

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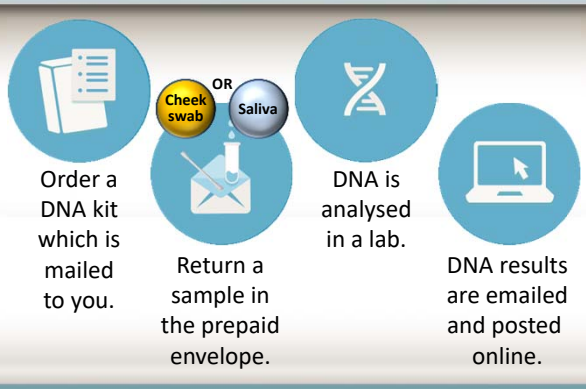
## How is DNA Collected?

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## How is DNA Collected?

- DNA is collected either with a cheek swab or a saliva sample, depending on which company you use.
- For the most part, there's no advantage to one method over the other.
- However, if the person being tested is very young (too young to be told to spit in the cup) or very old (and can't produce enough saliva), the cheek swab might be easier.
- Right now, AncestryDNA and 23andMe use saliva samples; other companies use cheek swabs.

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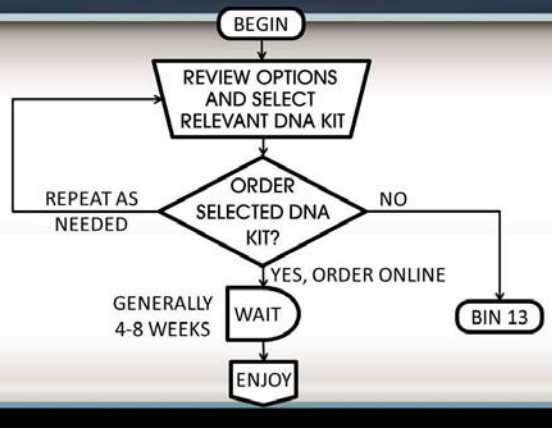
## Select and order a DNA kit online

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## What Happens Next?

- Once you've gathered your DNA sample, simply return it to the company for processing.
- It will usually take six to ten weeks for your sample to be processed - but could take longer during and after holidays since DNA tests are a popular gift.
- Results are emailed to you once your test is analysed.
- Depending on the company and the test, your results may include:
  - your raw data
  - ethnicity estimates
  - ways to contact potential relatives

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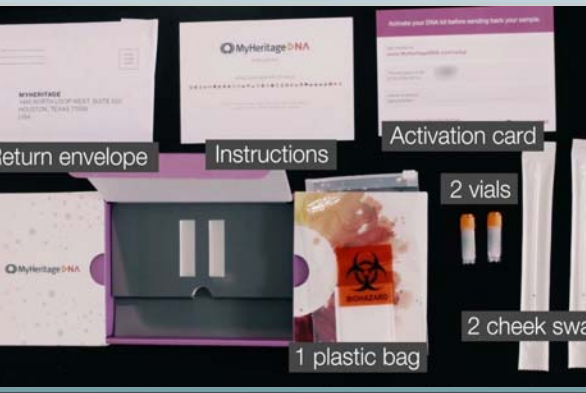
## Typical DNA test kit (e.g., MyHeritage)

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## Keep in Mind

- The vast majority of genealogical DNA testing is based on autosomal DNA. Autosomal DNA is inherited from both parents, and men and women both receive the same service.
- With specialised Y-DNA and mtDNA tests, men can trace both their maternal haplogroup (from mtDNA) and their paternal haplogroup (through Y-DNA), but women can **only** trace their maternal haplogroup (through mtDNA). This is because the paternal haplogroup is traced through the Y chromosome, which women do not inherit. But haplogroups are a **tiny part** of your ancestral analysis.
- If a male relative (e.g., father, brother, paternal uncle or paternal male cousin) is genotyped, women can infer their own paternal haplogroup information from any of them.

