Extracting cultural memory of prehistoric human from language and DNA

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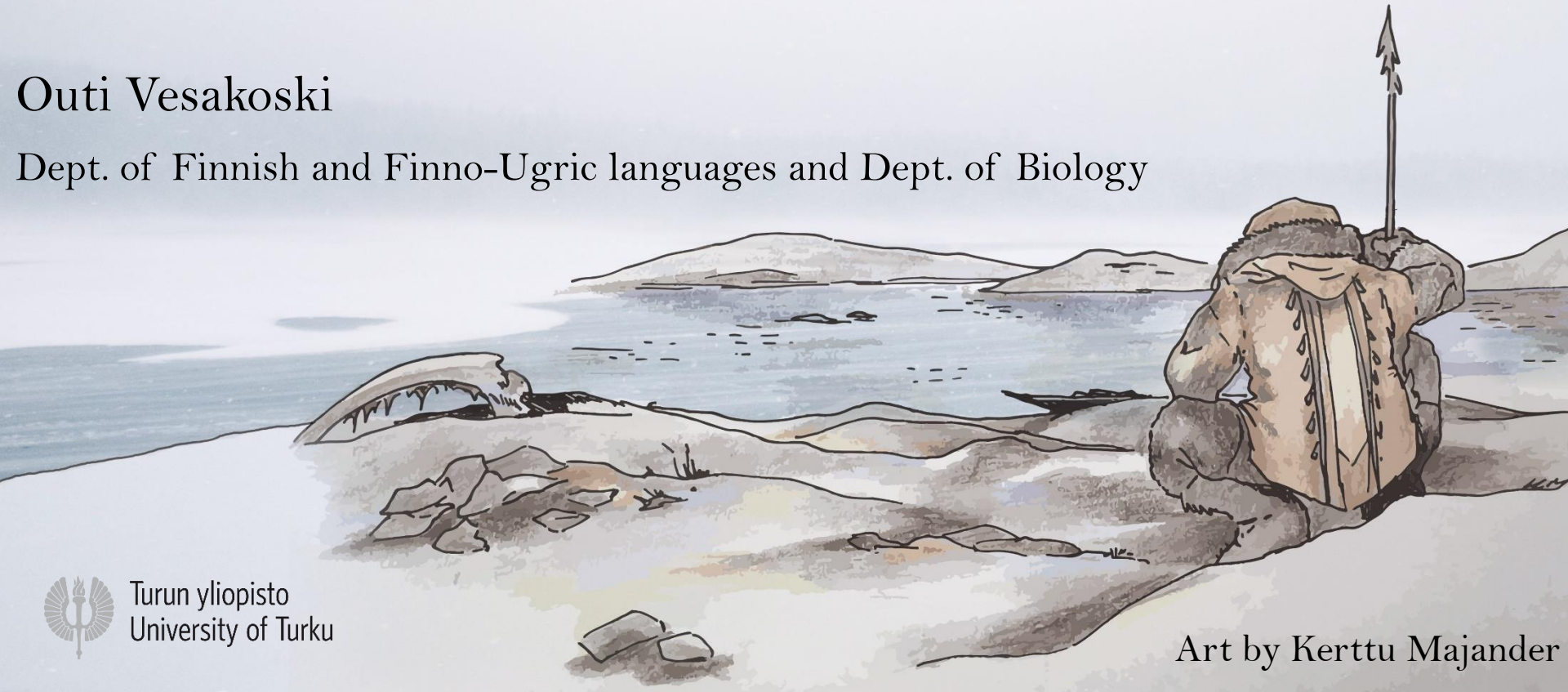
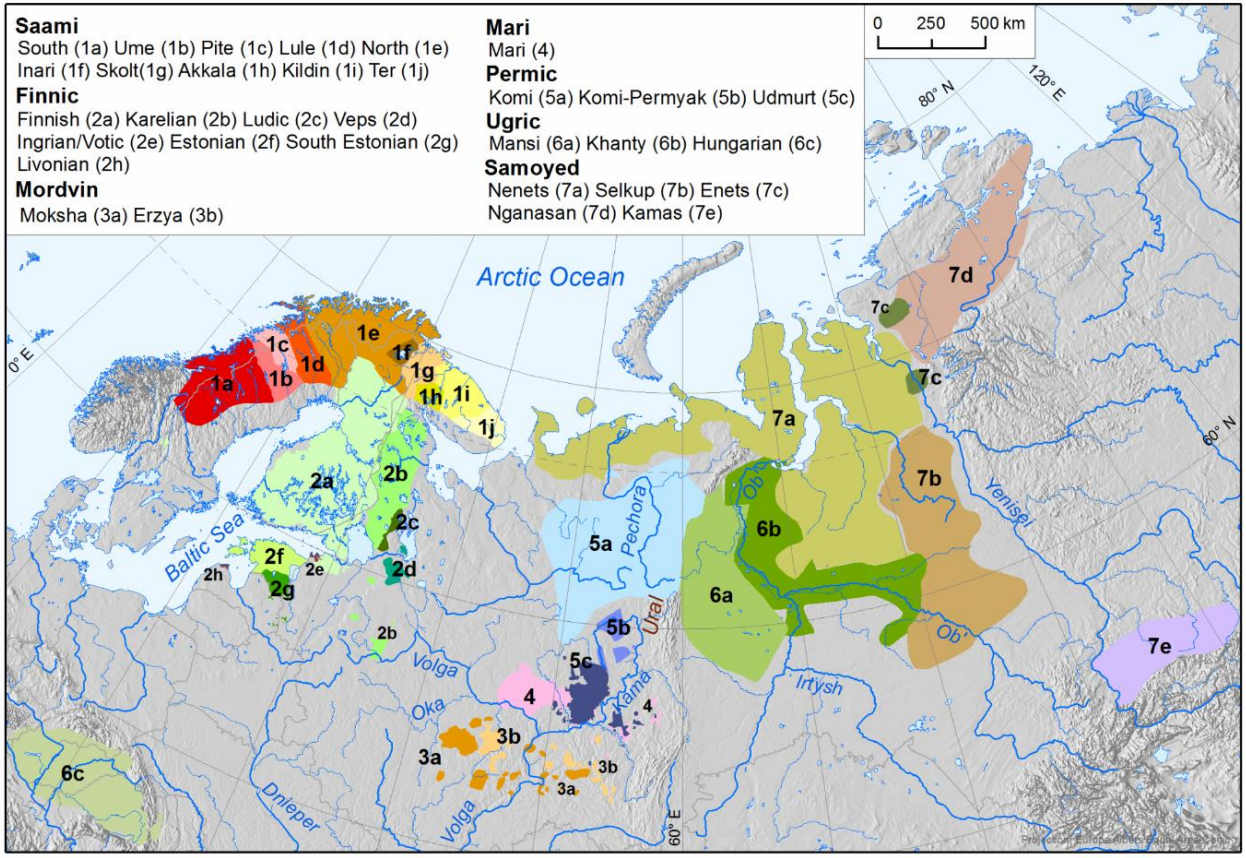


