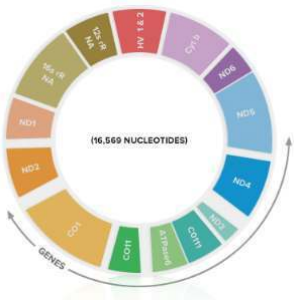
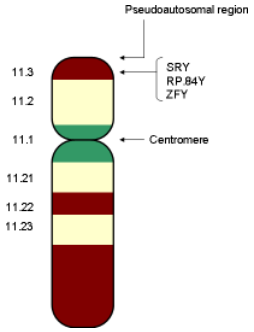
Introduction to Genetic Genealogy

Types of DNA

Mitochondrial DNA

The genetic material found in mitochondria. It is passed down from females to both sons and daughters, but only daughters pass mtDNA to their children. This inheritance pattern reveals the direct maternal line, the mother's mother's mother's line. Both men and women can test mitochondrial DNA.



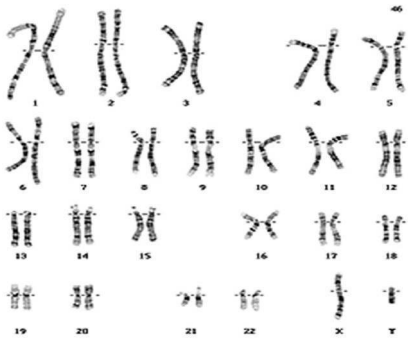


Y-DNA

DNA from the Y chromosome is used to trace paternal ancestry. Men pass their Y chromosome to their sons. Throughout generations, small changes take place. The amount of time these mutations took to happen can be estimated, providing a starting place to look for genealogical connections.
Only men can test Y-DNA.

Autosomal DNA

DNA chromosomes located in the cell nucleus. Humans have 22 pairs of autosomal chromosomes (autosomes) and a pair of sex chromosomes (X, Y for men, X, X for women). Those 22 pairs of chromosomes include recombined DNA from each parent, whose DNA was recombined from each of their parents. Both men and women can test autosomal DNA.



X-DNA

Short tandem repeat (STR) markers on the X chromosome have been used in forensic and siblingship cases, as well as population genetics. Men only have one X chromosome which they get from their mothers, so they know that all X matches come from their maternal side. Women have two X chromosomes, one from each parent. The inheritance pattern of X-DNA segments is complicated because of recombination, so working with X-DNA can be problematic. X-DNA segment information is included in autosomal DNA test data but is not typically included in the matching algorithm.

Useful terms

Bases: the part of DNA that stores information. Includes adenine (A), guanine (G), cytosine (C), and thymine (T). Complementary bases pair up, A with T and C with G, to form units called base pairs.
centiMorgan: A unit of measure of recombination frequency. In human beings, 1 centimorgan is, on average, equivalent to 1 million base pairs.
Direct: Descending along a straight gender line, maternal or paternal, mother's mother's mother or father's father's father.
Locus: A specific location in your genetic code. In a genetic map of our DNA, the locus tells us where to find any base.
Marker: A gene or a DNA sequence which has a known location on a chromosome. This includes any single nucleotide polymorphism (SNP), short tandem repeat (STR). In genetic genealogy, the result of testing various markers helps determine the closeness of a match.
Mutation: A heritable change that occurs in genetic material.
Nucleotide: the basic structural unit and building block for DNA, comprised of a
Haplogroup: A major branch on either the maternal or paternal tree of humankind. Haplogroups are associated with early human migrations and geographic region or regions.
Phylogenetic Tree: Both mtDNA and Y-DNA are arranged in evolutionary trees that illustrate how the mutations and haplogroups are related to each other.
Recombination: The mixing of the DNA on each chromosome that you receive from your mother and father, much like shuffling two decks of cards together.
Short Tandem Repeat (STR): Sequences of nucleotides that repeat at certain positions on the chromosome. Counting the number of times those repeats occur at a panel of locations allows comparison between people to determine degrees of relatedness.
Single Nucleotide Polymorphism (SNP): A change in your DNA code at a specific point, or locus. Referred to as a SNP, pronounced "snip." Found in all four types of DNA, they're particularly useful in Y DNA in tying genealogy to geographic origins.