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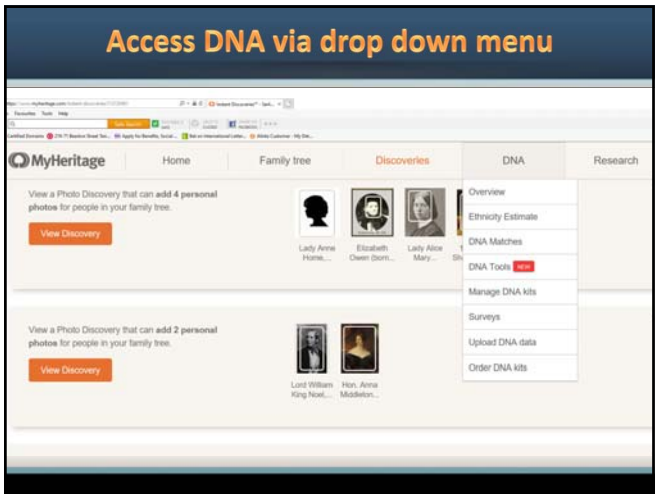
100

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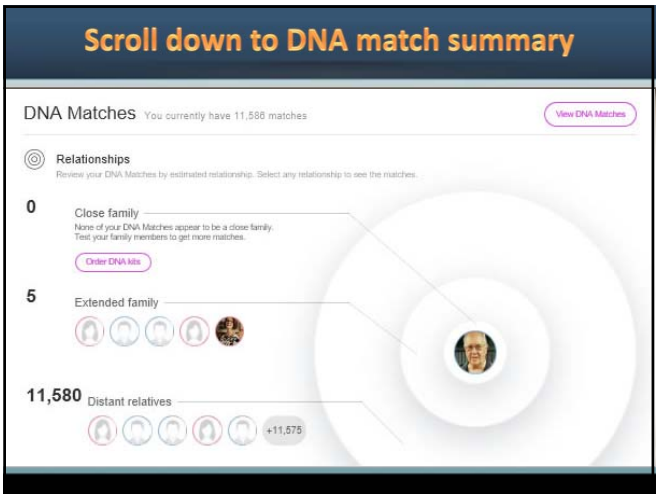


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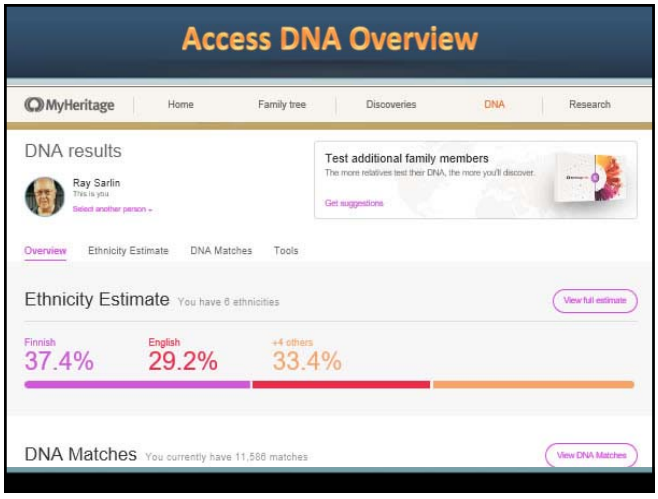


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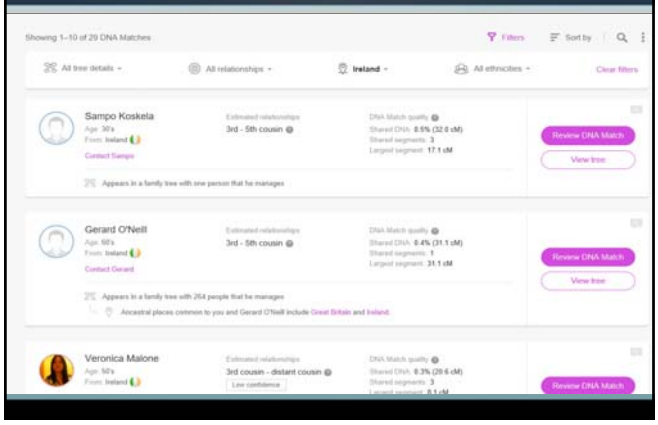
## Click on a country (Ireland) to see matches

