



John Doe

Neanderthal Index

AXXXX - 837XXXX

Genetic systems known as **autosomal markers** were analyzed at **DNA Diagnostics Center**. Testing revealed a unique **DNA fingerprint** or **profile**. The table below shows you how your personal DNA Fingerprint looks. The numbers reflect your genetic inheritance from all previous generations and can suggest statistical matches for your overall ancestry or mix of lines.

Your Lab Results

Locus	Alleles		Typical Range
D8S1179	13	15	7 - 24
D21S11	29	30	12 - 41.2
D7S820	10	11	5 - 17
CSFIPO	10	14	6 - 18
D3S1358	15	17	9 - 21.1
THO1	6	9.3	4 - 13.3
D13S317	10	12	5 - 17
D16S539	11	12	4 - 20
D2S1338	18	25	10 - 28
D19S433	14	14	9 - 19.2
VWA	17	18	8 - 24
TPOX	8	8	5 - 16
D18S51	18	19	7 - 31
D5S818	12	12	6 - 17
FGA	20	21	6 - 48.2

The scores shown in green and yellow above known as **CODIS** markers were compared with profile frequencies for 450 populations from around the world stored in our computer program **atDNA 8.0**.

Most humans are part **Neanderthal**. Europeans have between 1 and 4 percent Neanderthal genes on a conservative estimate (Green et al 2010). These entered the *Homo sapiens* gene pool from interbreeding probably in the East Mediterranean or Arabia as long ago as 80,000 years, when Neanderthal males first fathered babies with proto-Eurasian mothers. A founder effect ensued, and Neanderthal genes were well

preserved in the human populations who expanded into the Middle East, India, Southeast Asia, Australia, Native America and Europe. Isolated and marginalized populations appear, in some cases, to have retained more than others. Because Neanderthals did not live in Africa, Africans show the smallest amount. Neanderthal genes are believed to have been responsible for greater strength, cold adaptation, geo-spatial orientation, motor coordination and other traits in our ancestors. One measure of the Neanderthal legacy may be the [occipital bun](#) or bony ridge at the back of the skull found in many archaic populations. It is present in Turks and [Melungeons](#), an American ethnic group, where it is called the Anatolian bump or Central Asian ridge.

The Neanderthal Index reports any strong matches between your [DNA fingerprint](#) or unique [CODIS](#) marker profile and populations identified as “archaic,” that is, whose composition retains the earliest earmarks of out-of-Africa genetics. Archaic populations were by-passed by many of the mainstream developments of human history such as agriculture, manufacturing and city-states. Such peoples as the Saami and Berbers lived the lives of hunter-gatherers and herders in desolate areas with simple social structures. These comparisons are based on [autosomal markers](#) and statistical population samples assembled from studies published in the field of forensic science since the mid-1990s. The stronger the match the higher the likelihood your ancestors gave you Neanderthal genes. A [Random Match Probability](#) (RMP) or frequency expresses commonness or rarity of the subject’s profile in a given population, implying strength or weakness of genetic resemblance to that population.

Above-Par Population Matches

Turkish	1 in 63 billion
Iranic	1 in 67 billion
Berber	1 in 76 billion
Arab	1 in 76 billion
Egyptian	1 in 94 billion
Basque	1 in 124 billion

Lower Tier Population Matches

Levantine	1 in 183 billion
South American Indian	1 in 311 billion
Native American	1 in 606 billion

Of all archaic populations studied to date, the [Finnish](#), [Estonian](#), [Saami](#) (Laplander) or other [Ugric](#) or [Uralic](#) people retain the strongest links to the original colonizers of Europe because of their relative isolation and homogeneity down through history. They share a high incidence of mitochondrial haplogroup U with the Berbers, another archaic

population (Achilli et al 2005). Haplogroup U, termed Ursula in the scheme of [Oxford Ancestors](#), is the oldest branch of the human tree that took root in Europe. U colonized Europe as early as 50,000 years ago and co-existed with (and as we now know, intermarried with) Neanderthals, its occupants for hundreds of thousands of years before. The following matches were retrieved for your profile in the EURO section of database, which specifically covers 35 European populations, including Estonia and Finland.

