MATERNAL LINEAGE TEST RESULTS FOR
BRENT JAY BELNAP

Your DNA test results show that you belong to Maternal Ancient Ancestry haplogroup *H*, The Colonists.

MATERNAL HAPLOGROUP

H

THE COLONISTS

YOUR HAPLOTYPE

Location	Reference mtDNA	Your mtDNA
73	A	G
195	T	C
207	G	A
263	A	G
310	T	C
16356	T	C
16519	T	C

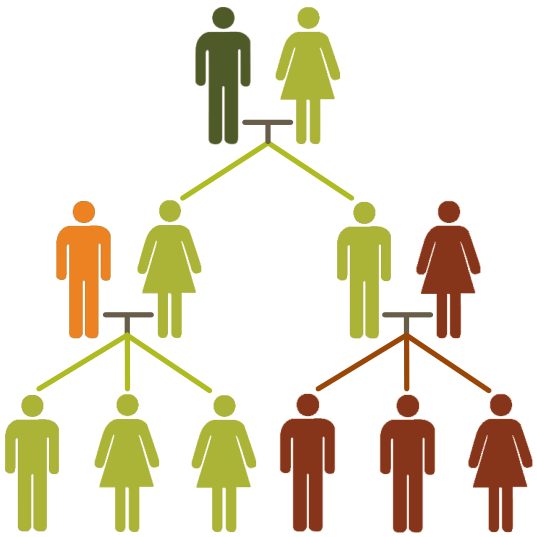
This map shows the migration pathways of your ancient ancestors, The Colonists, haplogroup *H*. Your ancient ancestors may have migrated to Europe, the Near East or the Caucasus Mountains, settling in present-day Basque Country, Scandinavia, Sardinia and other parts of Europe. Along with revealing your ancestral history, your results may also be used to eliminate certain hypothesized genealogical links. See page 2 for more details.

PART I: AN EASY EXPLANATION OF YOUR RESULTS

mtDNA Results—How They Vary

At first glance, the data that makes up your test results may not mean much to you. It's a lot like looking at the whorls on the pad of your finger tip, or the intricate pattern of a snowflake under a microscope. But your results are a special bit of information that may hold the answer to some of your ancestral mysteries.

To determine your Maternal Ancient Ancestry Haplogroup, we took a look at a circle of your DNA known as mitochondrial DNA (mtDNA). You can learn more about the function and genetics of mitochondria in Part II, Digging Deeper (page 4). Unlike chromosomal DNA, which contains the vast majority of an individual's genetic information, mtDNA is a special sort of DNA. Because mtDNA is not passed from the sperm to the egg during fertilization, our mtDNA comes only from our mother. Thus, your mtDNA results will be consistent among the members of your direct maternal line. In other words, your mtDNA results will be the same for your mother, her mother, your siblings, and so on. However, it's important to note that both men and women have mtDNA.



We inherit mtDNA from our mothers. Here the line of mtDNA inheritance is represented by color.

To understand where the letters and numbers which make up your test results came from, imagine your mtDNA as a circular ribbon. When we're doing your test, we travel down that ribbon, pull up to certain locations and compare your mtDNA sequence at those locations to a reference sequence (established arbitrarily by research scientists). Each location we look at is either "A", "T", "C", or "G", corresponding to the four components of DNA code. If your sequence is different from the reference, we make a note of it. That sequence difference is always unique to your DNA, and the combination of the differences allow us to match you to a haplogroup. Take a look at page 4, in Part II, Digging Deeper, for a more advanced explanation of your test results.

The results table on your certificate has three columns. The first column, labeled "Location," indicates the names of the locations where we found differences in your mtDNA sequence. The second column, labeled "Reference mtDNA" describes the genetic code at that location on the mtDNA of a standard reference sequence. All Maternal Ancient Ancestry Haplogroups are defined in comparison to this one universal reference, established arbitrarily by the original research scientists who sequenced human mtDNA. The third column, labeled "Your mtDNA", shows the differences in your mtDNA when compared with the reference. If you belong to the same haplogroup as the reference, you may not see any data at all.