Sources

https://www.familytreedna.com/learn/glossary/
http://www.merckmanuals.com/home/fundamentals/genetics/genes_and_chromosomes.html
https://genographic.nationalgeographic.com/science-behind/genetics-overview/

Resources

https://isogg.org/wiki - International Society of Genetic Genealogists Wiki
http://www.ncbi.nlm.nih.gov/ - National Center for Biotechnology Information
https://dna-explained.com/ - Roberta Estes' blog on Genetic Genealogy
https://thegeneticgenealogist.com/wp-content/uploads/2017/08/Shared_cM_Project_2017.pdf - The Shared cM Project
https://youtu.be/2QfI3iRnGDo – Jim Brewster on FTDNA tools (2016)
https://www.youtube.com/watch?v=U_mPClKX3ls - Maurice Gleeson on DNA tests
https://www.facebook.com/groups/dnanewbie/ DNA Newbie Facebook Group
https://www.facebook.com/groups/FTDNAUserGroup/ FTDNA User Facebook Group
https://dna-central.com/ Blaine Bettinger's subscription-based instructional site

Autosomal Transfer Program

If you or a family member have previously tested your autosomal DNA at 23andMe©, AncestryDNA™, or MyHeritage, you can transfer your results to Family Tree DNA by uploading your raw data file. After transferring your file, your autosomal data is uploaded to our database, one of the world's largest genetic genealogy databases.

When you transfer, for free, you will receive a list of your autosomal matches from our database and have access to our Family Finder – Matrix. The Matrix feature allows you to select and compare the autosomal DNA relationship between up to ten of your matches at one time.

Important: Each account is for one individual. If you have an existing Family Tree DNA kit and are attempting to upload data for a different individual, you MUST create a new account for the transfer.

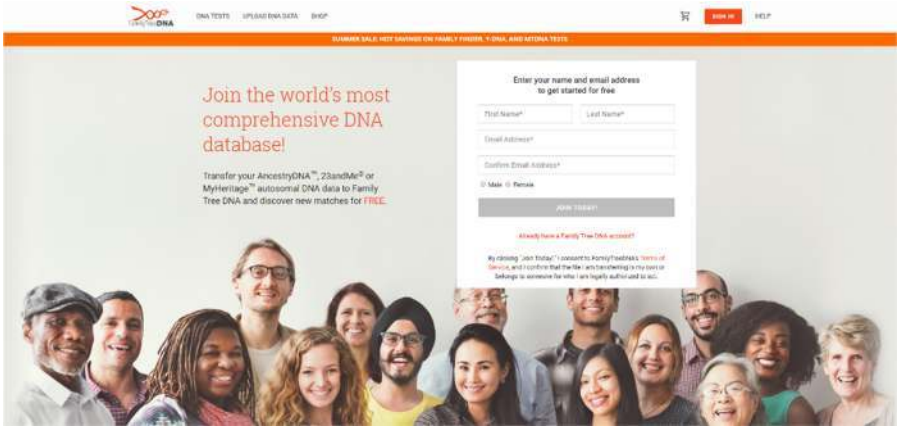
After transferring, you can unlock all Family Finder features, which include the Chromosome Browser, myOrigins, and ancientOrigins for only $19.

Please note that you can only transfer 23andMe© V3 and V4 or AncestryDNA™ V1 and V2 files. Unfortunately, at this time, you cannot transfer 23andMe© V1 or 23andMe© V2 results. Also, because of the smaller file sizes, AncestryDNA™ V2 and 23andMe© V4 files will get all but speculative matches, which are those at the 4th to remote and 5th to remote cousin levels.

How to Upload your Autosomal Transfer Data

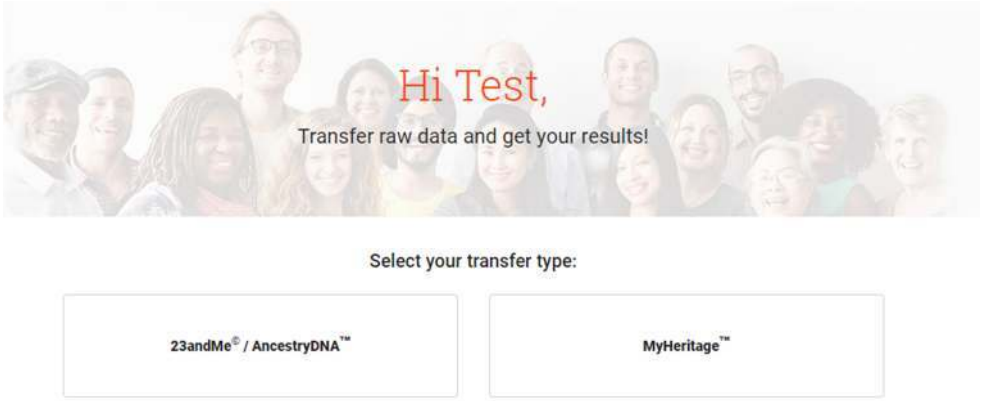
1. On the Family Tree DNA Homepage, click UPLOAD DNA DATA near the top-left corner to display the drop-down menu.