Turun yliopisto
University of Turku

Art by Kerttu Majander

My aim: To **reconstruct the human past** in the Uralic language speaker area…



Source: Geographical Database of Uralic Languages, project by BEDLAN and Jussi Ylikoski (prof of Saami languages in Univ. of Oulu).

…by extracting **cultural memory stored in linguistic, genetic and archaelogical** data

BEDLAN – Biological Diversification of languages

- Linguistic history of Uralic speaker area
- OV, Kone Foundation

SUGRIGE – Ancient Genes of Nort-Eastern Europe

- Prof Päivi Onkamo, Erkko Foundation

URKO – Uralilainen kolmio, *Uralic triangulation*

- Integrative spatial and chronological studies on human and cultural spread in the Uralic speaker area
- Finnish Academy: PO, Sirkka Saarinen, Harri Tolvanen

KIITOKSET

BEDLAN
BIOLOGICAL EVOLUTION AND DIVERSIFICATION OF LANGUAGES

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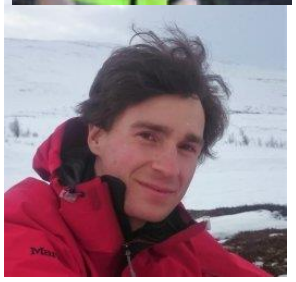

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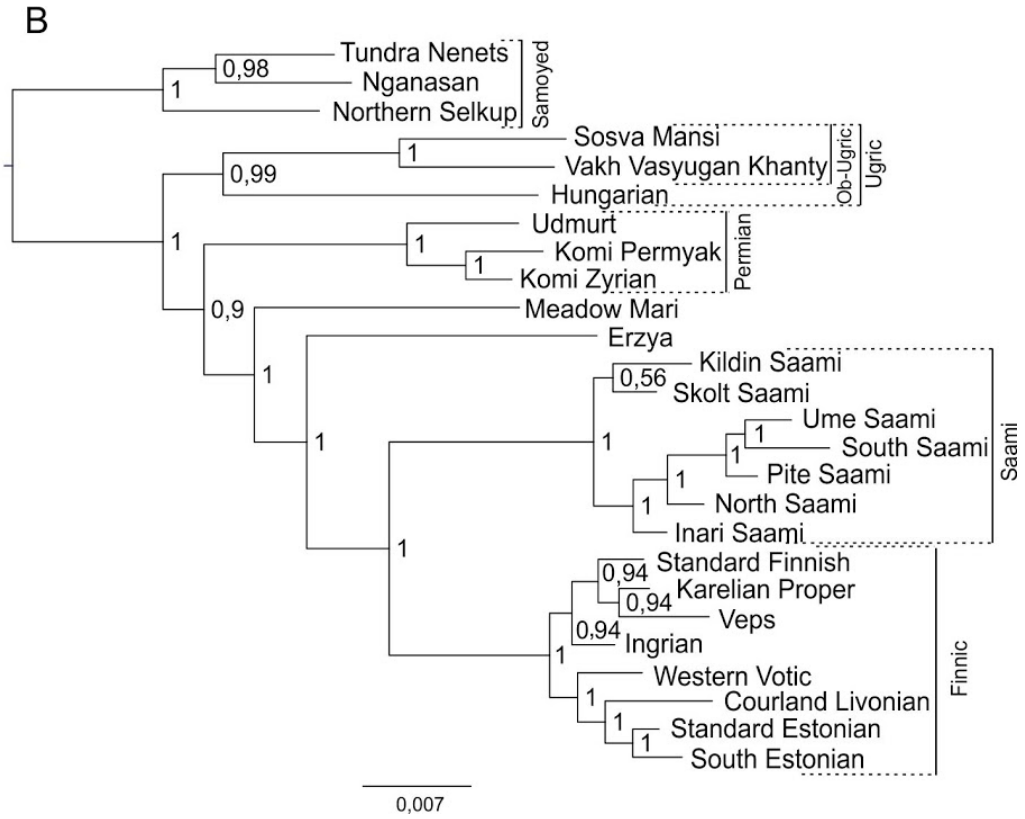
How does language carry memory of prehistory? - Vertical inheritance of linguistic material

- Ancestry of languages, e.g. language families
- Linguistic Comparative Method
- Phylogenetic linguistics extends results from CM



Cognate-coded basic vocabulary and Bayesian tree inference, Syrjänen et al. 2013

How does language carry memory of prehistory? - Horizontal transmission of linguistic material

