



DNA Tribes® Digest October 1, 2012  
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## Introduction

Hello, and welcome to the October 2012 issue of DNA Tribes® Digest. This month feature article explores genetic links in Eastern Europe based on both autosomal STR and autosomal SNP data.

The historical background emphasizes the possible role of Copper Age and Bronze Age agricultural expansions in shaping Eastern European genetic structure. In particular, the analysis highlights periods of early population growth based on farming and pastoralism, as well as migrations and dispersals during periods of climate change.

Best regards,  
Lucas Martin  
DNA Tribes

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## Genetic Links in Eastern Europe (STR and SNP)

### Historical Background

The Eastern European genetic region includes a large area between the Baltic Sea, Balkan Peninsula, Black Sea, and Ural Mountains (see map in **Figure 1**). Today, the cultures living here speak a variety of languages. These include the Indo-European Balto-Slavic languages (such as Lithuanian, Polish, and Slovak); as well as Uralic languages (such as Hungarian, Estonian, and Erzya).



**Figure 1:** Eastern Europe.

Classical Greco-Roman writers left only vague descriptions of cultures in this region, such as Cimmerians, Scythians, Venedi, Fenni, and Antes. The historical relationships of those early cultures with later Baltic, Slavic, and Uralic speaking cultures are not entirely clear.

For this reason, this article will emphasize more ancient processes that reshaped Eastern Europe between the Copper Age (Chalcolithic) and Bronze Age periods. In these periods, new ideas from the Fertile Crescent and Aegean were introduced to Eastern Europe in several cultural waves (see **Figure 2**).

**Indigenous Mesolithic Hunting-Fishing Populations:** Prior to these transformative waves of Copper Age and Bronze Age cultures, Eastern Europe was home to hunting and fishing communities living in the large forest belt of northern Eurasia since the Mesolithic period. Early cultures associated with these populations were the Pit-Comb Ware (possibly related to the Kelteminar culture of Central Asia<sup>1</sup>) and Dnieper-Donets (possibly related to cultures near the North Caucasus). Because of their early residence in Eastern Europe, these indigenous hunting-fishing populations probably formed a local population base that interacted and mixed with later cultures expanding from other regions.

**Balkan-Carpathian Farming Populations:** Some of the first agricultural societies of Europe emerged in the Balkan Peninsula and spread via the Danube River during the Neolithic period. By the Copper Age (Chalcolithic), a large network of farming settlements sharing Carpatho-Balkan metallurgical technology is attested throughout the Balkan Peninsula between 5,500 and 3,200 BCE.<sup>2</sup> Other nearby farming zones included the Cucuteni-Trypillian culture along the Dniester River (near present day Romania, Moldova, and Ukraine), which flourished between 4,800 and 3,000 BCE.

These farming settlements were important not only for introducing new ideas to Europe, but also for supporting large food-producing populations that expanded to found new settlements. Notably, the dispersal of these agricultural populations around 3,000 BCE (possibly due to climate changes) might have played an important part in reshaping the genetic landscape in surrounding areas of Europe.

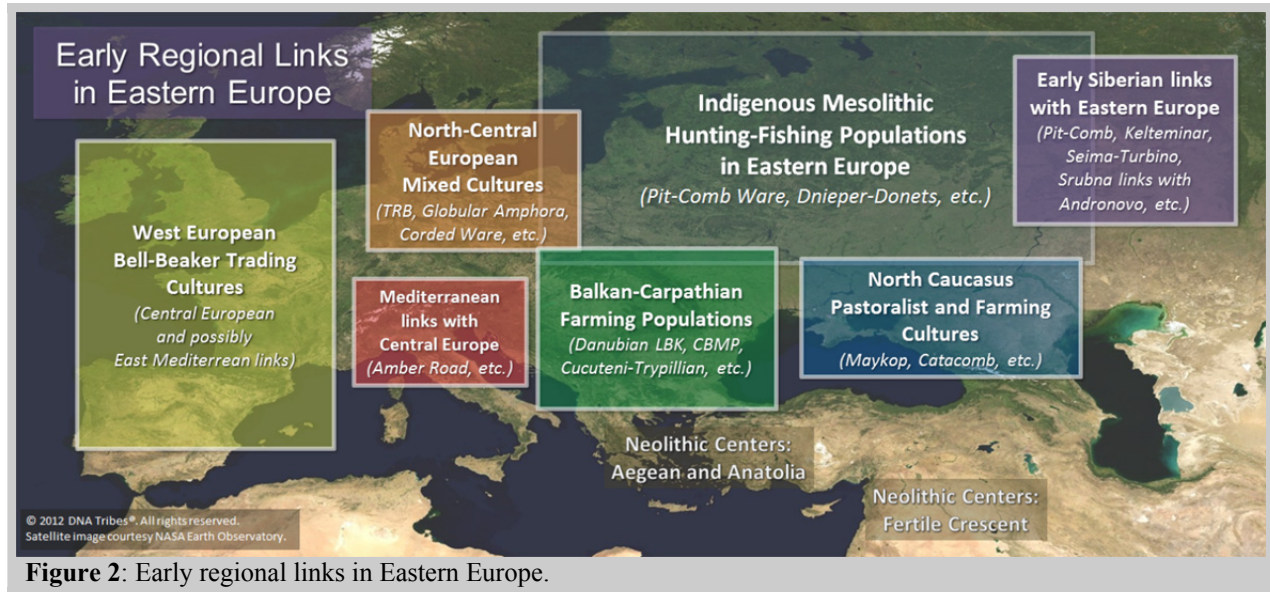
**North Caucasus Pastoralist and Farming Cultures:** Approximately coincident with the breakup of the Carpatho-Balkan and Cucuteni-Trypillian farming centers, new cultures emerged near the North Caucasus that emphasized animal husbandry (pastoralism). These included the Yamna, Catacomb,