Finno-Uralic Data

17 Estonia

Interpretive Analysis and Result

On an averaged basis for aggregate world populations, the subject's top matches include many populations that experienced early mixing with Neanderthals with no high match with Finno-Uralic peoples. Matching populations lying in the original range of Neanderthals today are shown in red (see map). Because of high world matches and low affinity with Finno-Uralic peoples, the subject has an estimated Neanderthal index of 3.0 or High on a scale of 0.1 to 5.0.

This test does not directly measure or determine what kind of genes you have but is based on probabilistic predictions of the occurrence of your individual autosomal profile in archaic populations retaining Neanderthal genes. Only a full genomic sequencing of the sort employed by the Human Genome Project or Draft Neanderthal Genome can map your entire genetic heritage as encoded in more than 3 billion nucleotides within your DNA. Nevertheless, because of the laws governing large numbers, this test can suggest strength or weakness of Neanderthal admixture in your overall genetic composition and, correspondingly, traits associated with Neanderthal ancestry. The growing list of physical features includes: large amount of body hair, red hair, blue or green eyes, fair skin, large eyes, greater fertility, early maturation into adulthood, short legs and forearms, weak knees and shoulders, a strong grip of the hand and fingers, barrel chest, wide pelvis, rugged brow ridge, large, sometimes odd-shaped noses, and, as mentioned, prominent occipital bun. Ongoing research promises to reveal even more about past human admixture with Neanderthals, particularly the division into Northern and Southern types.

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Principal Investigator

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Disclaimers

This Neanderthal Index is a probabilistic prediction of ancestry for personal knowledge only. It is a non-chain of custody form of testing and is not intended for legal or official purposes. Its results may or may not confirm expected ethnic composition, family history or genealogical determinations. Alone, it may not be used to prove identity, biological relationships, nationality, citizenship, immigration or tribal enrollment.

Understanding your Neanderthal Index

Who were the Neanderthals? The Neanderthals were archaic people who colonized Europe and some parts of the Middle East as long as 400,000 years ago. They co-existed with the first anatomically modern humans from about 80,000 to 30,000 years ago when they became extinct.

Why did Neanderthals become extinct? Although they had survived for hundreds of thousands of years and mastered the cold climates of the last Ice Age, Neanderthals became over-specialized and were never very populous to begin with. They were eventually edged out by *Homo sapiens sapiens*, but not before hybridization had occurred. Hybrid vigor due to Neanderthal admixture undoubtedly played a role in what human populations best succeeded in the changing climate of Europe. In a sense, Neanderthals never became totally extinct. Their genes live on in hybrid populations.

Are the Neanderthals a different species? No, the fact that they interbred with modern humans shows they were not a separate species. Modern humans are classified as *Homo sapiens sapiens*. Most scientists today view Neanderthals as a sub-species or hominid sister group of all present-day humans. *Homo sapiens sapiens* and Neanderthals are believed to have a common ancestor who lived about 500,000 years ago in Africa.

Where and when did modern humans mix with Neanderthals? The international research team that reconstructed the Neanderthal genome, Svääbo et al at the Max Planck Institute in Germany, suggests that interbreeding took place in Arabia, Israel or elsewhere in the Middle East or Western Asia when the first small group of modern human ancestors of all non-African peoples left the African Continent about 80,000 years ago. Taking the beachcomber route, these forefathers and foremothers of all non-African peoples spread and expanded to India, Southeast Asia, Australia, China, Siberia, the Caucasus and eventually Europe, with back migrations to the Middle East and North Africa. Because of what is known as a “founder effect,” they carried Neanderthals genes into all descendant populations.

So Africans have no Neanderthal in them? African Americans have Neanderthal genes to the extent they are part Caucasian in their ancestry (as much as 30% on average).