- De Heer et al. *ms:* Loanword layers in the basic vocabulary (N=313) versus whole lexicon

Standard Estonian

North Saami

Loanword layers in UraLex data
(Syrjänen et al. 2018)

- Baltic
- Germanic
- Early Indo-European
- Indo-Iranian
- Russian
- Scandinavian
- Finnic
- Balto-Slavic
- Proto-Uralic
- Inherited vocabulary or unknown source

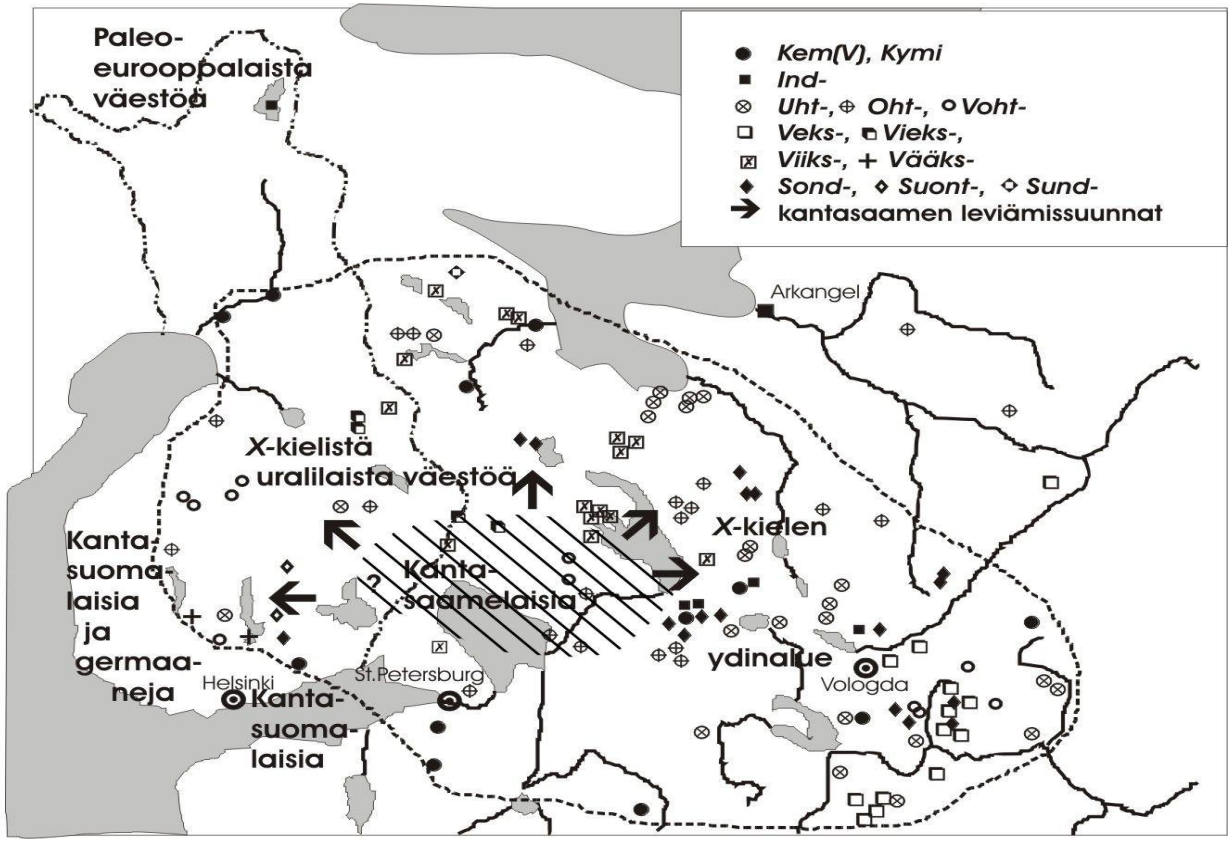
How does language carry memory of prehistory? - Linguistic substrate

- Memory of contacts with language of past speaker populations /past languages

- Restored in place names and vocabulary
  - Often words describing the local ecological environment
  - Substrate in Saami languages include words like *tunturi*, *kopara*, *tokka*

