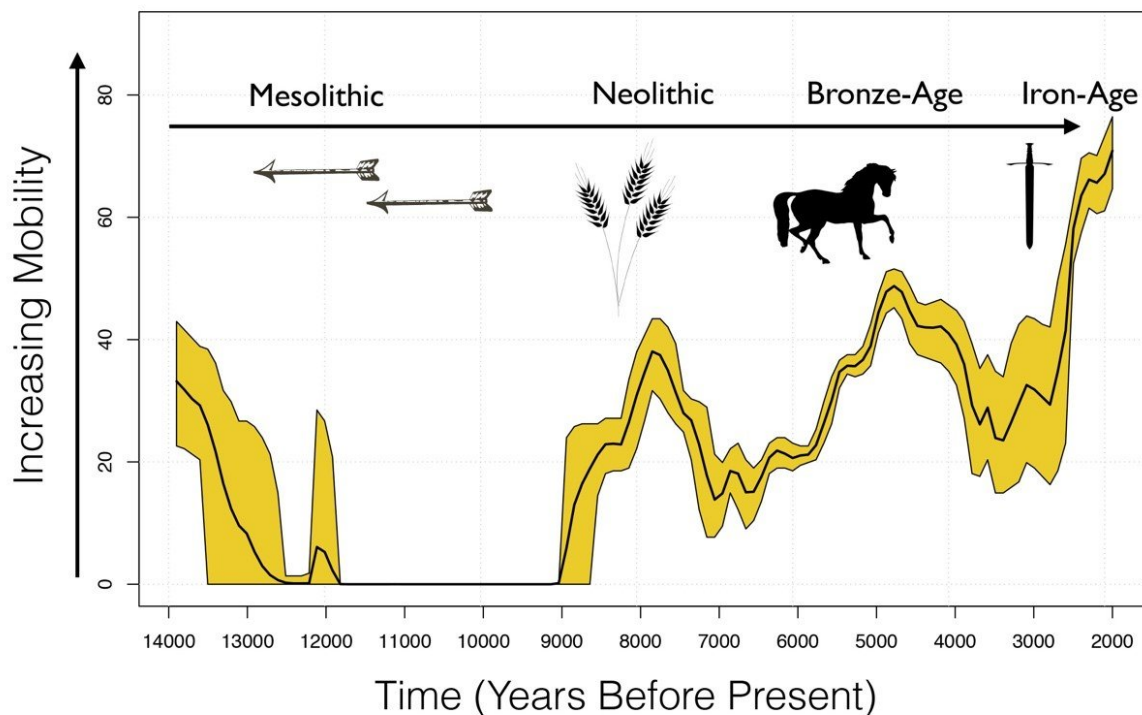


# The relentless rise of migration in Europe over last 10,000 years

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Rise in mobility has occurred in at least three distinct pulses. Credit: Mark Thomas

The new method, published today in *PNAS*, allows, for the first time, to directly quantify changes in prehistoric migration rates using ancient genetic data over the last 30,000 years.

The researchers found that migration has been on the rise since the beginning of the Holocene (the unusually warm and stable climatic period we have been in for the last approximately 11,000 years). Interestingly, this rise in mobility has not been gradual but instead has occurred in at least three distinct pulses (see figure).

The first occurred when agriculture spread across Europe from the Near East. The second coincided with the beginning of the Bronze Age; a time when complex civilizations were emerging, horses became a major means of transport, carts and chariots were invented, and new trade networks across Asia and Europe became established. The third mobility pulse occurred in the Iron Age, a period that saw significant increases in population sizes, trade and warfare.

"These findings suggest a strong link between technological change and [human mobility](#)" said Professor Mark Thomas (UCL Genetics, Evolution & Environment), an author of the study.

The researchers also found that mobility among the hunter-gatherers who lived in Europe before the migration of farmers was comparatively low, particularly after the peak of the last Ice Age (ca. 20,000 years ago).

"These are fascinating results - we associate a hunting and gathering lifestyle with nomadism and high mobility, and the development of the first farming villages and towns with sedentary societies. Yet, early farmers were on the move in search of more and more land to match their progressively larger populations, while the post-glacial hunters seemed to have met their needs locally" said Professor Marta Mirazón Lahr (Cambridge University), an author of the study.

"The relatively greater mobility of hunters as the climate deteriorated dramatically before 20,000 years ago shows how vulnerable human communities are to climate change".

Human mobility is ubiquitous and has influenced many aspects of our history and evolution. It shapes our genetic makeup, can influence how we evolve and adapt to changes in our environment, helps to maintain and spread ideas and technologies, and plays a key role in innovation. Ultimately, it enriches our biology and our culture.

For many years archaeologists - and more recently, geneticists - have been interested in how much people have moved around in the past. To detect migration episodes beyond the reach of written history, archaeologists have looked for clues in the changing distribution of artefacts (stone tools, pottery, crop species, coins, etc) belonging to different cultures. But these clues are not without controversy, as objects and ideas can spread without the wholesale movement of human populations.

More recently geneticists - particularly those who study DNA from long-dead human bones - have found convincing signatures of major past migrations in Europe. However, these studies focused on large migrations from one place to another, rather than the general hubbub of mobility in all directions, and did not allow researchers to compare the mobility of prehistoric people between different time periods or different regions.

The new method detailed in this study isn't limited in its application to [genetic data](#). "One of the great features of this new method is that it can be used not only on genetic data, but also on the variation in the shape of ancient fossils. This means that the mathematical framework behind our method can easily be extended beyond the study of human movement: We can now explore changes in [migration](#) rates through time in animals that are long extinct", said Liisa Loog, the first author of the study.

"In theory, our method could also be applied to cultural data", added Professor Thomas. "This would enable us not only to identify changes in

the rates of movement of people, but also in the rate with which ideas and objects spread".

**More information:** Liisa Loog et al., "Estimating mobility using sparse data: Application to human genetic variation," *PNAS* (2017).  
[www.pnas.org/cgi/doi/10.1073/pnas.1703642114](http://www.pnas.org/cgi/doi/10.1073/pnas.1703642114)

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