

HUMAN ORIGINS : OUR SHARED HISTORY TO YOUR STORY

The questions of who we are and where we come from have been asked for throughout our history. Once we explained our origins with mythology and folklore but now we utilize modern science to answer them. Genetics help us tell the story of our origins from the beginning, through the formation of the human gene pools and to the last 2000 years of history. The test results you have just received, along with the following information, will help you understand your personal story, from the shared history of all humans to your unique family story. [Read More](#) ►

GENE POOL PERCENTAGES

TOP 3 GENE POOLS



#1 Fennoscandia 25.1%

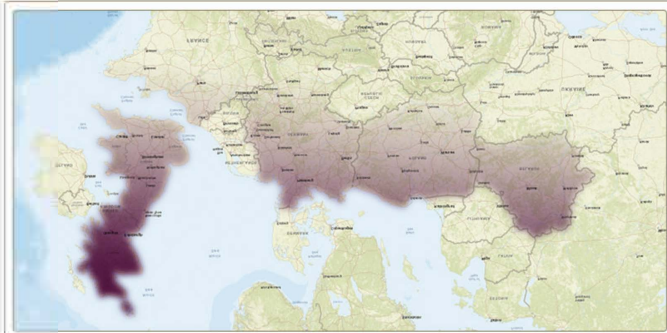
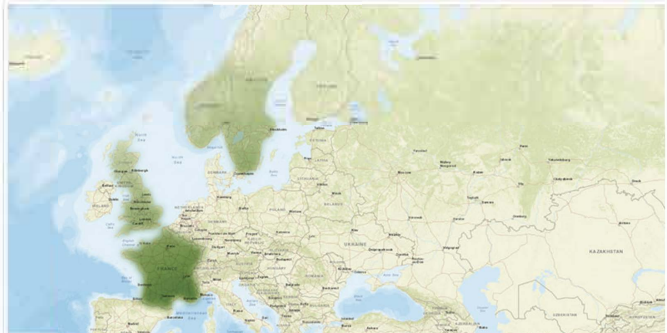


#2 Southern France 17.7%



#3 Orkney Islands 11.5%

GENE POOL REGIONS



/// #1 FENNOSCANDIA

The area known as Fennoscandia encompasses the countries of Norway, Sweden, Finland

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/// #2 SOUTHERN FRANCE

Southern France was a major crossroads of Europe with multiple waves of human migration. The people of

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/// #3 ORKNEY ISLANDS

The Orkney Islands are a small group of islands that lie off the North Coast of Scotland

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DNA MIGRATION ROUTES



* The GPS Origins test is an Autosomal (SNP) test that is not gender specific. Although both Migration Patterns represent your Maternal and Paternal DNA route, we cannot differentiate which route is specifically your parents' individual route at this time.

Migration Story B

Ancient ancestry in Denmark

Your ancestors came from Denmark prior to 459 AD, so let's take a look at what was going on in Denmark up to this point:

The Danish Tribes

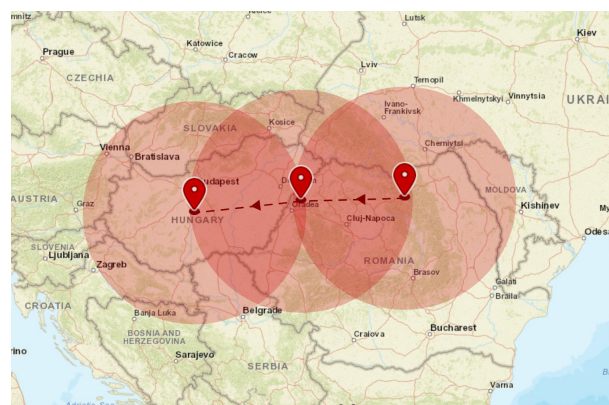
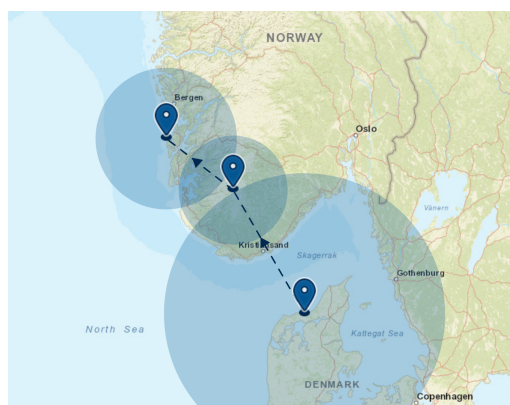
Between 400 BC and 101 BC, Denmark was ruled by local leaders in a period known as the Iron Age. The early Danes relied on agriculture and animal husbandry, traded with Romans and had some communication with the Celtic tribes of Central Europe. However, a change in the climate challenged this agricultural system and prompted many local groups to migrate south into Germany. At the same time, populations moved from Denmark to places like Germany and the Netherlands and Central Europe in response to a worsening climate in Scandinavia.

