Beginning with DNA Painter

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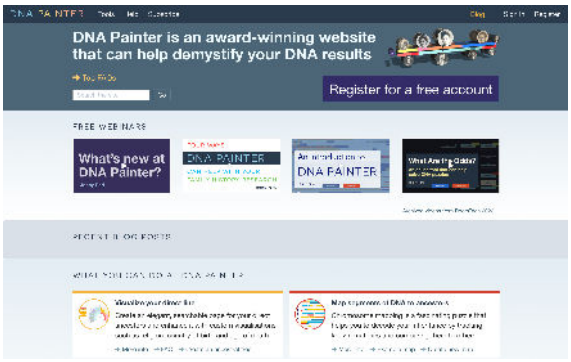


This talk is for any family historian who has taken a DNA test and received the results.

DNA Painter is a popular website for genealogists working with DNA. You can find it at dnapainter.com.

In this webinar I'll introduce the site and discuss some factors you should consider **before you start**. I'll then describe three of the site's main features:

- **Ancestral trees**
- **Relationship prediction** via the *Shared cM Project tool* and *What are the Odds* (WATO)
- **Chromosome mapping**

I'll introduce each feature, explaining:

- **Why** people use it
- **How** to use it, including practical steps

This is an introductory talk, so I'll be dipping into these features as opposed to providing in-depth case studies. You'll find links to further resources at the end of this handout in the "Useful links" section.

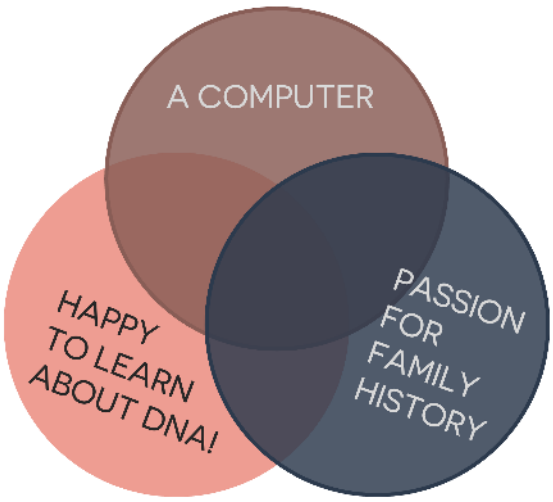
Finally, I'll provide my overall **top tips**.

While this talk is aimed at those who are new to DNA Painter, I hope there will also be some information that's useful to existing users who would like a refresh.

Before you start

To use DNA Painter you need a computer, a passion for family history, and a willingness to learn more about DNA.

You don't have to be very technical with computers or DNA, but it would help to take the following on board:



Computers

- Chromosome mapping involves copy and pasting data. You'll find this easier and quicker if you get used to the following:
  - CTRL-A (or ⌘/command-A on a Mac) will select **all** the text on a page or within a form field
  - CTRL-C (or ⌘/command -C on a Mac) will **copy** all selected text to your computer's clipboard
  - CTRL-V (or ⌘/command -V on a Mac) will **paste** the contents of the clipboard
- DNA Painter is a secure login-based website so there's nothing to be afraid of when working there
- Unless you specifically say so, nothing you do will be shared with anyone else, so you can experiment in complete privacy
- You don't have to play anything to try it out

Genealogy

- When you're investigating how you might be related to DNA matches, you will come across terms such as 1C1R and 2C
  - If you haven't already, it would be good to familiarize yourself with this terminology and perhaps print out a chart if necessary
- Ideally you will be comfortable with the idea of using your research skills to build trees for your DNA matches