Location: A Particular Place in the mtDNA Code	**Reference mtDNA:** The Reference Base at this Location	**Your mtDNA:** Your Genetic Code at this Location
Location	**Reference mtDNA**	**Your mtDNA**
250	T	C

Your mtDNA haplotype results are useful only for our database to match you with a Maternal Ancient Ancestry Haplogroup. Your test results don't tell you (or us!) anything about your hair color or other personal characteristics. The way we use DNA is very different from what you may have seen on TV or heard about in the past. If you're interested in learning more about the science behind the test, read Part II of this packet, Digging Deeper.

PART I: AN EASY EXPLANATION OF YOUR RESULTS

Geneaology—Meaning for the Maternal Line

Your results can be the final answer to certain genealogical puzzles. As mitochondrial DNA is inherited directly from our mothers, there are certain relatives who will always have the same results as you do. If there is a possible relative with whom you think you share a maternal link, you can compare mtDNA results. We can't determine whether you are related more recently than 5,000 years ago, but if you have even one difference, you can be certain you are not related.

Matching to Other Test Participants

Our database automatically compares your results with all other participants. Your Maternal Lineage results will show your closest maternal matches as well as how you differ from those matches.

Even over many, many generations mtDNA does not change much, so it's possible to have a "perfect" match with someone, belong to the same Maternal Ancestral Group and still not be related in a close familial way. However, any differences between your results and those of another participant indicate that you are definitely *not* related. The most common genealogical application of these results is to eliminate the potential link to an individual with whom you thought you had a direct maternal link.

If you're interested in contacting a maternal ancestry match, you can use the secure Ancestry.com Connection Service to protect your email address. You may be contacted by someone as well. An opportunity to collaborate with other participants depends on the level of participation you designate online. You may elect to share only your contact name with others or remain entirely anonymous. These preferences are available under "My Account".

Our database is growing, so you may discover even more maternal comparisons and matches when you visit in the future.

Your Ancient Ancestors—Where It All Started

Around 100,000 years ago, a single group of humans began dividing and migrating to form genetically isolated populations throughout the world. Over generations, the new populations' genes became slightly different from the original group and from each other. Some of those differences were random, while others provided genes for characteristics which let groups thrive in their specific environments. A few of these random differences appear in your mtDNA sequence and allow us to associate you with a Maternal Haplogroup—described by a letter and in some cases by a number.

We determine your specific haplogroup by comparing your mtDNA sequence to a reference. The differences we find are usually similar or identical to the differences between a known haplogroup and the reference, so we can assign you to that haplogroup. Haplogroups are usually associated with regions of the world, ancient peoples, and migrations, going back tens of thousands of years. By telling you a little bit about the people associated with your haplogroup, we give you clues to the life and times of your ancient ancestors. You may enjoy reading *The Seven Daughters of Eve*, by Brian Sykes, which offers a rich tale of all of our most ancient maternal ancestors.

Haplogroup *H*, The Colonists

You belong to the Colonists, haplogroup *H*, which is about 30,000 years old. You belong to the same haplogroup as the individual whose mtDNA was used to establish the standard (RCRS) with which we compare everyone's results.

The Colonists crafted Venus figurines, which may have represented a revered Earth Mother.

PART I: AN EASY EXPLANATION OF YOUR RESULTS

Your maternal ancient ancestors traveled this path—settling for various periods of time at points along the way.

The Colonists are believed to have arrived in Europe from western Asia about the same time as a culture known as Gravettian. For that reason, it's probable that the Colonists adopted or even originated the Gravettian technology.

Stone played both a functional and religious role in Gravettian culture. The Colonists may have used stone blades to craft voluptuous Venus figurines, possibly out of steatite, calcite, limestone or other soft stone. Although the exact significance of the figurines is not known, they may represent fertility or the Earth Mother goddess, a concept which prevails in many cultural mythologies. Your ancient ancestors may have regarded the Earth Mother as a symbol of security or as a deity who enabled plentiful harvests and numerous offspring.

The most famous of these statues is the Venus of Willendorf, discovered in an Austrian village in 1908. It's estimated she was carved between 24,000 and 22,000 B.C.E. Similar figurines were found later, and are collectively referred to as Venus figurines, although they predate the emergence of lore around the Roman goddess, Venus.

Over a 10,000 year period following their initial arrival, the Colonists spread wide and far through continental Europe and into central Asia. Their migration would have likely continued had it not been for the Ice Age. During this time, an ice shelf spread across Europe as far as southern Ireland, mid England and northern Germany. Northern Spain and continental Europe were covered in tundra during these climatic shifts. As the Colonists moved their homes south to hunt game below the tree line, they settled primarily in southern France, Iberia (present day Spain and Portugal), Italy and the Caucasuses. When the ice sheet retreated about 6,000 years later, many of the Colonists migrated back into northern Europe.