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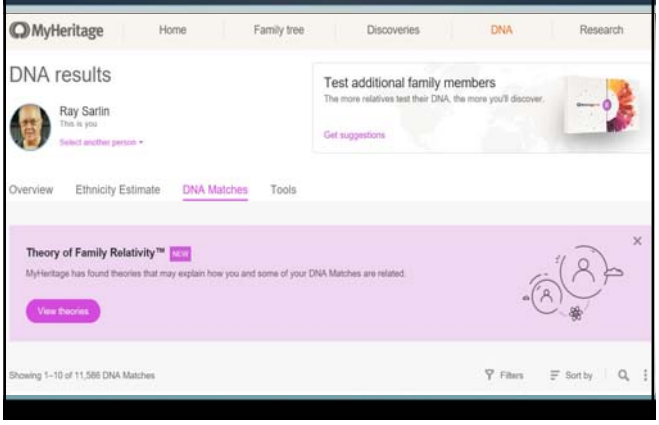
## Click drop down to select DNA results

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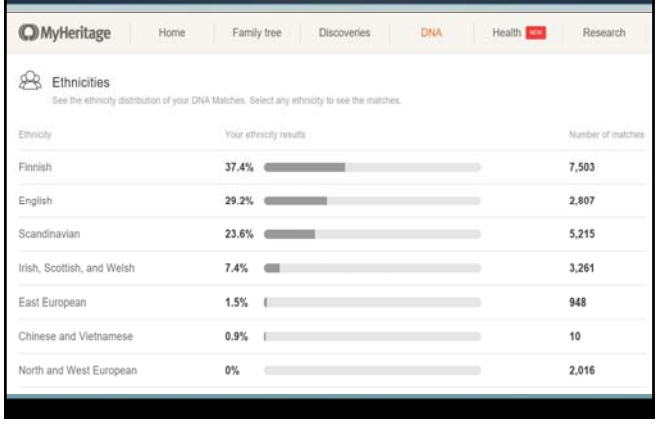
## Ethnicities

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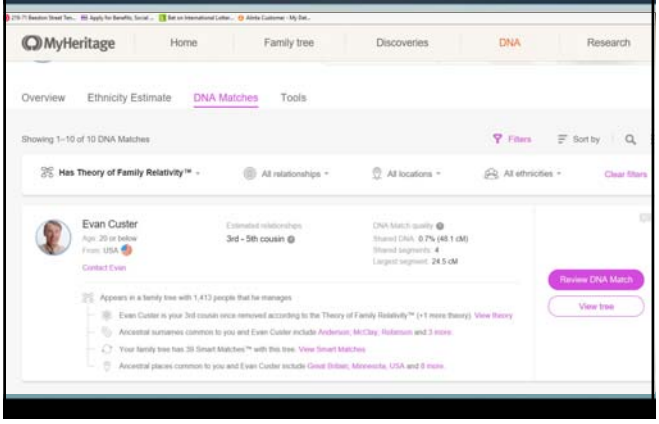
## Select individual match to explore

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## Scroll to bottom of index page