The Danes Adopt Runes

Between 100 BC and 400 AD, Denmark was ruled by local leaders in a period known as the Roman Iron Age. By the 1st century BC, the Roman Empire bordered Denmark to the south and the Roman influence over the Danes increased, with some Danish warriors fighting in the Roman army. Around 200 AD the Danes adopted a written form called runes.

The Danish Kings and Byzantine Trade

Between 400 AD and 800 AD, Denmark was ruled by local leaders in a period known as the Germanic Iron Age. Though the Roman Empire fell, the Danes continued to trade with the Byzantine Empire. Danish trade began to intensify, typically consisting of pottery, glass and ornaments and, by the 8th century, the first traders were establishing more permanent settlements. Many smaller tribal units had formed a confederation under the hegemony of Danish kings. At the same time, populations moved from Denmark to places like England as part of the migration of Germanic tribes, such as the Angles and Saxons, residing in Southern Denmark, Germany and the Netherlands, to England to fill the power vacuum left by Roman retreat.



Human Origins : Our Shared History to Your Story

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Genetics help us tell the story of our origins from the beginning, through the formation of the human gene pools and to the last 2000 years of history.

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From Sea to Land: Our Shared History

Our origins lie far beyond the first appearance of humans, with an evolutionary story common to many forms of life on earth. About 360 million years ago fish-like creatures ventured out of the Devonian Sea and became the first reptiles. After hundreds of millions years of evolution the mammals emerged after the extinction of the dinosaurs 65 million years ago thrust them into the evolutionary spotlight, and allowed them to expand into the world the dinosaurs left vacant.

Our human story really begins with the origin of primates, which split away from the other mammalian groups between 65 and 80 million years ago. It would be at least another 60 million years before the appearance of the species *Ardipithecus*, an ape that evolved from the Old World Monkeys and is regarded as the first fossil human ancestor.

Fossil finds from *Ardipithecus* in Ethiopia date it to between 4 and 6 million years ago.¹² This species could walk on two legs like humans but shared other characteristics with chimpanzees. *Ardipithecus* further developed into a number of lineages found throughout East Africa and South Africa that are known as the Australopithecines.¹³

Over the next 3 million years, many Australopithecine species appeared in Africa but they evolved little; their brains remained roughly the same size as those of chimpanzees and they did not use tools. Around 3 million years ago, the subspecies *Homo habilis*¹⁴ began using stone tools, and by 1.5 million years ago the fire-mastering *Homo erectus* appeared. Fossils reveal that *Homo erectus* had a much bigger brain than its Australopithecine ancestors. This subspecies began spreading across much of Africa, Asia, and the Middle East, while the Australopithecines began to disappear.¹⁵

Next, a new human subspecies, the Neanderthals, appeared. They evolved from a *Homo erectus* relative outside of Africa and had spread widely throughout Europe and the Middle East 500,000 years ago.¹⁶ Neanderthals had stocky builds and thick limbs and were specially adapted to the Ice Age conditions. There is evidence that Neanderthals buried their dead, a practice once thought exclusive to modern humans,^{17,18} which raises questions about the nature of the Neanderthal's genetic contribution to modern humans.¹⁹

Africa: The First Modern Humans

It is thought that the ancestor of modern humans is one of the *Homo erectus* relatives, which appeared in East Africa sometime between 100,000 to 200,000 years ago.