<sup>1</sup> See “The Neolithic period of north-western Siberia: the question of southern connections” by L. L. Kosinskaya, collected in Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations pp. 265-287, available at <http://www.tiedekirja.fi/>.

<sup>2</sup> See Evgeny Chernykh’s analysis at <http://tp.revistas.csic.es/index.php/tp/article/view/149/150>.

and Maykop cultures, whose wealth and emphasis on stockbreeding is symbolized by a finely crafted golden ox statue (part of the Maykop Treasure discovered in present day Adygea).<sup>3</sup>

Pastoralist North Caucasus related cultures expanded outwards during the Bronze Age, forming a key link in metallurgical trade networks that included not only Europe, but also West Asia and Siberia.<sup>4</sup> These early North Caucasus pastoralists were forerunners of the Urartian and Siberian influenced Cimmerian and Scythian societies that Greco-Roman writers observed during the classical period.<sup>5</sup>



**Figure 2:** Early regional links in Eastern Europe.

**Mixed North-Central European Cultures:** New lifeways based on pastoralism and farming eventually reached North-Central Europe. Here, hybrid societies emerged that integrated indigenous traditions (carried over from earlier Mesolithic inhabitants) with farming and animal husbandry. These mixed societies included the TRB (Funnelbeaker) (4,100 - 2,000 BCE), Globular Amphora (3,400 - 2,800 BCE), and Corded Ware (2,900 - 2,400 BCE) cultures, which eventually expanded outwards into a wide area of Eastern Europe.

Some archaeologists have suggested a demographic role for incoming pastoral populations from the North Caucasus and Black Sea in these cultural changes. Another possible factor might have been contacts expanding farming populations from the Balkan Peninsula.

**West European Bell-Beaker Trading Cultures:** Meanwhile, new Bell-Beaker cultures (2,800 - 1,800 BCE) were active in Western Europe, including present day Sardinia, Spain, Portugal, France, the British Isles, Denmark, and parts of Central and Eastern Europe. The Beaker culture was possibly spread by itinerant metallurgists and traders who acted as cultural intermediaries between local settlements. If so, the Bell-Beaker network might have played a role comparable to the modern North American fur trade in the ancient frontier societies of Chalcolithic and Bronze Age Europe. In Central and Eastern Europe, Bell-

<sup>3</sup> The central use of cattle imagery recalls archaeological finds at Çatalhöyük in Anatolia, as well as the role of cattle in later Aegean (Minoan) and East Mediterranean cultures.

<sup>4</sup> See <http://tp.revistas.csic.es/index.php/tp/article/view/149/150> and <http://www.ajaonline.org/article/300>.

<sup>5</sup> See *Europe Before History* by K. Kristiansen, pp. 195-207.

Beaker cultures might have mediated contacts with western populations from the Mediterranean and Atlantic coasts and perhaps participated in the formation of new mixed populations (analogous to the *Metis* societies that emerged in modern North America) ancestral to modern Western Europeans.

**Siberian links with Eastern Europe:** As mentioned earlier in this article, the indigenous hunting-fishing populations of Eastern Europe (such as Pit-Comb and Dnieper-Donets cultures) probably had early links with West Siberian and Central Asian populations dating to the Mesolithic period. However, a wave of Bronze Age cultural changes swept along the forest-steppe boundary during the Seima-Turbino Phenomenon (around 1,500 BCE).<sup>6</sup> This wave of cultures expanded from the Altai Mountains to Finland, although the languages associated with this phenomenon are unknown.

