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A transdisciplinary approach to the origin of Uralic peoples

Németh, E.[1] - Fehér, T.✉[1] – Vigh, J.[2]- Jávorszky, B.[2]-, Szeverényi, S.[3]- Gáspár, Cs.[4]

[1]Hungarian Natural History Museum ✉ jafetie@gmail.com
[2]Independent researcher
[3]Finno-Ugric Linguistic Institute, University of Szeged, Hungary
[4]Department of Mongolian and Inner Asian Studies, Eötvös Loránd University, Hungary

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Abstract
The Uralic language family comprises of over 30 daughter languages spoken from the Atlantic Ocean to the Yenisei River in the Northern part of Eurasia. This article summarizes the most recent linguistic, ancient DNA and archaeological results to identify the original homeland of the Proto-Uralic community. Our conclusion is that Proto-Uralic formed in Eastern Transbaikalia, in the upper Amur River Basin between 8300 and 4200 yBP. The article describes the spread of various Uralic subgroups from the Transbaikal area towards their actual locations after 4200 yBP in connection with the 4,2 kya climatic event, connecting specific Y-SNP subgroups and TMRCA coalescence times with linguistic branches. We describe in detail how the Transbaikal homeland is possible from a paleo-linguistic perspective, including the early Uralic contacts with other language families. From a more ancient perspective, the Transbaikal homeland and the earlier arrival of Haplogroup N to the area from present-day Manchuria also provides the right chronology and location of early contacts with the Macro-Altaic linguistic phylum. We believe that our comprehensive approach provides a feasible solution of the Proto-Uralic homeland challenge and enables further research on the chronological, linguistic, and genetic contacts with other North-East Asian population groups including Yukaghir, Eskimo-Aleut, Turkic, Mongolic, Tungusic, Korean, and Japanese.

Keywords:
Proto-Uralic, Uralic homeland, Ural-Altaic, Prehistoric Siberia, Y-DNA Haplogroup N

Introduction

The Uralic language family comprises of over 30 daughter languages. They are spoken from the Atlantic Ocean to the Yenisei River in the Northern part of Eurasia (Grünthal et al, 2022). The overwhelming majority of Uralic speakers today live in Europe, while in Western Siberia, small Uralic-speaking groups live in relatively large areas. In historical times, the expansion of Turkic languages, and later the Russian language put the Uralic speakers in Siberia under assimilation pressure. Among the extinct Uralic languages, we must highlight Mator as the Easternmost Uralic language, which was once spoken as far as Lake Baikal and became extinct in the early 19th century (Janhunen 2014). Overall, Uralic languages do not form a contiguous geographical area, their speakers live scattered over a vast territory. The widespread and mosaic geographical occurrence over that vast expanse not only indicates a high degree of mobility of early Uralic speakers, but it made mapping their migration routes considerably more difficult.

In fact, it has been only recently widely accepted that the Uralic homeland was in Siberia and not in Europe, where the overwhelming majority of Uralic speakers live today (Grünthal et al. 2022; Nichols 2021; Saarikivi 2022). In addition, important discoveries have been made in the chronology of bifurcations of Uralic languages. The new approach places the split of Uralic languages between 4500 and 4100 BP, in connection with the 4.2 kya event (Grünthal et al, 2022). In Central Asia and East Asia the 4.2 kya event resulted in cooling and intense aridity because of the expansion and strengthening of the Siberian High (Xiao et al, 2018, Perşoiu et al, 2019).

However, the precise or even a general localization of the starting point of Uralic spread, the so-called Uralic Urheimat remained open. Based on the latest archaeogenetic results, the Ymyyaktah culture in Yakutia (Zeng et al. 2025) and the Middle Yenisei region (Németh et al, 2024) have also been suggested as possible Uralic homelands. However, the Ymyyaktah culture started around 4200 years ago, and the relevant samples from the Middle Yenisei region are also approximately of the same age. It is much more likely that none of these two areas were the original starting point of the Uralic spread, but rather we can see the reflection of an already spreading population into both areas.

There is still no satisfactory explanation for certain typological parallels between Uralic languages and some languages of Northeast Asia. Uralic languages have a number of traits shared with the Tungusic, Turkic, Mongolic, and to a lesser extent, Korean, Japonic, and Eskimo-Aleut (Nichols 2021) language families. A plausible explanation for this phenomenon is that the Pre-Uralic community once lived in the Far East in the distant past and reached Western Siberia through a westward migration (Janhunen 2014).

In our study, we present a novel approach to define the Uralic homeland and the migration routes of Pre-Proto-Uralic groups to the Uralic homeland. We followed a comprehensive approach that combines the latest archaeogenetic and linguistic results and takes into account the archaeological aspects. This approach can also

provide an answer to the enigmatic relationship between Uralic and Altaic languages, and it is consistent with the chronology of spread and separation of Uralic subgroups.

At this point, we would like to emphasize that the chronology of language separation and that of paternal lines are comparable with each other but can never be identical because of the different nature of linguistic and biological processes. Linguistic separation is always a gradual process. The languages spoken by two communities can move away from each other for centuries before they truly become independent. The bifurcation of paternal lines is a point-like event, which, on the other hand, does not even imply a separation in the community.

Areal contacts

There are four regional Sprachbunds, that may give us hints regarding the migration routes of the Pre-Proto-Uralic and early Uralic groups. Let us start in the assumed reverse chronological order from the latest linguistic influence and go backwards in time to the earliest Pre-Proto-Uralic linguistic interactions. First, we should have a look at the topic of Indo-European loanwords in the Proto- and Early Uralic, then the Uralic-Yukaghir and Uralic-Eskimo language contacts, and finally the proposed Uralic-Altaic complex.