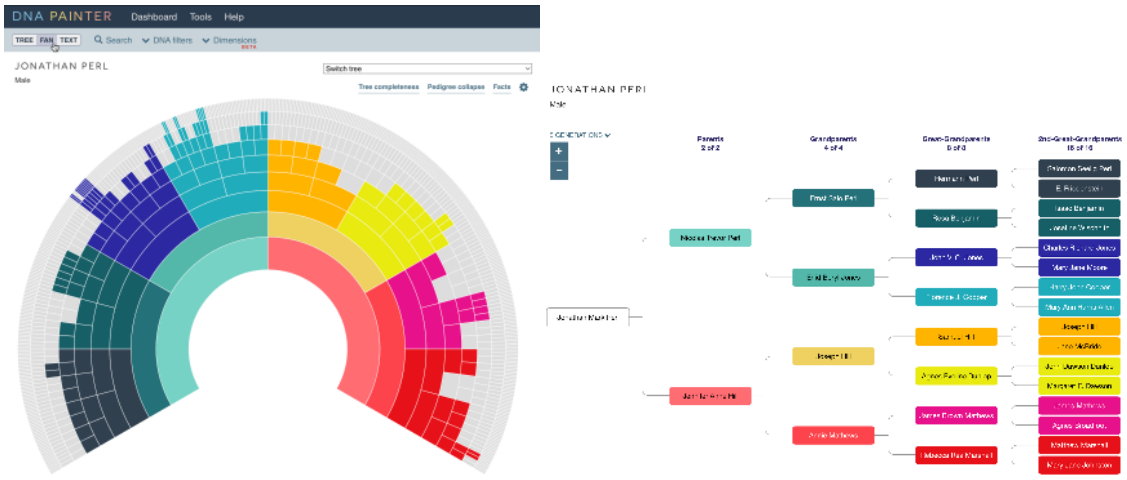
DNA

- Understand the main ways that DNA Painter can help you:
  - Visualize and share your tree
  - Examine your matches

    - Make a chromosome map
    - Learn more about DNA
- DNA can't provide the names of your missing ancestors, but it can suggest next steps and research avenues
- These can then lead you to matches who can share family documents and perhaps even photos
- Bear in mind that as soon as you delve into DNA results, there's a chance you might uncover something life-changing
    - This is an important responsibility, and if you find yourself in this situation, please treat it very sensitively
- If you took your DNA test at AncestryDNA and you want to try chromosome mapping, you will need to transfer your DNA to a different company in order to access match segment data
    - To do this, you'll need to download your raw DNA file from Ancestry and then upload it to one or all of the sites that accept uploads: FamilyTreeDNA, Gedmatch, Geneanet, Living DNA and MyHeritage
    - There is a comprehensive set of links in the "Useful links" section below that show you how to do this

Ancestral trees: why and how

An ancestral tree at DNA Painter is simply a representation of someone's direct line (also known as a pedigree chart)



Why would you create an Ancestral tree?

- Extracting just your direct line helps you to focus on the gaps that represent missing ancestors
- You can also overlay DNA inheritance paths, which can help you understand them more easily
- The dimensions feature allows you to explore different views of your ancestors, including charts showing age at death and country of birth
- An ancestral tree distils the information that will be most useful to DNA matches, and you can choose to share it easily while keeping information about living people private

How do you create an Ancestral tree?