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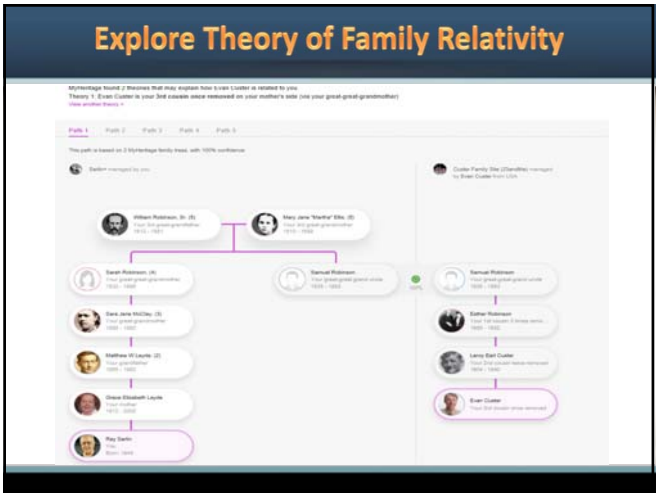
## Explore Theory of Family Relativity



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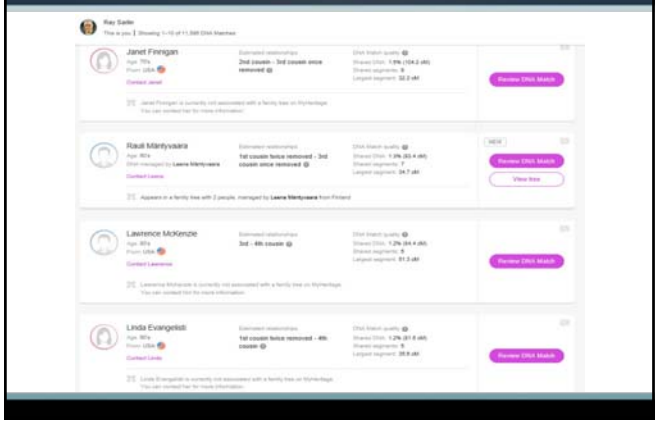
## Normal DNA match information



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## What does a DNA test show me?

## Case Study extension

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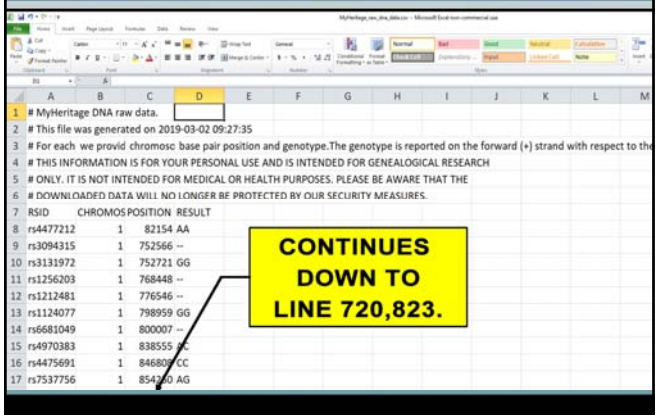
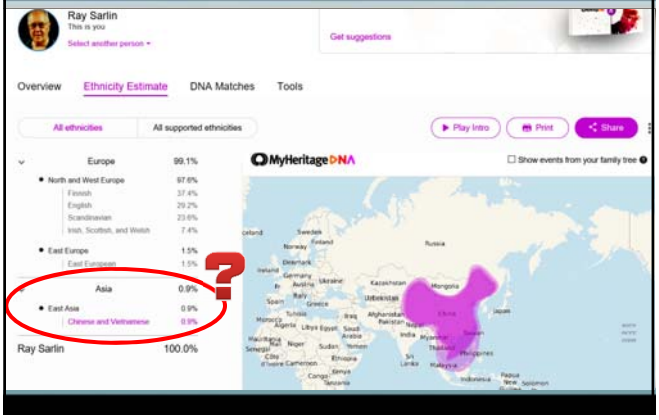
## My DNA Raw Data as an Excel file