Many different ancient human species also evolved outside Africa, and persisted for more than a million years of geologic time. Their fossils have been unearthed in Europe, Southeast Asia, and China. Yet this diversity had all but disappeared by 100,000 years ago, and human fossils became remarkably uniform across the globe.²³

The theory that has become known as the Out of Africa model began with a study in the late 1980s, investigating small changes in the DNA carried by the mitochondria - the DNA passed down by the mother.²⁴ The study analyzed DNA changes in the mitochondrial genome, and surmised that all humans diverged from a single ancestor living 200,000 years ago in Africa. While this does not indicate that there was just one mother, or 'African Eve', for all humanity, the results suggested that all humans alive today descended from a single population residing in Africa more recently than any of the previously mentioned early human species.

The Out of Africa model has also been applied to research on the Y chromosome.^{25,26} This chromosome is found only in male lineages and passed down through the generations, unchanged for the most part. A recent study estimates that the 'African Adam' lived 208,000 years ago²⁷.

Beyond Africa: Colonizing the Continents

Mitochondrial and Y chromosomal DNA have been our primary tools for deciphering the human story because each person receives only one copy from each parent. Mitochondrial DNA is passed down from the mother and Y chromosomal DNA from the father, allowing scientists to track the ancestry of both the maternal and paternal lines. Perhaps one of the most interesting stories told by the mitochondrial and Y chromosomal DNA is how humans colonized the world.

The earliest human migrants appear to have reached Southern China some 80,000 years ago²⁸, and DNA studies suggest they may have interbred with Neanderthals on their way through the Middle East.²⁹ They then spread to the rest of Asia along a route that probably tracks south of the Himalayas and into East Asia between 50,000 and 60,000 years ago,³⁰ possibly interbreeding with another subspecies known as the Denisovians.³¹

Archaeological and genetic evidence indicate that modern humans crossed the ocean from Southeast Asia and reached the islands near the tropical Pacific area of Oceania as far back as 50,000 years ago, probably in small water craft.³² At the same time, populations spread to Europe through Turkey and into Central Asia. Some of these Central Asian migrants subsequently moved westward from the Ural Mountains and may be represented today by the peoples of Northern Europe and of the Baltic region, such as the Sami people.

Climate and geography delayed further migrations of modern humans into other areas of the world. Much of northern Eurasia was extremely cold during the last Ice Age (11,000 to 12,000

years ago) and human populations remained small and isolated. A small group of people from Siberia, however, managed to reach North America around 18,000 years ago³³ by way of a land bridge that existed when sea levels were lower. They moved south, and by 15,000 years ago, began to populate South America.

There were several more migratory waves to the Americas with the most recent being the Inuit, who colonized the Arctic of North America between 4,000 and 6,000 years ago.

Asian migration also continued eastwards to Oceania. The large islands of Oceania that are closest to Asia have been inhabited for at least 30,000 years, while the most isolated islands of Northeastern Oceania remained uninhabited until just 3,500 years ago.^{34,35} The people who made the first voyages into this region were Austronesians, a group that emigrated from an area around present day Taiwan and are today known as Polynesians.

But as the last Ice Age came to an end and the climate warmed, a human cultural revolution was about to start, and it began in the Middle East.

Agriculture and the Growth of Civilization

The transition from hunter-gathering to farming occurred in the Middle East between 10,000 and 12,000 years ago,³⁶ and between 9,000 and 10,000 years ago in China³⁷ and parts of the Americas.^{38,39} By 5,000 years ago agriculture had facilitated the rise of some of the first large civilizations such as Mesopotamia in West Asia,⁴⁰ the Maya in Central America,⁴¹ and the earliest Chinese civilizations along the Yangtze.⁴²

Early farming cultures then expanded into new areas. Farmers from the Middle East brought agriculture to Europe and rice farming travelled with groups across East Asia. This expansion was accompanied by a genetic reshuffling as different groups came into contact and reproduced. Such reshuffling has been a continuous process over the last 10,000 years.