Indo-European

- There are no unambiguous early Indo-European loanwords in Proto-Uralic (Grünthal et al. 2022).
- Approximately 4,000 years ago, the ancestors of the Finno-Ugric branch absorbed a good deal of vocabulary from the Indo-Iranian branch of Indo-European (Holopainen 2019).
- The Yamnaya expansion - which researchers associate with the spread of the Indo-Europeans - reached the Altai region around 5200 BP, where it left its signs as the Afanasievo culture (Lazaridis et al. 2025).
- So, it is plausible that Pre-Uralic groups lived east of the Altai region or in Western Siberia far North to the Indo-Europeans.

Yukaghir

- Linguists have been interested in the relationship between the Uralic languages and the eastern Siberian Yukaghir languages for a long time. Nowadays it is widely accepted that Yukaghir and Uralic languages are unrelated (Aikio, 2014).
- However, there is evidence for contact between them in the distant past (Aikio, 2014).
- The most likely scenario is that Pre-Proto-Samoyed loans came into Proto-Yukaghir (Aikio, 2014).
- The Yukaghir maternal lines consist of only East Asian lines (Volodko et al. 2008). It suggests that Yukaghirs never lived west of or along river Yenisei, because ethnic groups living around the Yenisei like Ket and

Nganasan have some West-Eurasian element in their gene pool (Volodko et al. 2008).

- The breakup of Samoyedic happened roughly 2000 years ago (Helimskij 1996).

Ural-Altaic Sprachbund

If we go back in time, we find another language group, Altaic, with which the Uralic languages have a mysterious relationship.

- This relationship must be very ancient, and it manifests itself predominantly in typological features (Janhunen 2014).
- The Ural-Altaic complex is best viewed as a macroscopic Sprachbund, assuming a geographic space of linguistic convergence based on secondary areal contacts among the ancestors of Uralic, Tungusic, Turkic, Mongolic, and to a lesser extent, Koreanic, and Japonic language families (Nichols 2021).
- The Mongolic and Tungusic families originated from Iron Age Southern Manchuria. The Korean and Japanese families have an origin in the neighboring Korean Peninsula, also in the Iron Age (Janhunen 2014).
- The Ural-Altaic Sprachbund certainly dates back well before the Iron Age, but based on the principle of random wandering, it is unlikely that 5 of 6 moving groups would meet again in anywhere by chance, after they had left the common starting point. It is much more likely that southern Manchuria or the adjacent areas formed the Ural-Altaic Sprachbund in the distant past.
- Since rivers and coasts were the dominant transport routes in the past, it is plausible that the Pre-Proto-Uralic speaking groups migrated Westward along the River Amur or its tributaries from southern Manchuria. Such major Westward leading tributaries are the Ussuri and the Shonghua rivers.

Eskimo-Aleut

- The Eskimo-Aleut languages are currently spoken in the Arctic regions of East Siberia and North America. Therefore, it is a bit surprising that there is some connection between Uralic and Eskimo-Aleut languages (Nichols 2021). It is quite clear that the two language families are not genetically related to each other, but the similarities raise the question of when and where this ancient connection could have arisen.
- Paleo-Eskimo population predominantly and specifically belongs to the paternal Haplogroup Q-B143, the ancestor found in present-day-Yakutia, in the Kolyma River basin in the Upper Palaeolithic, dated 7952-7658 calBCE (Sikora et al. 2019.). This finding might refer to the Paleo-Eskimo nature of the Syalakh-Belkachi culture.
- The first proven Paleo-Eskimo sample in Northern America from Saqqaq is dated to 2220-1650 BCE (Rasmussen et al. 2010). The latest research confirms the Pale-Eskimo nature of the Belkachi culture, as the Belkachi samples form a clade with a Paleo-Eskimo individual, Saqqaq (Gill et al. 2024). This practically opened a time window for Proto-

Uralic and Proto-Eskimo-Aleut contacts in Northeast Asia between 8300 BP and 4200 BP (Note: Old Bering Sea Inuit ancient DNA samples from Chukotka are still abundant into the medieval period).

