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NEW TECHNOLOGIES REINVIGORATE ARCHAEOLOGY

Cooperation with specialists using state-of-the-art technologies has ushered archaeological research into a whole new era, making it much more attractive to the public.

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Today's archeologists are harnessing an increasing variety of new technologies. Modern tools are available for use during exploratory research, field excavations, and in the lab while analyzing finds from fieldwork. A particularly significant advance has come with the recent ability to analyze ancient DNA from humans, animals, and plants. Prominent Danish archaeologist Kristian Kristiansen has called the introduction of genetic research into prehistoric studies the third great scientific revolution in archaeology. The first major leap forward, which gave birth to archaeology as an independent scientific discipline in the latter half of the nineteenth century, involved adapting evolutionary theory and applying methods drawn from geology and the biological sciences. The second breakthrough moment came in the mid-twen-

tieth century, as methods for determining the calendar age of artifacts (primarily radiocarbon dating) and environmental studies came to be used in research on ancient human history.

For more than a decade now, another great revolution has been underway in the field, with the application of the latest technologies. The scientists now at the peak of their careers started out with completely different methods and capabilities from those achievable today. As recently as 20 years ago, my professor and I, standing over Stone Age burials unearthed in a Polish village, had a lively but not very fruitful discussion: struggling to determine whether the individuals whose skeletons we were looking at might have been related to one other, whether they might have been recent arrivals at the site from some distant area. Since then, science has already provided answers to many of the questions that were then intriguing us. The use of new technologies has thoroughly reinvigorated the study of passionate problems in archaeology, bringing conclusive arguments into debates that had so far essentially been based on circumstantial evidence. One such problem now being viewed in an entirely new light is the study of the settlement of



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the European continent by steppe peoples at the turn of the 4th and 3rd millennia BCE (scholars from the Institute of Archaeology and Ethnology of the Polish Academy of Sciences have been among those involved in this research).

Migrations

As early as the beginning of the twentieth century, top-name European prehistorians such as Vere Gordon Childe noted that at the end of the Neolithic, vast swaths of the Old Continent had been settled by peoples with a specific set of burial customs and material culture features, which came to be known as the Corded Ware culture. These peoples built burial mounds, today called *kurgans*, for some of the dead (many preserved to this day in various regions of Europe, including Poland), and often decorated their ceramic vessels in a distinctive way, with cord imprints (hence the name given to the culture as a whole). The Corded Ware culture graves, vessels and other material artifacts seemed to archaeologists to be similar to the culture of the steppe peoples known from Eastern Europe in the early Bronze Age. Hence, starting in the interwar period, the theory gained popularity that nomadic peoples had migrated in from the east in mass numbers in the late Neolithic, transforming the demographic and cultural face of Europe. This migration was assumed to have given rise to the later Bronze Age civilizations and, consequently, to the subsequent nature of modern Europe.

The arrival of steppe peoples was also linked to the emergence of the Indo-Europeans. In the mid-twentieth century, the Lithuanian archeologist Marija Gimbutas played a leading role in establishing the Kurgan Hypothesis, a theory positing that the steppe peoples expanded in three major waves. In the most general terms, it entailed that the arrival of the new populations spelled the end of several thousand years of development of European Neolithic cultures. Such a conquest of European territories by peoples from the east could easily be compared with the events of historical times and the powerful invasions of various nomads, such as the Scythians, Huns, and Mongols. However, with further advancements in archaeological research, the concept of an invasion from the

steppes playing a crucial role gained more and more opponents. Some saw evidence for cultural continuity on European territories, rather than a cultural upheaval caused by steppe-people aggression. Moreover, the theory of the expansion of peoples ethnically defined as Indo-European came to be significantly discredited by its use in the political propaganda of the era of twentieth-century nationalisms. Because of a lack of good arguments that could reach out to a broader audience, the problem of the steppe invasion of the early 3rd millennium BCE receded into the background of scholarly interest. Researchers rarely emphasized the role of migration as an important factor in cultural change. The problem of what role steppe peoples played in the genesis of European Bronze Age societies became a scientific dispute that was difficult to resolve. This apparent impasse recently came to an end in the second decade of the 21st century when a game-changer appeared: the publication of ancient DNA analyses.