Genetic research has played a key role in understanding the migrations that took place during this period. Mitochondrial DNA lineages have been used to confirm and enhance archaeological interpretations such as tracing the ancestry of Norse and Gaelic populations, and Y chromosomal studies have been used to track male lineages in studies of Oceania.

Genetic Origins (Gene Pools): The Key to Identifying Your Ancestral Communities

As humans traversed the globe and colonized different continents each group accumulated small differences in their DNA. Most of these differences or mutations occurred in the X chromosome and autosomal chromosomes that are inherited from both parents and allows us to follow the specific journeys made by each human group.

Some genetic roads diverged, not meeting again until modern times, while others led back to one another as genetically distinct groups. The accumulations of mutations in people from different areas of the world are what allow us today to distinguish different groups from one another.

DNA mutations may have been enhanced by the custom of marrying within an tribe, class, or social group, creating a group of people who were more similar to one another genetically than they were to their ancestors and neighboring groups - in other words, creating a new gene pool or genetic origin..

It is difficult to know exactly how many gene pools there are because every genetic origin includes “gene puddles” where small, isolated groups of people married only within their local group, acquiring and maintaining unique mutations over time. At this time, scientists have identified about forty gene pools from all over the world. Over time, some of these gene pools spilled toward each other, particularly those in Eurasia, whereas other pools remained more constant.

Recent History and the Genetic Melting Pot

As ancient peoples traded, conquered, enslaved and fell in love, they spread their genes, along with their unique mutations, across larger areas at an increasingly rapid pace, interweaving previously distinct parts of the original gene pools. If, in the past, human groups diverged from one another and became genetically distinct, recent history has been characterized by populations coming together creating new genetic tapestries out of the original genetic origin. Today, every one of us is the product of these historical genetic exchanges: it is extremely rare to find individuals whose DNA belongs to a single gene pool.

Because the X and autosomal chromosomes contain the accumulated mutations that correspond with different gene pools, they provide a more nuanced picture of historical interactions in the past. Your genetic origin results will show you how your genome is linked to the human story of the populations who lived 60,000-15,000 years ago.

Empires, Pandemic and More Migration: Your Story in the Modern World

The past 2,000 years of human history have seen the rise and fall of empires that spanned entire continents, such as the Persian, Roman, Mongol, Arab Caliphate and most recently, the British Empire.

The expansion of European empires brought European DNA to many different parts of the world such as Australia, Asia and particularly the Americas, where the intermingling of Europeans and native tribes has led to many central and south Americans having mixed ancestry.

Pandemics, such as the Black Death in Europe and smallpox in the Americas caused widespread devastation. Conquests by Viking raiders reshaped entire cultures and identities. All of these events have left their mark in the DNA of present-day populations.

Countries such as the United States, which have experienced large waves of migration from different areas in the last two hundred years have facilitated the further mixing of many different gene pools.

Between the 17th and 19th centuries the slave trade brought up to 650,000 Africans to the United States. They were joined by 4.5 million Irish people who escaped famine and poverty

between 1820 and 1930, Other groups to enter the United States between the mid-19th and early 20th centuries include about 5 million Germans, over 2 million European jews, 4 million Italians and up to 300,000 Chinese.

Consequently, these migrations merged gene pools that had, thus far, remained largely separate due to geographical barriers. Many Americans and British now share genetic origins with up to a dozen different gene pools, some of which have diverged more than 60,000 years ago, such as the European and Native American gene pools.

Your GPS Origins results reveal your genetic origins and the journey your DNA has made with end-points recorded each time the DNA has markedly changed through intermarriages.

