DNA Genome Reconstruction

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What it is

Genome reconstruction is the process of creating a DNA raw data file for a deceased ancestor. A raw data file records what genes you have and where in your DNA. It is by comparing your raw data file to every other one in the database that companies identify your genetic relatives.

Benefits of Genome Reconstruction

Generation makes a huge difference in DNA research. Autosomal DNA is usually only helpful for solving brick walls about 5 generations back or closer. A parent will only pass on 50% of their DNA to their child. That means DNA is lost with each subsequent generation until eventually there is not enough DNA left to solve the brick wall. Genome reconstruction allows you to build the DNA of a deceased generation. This is helpful because your ancestors will have more DNA shared with the matches that are relevant to your problem and they will have less irrelevant matches to have to filter out.

Reconstruction also will turn your heart to both your ancestors and your living family members. It takes time and effort and as you go through the process you will become the glue that helps hold your family together for future generations.

You might have a missing family that has been adopted out of your family that you don't know about. As you recruit people to test and rebuild your ancestor's DNA, those DNA kits may help the missing members of your family discover their way back to you.

Sharing your Genome Reconstructions

Currently there are limited options for where you can put reconstructed kits. Ancestry and 23andme do not allow uploads at all so putting reconstructions there is not an option. MyHeritage accepts general uploads but has banned reconstructions since June. FamilyTreeDNA and LivingDNA have not made a stance about reconstructions in their terms and conditions but only a high-quality kit has a chance of getting into their databases.

The best place to put your reconstructions is GEDmatch. GEDmatch will allow you to upload kits of any quality even ones that only contain 1% of a person's DNA and at a minimum mark them as research kits. Research Kits can be compared to individual kits one at a time by anyone who knows both kit numbers but only the person who uploaded them can run them in the One-to-

Many tool and see their full match list of living people. I recommend uploading the reconstructions to GEDmatch, marking them as Research Kits and then putting the kit numbers on their FamilySearch profiles or wherever else you keep your tree with an explanation of what it is. Then anyone who comes along and sees it can also upload their DNA into GEDmatch and see what segments they share with your reconstruction.

Through experience I have found that kits above 51% complete will be able to batch process and generate match lists in GEDmatch if you add white noise to fill in the gaps. Meanwhile, kits above 76% will usually batch process in GEDmatch even without white noise.

Amount of DNA You Can Reconstruct

The amount of DNA you can reconstruct of a person depends on how many children they had.

Number of Children	Average Possible Reconstruction
0	0%
1	50%
2	75%
3	88%
4	94%
5	97%
6	98%
7	99%

GEDmatch: Lazarus

The Lazarus reconstruction tool is offered by GEDmatch. It is a Tier 1 tool which means you must have a subscription to use it. The Lazarus tool works similarly to Borland Genetic's Phoenix tool. You are given three groups of boxes. Group 0 is for relatives of the target person's spouse and is optional. Group 1 is for descendants of the target person and is required. Group 2 is for all other relatives of the target person and is also required. Anytime the tool finds DNA that is shared between someone in group 1 and 2 but is not also shared by someone in group 0, that DNA is added to the reconstructed kit.

If you can reconstruct at least 1500 cM's (20%) of a person's DNA, GEDmatch will attempt to batch process your kit. In other words, your reconstruction will be compared against everyone

else in the database for matches. This will usually work but occasionally the kit might have too many false matches and this will fail.

The biggest advantage to Lazarus is GEDmatch's database is large and you can use anyone who matches you in the database for your reconstruction. The problem with Lazarus is only the person who created the reconstruction can ever see it, use it or benefit from it. Your relatives will have no idea the Lazarus kit is in the database.

Hapi-DNA

The website, Hapi-DNA.org also offers a reconstruction tool. This tool requires the DNA raw data files of the target person's spouse and at least three children but the more children you use the better the reconstruction will be. The tool compare's the DNA of the children to the living parent. Any DNA that is unique to the children must have come from the missing parent and is added to the kit. Hapi does not have a DNA database so after making a reconstruction on Hapi please upload it to GEDmatch and Borland Genetics.

Currently reconstructions made at Hapi do not include the X chromosome.