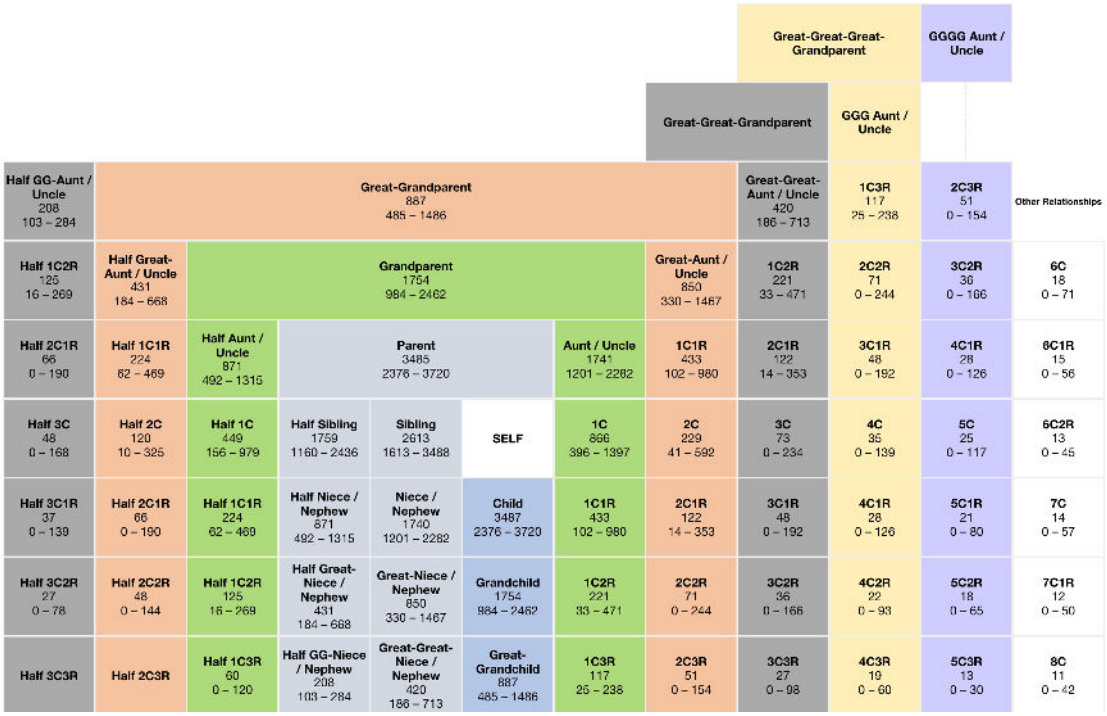
- After signing in, click the 'Ancestral trees' tab and click 'create a new tree'
- You'll see a blank tree with generic names like "Father"
    - You can **click** on any node to edit the name
    - Hit **enter** to save it…
- Or you can import your tree from a GEDCOM file (a common format that you can export from family tree websites/software)

    - To do this, click ‘Load GEDCOM’ at the top right
    - Drag your file into the box or click and select it
    - Once your file is loaded, type the first few letters of the name of the person whose ancestors you want to import
    - As you type, matching names from your GEDCOM will appear
    - Once you see the name of the person you want to import, click it and then click ‘Import ancestors’
- To change the colour scheme, click ‘Palettes’ at the top right and click on a different set of colours.
- To overlay an inheritance path, click ‘DNA Filters’ and click the path you want (for example, ‘Show X-DNA path’)
- “Genetic ancestors” refers to ancestors that you’ve verified with DNA (for example, if you share significant DNA with a cousin who is their descendant)
    - To mark someone as a genetic ancestor, hover over them in the tree and click ‘Edit person’
    - Then check the box ‘Mark as a genetic ancestor’ and click ‘Save’
    - Genetic ancestors are then visible if you click ‘Show genetic ancestors’ under ‘DNA Filters’
- To share your ancestral tree, click ‘Share’ at the top right
    - This will bring up the share overlay
    - By default, all trees are private, but you can click the switch to mark the tree as shared
    - The default privacy setting is ‘Hide the names and details of living people’ but you can change this if you want
    - You can then copy and email the link to anyone you’d like to share the tree with
    - Other users will not need to log in and the link will be active as long as the switch is set to ‘shared’
    - To revoke access, click the switch to set the tree back to private
    - The shared tree is searchable, so DNA matches can for example enter locations, professions and names
- More ideas for how to use this feature are linked in the “Useful links” section below

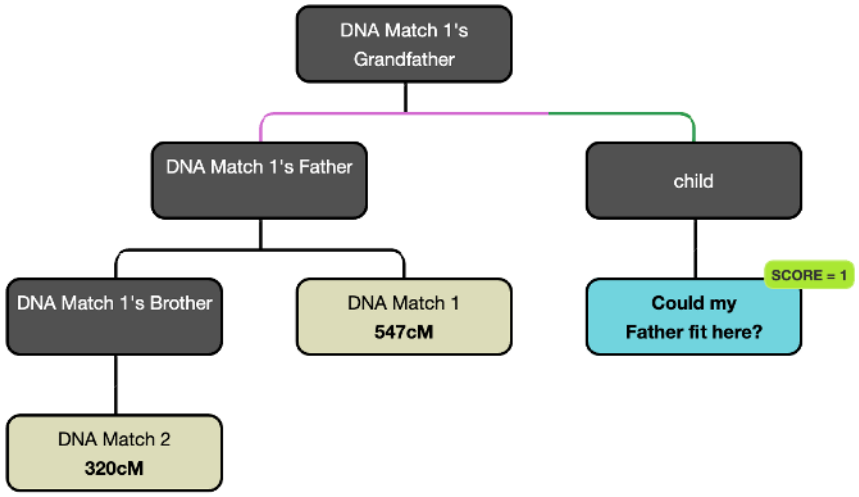
Relationship prediction: why and how

The amount of DNA you share with an unknown match can help you predict what the genealogical relationship you have with this person might be.