110

## An apparent DNA anomaly

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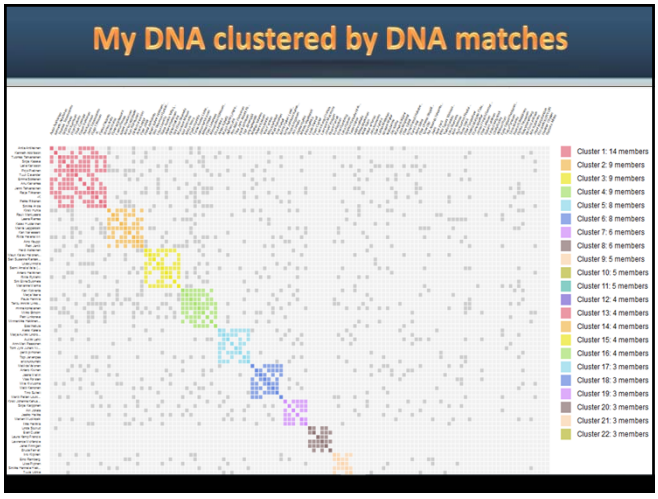
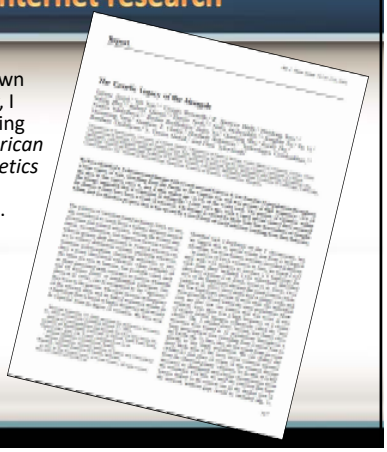
## My DNA clustered by DNA matches



111

## A little internet research

- When trying to run down this apparent anomaly, I came across a fascinating 2012 study in the *American Journal of Human Genetics* entitled The Genetic Legacy of the Mongols.



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## A little internet research

- Y-DNA studies show that 1 in 200 Finnish men are direct line descendants of Genghis Khan (1162-1227), who had the most male children of anyone in history (>2,000).
- In addition, some 8-10% of men from lands covered by his empire have his Y-chromosome. In Asiatic societies, descent from Genghis Khan became a mark of prestige even within Islamic societies, almost essential for would-be warlords.
- In a separate study, genetic clusters unique in Europe to the Sami Peoples indigenous to northern Finland appear to have migrated from Asia at about the time of the Mongols.
- These studies and other indicators (including tracing ancestors to the edge of the area of the Mongol Golden Horde) enable me to form a hypothesis about the seeming 0.9% Asian DNA anomaly.

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## Testing the Hypothesis

- To test the hypothesis that my 0.9% East Asian comes from Genghis Khan, I took a Y-DNA test.



My Y-DNA dashboard

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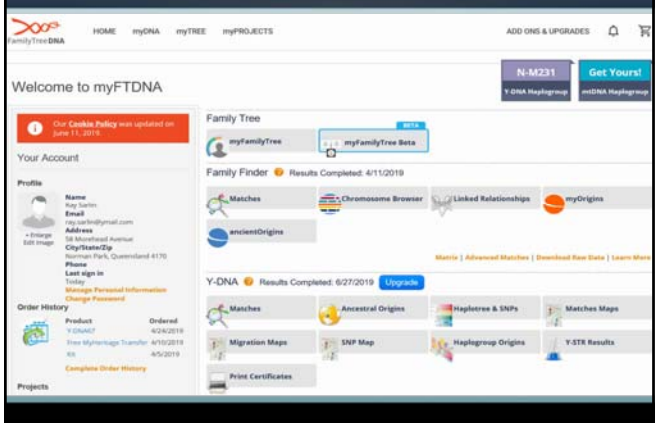
## Results