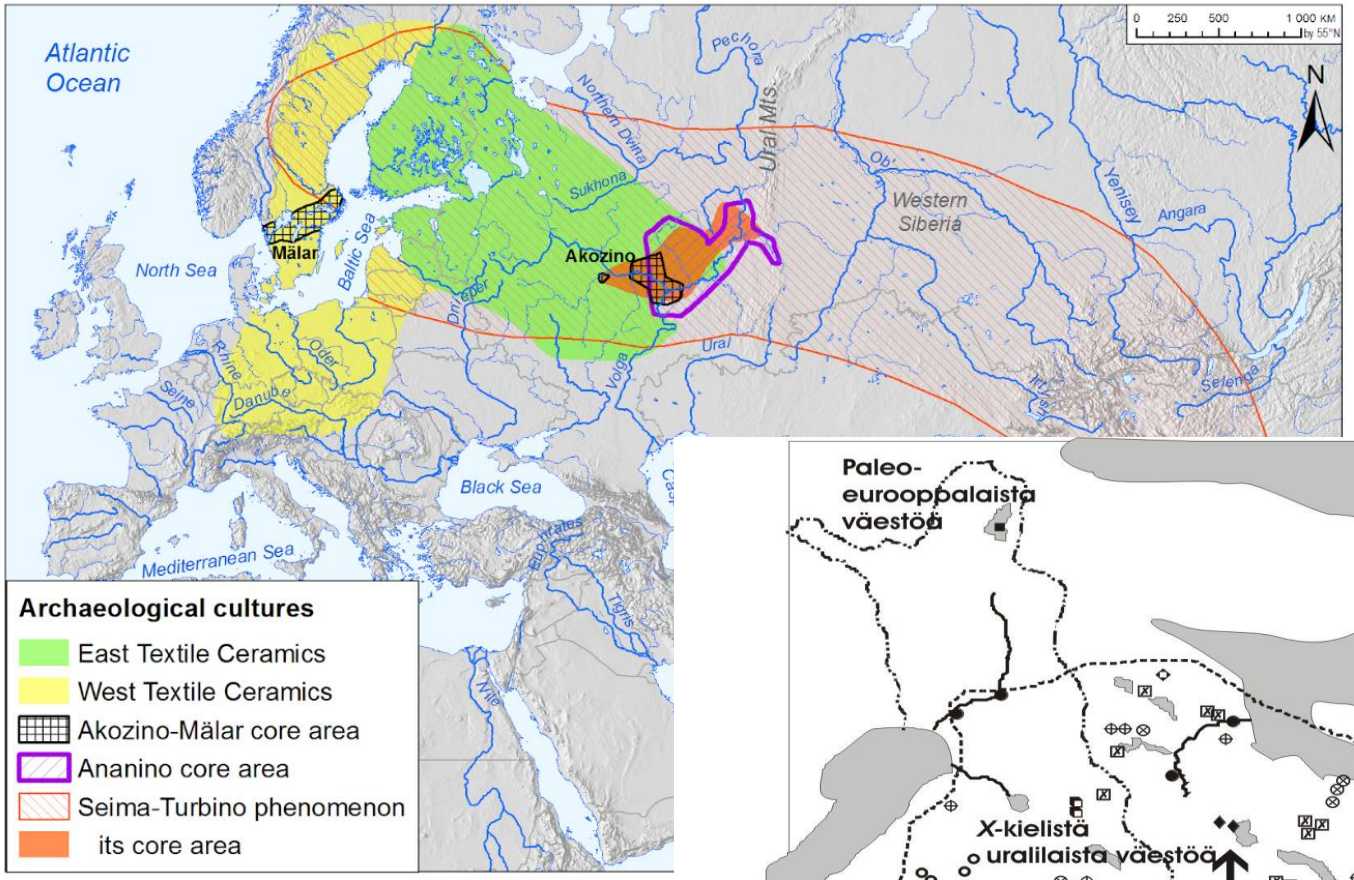
How does language carry memory of prehistory? - Substrate: Place names

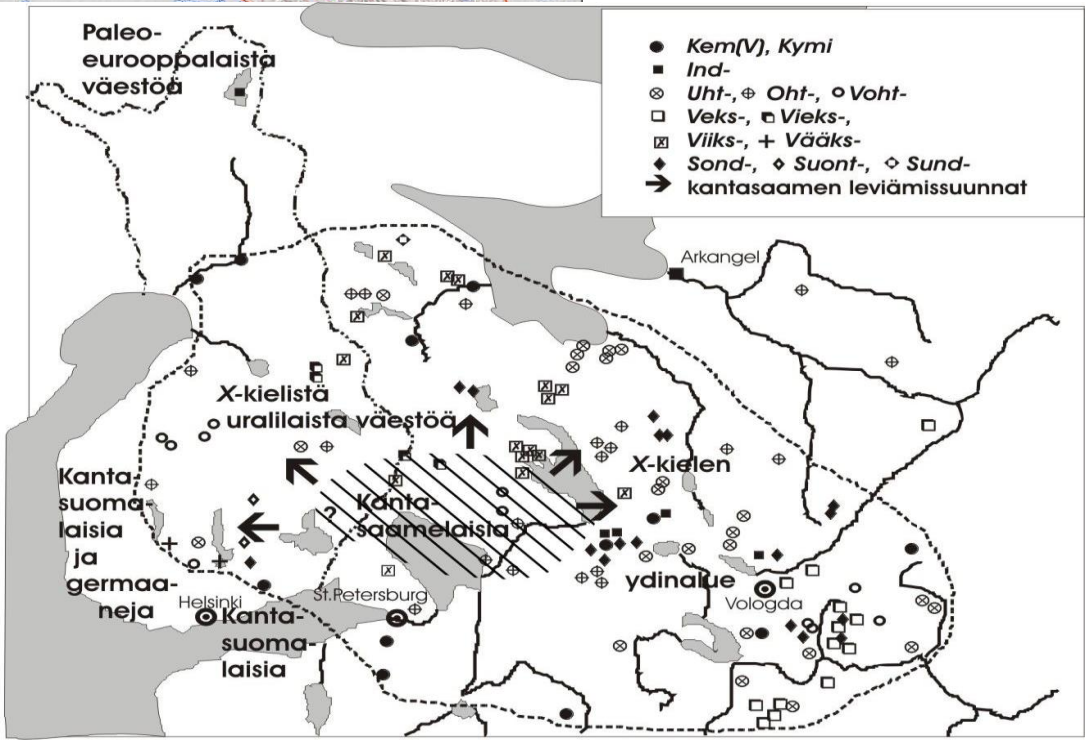
Hydronymes reveal the speaker area of an extinct western Uralic language preceeding Saami and Finnic expansion



Rahkonen 2013

Place names and archaelogy





Map produced for a review of the history of the Uralic speaker area, Salmela et al. *ms*

How does language carry memory of prehistory? - Substrate: Vocabulary

- *Place names* reveal the earlier speaker area of Proto-Saami
- Substrate words show Saami contact to two extinct languages

