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SCIENCE | ESSAY

The Ancient Horsemen Who Created the Modern World

New DNA research shows that half the human beings alive today are descended from the Yamnaya, who lived in Ukraine 5,000 years ago.

By Bojan Pancevski

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Yamnaya graves found during an excavation in Bulgaria. PHOTO: BIANCA PREDA-BALANCIA, HELSINKI

For about half the people alive today, the story of where they came from just became clearer.

For centuries, historians and linguists have been searching for the cradle of the Indo-Europeans, an ancient people who shaped history and created the world's largest language family, now spoken by over 40% of humanity. Now research led by David Reich, a geneticist at Harvard Medical School who specializes in the study of ancient populations, is making it possible to give a precise answer.

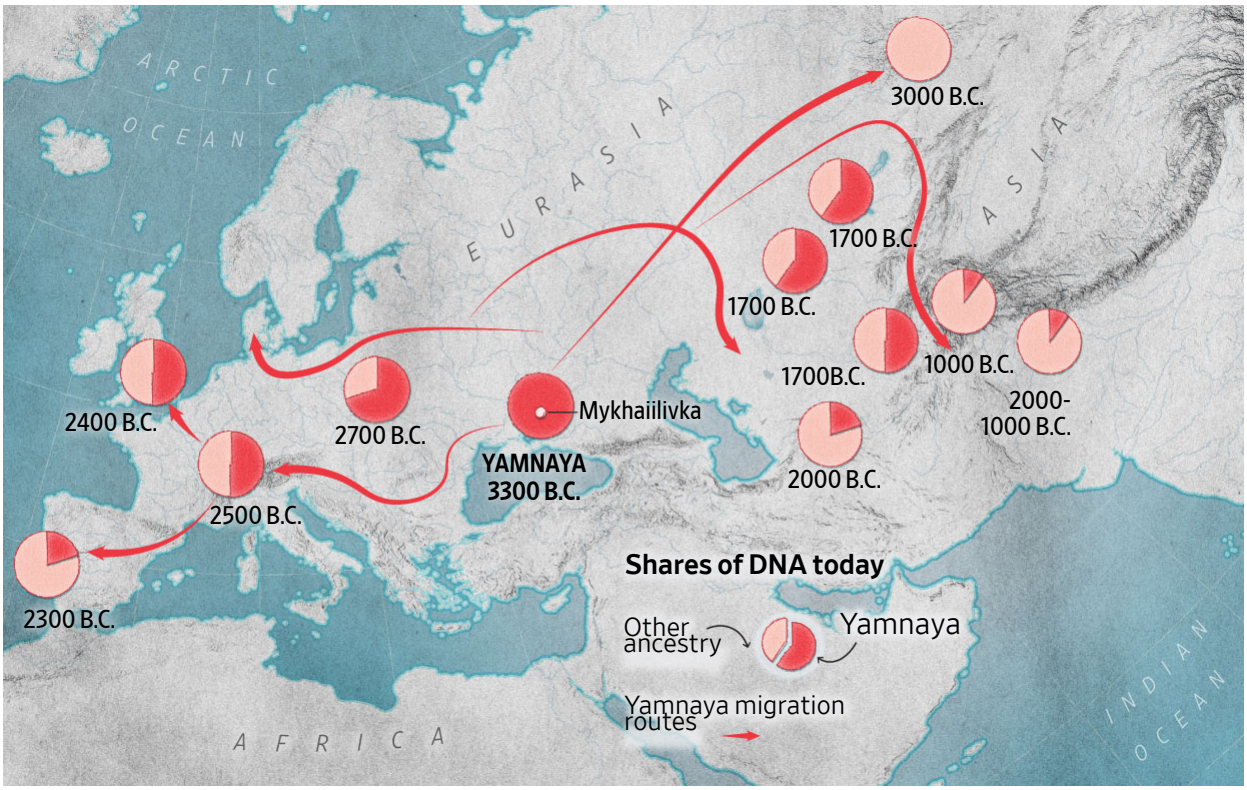
The peoples of Europe and West Asia, as well as everyone descended from their migrations across the globe—some four billion human beings alive today—can trace their ancestry to the Yamnaya, a small community of cattle-herders who lived 5,000 years ago in what is now Ukraine.

DNA detectives, including at Reich's lab, analyzed DNA samples from the remains of around 450 prehistoric individuals taken from 100 sites in Europe, as

well as data from 1,000 previously known ancient samples. In two papers published in the scientific journal Nature last month, the researchers combine genetic evidence with archaeology and linguistics to argue that sometime before 3000 B.C., a previously unknown people migrated from the Volga River to the Ukrainian steppe north of the Black Sea, where they mixed with a local population and formed the Yamnaya.

The Ukrainian hamlet Mykhailivka, now under Russian occupation, was pinpointed as the genetic cradle of the Yamnaya. From there they exploded across Eurasia, spreading their genes and their way of life from Portugal to Mongolia. This expansion, archaeologists and geneticists say, defines much of the world's genetic and cultural heritage to this day. "They changed the populations of Europe, and ultimately, the world," Reich said.

