Intro to DNA and Genetic Genealogy

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Dec 6, 2021

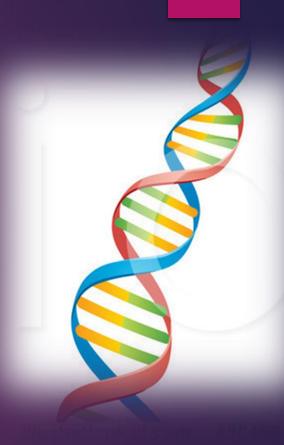


KEN WATERS

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Outline

- ▶ Some Questions to Start
- ► Types of DNA Tests
- ► The 5 Testing Companies
- ► Testing Strategies
- ► Ken's 10 Tips

What is genealogy?

Genealogy, the study of family origins and history. Genealogists compile lists of ancestors, which they arrange in pedigree charts or other written forms. The word *genealogy* comes from two Greek words—one meaning "race" or "family" and the other "theory" or "science." Thus is derived "to trace ancestry," the science of studying family history. The term *pedigree* comes from the Latin *pes* ("foot") and *grus* ("crane") and is derived from a sign resembling a crane's foot, used to indicate lines of descent in early west European genealogies. Chart pedigrees, familiar to most people from school history books, include arrow shapes, parallel lines, a crinkled line denoting birth to unmarried parents, and the sign = denoting marriage.



What is genetic genealogy?

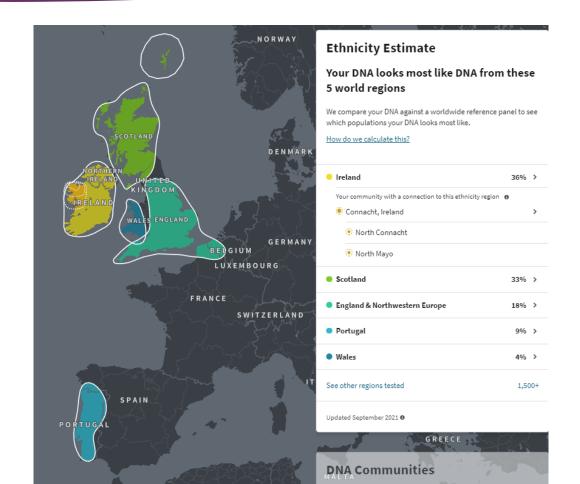
First step: answer some questions

- ▶ [1] Why am I interested in taking a DNA test?
- [2] What do I hope to get out of it? (any very specific goals?)
- [3] Do I understand there could be unsettling discoveries that come out?
- ▶ [4] Do I have the time and interest to pursue the genealogy aspect?

Why do we take DNA tests??

Curious about ethnicity

E.g., Am I part Native American?



Why do we take DNA tests??

2. Curious about health aspects

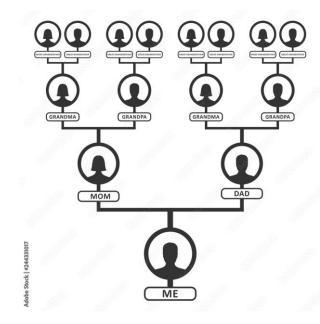
E.g., Do I carry the BRCA gene?



Why do we take DNA tests??

3. Curious about relationships, i.e., Genealogy

- Unknown parentage (adoption, misattributed parentage, donor conceived)
- Find living cousins
- Help fill in (or confirm) family tree



Assuming it's to learn about family history or solve unknown parentage case...

- What it WILL do:
 - Confirm close relative relationships (e.g., parent/child, full vs. half sibling, etc.) if both individuals take test
 - Introduce you to an amazingly long list of potential cousins (especially for those with strong North American origins such as colonial roots)
 - For unknown parentage cases it's likely to provide valuable hints to help solve t
- What it MAY do:
 - ▶ WARNING!!!!
 - Uncover dark secret(s) that may or may not greatly upset your family
- What it will NOT do:
 - Absolutely confirm ethnic relationships except in perhaps limited circumstance.
 - Fill in all the missing persons (brick walls, etc.) in your family tree