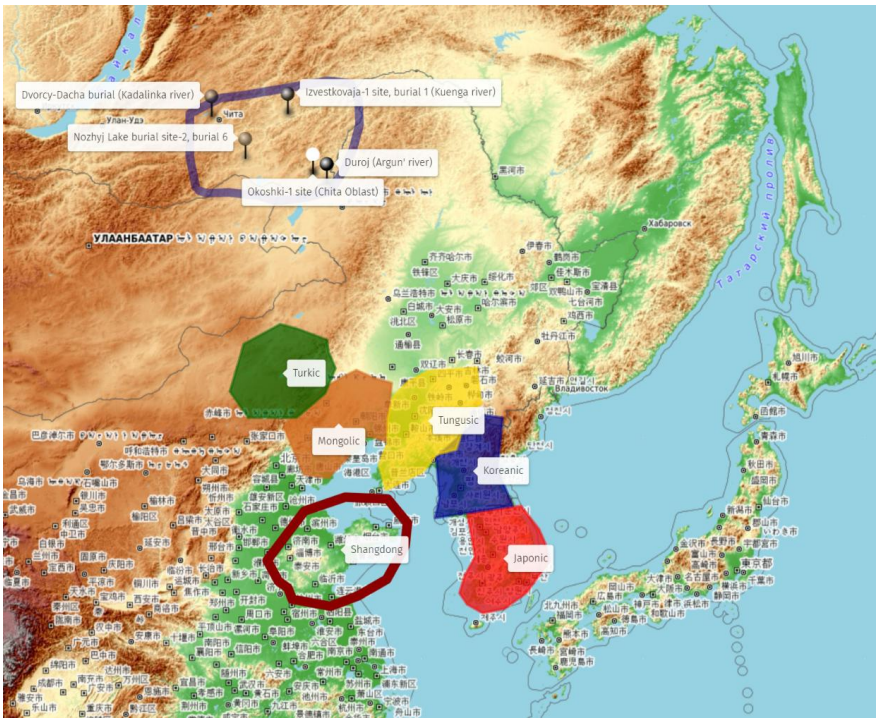

Figure 1: Potential homeland of macro-Altaic languages: green = Proto-Turkic; orange = Proto-Mongolic; yellow = Proto-Tungusic; blue = Proto-Koreanic; red = Proto-Japonic. Proto-Uralic could have been dwelling to the North of them. Shandong is very close to this region, where the earliest N samples were detected. It is not clear, if Y-DNA Haplogroup N originates from that area, but is clear that by 8-9000 years BP Haplogroup N reached that area. The area noted by purple is the assumed Proto-Uralic homeland. The pins are in that area are the analysed aDNA samples from 8300 BP to 3000 BP. The lighter ones indicate the younger, while the darker pins indicate the earlier samples based on Kilinc et al. 2021.

In light of the above observations, an East-West spread of Pre-Proto-Uralic seems rather plausible. The relationships of the Uralic languages with the Eskimo-Aleut, Yukaghir, and Macro-Altaic language families point towards Northeastern Asia. More precisely, a route from southern Manchuria through central Siberia to western Siberia is taking shape, which reached the contact zone with Indo-European groups somewhere in Western Siberia about 4000 years ago. Since in ancient times the transportation routes led along rivers and coasts, we must assume that the path of the Pre-Proto-Uralic group led from Manchuria to Central Siberia along the Amur or its tributaries; and ended somewhere in Central Siberia in the vicinity of the Belkachi culture, present-day Yakutia.

Paleo-linguistics

Paleo-linguistics is not suitable for accurately defining the Uralic homeland, but it is still able to identify some important limiting factors that delimit the location of the Uralic homeland in space and time. Thus, despite the known pitfalls of Paleo-linguistics, we can make the following observation about Proto-Uralic speakers.

- They did not practice food production (Saarikivi, 2022)
- They fished and hunted animals with arrows and bows (Saarikivi, 2022).
- It is unlikely that the Proto-Uralic community lived in the steppe or tundra due to a number of shared words for trees (even if exact species cannot be identified). The most likely scenario is the southern taiga zone origin of Proto-Uralic from the reconstructible Proto-Uralic vocabulary (Saarikivi, 2022). This is a very significant limiting factor in the north-south direction, which, combined with an east-west limiting factor, would be suitable for defining the Uralic homeland. Although the latter so far does not exist in any proposed theory.
- It is uncertain if they knew metallurgy (Saarikivi, 2022). There is only a single reconstructed word with the generic meaning of metal (Vigh 2023). Based on this, it is highly unlikely that the Proto-Uralic community split up in the Bronze Age, because bronze craftsmanship would have required knowledge of at least two metals. It is most likely that the Proto-Uralic community broke up in the Copper Age or even earlier.
- Traditional Uralic linguistic research considered **pata* 'pot'[1] an Indo-European loanword in Proto-Finno-Ugric, and it is missing from the Samoyed branch (Vigh 2023). However, some newer research results do not support a separate Proto-Finno-Ugric stage, only Proto-Uralic and then the well-defined descendant branches (Kallio 2006, Häkkinen 2009). Overall, we have no reason to assume that the proto-Uralic community was unaware of pottery.
- Textile crafts were known based on vocabulary referring to spinning and sewing. They must have known separate transportation modes like rowing and sledging (Vigh 2023).
- Based on genetic data, a very clear asymmetry can be observed between the maternal and paternal lineages of the Uralic peoples. The paternal lineages of Siberian origin connect the Uralic peoples much more than the maternal lineages, which are rather of west Eurasian origin and relate more to neighboring peoples (Tambets et al. 2018). An interesting manifestation of this phenomenon can be observed in the Baltic-Finnic languages, where the etymologies of the most important kinship terms differ. Names referring to paternal kinship are Uralic in origin, while maternal ones are Indo-European.

[1] https://uralonet.nytud.hu/eintrag.cgi?id_eintrag=710&locale=hu_HU

Meaning	Baltic Finnic	Origin	Meaning	Baltic Finnic	Origin
'father'	*isä*	Uralic	'mother'	*äiti*	Indo-European
'boy'	*poika*	Uralic	'girl'	*tytär*	Indo-European
'brother'	*veli*	Finno-Ugric	'sister'	*sisar*	Indo-European
'groom'	*vävy*	Uralic	'bride'	*morsian*	Indo-European

Table 1: Finnic words for paternal and maternal relatives

Altogether, based on Paleo-linguistic observations we are not able to precisely localize the time and space of the Proto-Uralic homeland (Vigh 2023). Nevertheless, we can set up some important constraints. First of all, the breakup of Proto-Uralic must have happened in the Copper Age or even earlier, during the Neolithic (please note that in terms of Siberian archaeology Neolithic is equivalent to European Mesolithic, i.e. traditional hunter-gatherer lifestyle with pottery but without agricultural food production). Furthermore, the Southern Taiga zone is a clear limitation in the North-South axis, but it has no limiting factor in the East-West direction.

Human Population Genetics

We distinguish between the study of samples taken from people living today and those from the distant past. In this study we refer to the first discipline as Human Population Genetics, and to the second as Archaeogenetics. Both disciplines are branches of Historical Genetics, but different types of conclusions can be drawn from them. DNA data obtained from people living today provide a very broad picture of genetic relationships and migrations of cultural groups. All the while the study of ancient DNA can, in many cases, significantly refine or even override the conclusions drawn from recent samples. In our approach both disciplines state valid statements that can be matched to each other.