What about Native Americans? Since Native Americans were also part of the out-of-Africa primitive groups of humans who partly interbred with Neanderthals, they also have some degree of Neanderthal genes. Moreover, Native Americans with high quotients of Middle Eastern or European admixture, accordingly, have high probabilities of having Neanderthal admixture.

Does this test tell me how many Neanderthal genes I have? No. First, it is not a test but an *index*. It shows how you compare with others on a scale of 1.1 to 5.0, with 5.0 being the highest score. Only a costly procedure like the Human Genome Project can directly determine what genes you have. The Neanderthal Index measures how your individual DNA profile (DNA fingerprint) inherited from all your ancestors measures up against other human populations. Certain of these are “archaic.” They are thought to have higher rather than lower amounts of Neanderthal genes based on their individual genetic histories.

How reliable is the Neanderthal Index? The index is based on probabilistic predictions of the occurrence of your individual autosomal profile in archaic populations retaining Neanderthal genes. Because of the laws governing large numbers, this test can suggest strength or weakness of Neanderthal admixture in your overall genetic composition and, correspondingly, traits associated with Neanderthal ancestry. The statistics come from about 400 studies published in the field of forensic science, all publicly available. Each population was defined by a valid representative sample of living subjects in that location, usually about 200 tested individuals. There are no known biases in the statistics. For instance, they are not taken from purposive medical or genetic studies or criminal files like the FBI but academic and sound, objective sources.

What is an archaic population? This is a statistical model formed from a sample of contemporary DNA test subjects representing a population whose DNA patterns were set and preserved in the oldest of prehistoric times with relatively little genetic inflow from outside the group. This definition excludes African populations, which are believed to be even earlier and contain the highest diversity and deep ancestry of all humankind. Archaic populations reflect varying high degrees of Neanderthal ancestry and hybridization. They include the following out-of-Africa populations:

Arab	Egyptian	Moroccan
Aboriginal	Finnish	Saami
American Indian	Greek	Syrian
Algeria	Indian	Timor
Basque	Iraqi	Tunisian
Berber	Libyan	Turkish

What were Neanderthals like? They were much like “us.” They lived in family groups, had names, hunted game, usually at night in groups, baked acorn meal bread, and had language, religion, cuisine, medicine, trade, tools, crafts and art, including music, dance and body paint. The growing list of physical features known from study of their burials includes: large amount of body hair, red hair, blue or green eyes, fair skin, large eyes, greater fertility, early maturation into adulthood, short legs and forearms, weak knees

and shoulders, a strong grip of the hand and fingers, barrel chest, wide pelvis, rugged brow ridge, large, sometimes odd-shaped noses, and prominent occipital bun. Ongoing research promises to reveal even more about past human admixture with Neanderthals, particularly the division into Northern and Southern types.

What data are our notions of Neanderthals based on? Discovered in a quarry in Germany in 1856, 40,000-year-old Neanderthal man became the first recognized early human fossil. Neanderthals are named after the Neander Valley (German *thal* or *tal*) in which they first came to light. More and more of them turned up over the years: in Belgium (1886), a nearly complete skeleton in southern France (1908), Israel (then-Palestine, 1930) and Iraq (1953). The first ambitious genetic work was a partial sequencing of their mitochondrial DNA based on highly degraded specimens: Krings et al., *Cell* 90, 19 (1997). A second mtDNA sequence was achieved in 2000. The complete mtDNA sequence came in 2008: Green et al., *Cell* 134, 416 (2008).

What is the correct spelling of the word? Although first spelled Neanderthal, German language orthographic reforms rendered the spelling of the name Neandertal in the twentieth century, although most people even today prefer to stick with the “th” of the original word.

How can I learn more? The blockbuster scientific study proving Neanderthal admixture with humans by Green et al was published in May 2010. There are probably just one or two good books about our Neanderthal cousins, although several new studies are scheduled to appear this fall. Here is a short list of references you can explore now.