Current European populations are made of 40-50% Colonists and near east and Caucasus region populations have about 20-30% Colonists. It's thought that during the 6,000 years of forced ice age isolation, several genetic subpopulations of Colonists arose. Contemporary subpopulations of Colonists probably reflect the migrations which occurred after the end of the Ice Age. Subpopulation *H1* is found at high rates among present day Basque, Iberian, North African and Sardinian populations, among others. *H3* can be found at lower, yet still notable, rates among the Basque and Sardinian populations. As our DNA test and matching conventions progress, we may be able to match you with an *H* subgroup. For now, we'll

tell you about some cultural features of Colonist-associated populations, which may date back to ancient times.

Your ancient ancestors may have played a role in developing the unique music of Sardinia, a distinct quality of the island's culture. Known for its vocal polyphony, the music is characterized by the guttural

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sounds of throat singing. Sardinians also play the *launeddas*, a woodwind triplepipe that probably dates back to the 8th century BC. Crafted from reeds and beeswax, this instrument has a role in religious ceremonies and accompanies traditional Sardinian dance. The sound is so compelling that many contemporary musicians have incorporated the *launeddas* into their compositions.

A unique modern day population, the Basque people self-identify as a discrete ethnic group in north-central Spain and southwestern France. Early Basque culture was basically democratic and their pre-Christian religion was formed around a superior female goddess, Mari. A rich mythology of Basque creatures and characters includes imps, giants, dragons, soothsayers and other nature-based deities. Traditional Basque cuisine was dictated by the mountains and sea surrounding Basque country. Lamb, fish and beans are typical ingredients of a Basque meal. The language associated with the Basque people is *euskara*, which linguists believe exists in a family by itself, and is not related to English or other western European languages.

In *The Seven Daughters of Eve*, author Brian Sykes describes the lifestyle of the Colonists in a rich narrative surrounding their ancestral mother, whom he calls Helena.

A Basque bowling game.

PART II: DIGGING DEEPER

What is mtDNA?

Mitochondrial DNA, or mtDNA, is a unique kind of DNA. While most of our DNA is contained in the nucleus of our cells as chromosomes, mtDNA and the mitochondria associated with it exist pretty much on their own, floating around inside the cell and outside of the nucleus. Mitochondria act like teeny-tiny organs in the cell, in fact, they are sometimes called organelles. A cell can have hundreds or thousands of mitochondria producing and regulating energy, and in fact, we couldn't survive without them. It's thought that the mitochondria once lived on their own, like bacteria. At some point during evolution, our cells incorporated mitochondria into their own physical and functional make up, somewhat like swallowing a super helpful parasite. In any given individual, mtDNA is the same from cell to cell. Because mitochondria still replicate on their own, they need their own special DNA, which exists in a loop (unlike the strands of chromosomal DNA).

mtDNA—Thanks, Mom!

Like the rest of your genetic makeup, your mtDNA is determined at conception. A human egg cell is many times larger and contains thousands more mitochondria than a human sperm cell, in which mitochondria are concentrated in the tail. When the

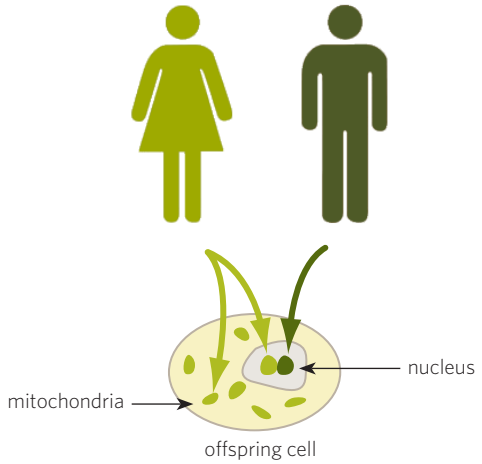
two cells fuse they create a single fertilized cell, a zygote, and virtually all its mtDNA is from the egg.