For example, if you have Scottish ancestry your results could show that you are descended from the Viking ancestors who arrived in the Medieval era, but did not mix with Scots and retained their Danish origin. If you are African American, you may learn about connections to the Bantu peoples and the pre-colonial trading kingdoms in West Africa. If you are an Ashkenazic Jew, GPS Origins may trace your origin to the ancient Ashkenaz in northeastern Turkey.

Ongoing genetic research of archaeological remains could mean that, in the future, you may be able to match your background with a range of individuals - whether that is an ancient Mayan King found in a temple complex in Guatemala, a warrior from a Viking boat burial or a flint-knapping craftsman from Mesolithic Germany. The human story, as told through our genes, is only beginning.

Now, you are ready to see your results.

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GENE POOL %'s

Complete Results

#1 Fennoscandia 25.1%

Origin: Peaks in the Iceland and Norway and declines in Finland, England, and France

#2 Southern France 17.7%

Origin: Peaks in south France and declines in north France, England, Orkney islands, and Scandinavia

#3 Orkney Islands 11.5%

Origin: Peaks in the Orkney islands and declines in England, France, Germany, Belarus, and Poland

#4 Western Siberia 10.6%

Origin: Peaks in Krasnoyarsk Krai and declines towards east Russia

#5 Southeastern India 8.8%

Origin: Endemic to south eastern india with residues in Pakistan

#6 Tuva 6.9%

Origin: Peaks in south Siberia (Russians: Tuvinian) and declines in North Mongolia

#7 Sardinia 6.7%

Origin: Peaks in Sardinia and declines in Italy, Greece, Albania, and The Balkans

#8 Basque Country 5.3%

Origin: Peaks in France and Spain Basque regions and declines in Spain, France, and Germany

#9 Northern India 2.4%

Origin: Peaks in North India (Dharkars, Kanjars) and declines in Pakistan

#10 Central America 2.2%

Origin: Peaks in Mexico and Central America with residues in Peru

#11 Austronesian Southeast Asia 1.5%

Origin: Peaks in Taiwan and Malay and declines in Thailand, Vietnam, Cambodia, and South China

#12 Pima County: The Sonora 0.9%

Origin: Peaks in Central-North America and declines towards Greenland and Eskimos

#13 Western South America 0.4%

Origin: Peaks in Peru, Mexico, and North America and declines in Eastern Russia

Fennoscandia Story

The area known as Fennoscandia encompasses the countries of Norway, Sweden, Finland, a part of Russia known as the Kola Peninsula. It also included Denmark during the Viking Age, which forms part of greater Scandinavia. The often blonde haired and blue eyed people of this region are known for their intrepid spirit, braving the bitter winters of northern Europe and conquering lands further afield within the continent, even briefly reaching North America.

The retreat of glaciation at the end of the last Ice Age saw the arrival of hunter-gatherers in the north of Europe between 11,000 and 12,000 years ago.¹ The presence of these people is known from archaeological evidence, but where they came from is still unclear and subject to some debate.² It is likely they were from similar populations that represent much of the early migration of small hunter-gatherer bands that moved into Europe during the Paleolithic.

Agriculture appeared in Scandinavia between 4,000 and 6,000 years ago.³⁻⁶ Archaeological evidence has shown that this farming culture originated in Central Europe and spread north into Fennoscandia.⁷ Similar to other regions in Europe, there has been a considerable debate as to whether this evidence for farming meant that immigrants arrived and pushed out the local ancient hunter-gatherers, or whether farming culture was adopted by the people already living in the area.