2. On the drop-down menu, click Autosomal DNA. This will direct you to the autosomal DNA transfer page.



3. Complete the fields by entering the first and last name, email address, and gender of the person whose data you are transferring. (If you are transferring someone else's data, make sure to enter their name and gender NOT yours.)

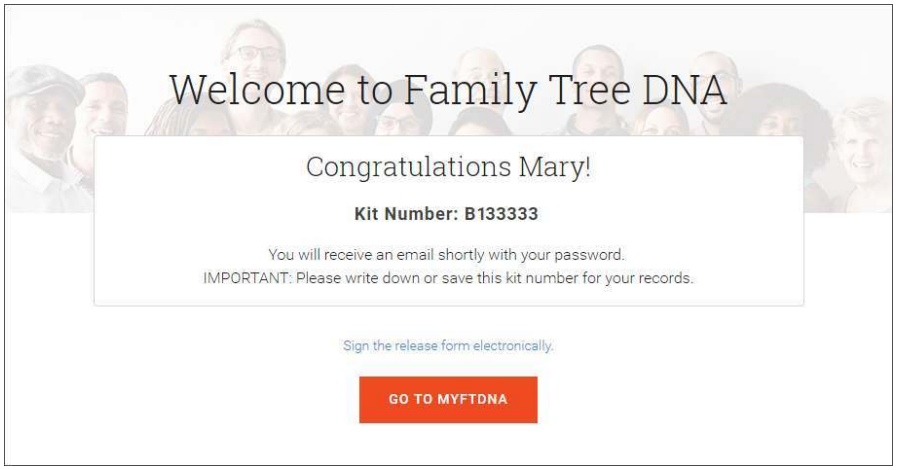
4. After entering the appropriate information, click Join Today. Please note that upon clicking Join Today, you are agreeing to Family Tree DNA's Terms of Service. You will be directed to the upload page.



5. Select the type of transfer file you wish to upload.

6. On the upload page, click browse file to browse to the autosomal DNA results file you want to upload, or drag and drop the file on the boxed area. The file will start uploading. Note that this could take several minutes. Once uploaded, the name of the file you uploaded will be displayed in the boxed area.

7. Click Submit to submit the uploaded file. Note that if you uploaded the wrong file, you can click ***remove*** in the gray box to remove the file and upload the correct one. Once submitted, the *Welcome to Family Tree DNA* page is displayed. On the welcome page, your kit number is displayed. It is important to keep this kit number for your records. You will need this number to sign in to your kit in the future. Also, an email will be sent to the email address you entered on the transfer page. This email will contain your password to sign in to your kit.



8. Click Go to MyFTDNA to go to your kit's dashboard. The transfer may take 24-48 hours to process, depending on processing volume.

Note: You can also click the Sign the release form electronically to sign the FTDNA Release form. You will need to sign the Release Form to review your matches or access the matrix. However, you can also sign this form at a later time.

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Email: https://www.familytreedna.com/contact.aspx
https://www.familytreedna.com

DNA – Ethnicity Estimates

Geneticists compare test-takers' DNA to collections of reference samples that were obtained from known locations.

The size and diversity of the reference panel is a strong factor in the accuracy of an ethnicity estimate.

Each of the testing companies has its own reference panel:

- **23andMe:** Utilizes a database of more than 10,000 people from various populations around the world. Uses a proprietary computer algorithm called "Finch" to phase the DNA to separate the test-taker's DNA sequence into father and mother. Then they break the chromosomes into short, non-overlapping adjacent segments of about 100 markers.
- **Ancestry DNA:** Use a reference panel with more than 3,000 DNA samples from people in 26 global regions. 40 different analyses.
- **Family Tree DNA:** DNA's reference panel is composed of numerous individuals from 22 different population clusters.
- **MyHeritage DNA:** A percentage breakdown selected on the basis of their backgrounds as genetically representative of their geographic region from among 42 ethnicities.