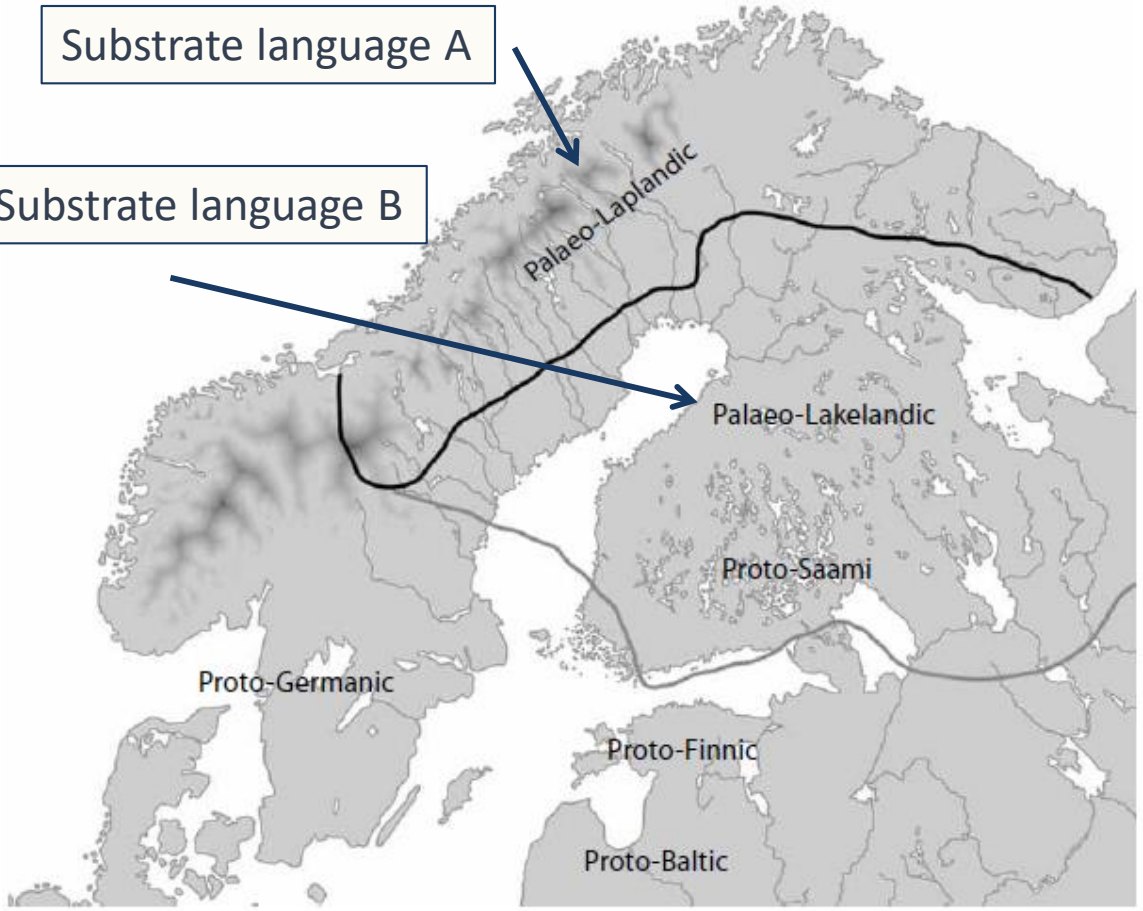


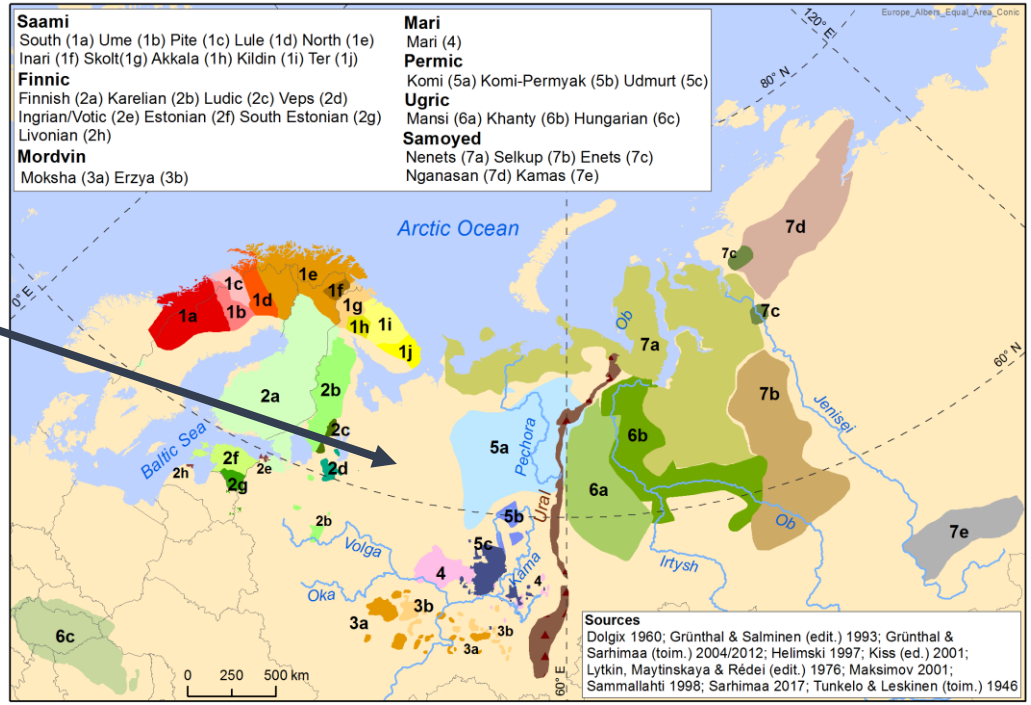
Figure 1. The linguistic situation in Lapland and the northern Baltic Sea Area in the Early Iron Age prior to the expansion of Saami languages; the locations of the language groups are schematic. The black line indicates the distribution of Saami languages in the 19th century, and the gray line their approximate maximal distribution before the expansion of Finnic.

