PATERNAL LINEAGE TEST RESULTS FOR
LAWRENCE DAVID COLLINS

Your DNA test results show that you belong to haplogroup *R1a*, The Metal Workers.

PATERNAL HAPLOGROUP

R1a

THE METAL WORKERS

This map shows the likely migration pathways of your ancient ancestors, The Metal Workers (haplogroup *R1a*), who most likely lived in present day Russia, the Czech Republic, the Ukraine, Poland and central and south Asia. Your ancestors may have played a key role in human advancement by introducing sophisticated elements of culture, like metal tools. To use your test results to build your family tree, visit dna.ancestry.com and learn about other participants with genetic profiles similar to your own.

ancestry.com | DNA

YOUR HAPLOTYPE

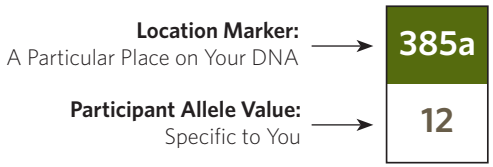
Location	19a	19b	385a	385b	388	389I	389II	390	391	392	393	426	438	439	441	447	448
Value	15	-	11	14	12	14	30	24	11	11	14	12	11	10	14	23	20
Location	449	454	455	458	460	461	463	464a	464b	464c	464d	464e	464f	YCAIIa	YCAIIb	Y-GATA-H4.1	
Value	33	11	10	15	10	11	24	12	15	15	16	-	-	19	21	23	

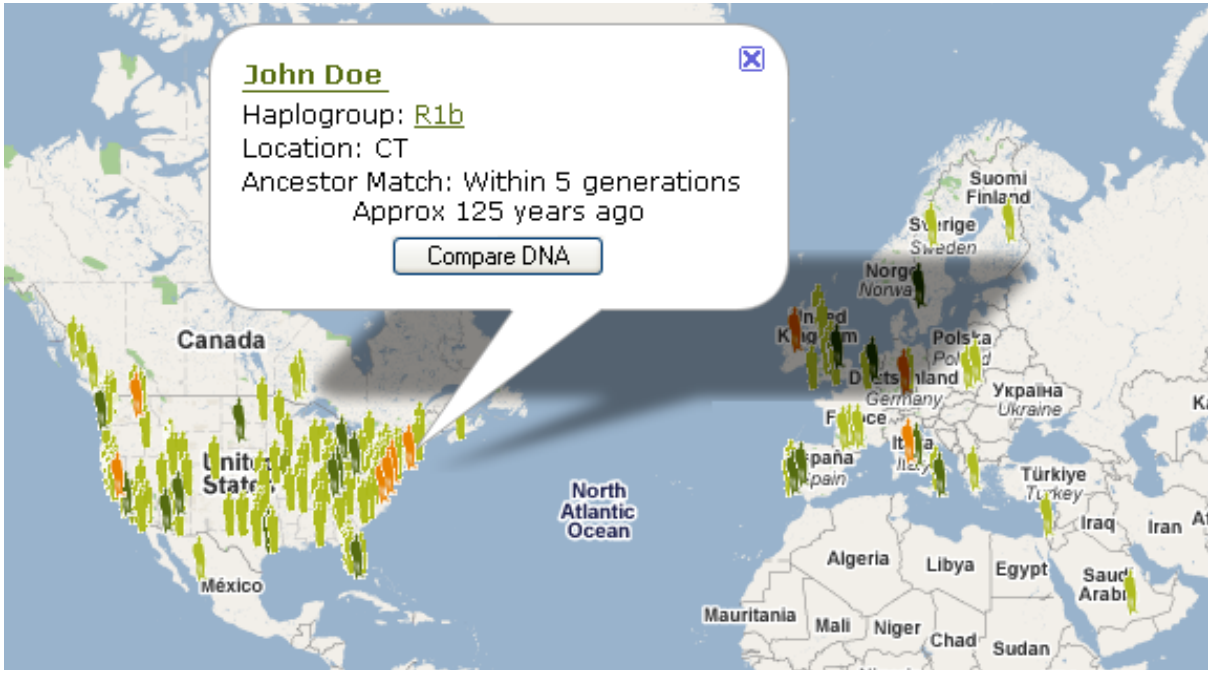
PART I: AN EASY EXPLANATION OF YOUR RESULTS

Y-Chromosome Results—Location is Everything

At first glance, the numbers that make 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 it's a special bit of information that may hold the answer to some of your ancestral mysteries.

To determine your genetic profile, we took a look at several scientifically established DNA "locations" in your Y-Chromosome test. *Haplotype* is the scientific term for this kind of genetic profile, and we'll call it that going forward. Your haplotype can help you find new genetic cousins and learn about your ancient ancestors. To understand where the numbers which make up your haplotype came from, imagine the DNA locations we tested as different destinations with specific addresses (location markers) on the long ribbon that is your chromosomal DNA. When we're doing your test, we travel down that ribbon, pull up to each address and write down what we find. That numeric value is always unique to your DNA, and the combination of the different values makes up the unique numbers of your haplotype.





