Languages and Myths of Prehistory

LAMP

Unravelling the speech and beliefs of the unwritten past
The LAMP project

Due to recent advances in ancient genetics, a new picture of prehistory is emerging. In the LAMP project we cast light on the aspects of prehistoric peoples that make them human: their languages and beliefs. The project asks three fundamental questions about the early speakers of Indo-European:

1. **How did they talk?**
   We reconstruct the sounds, grammar and vocabulary of the prehistoric language stages from which the extant languages descend.

2. **What did they talk about?**
   We compare the relevant parts of the reconstructed vocabulary with mythological and archaeological evidence in order to establish fragments of the myths, poetry and rituals of prehistory.

3. **How can we know?**
   We integrate the methodologies currently developing in the interfaces between the traditional fields of linguistics, archaeology and mythology.
Introducing *h₁roy₂dʰah₂ ‘Redhead’

archaeology
- woman, 19 years old
- Yamnaya
  (western Ukraine)
- 3100 BC

ancient genomics
- mix of steppe ancestry and European farmer ancestry
- related to present-day populations of northern Europe
The Bronze Age of Eurasia (around 3000–1000 BC) was a period of major cultural changes. However, there is a debate about whether these changes resulted from the circulation of ideas or from human migrations, potentially also facilitating the spread of languages and certain phenotypic traits. We investigated this by using novel, improved techniques to sequence low-coverage genomes from 161 ancient humans from across Eurasia. We show that the Bronze Age was a highly dynamic period involving large-scale population migrations and replacements, responsible for shaping major parts of present-day human diversity. Genomic data indicate that the Bronze Age was characterized by a hypodense spread of Indo-European languages during the Early European Bronze Age. We also demonstrate that light skin pigmentation in Europeans was already present at high frequency in the Bronze Age, but not lactose tolerance, indicating a more recent onset of positive selection on lactose tolerance than previously thought.

The processes that created the genetic landscape of contemporary human populations of Europe and Asia remain contentious. Recent studies have revealed that Western Eurasians and East Asians diverged outside Africa between 45 and 362 thousand years ago (kya), but that East Asians, but not Europeans, received a gene flow from ancestors of an earlier migration into Asia, of Aboriginal Australian ancestors some point before 20 kya. There is also evidence that the Bronze Age in Europe and Asia resulted in a major out-of-Africa population stretching from Europe to Asia, and that it contributed to a genetic component to modern Western Eurasians and indigenous Americans. The early Europeans received gene flow from the Middle East during the Neolithic into transition from hunting-to-farming around 8.5–4.5 kya and possibly also from northern Asia. However, what happened hereafter, during the Bronze Age, is much less clear. The archaeological record testifies to major cultural changes in Europe and Asia after the Neolithic period, but beyond 3000 BC, the Bronze Age, northeastern and southeastern European Neolithic farmers were replaced by Indo-European-speaking populations. This process was largely replaced by the Early Bronze Age Yamnaya culture, which is associated with a complex combination of mobility, property and political factors.

We generated genome-wide data from 69 Europeans who lived between 6000–3000 years ago by enriching ancient DNA libraries for a target set of almost 480,000 polymorphisms. Enrichment of these positions decreases the sequencing requirement for genome-wide ancient DNA analysis by a median of around 250-fold, allowing us to study an order of magnitude more individuals than previous studies and to obtain new insights about the past. We show that the population of Western and Eastern Europe followed opposite trajectories between 6000–5000 years ago. At the beginning of the Neolithic period in Europe, ~8000–7000 years ago, closely related groups of early farmers appeared in Germany, Hungary and Spain, different from indigenous hunter-gatherers, whereas Russia was inhabited by a distinctive population of hunter-gatherers with high affinity to a ~24,000-year-old Siberian. By ~6000–5000 years ago, farmers throughout much of Europe had more hunter-gatherer ancestry than today, whereas in Russia, the Yamnaya steppe hunters of this time were descended not only from the preceding European hunter-gatherers, but also from a population of Near Eastern ancestry. Western and Eastern Europe came into contact ~4000 years ago, and this contact continued in the Bronze Age. These results provide strong support for a steppe origin at least some of the Indo-European languages of Europe.

Genetic ancestry in Europe has emerged as a transform-ative tool for studying prehistory, providing information that is comparable in power to archaeology and linguistics. Reconstructing past migrations, however, requires collecting genome-wide data from an adequate number of individuals to characterize population changes over time, which means not only sampling a succession of archaeological cultures, but also multiple individuals per culture. To make this large amount of ancient DNA samples practical, we used a solution capture library protocol that enables efficient sequencing for a target set of 39,557 single nucleotide polymorphisms (SNPs) (90% capture, 335,242 of which are autosomal SNPs that have also been genotyped using the Affymetrix Human Origins array in 3,543 Europeans from 203 populations). This reduces the amount of sequencing required to obtain genome-wide data by a minimum of 45-fold and a median of 225-fold (Supplementary Data 1). This strategy allows us to report genome-scale data on more than twice the number of ancient Eurasians as has been presented in the entire prehistoric literature.