Aikio 2012

Case: Genetic memory and development of linguistic landscape in Central Northern Russia

Finno-Ugrian substrate in Northern Russian dialects indicate earlier FU speaking settlement

Saarikivi 2006



Case: Genetic memory and development of linguistic landscape in North Russia

- Hypothesis 1: Slavic speakers arrived and replaced the earlier FU speaking population but achieved loanwords, and retained place names (***genetic turnover***)
- Hypothesis 2: FU speakers changed their language in contact with Slavic speakers (***language shift***)

Could genetics provide an answer?

Case: Genetic memory and development of linguistic landscape in North Russia

Tambets *et al. Genome Biology* (2018) 19:139
https://doi.org/10.1186/s13059-018-1522-1

Genome Biology

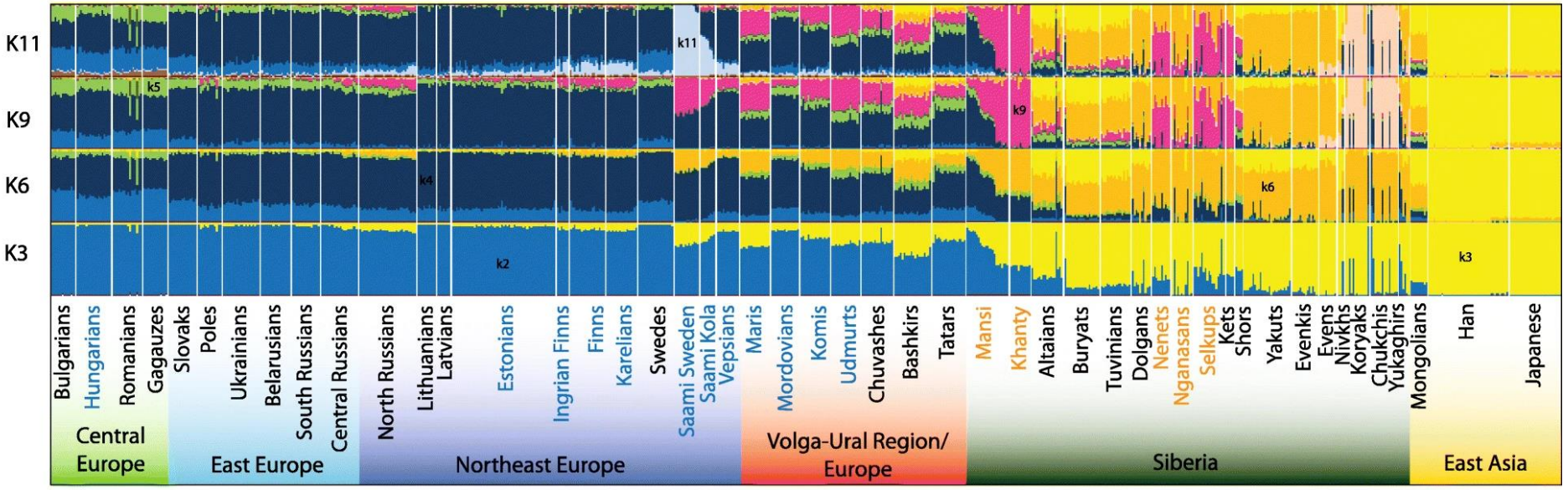
RESEARCH Open Access

Genes reveal traces of common recent demographic history for most of the Uralic-speaking populations

