Chromosome mapping for absolute beginners
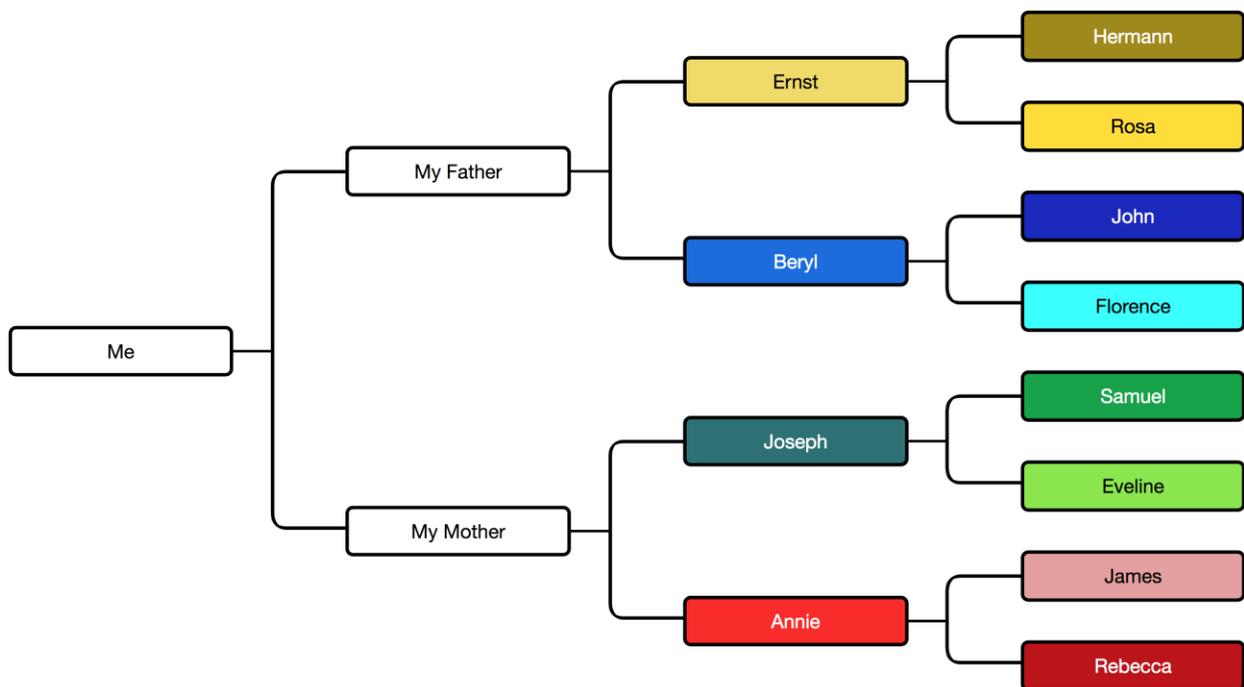
Jonny Perl

jonny@dnapainter.com / twitter: @dnapainter

What is it?

Chromosome mapping is the process of using your DNA test to discover which ancestors you inherited your DNA from.

Here are the first few generations of my direct line. All of my DNA came from these people and their direct ancestors.
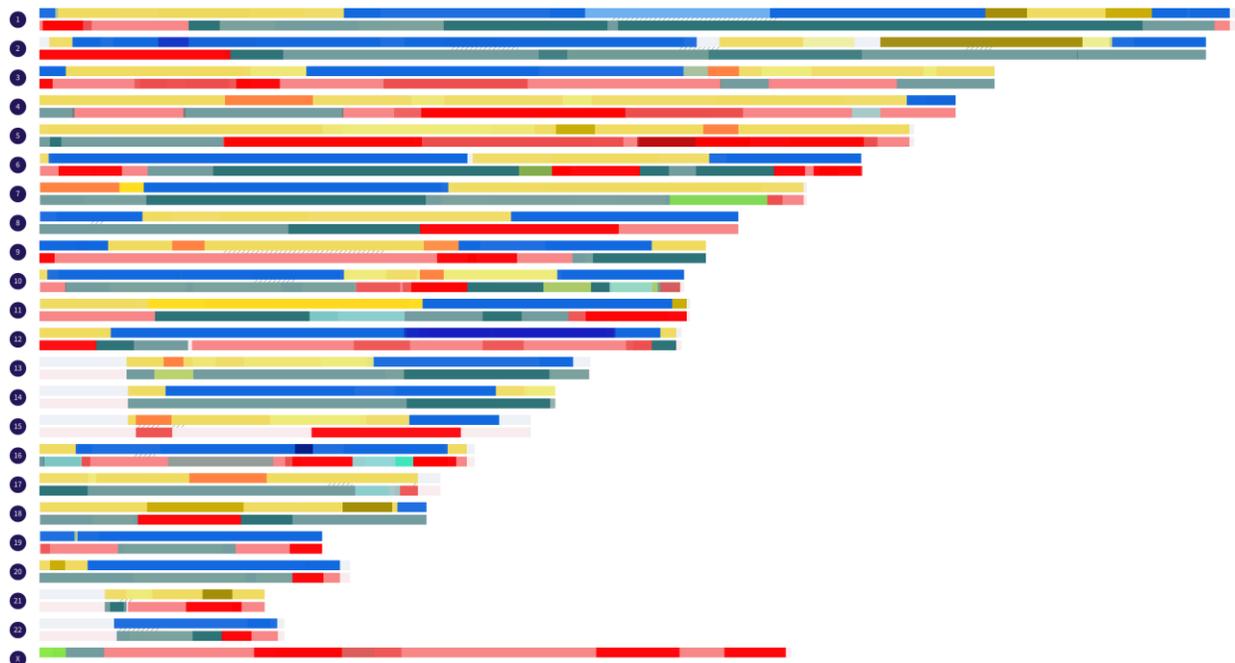

The amazing thing is that here, today, in 2019, a great deal of history is hiding in my DNA like a puzzle waiting to be solved.