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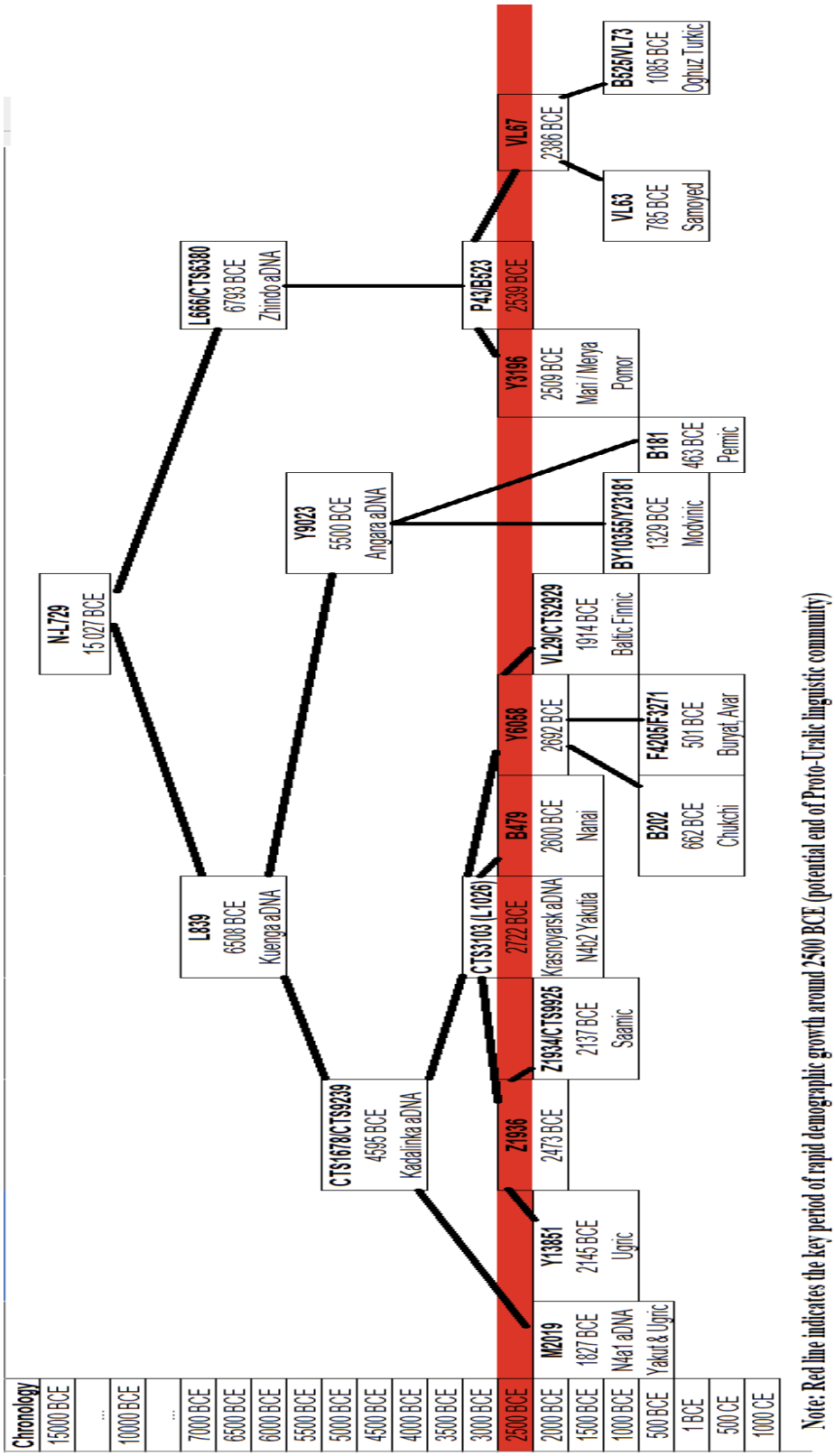

Note: Red line indicates the key period of rapid demographic growth around 2500 BCE (potential end of Proto-Uralic linguistic community)

- Demographic histories of Uralic-speaking populations inferred from maternally inherited mitochondrial (mtDNA) and paternally inherited Y chromosomes (chrY) are different (Tambets et al., 2018).
- This kind of asymmetry between maternal and paternal lines is neither unique nor limited to the spread of Uralic languages. In a mysterious way, between 10,000 and 5,000 BP, the effective population size of men across Eurasia decreased drastically, while maternal lineages showed an unambiguous increase (Karmin et al, 2015).
- Contrary to that, a considerable amount of chrY lineages of both West Siberian and European Uralic speakers belong to East Eurasian Haplogroup N. The only exceptions to this pattern among Uralic speakers are the Hungarians and Selkups.
- Historical reasons can explain both exceptions. The ratio of Haplogroup N in Uyelgi, in the easternmost Proto-Hungarian cemetery in the Ural region is about 70% (Csáky et al. 2020). The Selkup-Ket contacts have always been very close: for centuries Selkups and Kets were allies and marriage partners (Kazakevich, 2011).
- Haplogroup N originated in Southeast Asia (Rootsi et al., 2007). See the haplogroup structure on Figure 2 on the left, and also Family Tree DNA Discover Tree N-M231 and YFull N tree as linked at the end of the References.
- From Uralic point of view N haplogroups has two major important subclades: N-TAT and N-CTS6380.
- N-CTS6380 has two subgroups: the N-B523/P43 and N-CTS11713. N-CTS11713 can only be found among populations living near the coast of Northeast China.
- Regarding N-TAT also has two subgroups: N-B496 (N-Y23747) and N-F1419. The first one, N-B496, can be detected only near the coastal part of Northeast China (these are not shown on Figure 2).
- N-F1419 has two major subclades: N-L839/L708 and N-B187. The geographical distribution of of N-L839/L708 is very complex, characteristic of vast areas from Chukotka to Lapland and will be discussed later in more detailed way. N-B187 is practically non-existent outside of the Altai-Sayan region, and it is especially frequent among the Khakass and Tuvans (Ilumäe et al. 2016, not shown on Figure 2).
- The TMRCA of N-TAT (BP 11 700) (Ilumäe et al. 2016) practically coincide with the end of the Younger Dryas (BP 11 600).
- The TMRCA of lineages-specific N subclades all fall between 4500 and 4000 yBP (see Figure 2, Tibor Feher's work based on Family Tree DNA discover tree TMRCA)
- Examining the correlation of N subbranches between language subfamilies, the most salient values are produced by the subgroup N-VL63 in the case of the Samoyedic population, N-Y9023 in Permic peoples, N-VL29 and N-Z1934 in the case of Finno-Saamic peoples, and N-B539/Y13851 in the Ugric population (Németh et al., 2024).