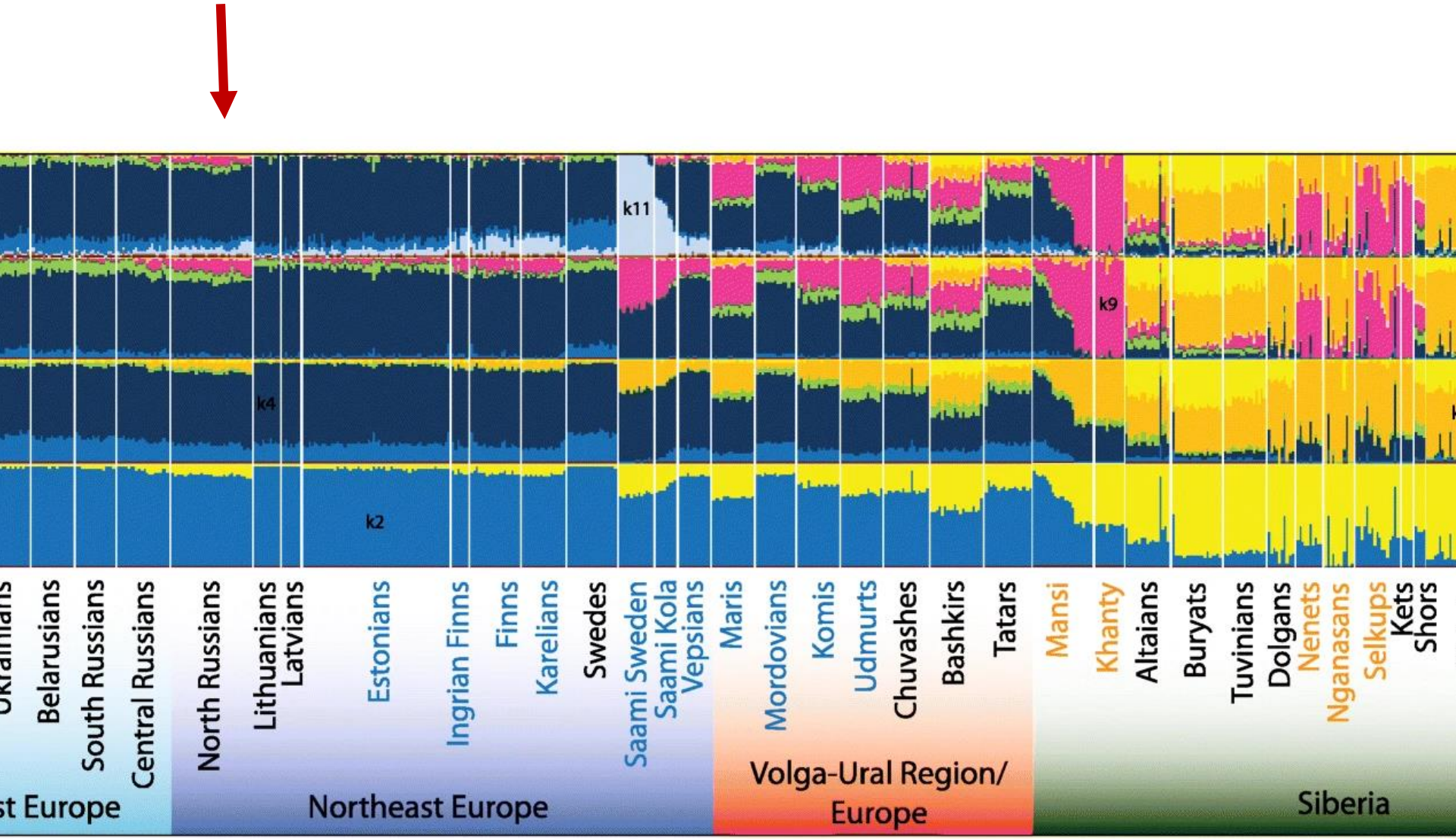
Kristiina Tambets[1*], Bayazit Yunusbayev[1,2], Georgi Hudjashov[1,3], Anne-Mai Ilumäe[1], Siiri Rootsi[1], Terhi Honkola[4,5], Outi Vesakoski[4], Quentin Atkinson[6,7], Pontus Skoglund[8], Alena Kushniarevich[1,9], Sergey Litvinov[1,10], Maere Reidla[1,11], Ene Metspalu[1], Lehti Saag[1,11], Timo Rantanen[12], Monika Karmin[1], Jüri Parik[1,11], Sergey I. Zhadanov[1,13], Marina Gubina[1,14], Larisa D. Damba[1,15], Marina Bermisheva[1,10], Tuuli Reisberg[1], Khadizhat Dibirova[1,16], Irina Evseeva[17,18], Mari Nelis[19], Janis Klovins[20], Andres Metspalu[19], Tõnu Esko[19], Oleg Balanovsky[16,21], Elena Balanovska[16], Elza K. Khusnutdinova[10,22], Ludmila P. Osipova[14,23], Mikhail Voevoda[14,23,24], Richard Villems[1,11], Toomas Kivisild[1,11,25,26] and Mait Metspalu[1]

Genetic memory and population genetic methods

- Lots of populations sampled
- Ethnicity according to the informant's own report
- Cluster the individuals and study the similarity



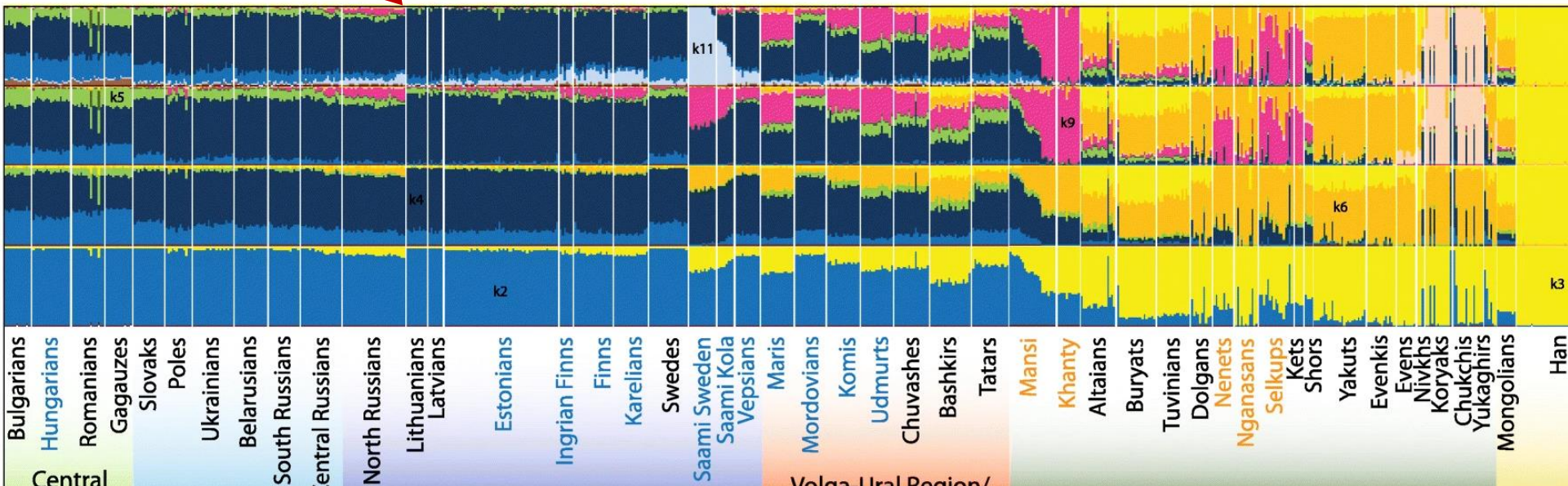
Genetic memory and population genetic methods



Case: Genetic memory explaining the development of linguistic landscape in North Russia

North Russian genetic resemble their Finno-Ugric speaking neighbours, not Slavic speaker populations

Hypothesis 2: FU speakers changed their language (*language shift*)