3 Types of DNA

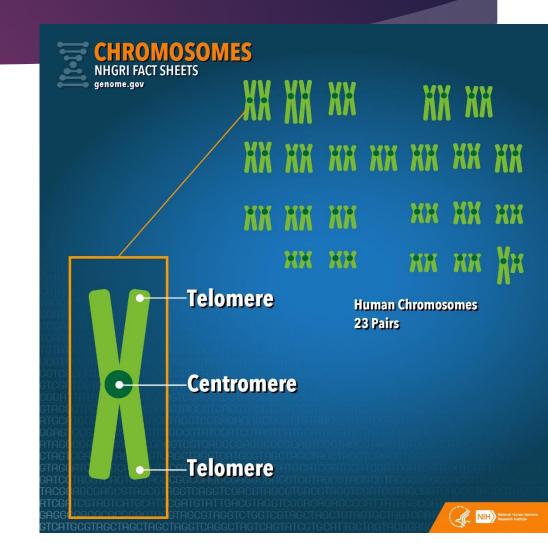
► Autosomal (22 chromosomes + 1 sex chromosome "X")

Y-DNA

Mitochondrial DNA (mtDNA)

What is DNA? -- chromosomes

- ▶ We all have 23 pairs of chromosomes
 - ► The last pair, 23rd, chromosome is considered the sex chromosome
 - Women have two "X" chromosomes for this whereas men have one "X" and one "Y"
 - ► Chromosomes 1 through 22 are known as autosomes
 - ► Foundation of autosomal DNA, or "atDNA" which is the primary DNA used now by DNA testing services

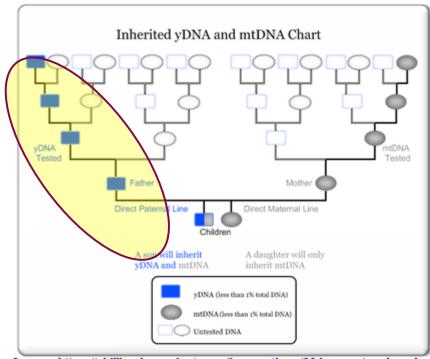


What is X-DNA?

- ▶ We all have 22 pairs of autosomal chromosomes
- ▶ One additional, the 23rd chromosome, is known as the "sex" chromosome and can at times be useful in evaluating a match.
- Females have two 'X' chromosomes
- Males have one 'X' chromosome (from mother) and one 'Y' chromosome (from father)

What is DNA? - Y-DNA

- *ONLY* found in males
- Similar to mtDNA inheritance Y-DNA is only passed along the patrilineal line
 - ► Father's father's father's....[etc.]



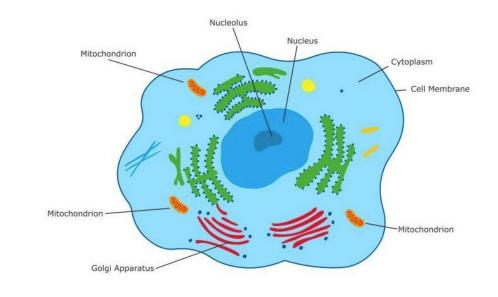
Source: https://phillipsdnaproject.com/faq-sections/304-ancestor-dna-chart

What is DNA? -- mitochondrial

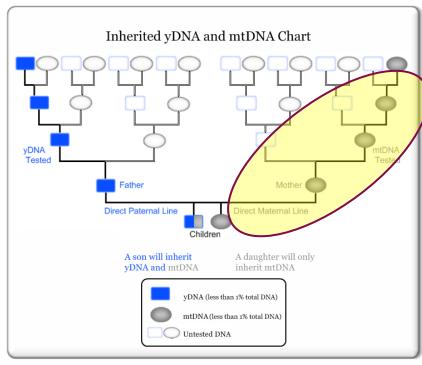
MAGE

Cell diagram showing mitochondria

- Located outside the nucleus of cells as part of mitochondria
- Males and Females both have
- Has unique characteristic of carrying deep ancestral heritage of matrilineal line
 - Mother's mother's mother's....[etc.]