How the Yamnaya People and Their Descendants Conquered Eurasia



Note: DNA data and locations are approximate.
Source: Original map from 'Atlas of the Invisible', Oliver Uberti and David Reich
Camille Bressange/WSJ

This "incredible expansion laid a foundation for premodern globalization," said Kristian Kristiansen of the University of Gothenburg in Sweden, an authority on the Yamnaya who did not participate in the new research. Their language, which was not written down but can be partly reconstructed by linguists, was the ancestor of 400 later tongues, including Latin and Greek, English and Russian, Urdu and German. Ancient civilizations that we usually think of as antagonists—

the Romans and the Celts, the Persians and the Macedonians—all shared this genetic and cultural heritage, the new research shows.

These ancient people did not call themselves Yamnaya. The name was coined by archaeologists from the Russian word yama, meaning "pit," because they buried important people in pits beneath mounds known as kurgans. They were also likely the first people to ride horses and use wheeled carts, technologies that allowed them to conquer the Eurasian steppe.

Only a handful of labs work on ancient DNA research. Scientists can retrieve DNA from human bones, teeth or tissue from museum collections, as well as from ancient cave dwellings, burial grounds, battlefields and disaster sites. DNA is preserved in the most unlikely places: Ancient Europeans mixed their saliva with birch tar to make a glue to repair pots and attach arrowheads. Reich's award-winning lab at Harvard has one of the largest ancient DNA databases in the world and uses proprietary gene-analysis software co-developed by Nicholas Patterson, a British mathematician who once worked as a codebreaker for U.K. intelligence services.

The new genetic research reinforces earlier theories about the spread of the Yamnaya based on linguistic and archaeological evidence. The idea that the languages of Europe, Iran and India descend from a single ancient tongue was first proposed by Sir William Jones, a British colonial judge in 18th-century India. Jones taught himself Sanskrit to interpret local laws and suggested that the ancient Indian language had a common ancestor with Latin, Greek and Old Iranian.

DNA evidence shows that the proto-Yamnaya population migrated from the Volga region to Anatolia, presumably spreading their language along the way. Still, some linguists remain cautious. "Genetic evidence alone will never be enough to prove the origin of a language," said Lehti Saag, an ancient DNA researcher at Tartu University in Estonia.

For the peoples living in Eurasia before the Yamnaya arrived, being conquered was tantamount to "cultural erasure," Reich said. The erasure was often physical, too. In many places, indigenous male DNA disappears upon the arrival of the Yamnaya, while indigenous female DNA is traceable in the following generations.



Yamnaya stone engravings from the 3rd millennium B.C. found in northeast Bulgaria. PHOTO: VLADIMIR SLAVCHEV (2); DILEN DILOV; KALIN DIMITROV

This suggests that the newcomers exterminated the men in the farming and hunter-gatherer populations they encountered, while incorporating the surviving women into their community. The Yamnaya were originally dark-skinned, with dark hair and brown eyes; their descendants in Western Europe inherited genes for blue eyes and lighter skin from the women they conquered.

In other places, “it’s a process of almost no mixture with the previous people, who just disappear,” Reich said. That is what happened to the highly sophisticated civilization that built Stonehenge in Britain. Shortly after the giant stone structure was completed around 2500 B.C., descendants of the Yamnaya steppe-riders landed on Britain’s shores. Within years of their arrival, some 99% of the indigenous people disappeared, according to Reich’s analysis of DNA samples from the time. Stonehenge, an apogee of a vanquished culture that took centuries to complete, was turned into a garbage dump.

Experts believe there was likely a religious or ideological driver of the Yamnaya expansion. Since they left no written records, it is impossible to know exactly what they believed and what drove them to expand the way they did. But the

ancient epics of the cultures they engendered, including the Hindu Rigveda and Homer's Iliad, suggest that they glorified battle and expanded through colonization.

Archaeological evidence from their settlements and burial grounds shows that young Yamnaya men were trained not only in hunting, herding, riding and fishing, but also to be warriors. By analyzing words related to kinship and social order from later cultures descended from the Yamnaya, researchers conclude that they had a patriarchal social structure, in which firstborn sons inherited all their fathers' property. This system of primogeniture created an "expansive dynamism" that encouraged younger sons to embark on conquest, said Volker Heyd, professor of archaeology at the University of Helsinki.

The Yamnaya also had biological advantages. Studies comparing their skeletons with those other contemporary groups show that on average they were about 6 inches taller, possibly as a result of their meat and dairy consumption, researchers believe.



An ancient Yamnaya skull painted with red ocher.
PHOTO: SIMON RASMUSSEN/CELL 2015ASSOCIATED PRESS

"It was a group of Arnold Schwarzeneggers riding into conquest," Heyd said.

Traces of Yersinia pestis, the bacteria that causes plague, were found in Yamnaya remains, suggesting that they may have developed immunity to the disease and carried it as an unintended "biological weapon" that decimated rival groups.

One group derived from the Yamnaya were the Aryans, who shaped the cultures of ancient India and Iran. In the 20th century, the term Aryan became associated with white supremacy, after theorists of racism falsely identified them as a Germanic race of conquerors superior to other Europeans.

In fact, the new findings show that most people in Europe share Yamnaya ancestry as one element in a complex genetic inheritance, which also includes DNA from earlier hunter-gatherer and farming groups and later migratory peoples such as the Huns or the Mongols.

"Large-scale movement of people is a repeated event in human history, and it's been often disruptive," Reich said. "It occurs again and again and again."

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