Two important publications appearing in *Nature* in 2015 bore the indicative titles: “Massive migration from the steppe was the source of Indo-European languages in Europe” and “Population genomics of Bronze Age Eurasia.” All of the new findings resoundingly concurred: the genomes of the populations of the Central European Corded Ware and the Yamna steppe culture were indeed very similar, and the spread of haplogroups (groups with similar series of genes on their chromosomes) linked to these communities on the European continent is dated to the early 3rd millennium. It was then that Y-chromosome haplogroups R1a and R1b, now common on the European continent, first appeared in large numbers. Moreover, many haplogroups extant among older European Neolithic populations are absent today. In 2011, a mass grave (15 individuals) from the early 3rd millennium was discovered in the town of Koszyce in Poland’s Małopolska region, linked to a community of the Globular Amphora culture – considered by archaeologists to be a local, Central European population. The skulls of all the people buried there bore traces of a brutal murder carried out either by their own kin or by some foreign population. The local origins of these victims were confirmed by DNA tests, performed by specialists from a laboratory in Copenhagen: all the

Burial mounds (*kurgans*) left behind by steppe peoples from the 3rd millennium BCE in Pet Mogili (Upper Thrace, Bulgaria)



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Photo 1
Survey of the *Medisova humka* burial mound in Žabalj, Serbia

Photo 2
A mass grave of the Globular Amphora culture from Koszyce, Małopolska province, Poland

men had Y haplogroups which are contemporarily absent, associated with older Neolithic populations. In turn, another project, headed by Prof. Anita Szczypanek at the PAS Institute of Archaeology and Ethnology, studied the biological characteristics of Corded Ware populations in the Małopolska region. DNA analyses, performed in a lab in Stockholm, indicated that all the men were of haplogroup R1b. This further confirmed the influx of a new population of Eastern European descent in the area of today's Małopolska region in the 3rd millennium BCE.

New methodology

Studies addressing the issues discussed here have also been conducted at the PAS Institute of Archaeology and Ethnology's center in Kraków. Such work was initiated in the mid-twentieth century by Prof. Jan Machnik, who analyzed Corded Ware cemeteries in various regions of southeastern Poland, and later in eastern Slovakia and western Ukraine. As part of this research, effective methods were developed for excavating kurgan sites (yielding good-quality information on features of prehistoric peoples' burial rites and material culture). In the last 15 years, under the framework of various international projects (funded mainly by Poland's National Science Center), excavations have been carried out in Bulgaria, Hungary, Serbia, Slovakia, and Ukraine. Kurgan sites located in hitherto poorly recognized areas have been examined. The research sites are located on the borders of the Eurasian steppe, in zones that have traditionally been settled by nomadic communities migrating from the east. The results of this work are being followed with interest by archaeologists and geneticists. This is because only such new excavations make it possible to describe a given prehistoric population both in terms of its biological characteristics and in terms of its cultural behavior. Many important specialized analyses

(including DNA) can often be carried out for artifacts deriving from fieldwork conducted many years ago. Unfortunately, for most of them, the documentation does not allow a sufficiently accurate description of the burial rites of the prehistoric community. Hence, the attention of the scientific community is now focused on newly conducted excavations. In 2017, a Polish-Serbian project studying a kurgan mound in Žabalj (Vojvodina, Serbia) was used by *National Geographic* reporters to present a typical grave of the Yamna culture in a story they were preparing on prehistoric migrations. In turn, another grave of this culture, surveyed by a Polish-Bulgarian expedition in Malomirovo (Upper Thrace, Bulgaria) became widely circulated in the world media, as an illustration of the oldest horse riders of the 3rd millennium BCE (in connection with a scientific article that appeared in *Science Advances*). Genetic samples from these recent studies very swiftly become attractive additions to ongoing major ancient DNA analysis projects carried out by the most reputable laboratories. Without a doubt, thanks to cooperation with specialists in new technologies, the results of archaeological research have become more widely present in the public sphere – and more attractive to the public eye.

The above remarks by no means imply that modern methods have replaced the traditional set of techniques used by archeologists. Rather, the toolkit has expanded, and prehistorians still need to be able to collect all available data in order to try to accurately describe what the world was like thousands of years ago. Access to new technologies significantly aids them in this, showing the results of their work in an attractive light. One might even go so far as to say that technological advances have given archeology a new lease on life, reinvigorating its position in the modern world. As we become able to tell more and more of the story of human prehistory, the public is sure to be enthralled. ■

Further reading:

Curry A., *The first Europeans weren't who you might think*, *National Geographic* August 2019, <https://www.nationalgeographic.com/culture/article/first-europeans-immigrants-genetic-testing-feature>

Krause J., Trappe T., *A Short History of Humanity: A New History of Old Europe*, 2021.

Reich D., *Who We Are and How We Got Here: Ancient DNA and the New Science of the Human Past*, 2019.



The days of brilliant lone scientists, working all on their own, are long gone. Today, success in research is predominantly achieved by diverse international collectives – precisely the kind of teams that we are establishing at the Polish Academy of Sciences. The success of research in Poland largely depends on how active we are internationally. That's why we set up the PASIFIC program, which aims to attract in dozens of talented and promising scientists and scholars from abroad to the institutes of the Polish Academy of Sciences.

Prof. Paweł Rowiński
PASIFIC program coordinator



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