Borland Genetics

BorlandGenetics.com was founded in 2018 by Kevin Borland. The purpose of the website is to help you reconstruct the DNA of your deceased ancestors. Kevin Borland's vision is that his website will one day be a large database of deceased reconstructed ancestors. Most of the tools are free but the ones that require the most computations require a subscription.

There are main tools that you will use most often are:

1. Missing Parent
2. Reverse Phase
3. Phoenix
4. Darkside
5. Phase Map Locker
6. Humpty Dumpty

The first four are for breaking up a living person's DNA by separating their paternal and maternal chromosomes. Then you use the Phase Map Locker to tell Borland Genetics which portions within those broken kits you want and then the Humpty Dumpty merges those together to create the DNA of your ancestor.

Missing Parent

Use this tool when you have your DNA, one of your parent's DNA and you are trying to reconstruct the genome of the other parent. The tool will compare your DNA against the tested parent and identifies all the DNA that is unique to you. All the DNA you did not inherit from your tested parent must have come from your missing parent so this tool creates a new kit that only contains that DNA. Each time you run this tool on a parent and child you will end up with 50% of the target person's DNA.[1]

Reverse Phase

Use this tool when you have your own DNA and the DNA of one of your children and you are trying to reconstruct genomes for both of your parents. This tool allows you to separate out your paternal and maternal chromosomes by comparing your DNA against your child rather than a parent.

The free version of this tool requires knowledge of chromosome mapping and DNA Painter. The subscription version does those things for you automatically.

Phoenix Tool

Use the Phoenix Tool when you have your DNA and relatives that are only related to the parent you are trying to reconstruct. The Phoenix will compare your DNA against these relatives and any DNA that matches between you and them will be added to the kit.

Darkside Tool

The Darkside does the opposite of the Phoenix. Use this tool when you have your DNA and relatives who are only related to the parent you are not trying to reconstruct. The Darkside will compare your DNA against these relatives and in all the places you match those relatives, the DNA that is unique to you will be used instead.

[1] If you run missing parent on a father and son you will end up with 47% because a father does not pass on his X chromosome to the son.

Phase Map Locker

After you have separated the DNA of a living person using Missing Parent, Reverse Phase, Phoenix, or Darkside, you can create chromosome maps in DNA Painter, link those maps to the kits and then use the maps to extract out the segments you are interested in. The Phase Map Locker is a subscription tool. You don't need to use this tool and instead could just use the Extract Segment Tool but I love the Phase Map Locker because it saves the chromosome maps for future use.

The Creeper

The Creeper is the main subscription tool. It is named this because the site launched Halloween 2018 and the idea was the Creeper would creep through your matches and decide the best way to proceed. The Creeper is an AI machine trained in all the tools available at Borland Genetics. It can pick the best tools based on the kits you have, it automates the Reverse Phase process for you, and even knows how to do Visual Phasing.

Humpty Dumpty Merge

The Humpty Dumpty tool allows you to combine multiple reconstructed kits for a target person into one larger one containing the data from all of them. There are three options for this tool:

1. Mono to Mono: Use this option if all the DNA of the target person you are merging came from only one of their children. You will use this option a lot during your reconstructions.
2. Mono to Stereo: Always use this option as the final step of your reconstructions.
3. Merge Factory Kits on Different Templates: Not used on deceased ancestors. This option is for a living person who tested at multiple companies and wants to combine their raw data files into one larger file that contains the genes tested by all of them. If you are going to use this tool it is best to do this first.

White Noise

At any point if you wish to download a full or partial kit from Borland Genetics, subscribers have access to advanced options. One of them is the ability to add white noise to the kit. Doing this will help kits 50-75% complete work in GEDmatch.

More Information

For more information on Borland Genetics you can read our FamilySearch Wiki page about it here: https://www.familysearch.org/en/wiki/Borland_Genetics_in_Genealogy_Research

Alternatively, you can join the Borland Genetics user's group on Facebook: https://www.facebook.com/groups/358296988044804

Last year I wrote a blog about how to reconstruct a genome using Borland Genetics. In that blog I go into more detail about the tools and functionality of that website. To access that blog, click here: https://blog.dnapainter.com/blog/grammys-dna-reconstruction/