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Types of DNA tests

- Autosomal
 - ▶ The vast majority of DNA tests are this type
 - ► Relatively inexpensive (\$49-\$99)
 - ▶ FOCUS of this presentation is on Autosomal
- Y-DNA
 - ▶ Only used for male subjects and can find matches along the same patrilineal line
 - ► Can be expensive (up to \$300 for more precision/markers)
- mtDNA (Mitochondrial)
 - ► Can be used to solve matrilineal line questions
 - ► Expensive (~ \$200)
- Full Genome
 - ▶ New kid on the block!
 - ► More expensive (~\$1000) but cost is going down

Testing company options -- Autosomal

- ► There are 5 known, reputable, and trusted companies at this time:
 - Ancestry
 - ► Family Tree DNA
 - MyHeritage
 - ▶ 23andMe
 - **▶** Living DNA
- There are others out there but not recommended for a variety of reasons

What to look for with testing companies

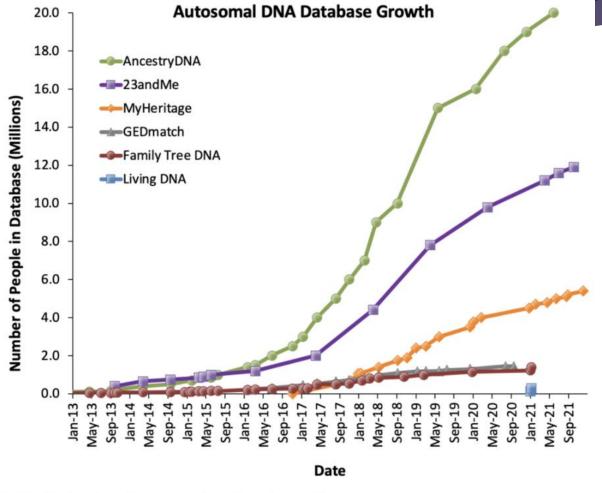
- What all 5 companies have:
 - Provide ethnicity estimates (emphasis on "estimates")
 - Provide a list of others who match the tester's DNA
 - Ability to download raw DNA data file
 - Test autosomal chromosomes (1-22)
- What some of them have:
 - Provide family trees for your matches
 - Provide health information
 - Ability to group matches that are common to each other
 - Ability to upload raw DNA data file from other companies
 - Test other aspects of DNA such as X-DNA, Y-DNA, and mitochondrial (mtDNA)

Comparison of Testing companies

	Allow Uploads	Trees	Chromosome Browser	Research Databases	Est. Database Size	Matching	Y-DNA mtDNA
FamilyTreeDNA	X	X	X		1.6M	X	X
→ ancestry		X		X	21M	X	
MyHeritage	X	X	X	X	5M	X	
23andMe		X	X		12M	X	
Living DNA YOUR ANCESTRY	X *** Service one of the	e is very limi e other 4 cor	ted, few in database npanies over this on	e; recommend e ***	< 1M	Very limited	X

Comparative Database Sizes (autosomal kits)

- This chart shows the change over time of the number of DNA kits with each service
- ► The top 2 services do *not* allow uploads of kits from the other companies



© 2021 by Leah Larkin, www.theDNAgeek.com/dna-tests

3 of the 5 testing companies allow uploading











Allows you to use test results from one company to compare to other databases --- more matches!

FREE to upload (nominal cost to use extra analysis tools)

Testing strategies

- First, ask yourself a few questions:
 - Why do you want to test? (recall the reasons brought up earlier)
 - ▶ How much can you spend or are you willing to spend?
 - Are you searching for a specific answer that may require looking for matches in many places?
- Based on the answers to those questions you can begin to devise a testing plan

Testing strategy #1

- General questions on family tree
- Willing/able to spend maybe \$200 or so
- Testing Plan:
 - Wait for good sales and then test with the 2 companies that don't allow uploads: Ancestry and 23andMe
 - ▶ Download the results from one or both of them and then upload to sites that do allow uploads (MyHeritage, FamilyTreeDNA, LivingDNA, GedMatch)
 - ▶ Pay small upgrade fees to get full tools

Testing strategy #2

- Limited budget: \$50
- ► Testing Plan:
 - ▶ Wait for good sale and then test with Ancestry
 - Download the raw DNA and then upload to sites that do allow uploads (MyHeritage, FamilyTreeDNA, LivingDNA, GedMatch)
 - ▶ Skip the upgrades as at least you will get matches for free

Testing strategy #3

- Special situation---trying to solve unknown parentage
- Willing to spend whatever it takes (anywhere from \$200 up)
- Testing Plan:
 - ▶ Test with both Ancestry and 23andMe
 - Upload to sites that do allow uploads (MyHeritage, FamilyTreeDNA, LivingDNA, GedMatch)
 - ▶ Pay for upgrades on all sites
 - ▶ Buy additional kits when on sale (recommend Ancestry) to use to test known family members or suspected family relations who may help solve the mystery
 - ▶ We call this "targeted testing"