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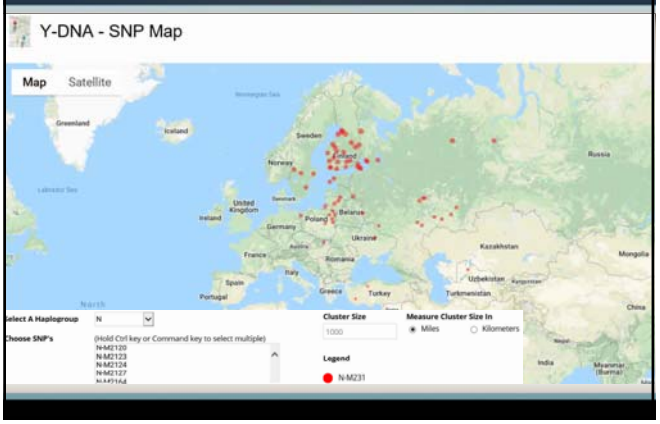
## Where is Y-DNA Haplogroup N-M231 found?

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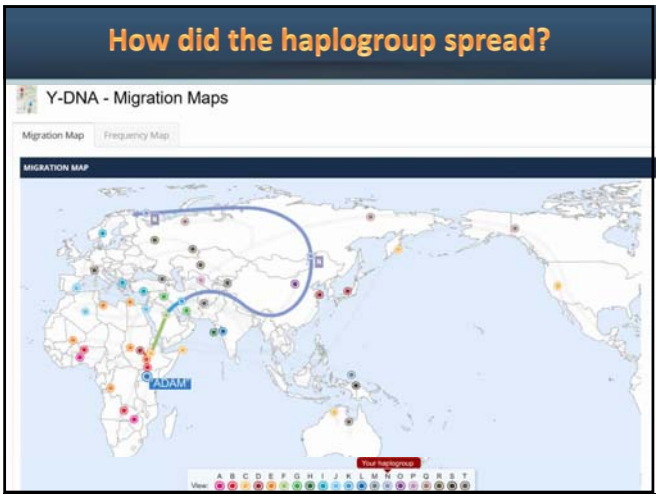
## How did the haplogroup spread?

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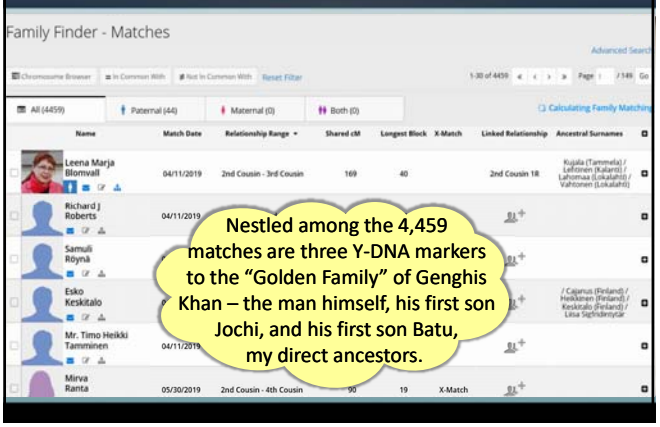
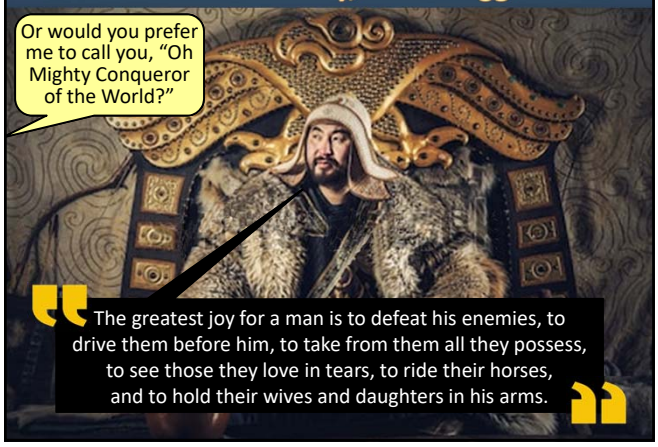
## Among the 4,459 individual matches




120

## Welcome to the family, Mr. Chinggis Khan.

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- According to MIT, as of mid-2019, over 26 million people have already taken at-home DNA tests.
- Their accessibility and popularity contribute to the development of personalized medicine. This trend is transforming healthcare and pharmacology as it opens routes for better treatments.
- Although in its infancy, it may lead to discoveries and development of efficient cures for many diseases.