An example of a Y-Chromosome DNA test matching map. The "people" icons represent another participant who may share a common ancestor with you. Visit dna.ancestry.com to see *your* matching map online—click each icon to learn more about possible matches.

The haplotype table on your certificate has two rows. The top row, labeled "location," indicates the names of the defined markers for each of the locations (like 385a). We've filled in a numeric value for you at each of these locations, which you can see in the second row, labeled "value".

Your DNA haplotype results are useful only for our database to match you with possible genetic cousins and tell you about your ancient ancestors. 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.

Haplotypes—Play the Matching Game

Comparing your haplotype with another participant's is an objective and accurate way to determine the range of generations in which you and that

participant may have shared a common ancestor.

Our database automatically compares your results with all other participants and lets you know about possible matches. Even if you have only a few close matches now, we automatically compare your results against each new entry in our continually growing database.

Your list of matches starts with participants who are most closely related to you. You'll be able to view the general home locations of participants in a map like the one on page 1 and see matches between 2-70 generations, as well as an estimate of the Most

Your list of matches starts with participants who are most closely related to you.

Recent Common Ancestor (MRCA) that you share with your matches. Your MRCA is an approximate number of years since you had a direct ancestor in common. An ancestor match of "approximately 550 years ago" could mean you shared a great-great-great-great-great-great grandfather.

Genetic Cousins—Exploring the Possibilities

You can unlock your new connections whenever you like. Visit your results on dna.ancestry.com and click on the "Paternal Matches" button, then click on the names of matching participants to see how you are related. We'll notify you by email when a new participant matching your haplotype is added to our database.

When you find a match, 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.

You may be contacted by someone as well. An opportunity to collaborate with your genetic cousins 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".

Your Ancient Ancestors—Where It All Started

We determine your haplogroup based on your haplotype. Your haplogroup then gives you clues about the life and times of your ancient ancestors from tens of thousands of years ago.

Starting from the point in human history when many ancient ancestral groups migrated out of Africa, discrete populations began to settle in different parts of the world. Over generations, as they adapted to their unique environments, each population's genes became slightly different from the original African group. Some of those differences were random, while others provided genes for characteristics which let groups thrive in their environments. Taken together, those genetic differences define haplogroups.

Your haplogroup is described by a letter, A through T. Numbers and lowercase letters may also subdivide your haplogroup. Everyone in a haplogroup shares a certain number of values at definitive locations on their Y-chromosomal DNA. We took a look at those locations on your DNA and matched you to a haplogroup.

The Metal Workers—Haplogroup *R1a*

You belong to haplogroup *R1a*, the Metal Workers, who originated 35,000 to 40,000 years ago, during what anthropologists refer to as the Upper Paleolithic or Late Stone Age. This time period is characterized

Artifacts found at burial mounds, like at this Ukrainian Kurgan site, revealed much about the life of the Metal Workers.

PART I: AN EASY EXPLANATION OF YOUR RESULTS

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

by a surge of sophisticated human behavior. Abstract thought, creativity, and language are believed to have arisen at this time. Advanced modernity is evidenced by cultural hallmarks: the use of metal tools and processing of pigments, bartering and fishing, and the emergence of jewelry, games, music, and art. The introduction of elaborate burial sites is also associated with this time period.

Your ancient ancestors may have lived in central or south Asia, and migrated further as time progressed. Around 20,000 years ago, during the final Ice Age, sheets of ice extended to cover the maximum amount of earth they would ever occupy. The environmental extremes of this Last Glacial Maximum (LGM) created many isolated populations, which occasionally led to the emergence of a distinct haplogroup. The Ukranian LGM refuge is one such area around the Black Sea where some population geneticists think a subpopulation of your haplogroup, *R1a1*, arose. We were only able to determine that you belong to haplogroup *R1a*, which includes the subgroup *R1a1*. Future developments in DNA testing may reveal that you belong to *R1a1* or simply the umbrella group, *R1a*.

A combination of nomadic lifestyle and retreat of the ice shelf would have allowed the *R1a1* haplogroup to proliferate on the Eurasian Steppes, the stretch of land between present day Hungary and Mongolia. Today the *R1a1* haplogroup can be found in high frequencies among groups living in the Ukraine, Russia, the Czech Republic and Poland. Haplogroup *R1a1* is also found at rates of 50% in Ashkenazi Jewish populations, who ultimately settled in the Rhineland, now Germany, and have a deep and detailed contemporary history.

The Metal Workers may have been part of the Kurgan population who migrated during the Copper Age, when metal tools first evolved. The Kurgan people lived in northern Europe and are considered by some population geneticists to be the single ancestral pool from which all Indo-Europeans descended. The earliest sites associated with the Kurgan people are found in the Ukraine and in southern Russia and are known for their distinct burial mounds, which reveal much about the progress of the culture. The Kurgans kept cattle, pigs, sheep and goats. Horses probably played a significant role in Kurgan life and may have been key players in the dispersion of haplogroup *R1a*. Wheeled wagons have been found at sites associated with the Kurgan people and were probably driven by oxen or horses. The Krugan Metal Workers most likely cultivated the flat grasslands near wooded

areas and used hammer-hoes fashioned from elk antlers for this task. Copper knives and daggers have also been found in the Kurgan settlements, as witness to the time period.