1. Arsuaga, Juan Luis (2002). *The Neanderthal's Necklace. In Search of the First Thinkers* (New York: Four Walls Eight Windows).
2. Briggs, A. W. et al (2009). “Targeted Retrieval and Analysis of Five Neandertal mtDNA Genomes.” *Science* 325:318-21.
3. Dalton, Rex (2010). “Ancient DNA Set to Rewrite Human History.” *Nature* 465:148-49.
4. Fuerle, Richard D. (2008), *Erectus Walks Among Us*. New York: Spooner. Ch. 25: “The Neanderthals.” Available online at: <http://erectuswalksamongst.us/Chap25.html>.
5. Green, R. E. et al (2010). “A Draft Sequence of the Neandertal Genome,” *Science* 328/5979:710-22.
6. Green, R. E. et al (2008). “A Complete Neandertal Mitochondrial Genome Sequence Determined by High-throughput Sequencing.” *Cell* 134:416-426
7. Hublin, J. J. (2009). “The Origin of Neandertals.” *Proc. Natl. Acad. Sci. U.S.A.* 106, 16022.
8. Lalueza-Fox, Carles, et al. (2006). “Mitochondrial DNA of an Iberian Neandertal Suggests a Population Affinity with other European Neandertals.” *Current Biology* 16(16): R629-R630.
9. “The Neandertal Genome,” multimedia news feature of *Science Magazine*.
10. Max Planck Institute for Evolutionary Anthropology, Leipzig, “The Neandertal Genome”, Svante Pääbo, Director. Website: <http://www.eva.mpg.de/neandertal/index.html>.

11. Shea, John J. (2003). "Neandertals, Competition, and the Origin of Modern Human Behavior in the Levant." *Evolutionary Anthropology* 12:173-187.

What does my Neanderthal Index score mean? To understand your score of 0.1 to 5.0, please refer to these rubrics.

Very High (4.0-5.0). You have numerous high matches to Archaic Populations, including a strong match in your European ancestry to Finno-Uralic peoples.

High (3.0-3.9). You have prominent matches to Archaic Populations, not necessarily including Finno-Uralic peoples.

Average (2.0-2.9). You have matches to Archaic Peoples on a par with other people's results.

Low (1.0-1.9). Your matches to Archaic Populations are generally below other people's results.

Very Low (0.1-0.9). You have no significant matches to Archaic Populations.

What populations have the smallest amounts of Neanderthal admixture? There are probably no populations that are completely free of Neanderthal admixture, although Central Africans may have the least. Here is a list of populations that generally score lowest on admixture with the Neanderthal Index: Japanese, Swedish, British, Russian, Slavic, Chinese, Sub-Saharan African (especially Central and Mozambican and Angolan) and Indian (when dominant).

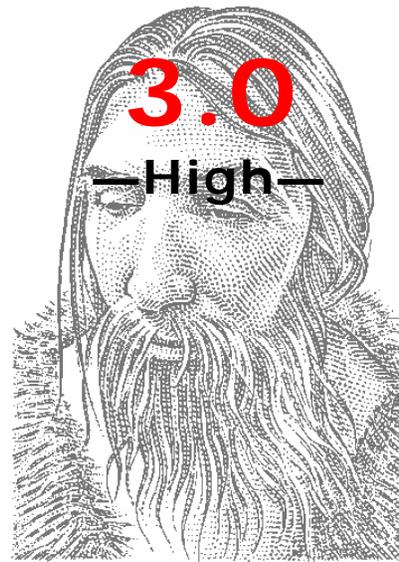
How much of this is science and how much theory? Since the publication of the Draft Sequence of the Neanderthal Genome in May 2010, it has become an accepted scientific fact that most humans are part Neanderthal. Europeans have between 1 and 4 percent Neanderthal genes on a conservative estimate. As more Neanderthal fossils are studied and new sources of admixture identified in hybrid fossils, it is likely that this figure will be revised upward. Many theories abound on the timing and extent of Neanderthal admixture, but no scientists question the evidence.



THIS DOCUMENT CERTIFIES THAT

John Doe

Ordered a **Neanderthal Index** Analysis Producing the Following Result



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