Recent genetic studies looking at samples of ancient DNA from preserved bones have found inconsistencies between prehistoric people and later farming populations,² suggesting that there may have been replacement of people to some degree. There are two major language groups in Scandinavia, these being the Germanic language of Norway, Sweden, and Denmark, and the Finno-Ugric languages of Finland. The division between the Germanic and Finno-Ugric speaking areas has been used as evidence to support the theory that the Baltic may have been a refugia for earlier hunter-gatherers.^{2,8} Analysis of Y-chromosome ancestry from Finno-ugric speakers in Scandinavia and other areas points to a high level of heterogeneity. The potential ancient origins of these people date to 12,000 - 14,000 years ago, when they would have travelled on an ancient Paleolithic migration route that may have gone through Central Asia before turning west to Europe.⁹

The consensus among researchers today is that the genomes of the people of Fennoscandia are of a mixed ancestry, combining ancient hunter-gatherers and more recent Germanic farmers. In areas with more extreme cold climates, there remains more original hunter-gatherer influence, likely due to the marginal nature of farming under such conditions. In Finland, some genetic studies have noted potential historic population crashes as evidence for regional genetic distinctiveness, possibly occurring around 3,900 years ago.¹⁰ Surviving on farming alone was perilous in such an extreme climate and there is evidence for a long coexistence of farming and foraging cultures in Finland.¹

Between 600 and 700 A.D., social changes in Scandinavia marked the start of a migration event of a different kind, one that saw the cultures of Scandinavia make their mark on the rest of Europe. It is believed that economic and political stress, as well as a rapid period of agricultural expansion led to a desire to seek resources and land further afield, giving birth to the start of the Viking Age.¹¹ Various small kingdoms and chiefdoms invaded and colonized many countries within Europe. Vikings raided and invaded much of Northern and Western Europe, taking over lands in England, Scotland, and France. They moved east into Russia and moved

further west into Iceland, Greenland, and ultimately North America. They briefly settled in what is now Canada's province of Newfoundland.^{12,13} They often mixed with the local populations, as shown by the mixed British Celtic and Norse origins of Iceland that have been identified both through historical and genetic research.^{14,15}

The age of the Vikings may have ended in medieval times but the movement of people from Scandinavia has continued to the present day. In recent centuries, many have ended up in parts of United States and Canada, often moving into the Midwest, such as Northern Michigan where a distinct Finnish immigrant community has been well established.¹⁶

In the future, we can envision genetic tests that will be able to distinguish between the ancient hunter-gatherer and more recent Germanic farming components. There may also be tests that can link individuals back to ancient DNA extracted from archaeological skeletal material. What may also prove fascinating for historical enthusiasts is the possibility of future tests that are able to distinguish specific migrations of Viking settlers to different areas of Europe.

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Southern France Story

Europe has seen multiple waves of migration of humans and ancient human ancestors, with Southern France being a major crossroads in such journeys. The people of Southern France today appear to share many commonalities in appearance with their Mediterranean neighbors. At the same time, the region's position within Europe to the west of the Alps has facilitated a higher rate of movement of people between north and south.

Southern France and much of the surrounding area was inhabited by Neanderthals during the Paleolithic: an early human species that went extinct upon the arrival of modern humans between 35,000 to 50,000 years ago.¹ The area was at the edge of the Paleolithic ice sheets and was a place of refuge for people pushed back by worsening climate conditions further north. This meant constant movement in and out of the region. The earliest modern humans that arrived in Southern France were Ice Age hunter-gatherers. These people are famous for producing some of the earliest cave paintings known to exist in the limestone caves of the Pyrenees.²

Hunter-gatherer subsistence patterns persisted for many millennia and population density remained low. The development of agriculture in the Middle East and its spread into Europe starting 12,000 years ago³ brought major changes to the region, and involved potentially large-scale migration of people along the southern corridor of the Alps. These people brought their languages, which are believed to be part of the Indo-European language family which exists all over Europe today.^{4,5} Virtually all of the currently spoken languages in Europe are thought to relate to this expansion of early farmers. In Southern Europe, this track south of the Alps links the Latin languages of Italy, Spain, and France, while Germanic languages are found north of the Alps.⁶ This suggests that the early farming cultures that arrived in France came through the south and proceeded north.