► For simplicity, all of the following slides assume a test was taken at Ancestry

▶ If you test at one of the other companies you will see some similar results but also some differences

Cost of kit: varies, as low as \$49 on limited sales, up to \$99

- (C) 10 50 11
- Don't eat or drink within one hour before testing
- Be careful with the test (clean hands, no contamination)
- Pack up and mail it back
- Results can take anywhere from 2 weeks (ideal) to 14 weeks (worst case); currently running about 3-4 weeks



- Set up an account on Ancestry to hold your results
 - ▶ FREE Account is okay, NOT required to pay subscription cost in order to process your DNA record and view matches
 - You only need to pay for a subscription if you want to do research on your tree
- Please note:
 - Ancestry now requires a unique e-mail address for each account tied to a DNA kit
 - Only a big deal if you're like me, administering a lot of different accounts

Help Another Adult Activate

Protecting personal data is important to us.

We require that a DNA kit be activated by the person providing the DNA sample, or their parent or legal guardian if they are under the age of 18.

Once the person providing the DNA sample activates their kit, they can give you full access to view and manage their test results through your Ancestry account.

Enter their email to help them get started.

Enter email address

SEND ACTIVATION INVITATION

Alternately, the person may <u>sign in</u> to their Ancestry account or <u>create a new account</u> for free.

Frequently Asked Questions

Why can't I activate the kit?	~
How do I activate the kit?	~
Why should I send an activation invitation?	~
How do I become a test manager?	~
What can a test manager do?	~

- ► When you send the kit in be
- Important item is the Activation Key tound on the sample container and in the box
- ▶ This is the ONE THING Linking YOU to the SAMPLE
- ▶ Enter minimal information to register:
 - Name, Sex, Age
- Start building a family tree this is free
- Make the tree PUBLIC, not PRIVATE

The Waters Suggestion for Tree Size

- ▶ For the Family Tree to link to your DNA account I strongly encourage:
 - Make sure it's a PUBLIC tree and searchable
 - Keep it relatively small (50-1,000 people)
 - Focus on direct ancestors
 - ▶ Include Birth-Marriage-Death information
 - ▶ Try to go back 5-7 generations (remember autosomal only goes back this far)
- DON'T attach a huge tree to your DNA kit
 - This greatly reduces the effectiveness of your matches trying search surnames that match their trees
 - Super large trees mean many of your DNA matches will match surnames, most of which are not relevant (i.e., not genetically related)
 - Feel free to work on your large trees but please keep them separate from your DNA-linked tree





Results arrive!

You'll get an e-mail notifying you that your results are in Your wait is over.

Explore your DNA results





the AncestryDNA results you've been waiting for are here.

You're about to discover your ethnicity estimate, get a unique look at your family's journey through generations, and maybe even connect with long-lost relatives. We're so excited for you!

Explore your DNA results

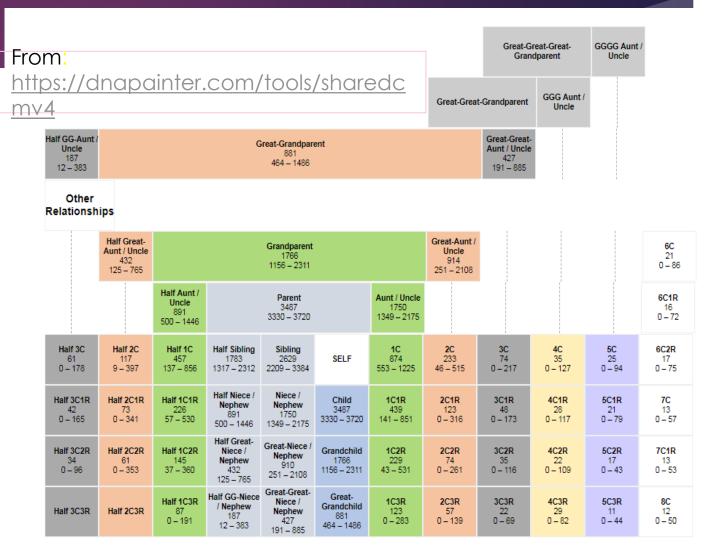
First of all --- What is a "CentiMorgan"??

