

Examining your DNA matches with DNA Painter

Jonny Perl

dnainter.com

jonny@dnainter.com / twitter: @dnainter

My goals for this lecture:

- Explain what DNA Painter is and how it can help you
- Introduce DNA Painter's tree visualizations, which allow you to overlay DNA inheritance paths on your ancestors.
- Discuss the concept of chromosome mapping, including reasons you might or might not want to try it
- Show you how to use the site, presenting real-life examples of how to interpret the results of chromosome mapping

What is DNA Painter?

DNA Painter is a website at dnainter.com with:

- A web-based method for chromosome mapping
- A tree application that allows you to build or import your direct line and then visualize it in a tree, fan or text chart
- Tools for relationship prediction based on the amount of DNA shared

This presentation will focus on **tree visualization** and **chromosome mapping**. I'm presenting a separate lecture (RT9731) on relationship prediction.

DNA Painter Trees

A feature was recently launched allowing you to create a tree showing your direct line or "pedigree" – with these key aims:

- Allow you familiarize yourself with your direct ancestors and make research notes attached to specific people.
- Highlight the degree to which your tree is complete, a key consideration when evaluating DNA connections.
- Keep track of your genetic family tree – the subset of your genealogical tree where you've been able to confirm the connection via DNA matches.

- Have the option to share your direct line via a simple link.
- Make it easy to search your ancestral line by name/location.

In future you will also be able to integrate your tree with your chromosome map.

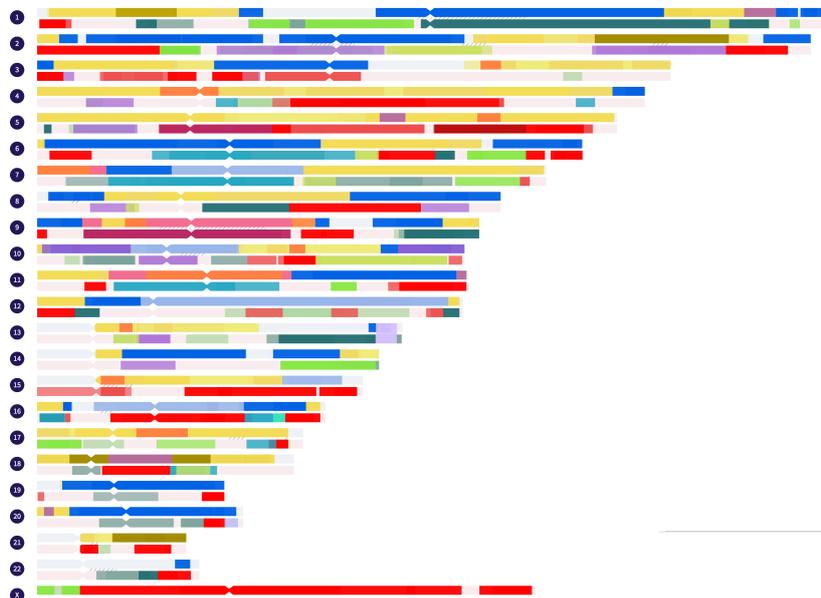
Introduction to Chromosome Mapping

We all have a family line, whether or not we know the identities of the people in it. We all had a biological mother and father, and they in turn had a mother and father, and so on, back in time.

Also, we all have chromosomes. We don't necessarily have to have a thorough understanding of the science underlying chromosomes in order to accept that we each have 23 chromosome pairs. We inherited one of each pair from our father, and one from our mother.

So in the same way we all have a family line, we all have a "chromosome map." When each of us was created, we inherited a specific subset of our parents' DNA, and they in turn inherited a specific subset of **their** parents' DNA, and so on. The result is that each of us has a distinct selection of genetic material that we've inherited from our ancestors – and it exists in your cells whether or not you choose to abstract it into a chromosome map.

Chromosome mapping is the process of assigning segments of your DNA to specific ancestors or ancestral couples. Once you've started to map your chromosomes, you can begin to use this information to identify new matches more quickly and efficiently.



What do you need in order to map your chromosomes?

- To have taken an autosomal DNA test and received the results.
- Access to segment data for matches. The more segment data you have access to, the better. This means you might need to transfer your DNA to additional databases in order to proceed, since some testing companies (e.g. AncestryDNA, Living DNA) do not currently provide segment data.

Ideally you'll have some known matches in your match list. For those looking for birth parents, chromosome mapping is not the best technique to start with.

Basic usage

To create a chromosome map, go to dnapainter.com, log in, and go to the Profiles page. You'll see a button 'create a new profile'.

