An African migrant is seen at the CETI, Short Stay Immigrant Center, on Oct. 20, 2005 in the Spanish Enclave of Melilla, Spain.

Marco Di Lauro/Getty Images

How Human Migration Works

Where did humans come from? How did we get to where we are now? Where are we going in the future? Studying the migration patterns of humans gives us a glimpse of the development of human civilization and shows us the patterns of human existence. Studying modern migration helps us understand complex economic systems, and it might even give us a way to ensure the future survival of the human race.

In this article, we'll examine scientific research that shows how the earliest humans spread across the globe, and we'll look at modern migration patterns. Then we'll turn our gaze to space, the future target for human migration.

Human Origins

No one knows for sure exactly when humans first became humans. Scientists use certain characteristics found in fossil evidence (generally the shape of the skull) to differentiate Homo sapiens from earlier species in the genus Homo, such as Homo erectus. Recently, genetic data has also been used to identify early human populations. Since we're not quite sure when humans evolved in Homo sapiens, we're also not really sure exactly how or when the earliest humans spread across the rest of the world. Paleoanthropologists have several theories based on the best evidence available.
The prevailing theory is the **Out of Africa theory**. Pre-human hominids probably developed in **Africa** and spread to **Europe** and parts of **Asia**. The first **Homo sapiens** appeared in Africa roughly 400,000 years ago [source: **National Geographic**]. This is strongly supported by genetic and fossil data. About 100,000 years ago, they moved north out of Africa into the Middle East, eventually pushing into Europe and Asia. **Homo sapiens** coexisted with earlier hominids such as **Neanderthals**. With their greater intelligence and organization, **Homo sapiens** out-competed other pre-human species for resources, enjoyed greater reproductive success and eventually replaced them [source: **Smithsonian Institution**].

A competing theory suggests that pre-humans that had already spread throughout Europe and Asia evolved into **Homo sapiens**. Separate regional **Homo sapiens** populations interbred, passing the characteristics of modern humans through the entire human population. This theory accounts for some of the regional differences seen between different human populations.

Today, the Out of Africa theory is widely accepted and has the most scientific evidence supporting it. This means that the story of humanity is a story of migration.

**CONTINENTAL DRIFT? NOT A FACTOR**

The movement of tectonic plates means that land masses that are now thousands of miles apart were once linked as one huge supercontinent. This had a huge influence on animal migrations, as scientists have found fossil remains of identical creatures in distant, unconnected places. Human migration, however, was not affected. Why? We're too new. By the time the first humans appeared, the continents were already pretty much in their present-day positions.

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An Indian nomadic family undertakes their annual migration. India’s 2003 heat wave spurred nomadic families to start their migration early.
Why People Migrate

What drove those first humans to leave Africa? That's best explained by examining the forces that continue to drive humans to migrate even today.

A population of humans living in a given area faces certain pressures. Those pressures depend on the size of the population, the resources available and the community's ability to exploit those resources.

Food - The most basic population pressure, and the one that likely drove the earliest migrations out of Africa, is food. An area of land can only support a certain population with the food produced there. Modern agricultural techniques and technologies can vastly increase food output, but in the African forests and savannas of 100,000 years ago, humans subsisted by hunting and gathering. If the population grew too large, there wouldn't be enough meat or fruit to feed everyone. A portion of the population could simply move a few miles away to find new hunting grounds. Humans may only have moved a few dozen miles per generation, but over tens of thousands of years, this slow but inexorable migration spread humans throughout Europe and Asia.

Space - You can only pack so many humans into a given space. Improvements in medical and sanitation technology make the exact limit enormously variable, and often far higher than the food limit mentioned above, but at some point the population becomes too large for the area. This can lead to outbreaks of violence or the spread of virulent diseases. A general decline in living conditions leads some people to move elsewhere.

Weather and climate - In the short term, weather events can drive a population out of one area. Flooding and severe storms can cause this. Long-term migration patterns have been shaped by climate change. A drought that turns a once-fertile area into a desert will drive the population to find a new home. Changes in sea level can reveal large stretches of coastal land. Massive sections of frozen ocean that occurred during the most recent ice age gave humans access to parts of the world they might not otherwise have reached [source: INSTAAR].
Early Human Migration

No historical record exists that tracks the migratory patterns of the earliest humans. Scientists piece together the story of human migration by examining the tools, art and burial sites they left behind and by tracing genetic patterns. They accomplish this by looking at mitochondrial DNA (mtDNA), which is passed from a mother to her offspring without being blended with the genetic code of the father. We can look at the mtDNA of two people who lived thousands of miles and years apart, and if their mtDNA genetic code is the same, we know they were ancestor and descendant [source: PBS NOVA].