- Numeric measure of "relatedness"
- From 0 to 3500
- 3500 indicates parent/child
- 0 indicates no DNA shared
 - 0 doesn't necessarily mean two people are NOT related; just not sharing DNA



Concept of "relatedness"

- Measured by CentiMorgans (abbreviated "cMs")
- Range from 0 to ~ 3500
- Higher numbers indicate closer relationships
- Top number in each box is average (mean)
- Bottom is range of numbers that could exist for that relationship



What is a Chromosome Browser?

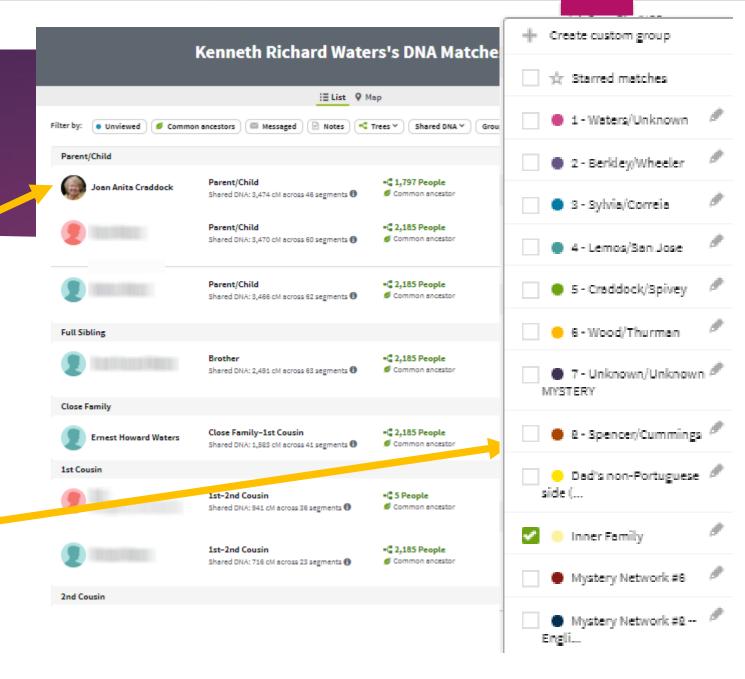
- Comparison of 2 DNA kits showing shared DNA by chromosome
- Available on:
 - ► Family Tree DNA
 - My Heritage DNA
 - ▶ 23 and Me
 - ▶ GEDMatch

Example of my DNA compared to a 1st cousin once removed showing shared segments



First steps

- Review your matches, strongest (highest centimorgans) first
- Try to identify the closest matches
 - ▶ Do you know them?
 - How are you related to them?
- ► If using Ancestry:
 - Enter notes about what you know about them
 - Use Tag Groups to identify them



Divide and conquer

- On Ancestry, Using Tag Groups in combination with Notes and Shared Matches:
 - Group your matches by dividing them
 - First, Paternal vs. Maternal side
 - ▶Then, work on Grandparents
 - Continue to divide matches

```
Starred matches (1)
0 - Distant Saved Matc... (17)
 1 - Waters/Unknown (3)

    2 - Berkley/Wheeler (25)

3 - Sylvia/Correia (48)

    4 - Lemos/San Jose (112)

    5 - Craddock/Spivey (122)

    6 - Wood/Thurman (170)

7 - Unknown/Unknown ... (6)

    8 - Spencer/Cummings (126)

    Dad's non-Portuguese... (98)

Inner Family (14)
Low matches (6-8) (0)

    Mystery Network #6 (17)

    Mystery Network #7 -- ... (10)

    Mystery Network #8 -- ... (35)
```

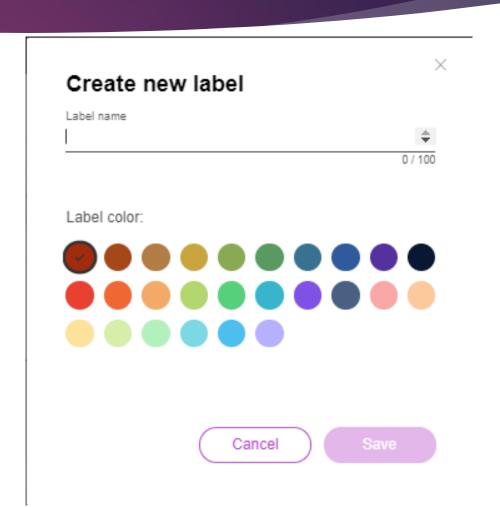
The goal: sort your matches into

common groups



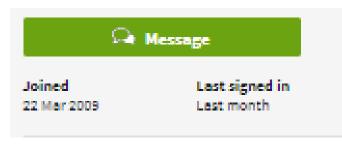
My Heritage Labels

- My Heritage also has feature similar to Ancestry Tag Groups
- ▶ 30 "dots" versus 24 on Ancestry