We used this technology to study population turnover in Europe. We began preparing 312 DNA Extracts from 119 ancient samples in dedicated clean-room facilities, and testing these by light-sequencing and mitochondrial ancient DNA capture (Supplementary Information: section 1, Supplementary Data 1). We restricted our analysis to individuals with molecular signatures of ancient DNA (elevated damage in the terminal nucleotides), indicative evidence of contamination based on mismatches to the mitochondrial consensus sequence. We sequenced a mitochondrial DNA haplogroup that matched previous results using PCR (Supplementary Information: section 2, for 122 Illumina probes prepared as the panel of undamaged DNA decay to enrich exons other than those damaged by DNA damage; we performed 30% capture, carried out paired-end analyses, and repaired the data to the human genome). We restricted analysis to 94 libraries from 69 samples that had at least 0.6-fold enrichment (objective quality control). That control signal was modeled in the same way as the major mitochondrial European haplogroup, and the sample was filtered for a signal of at least 0.6-fold enrichment. The data set revealed a Near Eastern ancestry signal in the main European samples, which we interpret as an ancient North-South European migration event. We use our data set to explore the history of ancient DNA, which reveals a high level of diversity among the samples. We find evidence for ancient European admixture with Near Eastern populations, which we interpret as an ancient North-South European migration event.

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Prehistoric migrations and languages

The Impact of Yamnaya Steppe Pastoralists

- **Yamnaya**
- **Other ancestry**
- **Flow of Yamnaya-derived ancestry**
  All arrows are approximate.
- **Eurasian Steppe**

Subgrouping the Indo-European languages

Proto-Indo-European

Proto-Core Indo-European

4000 BC
3000 BC
2000 BC
1000 BC
1 AD
1000 AD
2000 AD

Anatolian
Tocharian

Italic
Celtic
Germanic
Greek

Armenian
Albanian

Indo-Iranian

Balto-Slavic
How did they talk?

**Spiritual life**
*diẽus ‘Sky God’
*êkred âh₂eh₁- ‘believe’
*h₂ausōs ‘Dawn Goddess’
*puh₂sō ‘God of Pasture’

**Natural phenomena**
*h₂ueh₁ntos ‘wind’
*nokʷts ‘night’
*meh₁nōts ‘moon’
*h₂stēr ‘star’

**Kinship**
*ph₂tēr ‘father’
*suesōr ‘sister’
*daijkeh₂ër ‘husband’s brother’
*yeđh- ‘to lead, to marry’

**Animals**
*mūs ‘mouse’
*lūs ‘louse’
*ulkwos ‘wolf’
*h₁ekuos ‘horse’

**Wheeled vehicles**
*kʷekʷlom ‘wheel’
*h₂aksis ‘axle’
*h₃nebh- ‘nave’
*yegeh- ‘convey in a vehicle’

**Textile technology**
*uebhʰh- ‘to weave’
*h₂ulh₁nah₂ ‘wool’
*sieuh- ‘to sew’
*yes- ‘to wear a garment’

**How did they talk?**

* * *
What did they talk about?

Sky God
Horse Twins

Mythology
Linguistics
Archaeology
How can we know?
The research team

Thomas Olander
Ass. Professor, Copenhagen

Birgit Anette Olsen
Professor, Copenhagen

Jenny Larsson (PI)
Professor, Stockholm

Anders Kaliff
Professor, Uppsala

Anders Jørgensen
Ass. Professor, Uppsala

Peter Jackson Rova
Professor, Stockholm

David W. Anthony
Professor Em., Hartwick College

Peter Jackson Rova
Professor, Stockholm
Advisory board

Agnes Korn
Senior Researcher, CNRS

Joshua Katz
Professor, Princeton University

Kristian Kristiansen
Professor, Gothenburg University

James Clackson
Professor, University of Cambridge

Torun Zachrisson
Ass. Professor, Stockholm University
A collaboration between LAMP and the Swedish Collegium for Advanced Study (SCAS) was established in 2020.
Reaching a wider audience
Karin Bojs
author, science journalist
honorary doctor at Stockholm University

planned publications:

**HOW EUROPE GOT ITS LANGUAGES**

**Wagons, cattle and mead**

The Indo-Europeans and their culture

**Sweden in the Near East**

My European Family—The First 54,000 Years

Karin Bojs

**Photo: Ulrica Zwenger**
The LAMP project

With an ambitious outreach component the project will communicate the understanding of the variability of the linguistic and cultural landscape throughout history to a wider audience. By making the historical facts more accessible to the public, the project will provide a bulwark against nationalism and chauvinism and contribute to a deeper understanding of the complex questions concerning language, culture and religion in modern society.

lamp-project.se