DNA Painter provides several tools that can help with this, including:



Shared cM Project tool



What are the Odds?

Why would you use relationship prediction tools?

- They help you understand the wide variety of relationships that are possible for most amounts of DNA shared
- While testing company relationship estimates have improved a great deal recently, they can vary enormously
    - With the shared cM tool you can enter shared cM numbers from any site and get a fresh perspective
- These tools can help you figure out which grandparent level you might have to go back to in order to find the connection you have with a DNA match
- They can also help you use genealogy as you interpret shared DNA amounts
    - For example, if you know how two different DNA matches connect to each other, *What are the Odds?* (WATO) can help you to place yourself in their family tree
- These tools can also help you clarify your thoughts and map out possibilities

How do you use relationship prediction tools?

The Shared cM Project tool

- The centimorgan (cM) is the unit used to express the amount of DNA you share with someone
- The initial view consists of a grid of boxes, each representing a different relationship, such as first cousin, parent, grandparent
    - The boxes are colour-coded so that you can trace the path vertically back through the tree to the common ancestor level for that relationship
        - For example, the first cousin (1C) box is green, leading back to grandparent level also shown in green
        - The fourth cousin box is yellow, leading back to great-great-great-grandparent level, also shown in yellow.
- Each box contains
    - The relationship name (for example, 2C, meaning second cousin)
    - The average number of cMs of DNA reported for this

relationship (for example 229 for a second cousin)
    - The range of cMs of DNA reported for this relationship (for example 41-592 for a second cousin)
- You can enter the total number of cMs of DNA that you share with a match
    - The tool will then filter the relationship boxes, showing just the relationships that are possible for this match
    - You can also click on a relationship box to see a histogram graph showing how the amount you entered compares to what other people reported for this relationship
    - Finally, the tool will display probabilities, so for example you can see that for 178cM shared, the most likely group of relationships at 51% is Half-second cousin (Half 2C), second cousin once removed (2C1R), Half-second cousin once removed (Half 2C1R) and first cousin three times removed (1C3R)

What are the odds?

What are the odds? (WATO) takes the probabilities that you see in the *Shared cM Project tool* and uses them alongside a known family tree.

The goal of WATO is to connect a DNA match to a known tree.

- This could be connecting you to a tree where you are clearly genetically related but you don't know how you fit in.
- Or it could be fitting a DNA match into your own known tree

This tool is perhaps a bit too advanced to be included in a beginner DNA Painter talk. However, it's sufficiently powerful that I wanted to put it on your radar so that if you're interested, you can take the time explore more after this webinar.

Example case study:

- I share 100cM with a DNA match, James, who was born in 1962
    - My father's maternal cousin also matches James, sharing 40cM with him
- I can use What are the odds (WATO) to make a simple tree

containing my known family

- I then indicate in this tree the amounts of DNA that me and my father's cousin share with James
- I can now "try out" positions in the tree where James might fit by adding nodes in the tree, hovering over them and marking them as a hypothesis.
    - If a position is possible, its score will be marked in green
    - If it is not possible, the score will be zero and will be marked in red
    - If there's only one positive score, it will always be 1.
    - Beyond this, the scores are probabilities relative to the lowest possible score.
    - So a score of 100 would mean that this position is statistically 100 times more likely than the score of 1

In general, WATO will be most useful for helping you find more people to test and ruling certain people out.

It must always be used alongside genealogical research:

- A hypothesis might be statistically likely based on amounts of DNA shared
- But it might make no sense at all in terms of genealogy; for example, the people involved might not have been in the right place at the right time

For more in-depth info please see the links and webinar in the "Useful links" section below.