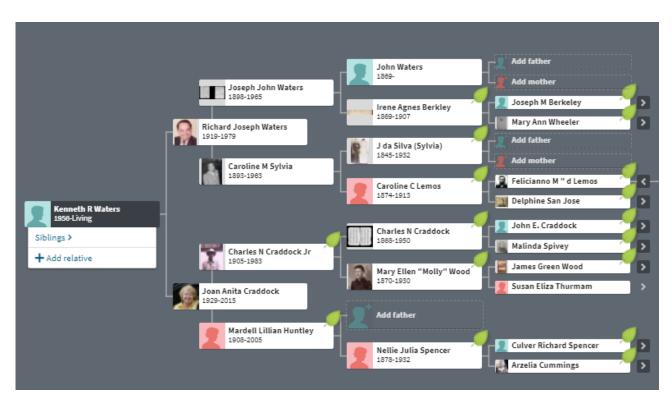
Next steps

- ▶ Build your online tree
 - ▶ Increases chances to match other test takers---remember, keep it lean
- Upload to other services including GedMatch (basic services are free)
- Start going through your matches, one-by-one
 - "Divide and Conquer" --- sort your matches into the bins of your family tree (start with dividing mother vs. father matches then build back up the tree)
- Communicate with your matches --- email, messaging --- there's power in sharing
- Learn more
 - Free classes, online and at the library
 - Facebook Groups Genetic Techniques



It's not genetic genealogy---without the genealogy

- DNA comparisons are great but mean nothing without genealogical context
- This means:
 - ► FAMILY TREES!
- Suggestions:
 - ▶ Be sure to always have a good tree, 5+ generations if possible
 - ► Keep it public and attached to your DNA kit (you can always have other trees private)
 - ▶ Backup your tree (store on local software)
 - Export your tree in GEDCOM formatUpload your tree (GEDCOM file) to GedMatch and WikiTree



GEDmatch

- A mostly-free public website which accepts
 DNA data from all 5 testing companies
- http://gedmatch.com
- Has more DNA match analytical tools than any of the 5 testing companies
 - ► Including triangulation
 - Auto-clustering



Tools for DNA and Genealogy Research

Welcome to GEDmatch. If you are already registered, just enter your login ID and password in the place provided below.

If you are not previously registered, click on the registration link near the bottom of this page. You will be asked to provide a valid email address and a password. After you are registered, you will be required to accept the GEDmatch Terms of Service. You can read the Terms of Service before you register by clicking on the link at the bottom of this page.

GEDmatch provides applications for comparing your DNA test results with other people. There are also applications for estimating your ancestry. Some applications are free. More advanced applications require membership in the GEDmatch Tier1 program at \$10 per month.

If you have any questions or comments, you can reach us at GEDmatch@Gmail.com

Log In

Email Address:	Barrily	@gmail.com	
Password:	•••••		2
	Log in		

Not Registered? Click <u>HERE</u> to register at the main site - when registered return to this page to access genesis.gedmatch.com

Forgot your password or wish to change your password? Click <u>HERE</u> to recover your password at the main site - when recovered return to this page to access genesis.gedmatch.com

Site policy: Click HERE

Dnapainter's shared cm project

- ► Enter cM value
- See all the possibilities

DNA PAINTER « back to tools

The Shared cM Project 3.0 tool v4

August 2017

Blaine T. Bettinger www.thegeneticgenealogist.com More about this project CC 4.0 Attribution License

Interactive version v4 by Jonny Perl at DNA Painter Click here to contribute data to the shared cM project Shared cM online tool version 4 with probabilities Last updated 20th April 2018

This is v4. Other variants of this tool:

v3 with additional relationships v2 with editable boxes v1 original

the	total	number	of	cM	for	your	match	here:

show %

Filter

Enter

Then any relationships that fit will stand out below

Click here for a sharable link to the cM amount above

Relationship probabilities (based on stats from The DNA Geek)