- In the Finno-Ugric populations N-B539/Y13851, N-Y9023, N-Z1934 and N-VL29 subgroups play dominant roles. All of these are subgroups of N-L708.
- 4 subgroups of N-L708 can be detected frequently among non-Uralic speakers: the N-F4205 among Buryats and its brother clade N-B202 among the Chukchi, the N-B479 among Nanais, and N-M2019/M2118 among Yakuts (Ilumäe et al. 2016).
- It is an open question if the N-Y9023 and N-VL29 subgroups in the Berezovka and Beloyarsk Khanty gene pool, which are typical of European Finno-Ugric peoples, were originally present in the early Khanty gene pool or they only appeared there via some unknown migration processes (Ponomarev et al. 2024)
- N-B478/VL63 under N-L666 frequent among Samoyeds and N-L708 frequent among Finno-Ugric branches separated more than 18,000 years ago (Ilumäe et al. 2016), which represents a linguistically uninterpretable time depth.
- It makes the relationship between N-L708 and N-B478/VL63 under N-L666 even more contradictory from Uralic perspective that another subgroup of N-L666, the N-Y1396 is also present specifically among Maris.[2]

It is likely that both N-P43 and the ancestor of N-L708, N-TAT originated in North-east China. It seems that the climatic conditions that became more favorable with the end of the last wave of cooling in the Ice Age played a positive role in the demographic expansion of the N-TAT subgroup around 11 600 BP. This spread must have started close to the Pacific Ocean, but it certainly moved inland very quickly, because the N-F1419 (TMRCA 10 700) can be found only in Central Siberia, and Western Eurasia.

The movement of N-L708 and N-B523 subgroups had a strikingly similar trajectory to what Janhunen predicted for Pre-Proto-Uralic based on linguistic research. Since early human migrations took place mainly along the coasts of rivers and seas, we must assume that the human groups carrying the relevant N subgroups set off along the Amur River basin towards Central Siberia.
It is an open question whether the N-L708 and N-B523 subgroups, which separated 18,000 years ago, moved together for millennia or they simply crossed their paths sometimes. If the latter is true, then we must assume that similar biogeographical and other constraints resulted in these encounters. There is an example for such an event among Uralic speakers: the dual migration route of N-VL29 and N-Z1934 to Suomi/Finland (Preussner et al, 2024). If the former is true, then we must assume an extraordinary and highly unlikely cohesion in the culture of groups carrying these N subclades. In any case, the demographic expansion of the most important

[2] Please note that authors have collected Y-DNA from contemporary Hill Mari, who are less prone to Russian admixture due to isolation, and 10 out of 20 unrelated males (50%) belonged to this N-Y3196 subgroup (unpublished data), while the remainder belonged to various diverse subgroups - special thanks to Nikolai Palutov for the sample collection and Nadezhda Efemich for support.

N subgroups from the Uralic point of view occurred almost simultaneously, suggesting that these groups successfully adapted to the 4200 BP event at the same time. The synchronous demographic expansion of many N subgroups is shown at Figure 2 above.

Archaeogenetics

- The earliest detected N samples are from Shangdong, North-East China (M. Yang et al. 2022) around 9-10 millennia ago. The Shangdong samples belong to N-Z1934, which today can be found only in China.
- Significantly later, but also in North-East China the Hongshan culture (6500 to 5000 BP) is dominated by N(xN1a, N1c) (Cui et al, 2013).
- In time, the N samples from Shangdong are followed by samples from the Cisbaikal and Trans-Baikal regions. The earliest Cisbaikal N sample has been found near Irkutsk, it is from around 8800 years BP (Kilinc et al. 2021), and it belongs to N-L666. We should also note that L666 ancient DNA Kitoi samples from the Western shores of Lake Baikal (Damgaard et al. 2018 - including DA245, DA248, DA250, DA251, DA359, DA362 - as well as from sample I0999 Zeng et al. 2025) form a dead-end N-FT210118 without any known descendants today.
- The earliest N-Tat could be found in the Fofonovo culture on the East shore of Lake Baikal (Kilinc et al. 2021, Zeng et al. 2025, Sirak et al. 2020). The deepest analysis showed that the Fofonovo samples belongs to N-B187 (Sirak 2020), which is brother clade of N-L708.
- The earliest N-L708 samples could be found in the Trans-Baikal region (Kilinc et al. 2021).
- Sample brn008 (Kilinc et al. 2021) on the Kadalinka river in the Trans-Baikal is C14 dated to 5511-5374 BCE, which is very close in time to the TMRCA of L708 (5900 BCE), which it belongs to.
- Sample brn003 (Kilinc et al. 2021) on the Kuenga river in the Trans-Baikal is C14 dated to 4690-4519 BCE, which is very close in time to the TMRCA of M2126 (M2005), a subclade of L708, 5085 BCE and completely matching the age of the largest M2126 subgroup, N-CTS9239 (4594 BCE).
- The Trans-Baikal region shows genetic continuity between 8300 BP and 3000 BP (Kilinc et al. 2021).
- Trans-Baikal genetic type reached the Cis-Baikal region approximately 4,300 years ago (Kilinc et al 2021).
- It is interesting that two archaeological sites or cultures are genetically linked to Uralic migrations around 4200 BP. The Neftoprovod sites along Kan River at Middle Yenisei area, and the beginning of the Ymyyakhtakh culture are all dated to around 4200 BP, although we have to note that the oldest sample from Yakutia (N4a1 from Kilinc et al.) is dated between 2832-2474 BCE. Thus, the movement down the Lena River might have already started a few centuries earlier.
- The N-Y9023 branch prominent among Permic and Mordvin speakers on the other hand shows up Northwest of Lake Baikal on the middle Angara