Chromosome mapping: why and how

- I built the chromosome mapping application after successfully connecting a match to my tree (much like James in the example above)
- Having connected this person, I wondered what I could do with this information beyond saying ‘I’ve found a new cousin’
- I realized I had not just the total number of shared cMs, but information about the actual segments of DNA

We all have 23 pairs of chromosomes:

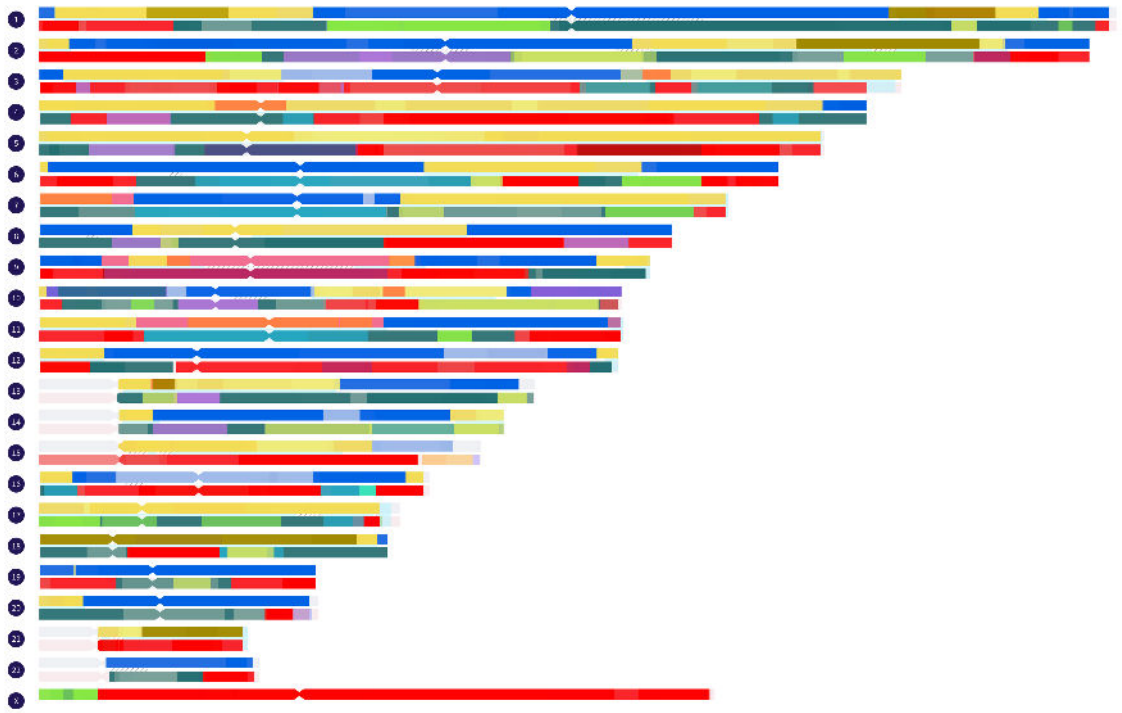
- One comes from our father
- And the other comes from our mother

Similarly, we all have a direct line:

- A biological father, his biological parents, and so on
- A biological mother, her parents, and so on…

Our chromosome map is the genetic equivalent of our direct line.

We start of just knowing we have one copy from each parent, but after working on our map we can narrow down pieces that we inherited from specific grandparents and ancestors beyond that.



Why would you map your chromosomes?

Most people are driven the sense of self-discovery that comes with identifying evidence of their much-researched ancestors within their own DNA. It's a puzzle that is tremendously fun and addictive for people who like to see how it all fits together.

Beyond this:

- Your chromosome map provides a practical repository for our DNA match research, allowing you to collate information from all DNA platforms (e.g. 23andMe, FamilyTreeDNA, Gedmatch, Geneanet, Living DNA and MyHeritage) in one place
- Mapping your chromosomes provides a practical and personal way to build and cement your understanding of DNA
    - For example, when you compare yourself with a match on a testing site, a set of chromosomes is displayed with just one chromosome for each number
    - But this is just because the testing company doesn't know whether the match is on your maternal or paternal copy of that chromosome
    - You have **two** copies of each chromosome: one **paternal** copy and one **maternal** copy
    - Mapping your chromosomes can help reinforce this
- You can find more ideas in the "Useful links" section below

How do you map your chromosomes?