Human culture and lifestyle: Phenotypic traits of human

- Neolithic (pre-agriculture) European people did not digest fresh milk
- Selection of lactase tolerance 7500 yrs ago
- Tolerance originates from Steppe, incl. Yamnaya horizon?
- Dairying arrived in Mongolian around 3300 yrs ago as **cultural transfer** rather than population migration

See a review of ancient DNA studies by Leonardi et al. 2017
Mongolian dairying Jeong et al. 2018

Human culture and lifestyle: Genetic memory of 2300 yrs old stallions and cultural values of Scythians

- Cognitive and behavioural changes related to **animal domestication**
- **Breeding for** valued traits: milking, movement and tolerance for drought
- **Breeding with** multiple stallions and wild horses
- **Sacrified animals** only stallions and likely gifts from alien tribes

Librado et al. 2017

Source: Britishmuseum.org

Reconstruction of Scythian horseman based on the finds from Verkh-Khaldjin-2, burial mound 3. © Reconstruction D V PozdnjakovRahkonen 2013

Take home message

BEDLAN:
When linguistic contacts included genetic contact?

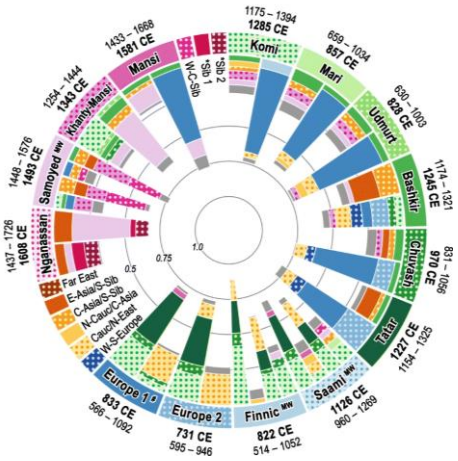
Sociocultural reconstructions are needed to understand human past (Saarikivi & Lavento 2016)

- Usage of genetic memory to fill the gaps in the linguistic memory?
- Parallelling lingustic and genetic memories?

Linguistic contacts in North Saami

Values of ancient cultures are stored in genes

- Ancient DNA studies of human and domesticated animals and plants help to reconstruct the past cultures



Genetic contacts of Uralic speaker pop's in Tambets et al. 2018

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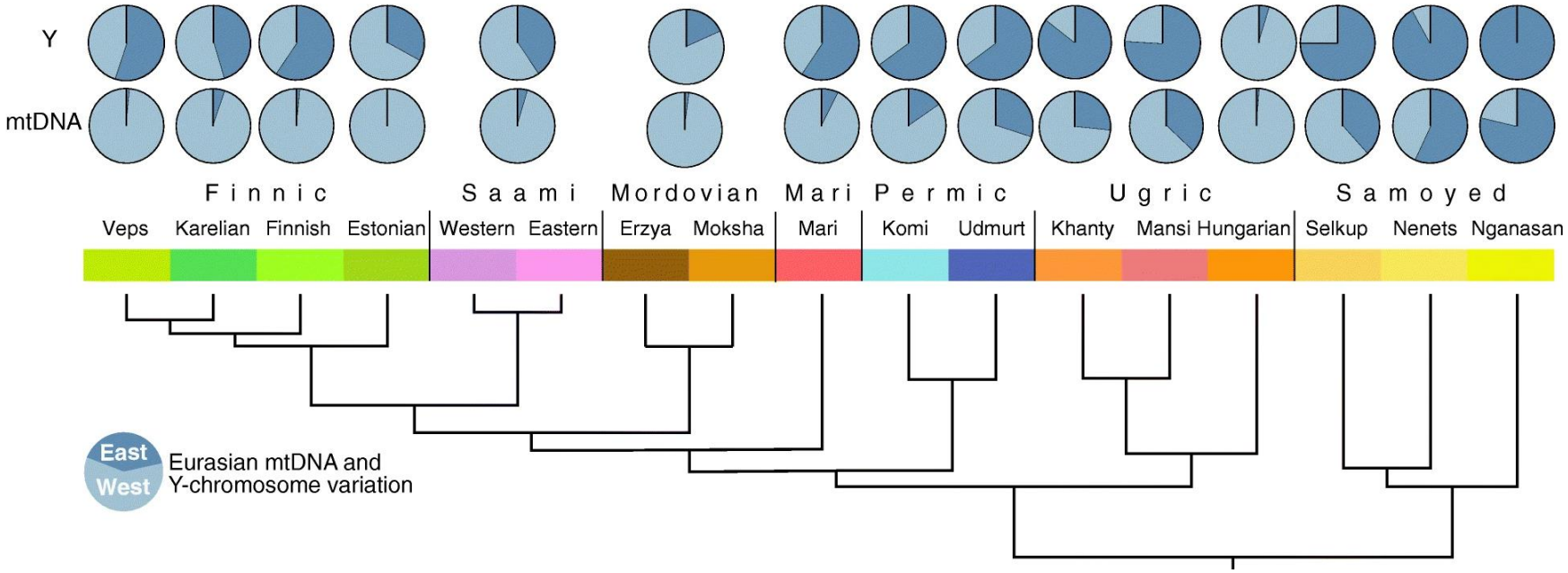
Human ancestry: Male and female lineages

- Y-chromosome (male lineages), mitokondria (female lineages), versus genome DNA
- In Uralic speaking pop's: Central Siberian origin in whole genome, more eastern origin in males than females



Outline of this talk

- How language carries memory of prehistory?
  - Vertical inheritance (e.g. inherited words) show linguistic geneaology
  - Horizontal transfer (e.g. loanwords) indicate linguistic contacts
  - Place names identify former speaker areas
  - Linguistic substrate reveal linguistic turnovers
- Genetic memory
  - Human population genetics and human ancestry
  - Human culture and lifestyle