To start with, I've given each ancestor his or her own color.

My chromosome map

Here's my chromosome map, in which I've been able to determine which ancestors gave me different parts of my DNA. It's like looking back through time:

Why do this?

- Help corroborate your existing research
- Highlight unknown connections and help bridge missing paper records
- Once you start to identify the ancestors who gave you specific sections of DNA, you potentially have a massive head-start when identifying new matches
- It's fascinating: a puzzle that has been there all along, hiding in plain sight in your DNA

What can you learn from it?

Each set of DNA results is different.

- In general, the aim is to have enough of your DNA mapped so that when a new match comes in, you have a clear reference that indicates where they might fit into your family tree
- This puts you in the best position to connect with and learn from your DNA matches, as opposed to chasing around multiple branches of trees.

Essential concepts

If you're new to DNA, all the unfamiliar concepts can feel overwhelming. However, you can build up your knowledge gradually; you don't need to learn everything at once.

- For chromosome mapping, the most important thing to understand is the concept of **maternal and paternal chromosomes**. For example, you have two copies of chromosome 1: one from your father and one from your mother. When you have a match on chromosome 1, your first task is to determine which of these chromosomes the match is on: the maternal or paternal. In the first instance you might not know, which is also fine!
- Another essential point is that since you inherit 50% of your DNA from each parent, this means there's another 50% of their DNA that you **didn't** inherit. This process repeats every generation, and as a consequence, you do not share DNA with all of your relatives, or even all your ancestors. For example, you are statistically likely to share DNA with only about half of your 4th cousins.
- It's also important to understand **units of measurement.** The size of a segment of DNA that you share with a match is often given in the form of the number of **centimorgans (cM)**. Segments of DNA that are shorter than 7cM may be coincidental or false. For more distant matches, the number of centimorgans shared will vary hugely. Charts and guides such as the Shared cM Project can help you understand the possible variations.

Basic method

- **Start with a known match**. If possible, start with one known relative who has taken a DNA test. If available, a second cousin is an ideal match to start with.
- You might typically share 10 segments of DNA with a second cousin
- Assuming you're related via just one route, the DNA you share with this second cousin must have come from your common ancestors: **your Great Grandparents**. By tracing the path to back to these ancestors, you will know if these segments are on your **maternal** or **paternal** chromosomes.
- In your chromosome map, assign these segments to your great-grandparents
- Repeat for other known matches
- Explore other matches who overlap with known matches
- Consider asking other relatives to test so that you can increase your coverage

Challenges you may face

- **Not enough good matches**: Without known matches, chromosome mapping becomes more difficult (but not impossible!)
- **Multiple relationships**: You might be related to your match in multiple ways. This makes it harder to determine the source of specific segments, since they could have arrived in your DNA via a number of routes

- **Endogamy**: If you have ancestry from an endogamous population (e.g. Ashkenazi Jews, Acadians), it is generally much harder to identify the path by which you inherited specific segments of DNA, and your genealogical connection to matches may be more remote than the amount of shared DNA suggests
- **Remember:** Whenever you assign a portion of you DNA to an ancestor, you are making an assumption that the DNA you share with your match came via the known relationship. There might be other connections of which you're unaware.
- **Always be prepared to revise your assumptions, but don't be afraid to experiment**

Checklist of tasks

Before you can start mapping your chromosomes, you need to

1. Take an autosomal DNA test e.g via 23andme, AncestryDNA, FamilyTreeDNA, Living DNA, MyHeritage	■
2. Have access to segment data If you tested with AncestryDNA, you will need to transfer your DNA to FamilyTreeDNA, Gedmatch or MyHeritage In order to find more matches, you might want to upload to other sites that permit transfers (regardless of the company you tested with)	■
3. Understand that you have two copies of each chromosome, one from your mother and one from your father*. When you are comparing yourself a match, your first task is to figure out which of these chromosomes your match is on: the maternal or the paternal. ** except if you're male, you inherit a Y-chromosome from your father rather than an X*	■

Useful links and resources

Background

https://isogg.org/wiki/Chromosome_mapping

https://www.geni.com/blog/dna-testing-for-genealogy-getting-started-part-three-376261.html

https://thegeneticgenealogist.com/2017/08/26/august-2017-update-to-the-shared-cm-project/

Tools for building your own chromosome map

https://dnapainter.com

http://kittymunson.com/dna/ChromosomeMapper.php

https://www.legacytree.com/blog/create-a-chromosome-map-without-living-grandparents