Enter a number above to see probabilities

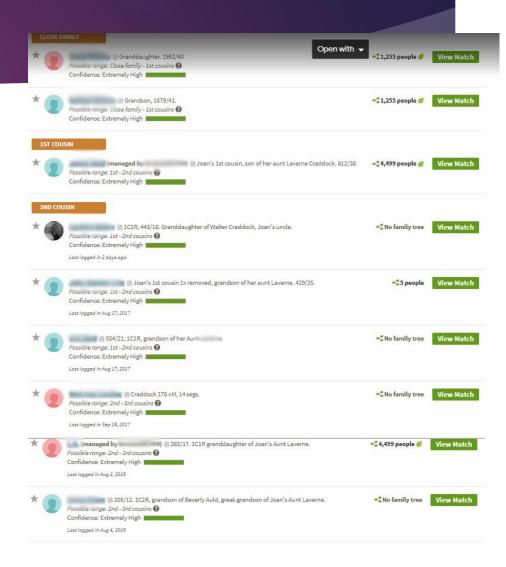
How to read this chart

reset

Relationship Average Range (low to high) (99th percentile)

Get what you can get from shared matches

- In this case due to good sampling of shared matches I was able to isolate the match to my maternal grandfather
- Some of these are 1st and 2nd cousins to Joan and use the cM values for each match help narrow down the precise line



#1: Test only with the 5 trusted companies (Ancestry, 23andMe, FTDNA, MyHeritage, Living DNA)



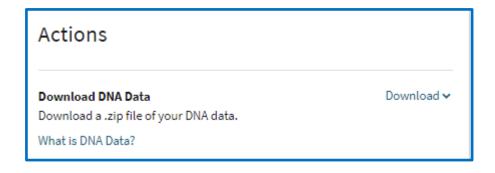






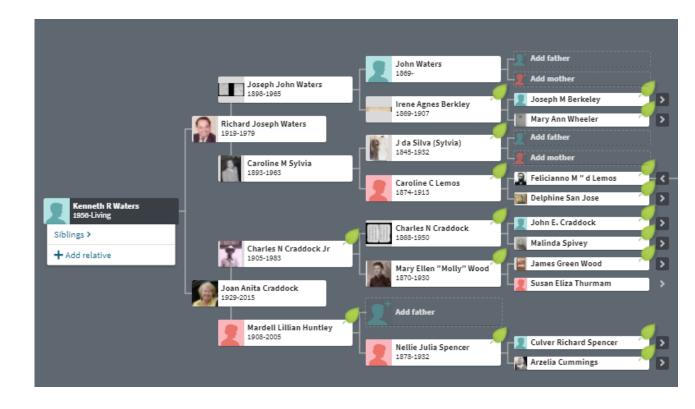


▶ #2: Download the DNA data and upload it to as many sites as you can

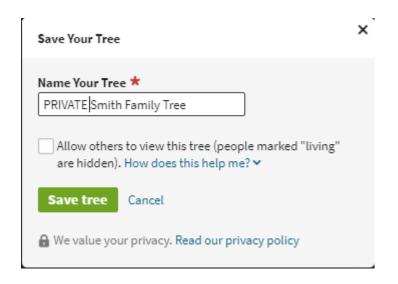


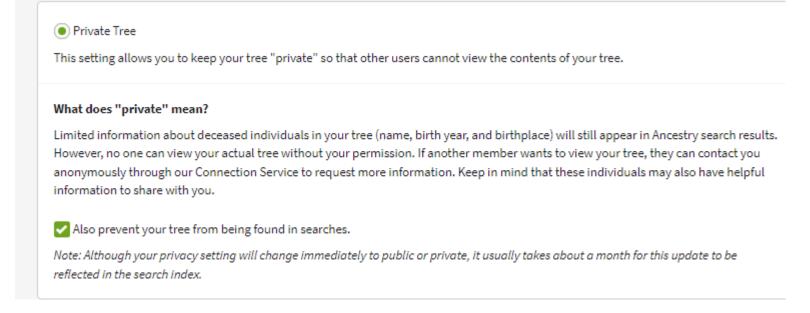


▶ #3: Build a single family tree that is accurate and supportable with goodquality records and keep that family tree PUBLIC (!) and make sure it's attached to your DNA record (aim for QUALITY, not QUANTITY)