- After logging in, click 'Chromosome maps' on the homepage
- Click 'create a new map'
- Enter your name (or the name of the person whose chromosomes you're mapping)
- Specify this person's sex (so that the site knows whether to output one or two copies of the X chromosome)
- You can now start paint your first match by clicking the 'Paint a new match' button at the top right
- Now you need segment data: the coordinates of each piece of DNA you share with your match
- This page at DNA Painter explains how to do this at each testing site, including how-to videos
- Once you have the data you can paste it into the 'Paint a new

match' form and click 'Save match now'

- You need to enter some basic information:
    - Match name
    - Known common ancestors
    - Whether the match is on your maternal or paternal side
    - The site will suggest a colour randomly but you can adjust this if you need to

Your match is now painted. A few things to bear in mind:

- The process of painting can be addictive, but you should only paint your own matches on your map. If you want to paint the match that your sibling or other relative shares with a match, you should create a map for them. This is because your map represents just the blend of DNA that *you* inherited from your ancestors. If you'd like to use the matches that family members have with known matches, there are some powerful techniques that can help you do this; please see links about inferred mapping below.
- Matching someone on a specific chromosome doesn't automatically "mean" anything in particular. But knowing that on this copy, you inherited DNA from a specific ancestor could be very helpful to you in future if you find an unknown person who shares the same DNA.

Top tips

Remember, this is not easy

When working with DNA, it's easy to feel 'I am not currently solving my mystery, so therefore I'm doing something wrong'. But you are probably not doing anything wrong. It's just that this type of work is very hard, and often requires a great deal of patience.

You also face some challenges that are outside your control. For example, having learned some basic DNA terminology and facts, you may excitedly contact DNA matches only to find that they ignore you. It remains the case that many DNA testers have no interest in or knowledge of their own genealogy.

Don't try to do too much at once

You will have noticed that DNA Painter hosts a wide variety of tools, and links to many more. Bear in mind that not every tool at DNA Painter is necessarily applicable or useful to every genealogist.

I'd suggest having a particular goal in mind and focusing on the appropriate tool(s)

- That could be a burning mystery (such as 'Who was my paternal grandfather?), in which case you might use "What are the Odds?"
- Or it could just be a general desire to keep track of matches or learn more about DNA and inheritance, in which case you might try chromosome mapping

The main help page at DNA Painter describes which types of tasks each of the main tools is best for.

Take it slow

It would make sense to start with simple tasks.

For example, if you are interested in mapping your chromosomes, don't try and be a completist! Not every match will be solvable. Start by mapping any known matches. Then focus on the biggest unknown matches.

Ask for advice if you need it

There are two very active DNA Painter-specific Facebook groups

(one for What Are the Odds? and one for everything else) as well as a site blog with how-to articles.

You can also email me, and there are also many other social media communities available to help you with DNA questions.

Have fun

Most importantly: this is supposed to be an enjoyable puzzle. If you are really not having fun, then perhaps the tool you're using isn't right – either for you or for the task you're attempting. For example, some people just don't get along with chromosome mapping. If that's you, there's no shame in that; there are many other analysis techniques to try.

Finally, please feel free to watch my four previous Legacy Family Webinars, all of which are linked on the DNA Painter homepage.

Thank you!

Useful links

Before you start

Computer literacy

How to Copy, Paste, Select All using Keyboard Shortcuts on Windows Computer

https://www.youtube.com/watch?v=fKIS5SX53IE

How to Copy/Paste/Select All using Keyboard Shortcuts on MacBook, iMac, Apple Computers

https://www.youtube.com/watch?v=VojT6-iTv90

Genealogy

Cousin Chart—Family Relationships Explained

https://www.familysearch.org/en/blog/cousin-chart

The Cousin Explainer Tea Towel (design by Geoff Sawers)

https://www.presentindicative.com/products/cousin-explainer-teatowel

DNA

Downloading DNA data from AncestryDNA

https://support.ancestry.com/s/article/Downloading-DNA-Data

Uploading to FamilyTreeDNA

https://www.familytreedna.com/autosomal-transfer

Uploading to Gedmatch

https://www.gedmatch.com/how-it-works/#how-to-upload

Uploading to Geneanet

https://geneanet.org/dna/upload/

Uploading to Living DNA

https://support.livingdna.com/hc/en-us/articles/360012509652-Uploading-to-Living-DNA-