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## Questions???


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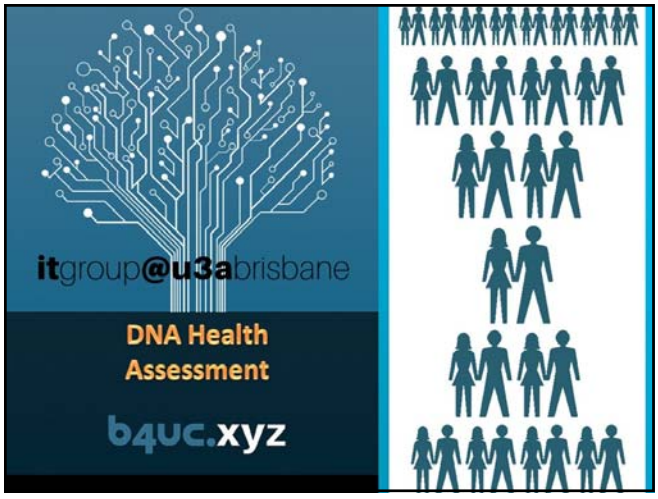
## DNA Health Reports

Reports tend to examine two factors:

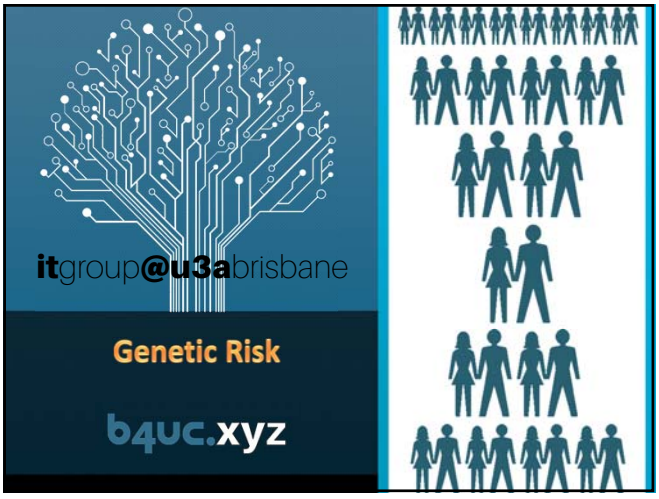
- Genetic Risk
- Carrier Status

These reports cannot replace regular medical testing. Users may wish to share results with healthcare providers.

125




123

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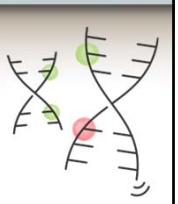
## What can your DNA tell you about your health?



- DNA contains the genetic instructions for the body. Most of the DNA in humans is the same. The differences are called **variants** and tell us a lot about our health.
- Most variants have no negative impact on health.
- Some variants can increase the risk to develop certain conditions. These are called **pathogenic variants** or **risk variants**.

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## What is genetic risk?

- Most medical conditions are caused by a combination of non-genetic factors such as lifestyle and environment, and genetic factors — the DNA you were born with.
- The impact your genetics has on your health is called your **genetic risk**.

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## How is genetic risk determined?

- For some conditions, like BRCA related cancers, a few variants that are strongly associated with the conditions are analysed.
- For complex conditions, like heart disease, thousands of variants are analysed. The results of all of these analyses are combined too calculate a **polygenic risk score**, a cutting-edge method for estimating genetic risk.