River (sample I1961 from Zeng et al. 2025, aged 4239-4002 calBCE (6200 BP); S1961 on Yfull). However, this sample is not ancestral to the Permic and Mordvin groups (Y9022+ while the aDNA sample is Y9022-) but represents an old "uncle" whose lineage went extinct.

- The earliest samples of N-CTS6380, being dated also close to its TMRCA, are from Zhindo on the Chikoy river, near the triple border of Mongolia and Russia's Republic of Buryatia and Trans-Baikal District (NEO115 and NEO117 from Allentoft et al. 2024). These samples can be direct paternal ancestors of N-B523/P43.
- Based on autosomal markers, the Ymyyaktah culture consists of 3 groups: 50% Trans-Baikal, 40% Belkachi, and 10% Amur (Zeng et al. 2025). The most likely explanation for this phenomenon is that groups from the Amur region arriving through the Trans-Baikal region migrated to present-day Yakutia and mixed with the Paleo-Siberian (Y-DNA Haplogroup Q) Belkachi culture inhabitants living there.
- The TransBaikal_8300_3000_BP group (Kilinch et al 2021) was genetically close to the Neolithic individuals from the Devil's Cave in the Primorsky Krai of Russia.

The Amur origin of TransBaikal_8300_3000_BP is supported by their closeness to the Devil's Cave sample. The Trans-Baikal region is the earliest region where L708 has been detected. Furthermore, L666 has also been found here, and it gives a possible explanation for the mysterious joint occurrence of the N-L708 and N-L666 subgroups among the Uralic peoples. The chronology of reaching the Cis-Baikal region also fits into the latest model as explosion begun from that area around 4200 BP. Altogether the Trans-Baikal region seems to be an important station in the Uralic migrations where they spent around 4000 years and some groups stayed further after 4200 BP.

Geographical environment of the Trans-Baikal region

The Yablonovy Mountains divide Transbaikalia into a Western and Eastern part. The Yablonovy Mountains are a watershed between the Amur, Lena and Yenisei River basins. This means that crossing the Yablonovy Mountain range leads from the upper reaches of the Amur to the upper reaches of the Yenisei and Lena. That is, crossing the Yablonovy Mountain opens up easily passable waterways Northward within Central Siberia and from Central Siberia to Western Siberia. Four major river valleys shape the Eastern Trans-Baikal region. The Shilka originates from the confluence of the Ingoda and Onon, and the Amur from the confluence of the Onon and Argun. The Ingoda is the northernmost of these rivers, and the Argun is the southernmost.

The weather of Trans-Baikal today is generally characterized by long autumn and spring droughts. The spring is windy, with high insolation. Flora is predominantly Trans-Baikal coniferous (Pinus pumila, Larix czekanowskii, L.sibirica, Pinus sylvestris, Pinus sibirica and others) distributed in the zone of permanent or discontinuous permafrost, on around 76.4% of the total forest area. Due to the nature of

vegetation and topography, the area is particularly prone to forest fire during windy, dry periods (Rylkov, 1996).

Returning to the 4.2 ky event, there is evidence from the neighboring Hulun Lake in Inner Mongolia, which reveal a major dry period from 4210 to 3840 BP (Xiao et al, 2018), while records from Wudalianchi Crater Lake in the Lower Amur region indicate a sharp decline in evergreen broadleaf forests (Kaboth-Bahr 2021). Taiga fires are presumed to have been frequent in this period in the Eastern Trans-Baikal region.

Archaeology

Our results have highlighted the Neolithic Trans-Baikal region, especially its Eastern part as an important place for the prehistory of the Uralic-speaking peoples. Most of the sites in Neolithic Eastern Transbaikal can be found in the Onon river valley, but some sites are known along the Ingoda and Argun rivers as well (Parzinger 2006). By the Early Bronze Age, the center of gravity of the sites had shifted to North, to the valley of the Ingoda River (Parzinger 2006). This region is archaeologically less investigated than the Cis-Baikal area, only a brief outline can be presented here. The surrounding archaeological cultures are summarized in the table below (Parzinger 2006):

Region/Period	Early Neolithic	Late Neolithic	Copper Age	Early Bronze Age
Middle Yenisei	Kazacka	Kazacka	Kazacka>Afanasievo	Okunevo
Tuva	Toora-Das	Toora-Das	TD> Afanasievo	Okunevo
Cis-Baikal	Kitoi	Serovo | Isakovo	Glazkovo	Glazkovo | Sumilicha
W. Transbaikal	Muchino	Niznaja Berezovka	Glazkovo-Fofonovo	Glazkovo-Fofonovo
E. Transbaikal	Chindant	Budulan	Amogolon	Amogolon
Amur	Novopetrovka	Gromatucha	Kondon	Voznesenovka
Pacific Coast	Boisman	Zasyanovska	Zasyanovska	Zasyanovska
Yakutia	Syalakh	Belkachi	Belkachi	Ymyyakhtakh

Table 2: Archaeological cultures of North-East Asia from Early Neolithic to EBA.