A Bronze Age culture had developed by 1000 B.C.,^{7,8} with settlements throughout Southern France. Over the next millennia, Iron Age societies began to appear throughout all of France, and became unified as a culture known as the Celts.⁹ These Celtic societies formed strong links throughout France and into other parts of Northern Europe. These societies were eventually subdued by the Romans who conquered all of present day France, turning it into the Roman province of Gaul.¹⁰ After the breakup of the Roman Empire, the southern area of France has generally remained within the borders of the Kingdom of France, with some fluctuation in Borders on the Catalanian and Italian sides. Similar regional economic practices have seen it stay firmly rooted in the cultures of the Mediterranean.

The level of linguistic diversity in the region may hint at historical populations that were divided based on ethnic divisions. Catalan, Aragonese, and Gascon are Indo-European languages related to French that are still spoken in other areas of the Pyrenees today.¹¹ Aragonese and Gascon have been in decline in recent centuries. While it may not be possible to link these populations back to the earliest societies in the area, they do provide some grounds for investigating local genetic ancestry.

Future genetic testing may be able to distinguish between early hunter-gatherer influences and later agriculturalists. Some studies have found links between Southern France and its Mediterranean neighbors.¹² Research has also found genetic contributions from other migration events such as Semitic and North African components. In the future, we may be able to distinguish these components as well. It may also be possible to determine which specific groups within Southern France (Catalan, Aragonese, or Gascon) an individual may be more likely related to and what languages their ancestors used to speak.

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Orkney Islands Story

The Orkneys are a small group of islands that lie off the North Coast of Scotland. They have a unique history of interaction with Neolithic populations to the south and later conquest by Viking Scandinavians populations from the east. The people of this region pride themselves in their Viking and Scottish roots.

The earliest evidence for human habitation of the islands dates to Neolithic, around 6,000 years ago. This period is associated with multiple-chambered tombs and distinctive ceramics that linked these people to mainland Scotland, where they are thought to have originated.^{1,2} Evidence for prehistoric hunter-gatherer cultures in the north of the British Isles that predate the arrival of agriculture is limited to a few archaeological sites in the Hebrides and the Western Isles of Scotland. Dating of these sites places human habitation back as far as 8,500 years ago.³ Challenging environmental conditions at the end of the last Ice Age may have prevented earlier establishment of human occupation. Early Neolithic societies appeared in Scotland around 5,000 years ago.⁴ The shift to agriculture is thought to have been slowed by the relatively cold climate and short growing season. In many areas of Northern Britain, archaeological evidence suggests a foraging subsistence strategy that remained in place for long periods after the arrival of agriculture. The arrival of agriculture, known as the Neolithic, brought changes to burial structures such as the shift toward circular tombs as opposed to chambered tombs.^{5,6} Fortified structures known as Brochs have been identified which transition from the Neolithic into the Iron Age between 2,500 and 2,000 years ago.⁷

Evidence for interaction between Orkney and the rest of Scotland during the Neolithic and Iron Age is reinforced by archaeological evidence such as stone monuments that are consistent with those in other parts of the British Isles. Archaeological research shows clear cultural continuities with the Picts during the Iron Age,⁸ an ethnic group that inhabited a large part of northeast Scotland.⁹ The strong links between the Orkney Islands and the Scottish mainland would change when Scandinavian invaders arrived around 800 A.D.¹⁰ These invaders took over the islands and maintained control for several centuries. While Norse migration clearly had a substantial impact on Orcadian demographics, archaeological evidence has pointed toward cultural continuity and assimilation between the Norse and the local population.^{11,12} Migration to the islands from the Scottish mainland continued both during and after the period of Scandinavian colonization.

The Orkney Islands eventually rejoined Scotland and have been a permanent part of the country since the 15th century. While distinguishing between ancient and historic migration from Scotland is currently not possible, recent genetic data supports the interpretation that there is not more than a 40% Nordic contribution in the genetic makeup of Shetland and the Orkney Islands as we know them now.¹³

Future testing may reveal Viking or Pictish ancestry, as well as admixture from more recent movement of people. Separate Y-chromosome and mitochondrial DNA lineages may also reveal mixed maternal and paternal ancestries. Genetic testing of ancient mummies found in the Orkneys may also lead to links with ancient DNA.

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