Once you click this button you'll be taken to your "blank" profile. This is a set of chromosomes that represent you (or another person of your choice). They aren't really "blank," since we inherit one copy of each chromosome pair from our mother and one from our father – so this is the starting point.

Next you need to choose a match to map (aka paint). An ideal place to start would be a known relative who is related to just one of your grandparents, such as a first cousin to one of your parents, or a 2nd or more distant cousin.

To paint a match you need to compare yourself to them on a site that provides segment data, such as MyHeritage, 23andme or FamilytreeDNA, or Gedmatch. The comparison result consists of a table showing which chromosomes and positions you match on.

Click 'Paint a new match' and paste in this data. Once you click 'Save match now', you can enter the information about this match and save them to your profile. The key piece of information is the ancestor or group. You need to ask yourself 'how did this DNA that I share with this person reach me', and enter the names of the common ancestors who are the source of this DNA.

Repeat this process with other known matches. Now, when a new unknown match emerges, you will potentially be able to harness your chromosome map in order to identify them.

Other DNA Painter functionality

- You can click on a chromosome number to expand it and show a stacked view of segments
- The controls area above chromosome 1 allows you to expand all chromosomes, search for a match, and also access the settings cog with:
 - Actions – including
 - Sharing a profile
 - Import composition segments from 23andme
 - Options – including
 - Show centromeres on chromosomes
 - Show a keyline when the cursor hovers above an expanded chromosome
 - Reports – including
 - All segment data, allowing you to download, filter and back up your profile
- The key/legend
 - Dragging and dropping groups within the key adjusts the layer order; segments that are in groups higher up the key will appear on top of those that are in lower groups.

Interpretation

- Narrowing down the connection to a match can be a multistage process
 - Maternal or paternal
 - Narrowing down to a grandparent or further
- If two match segments overlap significantly (as a rough guide, by at least 3,000,000 base pairs), and if you're able to compare them directly and confirm they match each other, then there is likely a common ancestor, but beware:
 - The segment might be much older than the genealogical timeframe, particularly if it's under 15cM
 - The segment may have reached you via a completely different relationship than the one you're aware of. Beware of confirmation bias when you assign DNA to specific ancestors!

Challenges

- Endogamous ancestry and/or multiple relationships between you and your match can make it harder to answer the question 'how did this DNA reach me?'
- Any assignment is an assumption and you should be prepared to be proved wrong

Some common misunderstandings about chromosome mapping with DNA Painter

- Not everything is magical and automated! DNA Painter helps visualize the data you enter so you can draw better conclusions.
- You can't use AncestryDNA matches unless you can persuade them to upload elsewhere
- Unless you've identified maternal and paternal relatives, your testing site probably doesn't know if a match is maternal or paternal, and neither does DNA Painter, although comparing matches can help you figure it out.
- DNA Painter can't talk to the testing companies to see if people match each other; you have to do this yourself
- The main reason to map your chromosomes is **because you want to!** It can help you solve genealogical puzzles too, but it's not a one-stop solution. If you don't find the process inherently interesting, it might make sense to focus on other ways of investigating your matches.
- For many types of genealogical puzzle, including unknown parentage searches, chromosome mapping is **not** the best approach, and you will have a better chance of success with clustering techniques (e.g. the Leeds method) and/or probability tools such as What are the Odds? (WATO).
- For these techniques, you need the total amount shared with a match, but not the segment data, which means you can use matches from AncestryDNA, currently the largest database of DNA testers.

A recap on some benefits of chromosome mapping

- As your map becomes more complete, it can often help you identify matches more quickly and precisely
- It helps you get to know your chromosomes better: perhaps you can identify areas of your chromosomes where certain family names seem to recur, which could be a basis for further research
- It can help you identify personal pileup areas
- It can help you unthread multiple relationships
- It can enable you to compare matches across testing sites
- It helps to cement your DNA knowledge.
- For some of us, it is endlessly compelling!

Useful links

DNA Painter

<https://dnainter.com>

<https://dnainter.com/help>

<https://dnainter.com/trees>

Transferring your DNA

<https://thednageek.com/how-to-transfer-your-ancestrydna-test-to-other-databases/>

How-to articles

<https://dna-explained.com/2018/03/28/dna-painter-chromosome-sudoku-for-genetic-genealogy-addicts/>

<http://www.jmhartley.com/HBlog/2018/04/11/playing-with-dnainter/>

Video tutorials

Jonny Perl: https://familytreewebinars.com/download.php?webinar_id=955

Blaine Bettinger: <https://www.youtube.com/watch?v=wyjcJxywTZI>

Jarrett Ross on trees: https://www.youtube.com/watch?v=Z_RSGDS5goE