A relatively recent migration of Slavic peoples occurred in the Early Middle Ages, around the 5th century AD. These migrations could have been prompted by a Hun invasion or as a response to population growth. How much this event, the Kurgan migratory settlements and the retreat of the ice shelf contributed to the movement of the *R1a* haplogroup is not known. It is possible that a blend of all three events led to the haplogroup dispersal and growth among present-day populations.

PART II: DIGGING DEEPER

Your DNA Test: Why Y? Thank Dad.

Everyone has 46 chromosomes, grouped into 23 pairs. One pair is the sex chromosomes, which, among other things, determine gender. All women have a pair of X chromosomes (one from each parent). And all men have an X chromosome from mom and a Y chromosome that passes essentially unchanged from father to son, making it ideal for tracing paternal lineage. In many cultures, the surname is also passed from father to son. This fortunate coincidence is what makes tracing your paternal lineage through genetic similarities so powerful for genealogy.

Location markers on the Y chromosome from your DNA sample were analyzed and compared against other Ancestry.com participants' results to automatically find people closely related to you.

The first application of your results is to pursue possible relatives you wouldn't have otherwise known about.

So, the first application of your results is to contact possible relatives you wouldn't have otherwise known about. See page 2 for more about how to do this through our service. Additionally, if your traditional genealogy work has led you to potential living relatives—particularly those who share your surname—and you'd like to confirm a connection with those individuals, encourage them to take a Y-DNA test as well. Comparing your results will provide you with an objective and scientific basis for confirming your familial ties.

Alleles & Location Markers—the DNA Details

What is it that makes your information unique? And if it's so unique, why do other people have some of the same information?

Imagine your DNA as a long set of Morse code instructions. Just like one "short" signal and one "long" signal give you a Morse code value (A), your DNA repeats its "signal" in unique ways. Your haplotype has different values based on the number of times your DNA repeats its code in the different locations.

The numeric value given for each location represents a count of repeating sequences of DNA building blocks called bases. 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.

Your Y-chromosome test measures the pattern of base repeats in your DNA code at specific locations. For example, a pattern of AACG AACG AACG would result in a value of "3", because the sequence "AACG" repeats three times.

Your test results, therefore, represent a unique pattern of repeating DNA which is inherited from your paternal lineage.

We record the DNA repeats in each of either 33 or 46 locations—depending on which DNA test you chose—and end up with a very rich message which is your haplotype. Because we look at so many locations, we have many points of comparison. You may match with someone in 15 different locations and you'll would still have 18 or 31 values which are unique to you. By looking at so many different locations, we can say something about the degree to which you match with

another participant. So, are you related? You get more than a "yes" or "no" answer.

When comparing haplotypes, your closest matches will differ at fewer than 2 or 3 marker locations. A "good" match will yield a likely common ancestor only a few generations back. But you can match up to someone at fewer locations and still discover that you're part of the same haplogroup; your common ancestor may have lived tens of thousands of years ago, or at any point in between.

Rates of Mutation—The Brains Behind Matching

Figuring out how your haplotype matches up with someone else's is more involved than a simple one-to-one comparison of location values. Each of the haplotype locations has a value which is unique to you. And finding that same value at that same location on someone else's haplotype is meaningful. But matching certain location values can be more significant than matching at others.

Why's that?

Certain bits of DNA are passed along relatively untouched from father to son, but other bits of DNA tend to change (mutate) each time they are passed down. The changes are completely harmless, but they're still identifiable. So the DNA at some of the locations we look at tends to change a lot from generation to generation, while DNA at other locations changes very little when it's passed along from father to son. Although they can't know *how* the DNA will change, scientists do know the constant *rate* at which DNA changes at each of the locations. And every location has a different rate of change.

We're constantly updating our data for the most precise matching information available.

A match in two participant results at a location known to have a high rate of change indicates a closer relationship than a match at a location known to have a low rate of change. Statisticians and geneticists have figured out fairly exact odds for change (mutation rates) in the DNA in each of the locations. By using those odds in a calculation, we can tell you just how meaningful a match is, and how closely related you are to another participant.

We're constantly updating our data and statistics to keep them as current as research allows, giving you the most precise matching information available.

MRCA—A Potential Link

MRCA stands for Most Recent Common Ancestor. It's an important genealogical term and gives you an idea of how many generations in the past you and another participant may have shared an ancestor. MRCA calculations are based on the number of location markers tested (either 33 or 46), the number of matching values, and the mutation rate of the markers. This provides you with a starting point from which you can compare respective family pedigrees with other participants to discover if you indeed share an identical ancestor.

Our MRCA report provides a confidence range from 50% to 95%. At 50% confidence, you have an equal chance that the generational range might be greater than what is stated. The higher the confidence level is set, the broader the generational range. This information can spark a new trail to a branch of your family tree or confirm or negate a lead you already had. See Part I for more about how to apply your results to build your family tree.

Still Have Questions?

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