Examining mtDNA is useful for another reason -- it accumulates mutations relatively quickly. Scientists can see how many mutations are present and roughly determine how old that genetic line is. By comparing the number of mtDNA mutations found in people from different locations, we can tell where humans arrived first. The more mutations, the longer humans have lived in that area. All of the mtDNA found in certain parts of Africa has more mutations than any other mtDNA in the world. This evidence strongly supports the Out of Africa theory. However, even with these clues, much about early human migration is uncertain.

Early Migration Routes

When humans first left Africa, they followed the coasts, where resources were abundant. The first wave moved across the Middle East, into southern Asia, and eventually all the way down to Australia [source: National Geographic]. This occurred roughly between 90,000 and 30,000 years ago [source: Haywood]. Additional waves of migration followed. Between 40,000 and 12,000 years ago,
humans moved north into Europe. However, their range was limited by an ice sheet that extended into the northern part of continental Europe.

The icy conditions at the time also helped expand early humanity's territory. A massive sheet of ice, combined with lower sea levels, formed a bridge between Siberia and Alaska that we call Beringia. The first humans crossed over 30,000 years ago, moving down the west coast of North America [source: National Geographic]. Other sources suggest a more recent North American migration, starting about 15,000 years ago [source: Haywood]. New evidence seems to keep pushing the date of first North American habitation further and further back. Humans eventually spread into South America and pushed east into what is now the eastern United States and Canada. This theory of North America's settlement is supported by mtDNA evidence and a similarity in the dental structures of Siberian and North American populations of the era.

There have long been competing theories that early humans crossed the Atlantic Ocean, either from Africa to South America or the Caribbean, or from Europe to Greenland to North America. While it may have been possible to make such a trip using available seafaring technology, it is unlikely that a large-scale migration occurred in such a way.

The initial spread of humanity across the Earth was driven primarily by food and climate. Nomadic tribes of up to a few dozen people likely followed the migration patterns of the herd animals they hunted. Climate change opened new areas for hunting, even as technology such as mastery of fire and meat preserving allowed humans to live in less-than-ideal conditions. The human ability to adapt to new circumstances not only gave early humans an advantage over Homo erectus, it also facilitated global expansion.

THE COASTAL ROUTE

The migration from Siberia to North America might not have been made over an ice/land bridge. Another theory suggests the settlers used a sea route that hugged the coasts and islands along the way. They stopped at the small pockets of land that weren't covered in ice, eventually getting far enough south that the land was free of ice altogether [source: National Geographic].
Members of Kenya's coastal hunter-gatherer tribe, the Boni, hold up dried-up honeycombs. The Boni, now numbering only about 4,000 members, have maintained a traditional lifestyle of hunting and gathering alongside paltry agriculture.

TONY KARUMBA/AFP/Getty Images

Technology and Migration

The Agricultural Revolution
Every human group survived as hunter-gatherers for thousands of years. About 10,000 years ago, humans first developed farming technology. This technology didn't develop at one location and then slowly spread throughout the world -- it appeared independently in many different places. Agriculture was successful because it could support greater populations with less land. The end of the Ice Age improved climate conditions in many regions, making farming more lucrative. While many societies maintained a hunter-gatherer existence even into modern times, the success of agriculture effectively ended the widespread constant human migrations that were part of the nomadic hunter lifestyle worldwide. Humans still migrated after the development of farming, but it was no longer the central aspect of their lives.

The migration that did occur was still driven by the same basic reasons -- climate and food. Instead of migrating to follow animal herds, people would migrate to areas of better soil. Without modern farming techniques, early farmers could use up all the nutrients in the soil within a generation or two, forcing migration to unfarmed land. Climate shifts could cause droughts or floods that forced migrations as well.

Migrations tend to follow paths where resources are easy to come by. Coasts and rivers, which provide fish and fertile land, are almost always settled first. Humans didn't push inland or into less hospitable areas until population pressures forced them to.
Agriculture had an enormous effect on humanity. It formed the basis for all modern human civilization. The end of constant migration and the ability to support larger populations lead to the creation of cities, states, governments, organized religions, monetary systems and militaries. None of these would be possible with a nomadic population.