Our first important observation is that in the examined periods, the archaeological cultures in the wider environment of the Trans-Baikal region were located as “islands” and did not form a continuous area covering the whole Central Siberia.

The eastern part of the Trans-Baikal region is linked to the South Siberian Neolithic together with the Northern Chinese and Mongolian area of the same period. As we mentioned before, the region is poorly investigated, only the early Neolithic Chindant, the middle Neolithic Budulan and the late Neolithic Amogolon stages can be identified. The pottery tradition of the Omogolon-stage shows a connection to the Eneolithic material, therefore some researchers are classifying only the Chindant and Budulan to the Neolithic period (Parzinger 2006, 91, Ponomareva 2019, 70). The net decoration of Chindant-pottery has connections with the Gromatucha-

groups of the Middle Amur region, although cord decorations and incisions are more frequent (Parzinger 2006, 91, Ponomareva 2019, 70).

The younger Neolithic is present by the sites of Budulan and Aryn-Zhalga. The pottery sherds excavated in these sites have their roots in the Chindant-tradition, but the notches and other decorations (comb impressions, zig-zag and herringbone motifs) have greater importance. These stylistic variations have their own connections with the Cisbaikal, Tuva and Middle Yenisey regions (Studenoe 2-5, Ulan-Chada IX, Toora-Dash 1-2, Kazachka VI, Unjuk). The bone implements known from Aryn-Zhalga reveals close connections with the grave goods of the late neolithic graves of the Serovo-group of the Cisbaikal area (Parzinger 2006, 91). The Darashun-pottery of the Eastern Trans-Baikal shows clear connection with the decoration of the Budulan pottery tradtions. Furthermore, other similarities in the bone implements and flint tools can be recognized (Parzinger 2006, 92, Ponomareva 2019, 74). Graves are rarely known, we have to mention the burials of Ozero Nozhi, where the bone and flint tools (flint arrowheads and blades, bone daggers, wild boars tusk and bead necklaces) are similar to those of the Late Neolithic Serovo groups in the Cisbaikal area, although the equipment does not clearly indicate a group of hunters. We can identify further differences in the burial rituals, but we do not have enough explored graves to give a detailed comparative analysis of the burial rituals across Siberia (Parzinger 2006, 92). According to the newer research the cemetery has been dated to the Early Neolithic based on the similarities with the Kitoi burial rites (Ponomareva 2019, 74).

The Eneolithic Amogolon group has also been barely investigated, only a few conclusions can be made. The waffle-like impressions show clear connections with the Ymyyakhtakh culture in Yakutia and the Glazkovo culture of the Cisbaikal region. Based on these similarities the Amogolon-group can be dated between the late 4th Millenium and the beginning of the 2nd Millenium BCE. Furthermore, it is an open question whether the Southern Siberian or the Northern Chinese development was followed by the Amogolon-group. Currently the use of metals and early agriculture is debated (Parzinger 200, 204-205).

Conclusion

All the most recent archaeogenetic studies look for the Uralic homeland east of Lake Baikal. According to full genome analyses of Maróti et al. 2022 Fofonovo, according to Zheng et al. 2025 Ymyyakhtakh culture is the most likely origin of Proto-Uralic speakers. In our view, both archaeological cultures show the presence of the Uralic people, but neither is the original Uralic homeland. Zheng et al. 2025 recognizes the importance of Transbaikalia and the Amur River basin for the origin of Ymyyakhtakh culture, but they did not yet recognize them as a source. The main difference between our approach and Zeng's is that we place emphasis on both paternal lines and the full genome analysis, considering the presumed importance of clan organizations in early Uralic groups. However, we would like to emphasize that Zeng also observes that the relative majority in the Ymyyakhtakh culture is of Transbaikalian origin.

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Based on the comprehensive description of genetic, linguistic, and archaeological evidence and geographic circumstances, we can conclude that the most likely scenario for the emergence of the Proto-Uralic linguistic community is the following: Pre-Proto-Uralic groups were residing in Manchuria, in the beginning of Holocene. We consider it possible that the variants of the world creation myth, the Earth-Diver Myth, which regularly occurs among Uralic peoples but also some non-Uralic ones (Napolskikh, 2012), may date back to this very distant era. The Pre-Proto-Uralic population moved to the Upper Amur region 8-9 kya BP via the Amur River valleys from the Lower Amur-Ussuri area near the Pacific coast. That westward shift might have been partly connected to the 8.2 kya event (rapid global cooling).

Further research may clarify that route in a more detailed way. A possible intermediate station could have been in the Middle Amur region, one representative of which is the Gromatukha culture, which shows some archaeological parallels to the Chindant culture of Transbaikal region. The Gromatukha culture in the Middle Amur region became one of the most ancient Neolithic cultures among forest and riverine hunter-gatherer cultures, new – not yet consensual – dating putting it between 16 and 8 thousand years BP (Pavlu et al. 2019). It would be important to collect ancient DNA from this culture as a potential source of Pre-Proto-Uralic.