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## Average versus decreased risk

- Having an average or decreased risk is reassuring. However, it does not eliminate your chance of developing a genetic condition.
- Your level of risk is influenced by your environment, lifestyle, and age, in addition to your DNA.
- Only the most common variants associated with each condition were analysed. It is possible that a person may have a variant that was not analysed.

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## Is it helpful to know of increased risk?

- Yes.
- Knowing that you have an increased risk for a condition can help you make informed decisions about managing your health.
- Your reports provide your **genetic risk estimate** for certain conditions — they do not tell you whether you will definitely develop a genetic condition or the severity of that condition should it develop.

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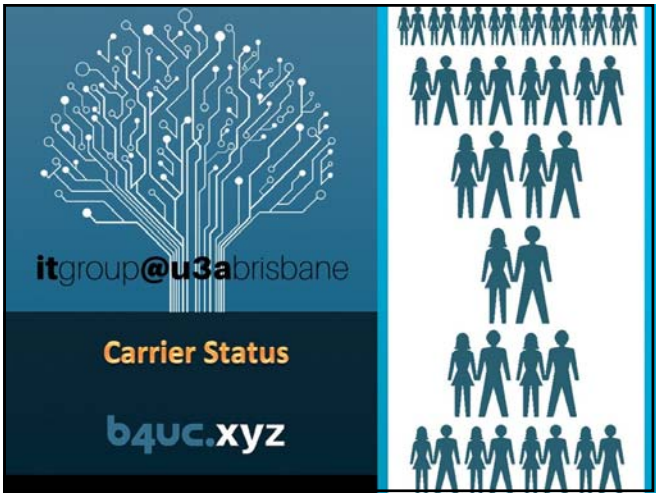


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## What are carrier status reports?

- Carrier status reports help you determine your child's risk of inheriting certain genetic diseases. They are most important for you and your partner before or during pregnancy.
- They are useful for everyone, including healthy adults, and including people who already have children.

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## What does it mean to be a carrier?

- A carrier is someone who has one altered copy of a gene, also called a pathogenic variant, that is associated with a disease that could be passed down to a child.
- It is normal to be a carrier, even if you are healthy and do not experience any symptoms. Many of us are carriers of at least one genetic disease.

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## How can carrier status affect your family?

- For most diseases, both you and your partner have to be carriers for the same condition for your children to be at increased risk to develop that condition.
- Note that if you have a child who is planning to start his or her own family, and you find that you are a carrier, your child may be a carrier too and you can advise him or her to test as well.

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## Carrier status reports have limitations

- They are not diagnostic.
- They do not include every condition, and do not include every variant of the conditions tested.
- They cannot replace clinical genetic screening.
- They are more useful for people of specific ethnicities, such as Ashkenazi Jews.

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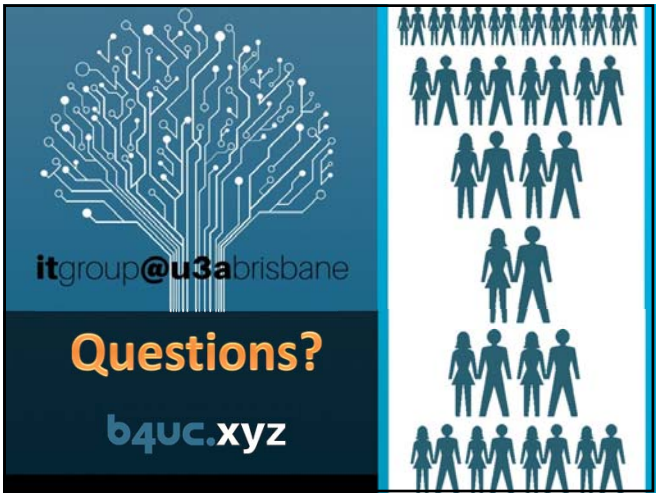


137