Determining Haplogroup—Circular Data

To determine your Maternal Ancient Ancestry, we look at the DNA sequence, or code, in two mtDNA regions, known as the Hypervariable Region 1 and 2 (HVR1 and HVR2). You may know that DNA is made of building blocks called *bases*. Specifically, DNA is comprised of four bases: Adenine (A), Cytosine (C), Guanine (G), and Thymine (T). Those four bases line up to create a code, much like the kind of code computer programmers use. Even though HVR1 and HVR2 are made up of DNA, these two regions serve a strictly structural purpose for the loop of mtDNA; they give proteins inside the cell a place to stick to the loop. Because HVR1 and HVR2 are structural and don't code for anything important, they can contain a lot of "mistakes" or variations in the bases that make up their code, without having any effect on the life of the organism in which they exist. The way a sequence of mtDNA varies at certain locations in HVR1 and HVR2 lets us associate that mtDNA with a haplogroup.

Comparing to a Standard—Revised Cambridge Reference Sequence

As we've mentioned before, we determine your haplogroup by comparing the sequence of your mtDNA with a reference. You may be wondering how



mtDNA is contained in discrete cell organelles, the mitochondria, which are already in the egg at the time of conception.

the standard was established and what goes on during the comparison. Scientists at Cambridge University sequenced the mtDNA of a random anonymous individual over 25 years ago. The sequence is called the Cambridge Reference Sequence (CRS).

The scientists figured out every single DNA base that makes up the mtDNA code, which turned out to be 16,569 bases long. About 10 years ago scientists used updated laboratory techniques to re-sequence the same mtDNA, and established the Revised Cambridge Reference Sequence (RCRS).

So, how do you compare? Most of the 16,569 bases are exactly the same from person to person, but the few differences give us enough information to make things interesting. The differences between two mtDNA sequences are based on something the science world calls SNPs, Single Nucleotide Polymorphisms. This just means that a single base position in one sequence is different from a single base position in the next sequence. If part of your mtDNA sequence reads ATC**G**ACT and that same part of the RCRS sequence reads ATC**A**ACT, then the fourth base is the SNP. Your Ancestry.com mtDNA test results show each SNP, by comparing the "mtDNA Reference" (RCRS) sequence to your mtDNA sequence. You'll see an A, C, G or T at each location. That specific base pair indicates the SNP—the difference in your mtDNA sequence and the RCRS sequence. In some cases the difference we're looking at is the addition or deletion of a base pair (instead of a replacement), then you'll see a line instead of a letter in your results.

Quite a few people discover that they have no differences in their mtDNA sequence compared to the CRS sequence.

What if you don't have any differences? It just so happens that when the scientists chose an individual at random to establish the CRS standard, they chose someone who belonged to one of the most common haplogroups in Europe. So quite a few people discover

that they have no differences in their mtDNA sequence compared to the CRS sequence. You won't see any locations or SNP base pairs spelled out in your results. This just means you were an exact match to the standard CRS sequence and belong to the same haplogroup as the individual whose DNA was used to establish the standard.

Genealogy—Making DNA Testing Meaningful

As we've mentioned before, mtDNA testing is very valuable for unlocking clues about your ancient ancestors. It can also be a powerful genealogical tool to eliminate possible relations through the maternal line. If you're looking for another way to use DNA testing for genealogy, you can take a Paternal Lineage, Y-Chromosome DNA test. This test can reveal possible familial connections which are more recent that the matches you find with an mtDNA test. Although only men can give a DNA sample for Y-Chromosome testing, a woman can still trace her paternal lineage using a DNA sample provided by a brother, father, or another paternal relative (for example, a male cousin) and she can treat these Y results as if they were her own.

If you submit a DNA sample for a Y-Chromosome test, your results will include possible participant matches as well as an estimate of the Most Recent Common Ancestor (MRCA) that you share with your matches. An ancestor match of "approximately 550 years ago" could mean you shared a great-great-great-great-great-great grandfather.

When you find a match using your Y-chromosome test results, you can contact your genetic cousins and compare family trees using the secure Ancestry.com Connection Service to protect your email address. If you're fortunate, our common ancestor analysis will narrow your search to a time frame, and together, you and your genetic cousin will discover the ancestor who joins your two family trees.

Still Have Questions?

If you have questions about your results or the science behind our tests, our website's live chat and email features allow you to contact us directly. For more information, visit dna.ancestry.com and the Ancestry.com Learning Center to see videos about our services.