Proto-Uralic linguistic community was then formed in present-day Trans-Baikal region of Russia, between the Yablonovy Mountains and the Shilka/Amur River between 8300 to 4200 years BP. Around 4200 years ago or a few generations earlier the Proto-Uralic community broke up and started climate change-driven expansions into various directions along river valleys. The crossing of the Yablonovy Mountains around 4300 BP opened the way east and west, through the Lena and Yenisei watersheds. Buryats, especially the Eastern Buryats – even though not speaking a Uralic language anymore – represent the descendants of the Proto-Uralic population which stayed in their original “Urheimat”.
From the eastern Trans-Baikal region, the Lena basin can primarily be reached by waterway through the Vitim, possibly via the Olyokma. From the Ingoda basin, the Baikal-Yenisei water system is reachable through the northeastern tributaries of the Selenga, primarily the Khilok, followed by the Uda and the Chikoy as waterways. And finally, the Baikal-Yenisei water system is accessible through the Lena River as well – since the source of the Lena is located in close proximity to Lake Baikal. The general view is that there are no toponymic layers anywhere that could be identified as Proto-Uralic (Saarikivi 2022). This scenario is very likely, because we are talking about a relatively small population in the distant past. In any case, further research may be worth examining the place names in the basins of the Vitim and Ingoda rivers.

Our model is in accordance with the early linguistic contacts of the Pre-Proto Uralic language. The Ural-Altaic Sprachbund must have been situated in the Amur-Songhua-Ussuri River basin in the early Holocene. Upon arriving in the Transbaikal region, they interacted linguistically with the paleo-Eskimos from the neighbouring

Belkachi culture sometime between 8300 and 4200 years ago, probably through female-mediated gene flow (marital exogamy). It is also understandable that the Uralic groups arriving in the region of Lena and Kolyma river valleys could have left their mark on the Yukaghir language. It is also clear that Indo-European language contacts could not have happened earlier than 4300 BP, because before it the geographical distances between the easternmost Indo-Europeans and the westernmost Uralic people excluded this possibility.

The Transbaikalia region also offers an explanation for why such remote N subgroups, like L-L708 and N-P43/B523, could have played such an important role in the Uralic ethnogenesis. The archaeogenetic studies confirmed the presence of both subgroups in the Neolithic Transbaikal. Even if the two subgroups arrived in the area independently of each other, the millennia spent in close proximity to one another surely led to linguistic convergence.

The Transbaikal region, as a starting point with the rivers originating from there, also clarifies the current extremely complex geographical location of the N-L708 subgroups. N-Y9023 typical for Permic (N-B181) and Mordvin (N-Y23181/BY10355) speakers likely traversed Lake Baikal from the North into the Angara Basin. N-M2126/M2005 stayed around the Yablonovy mountains longer and spread out in different directions. Baltic-Finnic VL29 and Ugric-Saami Z1936 traversed the Baikal from the North in the footsteps of Permic and Mordvin groups, getting into the Angara-Yenisei Basin from the Upper Lena (kra001 in Krasnoyarsk 2336-2135 calBCE). While later Turkified proto-Yakut M2019 moved northeast downriver the Lena. N-B479 typical for Nanai (Illumäe et al. 2016) moved back East along the Amur River. While N-B202 moved northeast (toward Chukotka) probably also along Lena or along the Zeya to the Kolyma basin, absorbing Eskimo-Aleut populations who stayed in Northeast Asia. Furthermore, some (N-F4205) stayed in the original homeland and participated in the formation of the Buryats. A part of this group later reached the Carpathian Basin (as a component of the Eurasian Avars) and Central Asia (as part of the Turkic peoples). The northwestern branch took part in Seima-Turbino migrations (Samus and perhaps Krotovo), Baltic-Finnic (N-VL29) and Saami (N-Z1936>Z1934/CTS9925) groups reaching the Baltic and White Sea coast between 2000 and 1500 BCE while Ugric N-Z1936>Y13851 staying on the Western Siberia. In any case, according to the available archaeogenetic data, the Seima-Turbino phenomenon may have played only a limited role in the spread of Uralic-speaking groups and was not dominantly Uralic. The occurrence of haplogroup N is dominant only at the Tatarka Hill archaeological site, which shows parallels to the Samus subgroup. At other Seima-Turbino sites, the occurrence of N haplogroup is sporadic or does not occur at all. Seima-Turbino was most likely a multicultural phenomenon in which Uralic speakers did not play a defining role.

At the same the same time N-P43/B523 typical for Samoyedic (N-VL67) and Mari (N-Y3196) speakers moved West south of Lake Baikal into the Minusinsk Basin (Yenisei valley). Afterwards, Permic, Mari and Mordvin groups moved further

West through the Southern Urals in the Volga-Kama basin while Samoyedic groups stayed (Kamass and Mator) and later moved northwards up the Yenisei (Enets and Nenets), while some of them were Turkified (N-VL73, 2300 years old subgroup of VL67), what have the linguistic sign in the Upper-Yenisei Sprachbund involving especially Khamas, Mator, Shor and Khakass, and to a minor extent Tuvinian and Tofalar languages (Helimski, 2004).

Due to the migrations described above, Hg N subgroups spread in less than a millennium from the Baltic coast to Chukotka all over North Eurasia, proving the extreme mobility of this population. They most likely travelled these distances on ski and boats, which would be also in line with Proto-Uralic vocabulary. If we compare the Trans-Baikal region with the neighboring Cis-Baikal region, we must conclude that the Trans-Baikal region has proven to be demographically very successful. During the Neolithic period, the Cis-Baikal region was much more populous than the Transbaikal region (Kilinc et al., 2021), but today the descendants of the Uralic forefathers are significantly more numerous than the descendants of Cis-Baikal Neolithic.

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