Uploading to MyHeritage

https://www.myheritage.com/dna/upload

[Video] GenealogyTV: How and Why to Download Raw DNA from AncestryDNA

https://www.youtube.com/watch?v=5069XcuoMUQ

[Video] Turi King: DNA Family Secrets: A beginner's guide to genetic-genealogy

https://www.youtube.com/playlist?list=PLPZER-xvCEr71byt84As0obB09MoTgVWx

DNA Painter: why and how

Registering at DNA Painter: Every step

https://dnapainter.com/blog/register-at-dna-painter-every-step/

Ancestral trees

What is a GEDCOM file?

https://www.whodoyouthinkyouaremagazine.com/getting-started/gedcom/

Q&A: Everyone Has Two Family Trees – A Genealogical Tree and a Genetic Tree

https://thegeneticgenealogist.com/2009/11/10/qa-everyone-has-two-family-trees-a-genealogical-tree-and-a-genetic-tree/

Eight ways you can use ancestral trees at DNA Painter

https://dnapainter.com/blog/eight-ways-you-can-use-ancestral-trees-at-dna-painter/

The Journey of DNA's Inheritance Paths: X-DNA and Autosomal DNA

https://www.legacytree.com/blog/x-dna-autosomal-dna-inheritance-paths

Keeping track of genetic ancestors: did you know? #2

https://dnapainter.com/blog/keeping-track-of-genetic-ancestors-did-you-know-2/

[video] Setting up an Ancestral Tree and Fan Chart and Exploring Tree Completeness

https://www.youtube.com/watch?v=lkJp5Xk1thg

[video] Keeping track of your genetic family tree in a fan chart
https://www.youtube.com/watch?v=W3Hcno7en94

DNA Painter Dimensions: a new way to showcase your ancestral line

https://dnapainter.com/blog/dna-painter-dimensions-a-new-way-to-showcase-your-ancestral-line/

Relationship prediction

The Shared cM Project

https://thegeneticgenealogist.com/2015/05/29/the-shared-cm-project/

What is a centimorgan?

https://hapi-dna.org/2020/09/what-is-a-centimorgan/

The Shared cM Project tool

https://dnapainter.com/tools/sharedcmv4

Introducing the updated shared cM tool

https://dnapainter.com/blog/introducing-the-updated-shared-cm-tool/

Shared cM histograms: did you know? #3

https://dnapainter.com/blog/shared-cm-histograms-did-you-know-3/

What are the Odds?

https://dnapainter.com/tools/probability

WATO FAQ

https://dnapainter.com/help/wato-faq

Focus mode in WATO

https://dnapainter.com/blog/focus-mode-in-what-are-the-odds-wato/

Previous WATO webinar

https://familytreewebinars.com/download.php?webinar_id=1288

[video] Michelle Leonard: Understanding Predicted Relationships at the DNA Testing Sites

https://familytreewebinars.com/webinar/understanding-predicted-relationships-at-the-dna-testing-sites/

Chromosome mapping

Why map your chromosomes?

https://dnapainter.com/blog/why-map-your-chromosomes/

Painting a match: every step

https://dnapainter.com/blog/painting-a-match-every-step/

[video] Your First Chromosome Map: Using your DNA Matches to Link Segments to Ancestors

https://www.youtube.com/watch?v=tzd5arHkv64

[video] Getting Started with DNA Painter

https://www.familysearch.org/rootstech/session/getting-started-with-dna-painter

How to Use Chromosome Browsers for Genealogy

https://education.myheritage.com/article/how-to-use-chromosome-browsers-for-genealogy/

Painting your DNA with inferred matches

https://dnapainter.com/blog/painting-your-dna-with-inferred-matches/

More tips for inferred chromosome mapping

https://dnapainter.com/blog/more-tips-for-inferred-chromosome-mapping/

DNA Painter Subscriptions

https://dnapainter.com/blog/dna-painter-subscriptions/