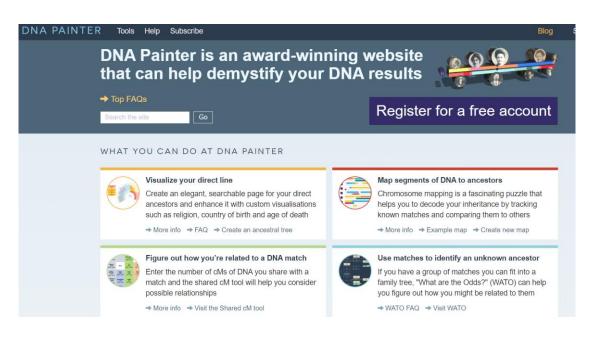


▶ #4: Build private trees for all your hypothesis tests ("what if") to see what hints can be found to help solve mysteries and build your public tree up





▶ #5: Learn to use useful tools such as DNAPainter and its relationship estimator (Shared cM Project)



The Shared cM Project 4.0 tool v4

Read more about the tool and this update

March 2020

Blaine T. Bettinger
www.thegeneticgenealogist.com
More about this project
CC 4.0 Attribution License
Interactive version v4 by Jonny Perl at DNA Painter
Click here to contribute data to the shared cM project
Last updated 26th March 2020

Other versions

Filter

Enter the total number of cM for your match here:

reset

or enter %

Then any relationships that fit will stand out below

New Click on any relationship to view a histogram

☑ Read more about cousin relationships

► #6: Be prepared to deal with unexpected surprises!

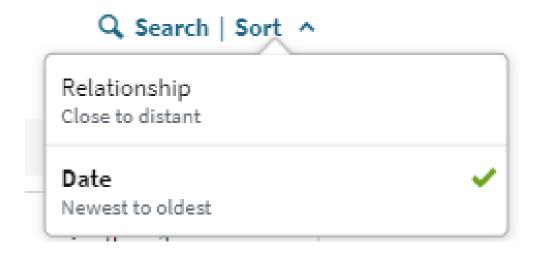


https://www.nbcphiladelphia.com/investigators/i-was-numb-family-secrets-come-to-light-as-dna-testing-gains-popularity/2117880/

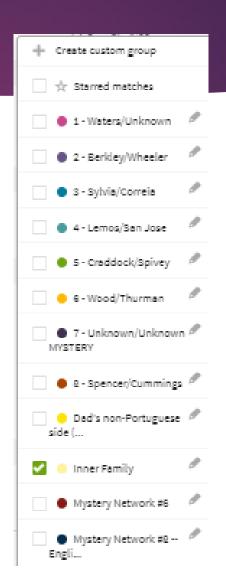
#7: Use wellcrafted, wellthought out messaging to DNA matches to share information and test your hypotheses

Hi Elaine, my name is Ken Waters. I'm writing to you due to research I'm doing on DNA as well as her aunt. You match who is my It appears very likely that you share a common ancestor with her on the line. I viewed your tree with in it and was wondering if you have any information on any other 's in your line? Thank you! My email is ken@familytreeaz.com. --Ken

▶ #8: Regularly check for new matches



- #9: Sort your matches (starting at the top) into family groups
 - ► I like to use Ancestry's Tag feature to sort into my 8 greatgrandparent lines



▶ #10: Learn more (go to conferences, attend local meetings (e.g., East Valley DNA SIG), watch videos, take classes [like mine!])



Phoenix East Valley DNA Special Interest Group

Resources

- ► GEDMatch.com
- DNAPainter.com
- Familysearch.com (to research sources)
- Legacy Family Tree webinars (free for 7 days)
- FindAGrave.com
- ► ISOGG.org Wiki
- WikiTree.com
- Facebook Group: Genetic Genealogy Tips & Techniques
- Local groups: (for example) Phoenix East Valley DNA Group [on Facebook]

Learn more --- upcoming classes

- Mesa Red Mountain Library (Power & University/Brown)
- Classes are free



Classes pending due to COVID-19.

Questions?

- ► Contact:
 - ► Ken Waters
 - ► E-Mail: ken@familytreeaz.com
 - ▶ Blog: familytreeaz.com
 - ► Twitter: @familytreeaz
 - ▶ Presentations: http://familytreeaz.com/Presentations