Another Eastern European culture that interacted with cultures beyond the Ural Mountains was the Srubna culture (1,700 - 1,200 BCE), which had links with the contemporary Andronovo culture (2,100 - 1,400 BCE) that encompassed large areas of Western Siberia (involving several local variant cultures, some linked to Central Asia).

**Mediterranean links with Eastern Europe:** As European trade networks developed during the Bronze Age, parts of Eastern Europe (present day Hungary and Slovakia) emerged as regional hubs for industrial production and contacts with the Minoan and later Mycenaean civilizations of the Aegean. Similarly, the ancient Amber Road linked Adriatic populations of Northeast Italy with a network of cultures in present day Hungary, Czech Republic, Slovak Republic, Poland, and the Baltic Sea.

Some archaeologists have interpreted this as evidence that some cultures in North-Central and Eastern Europe acted as secondary centers of Aegean civilization, stimulated by an early “creative class” of skilled metallurgists and other specialists.<sup>7</sup> Possibly illustrating these contacts, some cultural practices of the Urnfield culture and related Lusatian culture (1,300 – 500 BCE) of Eastern Europe have been compared to descriptions of the Aegean *Danaoi* recorded in Greek literature (such as Homer).

**Summary:** All of these regional links shaped early cultures in Eastern Europe and are potentially related to the present day genetic structure of these populations. Because of residence throughout Eastern Europe since the Mesolithic period, **indigenous hunting-fishing populations** possibly played a continuing role in local genetic structure.

However, expansions of **food-producing populations** (such as the Balkan-Carpathian farming settlements) might also have played an important role in re-shaping the genetic landscape of Eastern Europe due to early demographic growth and new cultural adaptations to farming and pastoralism. The eventual dispersals of these farming settlements (around 3,000 BCE) might have affected population structure in neighboring parts of Europe.

**Later hybrid cultures** (such as Bell-Beaker and Corded Ware) might also have played an important role in Eastern Europe, for instance participating in a mixed secondary wave of demographic expansions. These expansions might have involved mixed populations descended from indigenous hunting-fishing populations, Balkan Peninsula farmers, and/or North Caucasus pastoralists.

In contrast, trade related contacts might have played a less important role in shaping genetic structure (despite their key importance in cultural development). This is because early trade networks (such as Aegean linked specialists active in Central Europe during the Bronze Age) linked existing populations and did not necessarily require local population growth to be successful. Nevertheless, these patterns of trade might also have influenced Eastern European demographic history, by stimulating new patterns of contact between populations.

<sup>6</sup> See <http://tp.revistas.csic.es/index.php/tp/article/view/149/150>.

<sup>7</sup> See [The Rise of Bronze Age Society: Travels, Transmissions and Transformations](#) by Kristiansen and Larsson.



## STR Analysis of Eastern Europe

Genetic contributions to Eastern Europe (including the Balkan, Polish, Russian, and Scythian sub-regions) were identified using autosomal STR data. This analysis excluded reference to the related Germanic, Finnic, and Urals sub-regions.<sup>8</sup> Results are summarized in **Table 1** and illustrated in **Figure 3**.

World Region of European Sub-Region	Estimated Contribution (%)
Thracian	31.7%
Celtic	25.1%
Portuguese	23.3%
Norse	13.3%
Italian	4.6%
Other	2.0%

**Table 1:** STR based genetic contributions to Eastern Europe (including the Balkan, Polish, Russian, and Scythian sub-regions). This analysis excluded contributions from the related Germanic, Finnic, and Urals sub-regions.

**Discussion:** Results in **Table 1** indicate genetic links with several neighboring world regions. The largest contribution (31.7%) is from the Thracian<sup>9</sup> sub-region that includes populations of present day Romania, Moldova, and (to some extent) Hungary. These populations are located near the Carpatho-Balkan and Cucuteni-Trypillian farming settlements, which underwent Copper Age population growth and later dispersals around 3,000 BCE. This Thracian genetic link might to some extent express traces of these early expansions from Balkan-Carpathian farming populations (described in the historical background).

In addition, these Romanian and Moldovan populations are located near the steppe migration route leading from the Pontic-Caspian steppe into the Dobruja (near the Danube Delta and Black Sea). This extension of the Eurasian steppe was used by migrating pastoralist cultures, including “Thraco-Cimmerian” migrations that influenced Europe at the beginning of the Iron Age, as well as earlier Bronze Age pastoralist and farming cultures linked to the Black Sea and North Caucasus.

Results also identify genetic links with Atlantic Europe, including Celtic (25.1%) and Portuguese (23.3%). These genetic links with Western Europe might to some extent reflect relationships dating to the Mesolithic period (possibly preserved to a higher degree in geographically peripheral areas such as Western Iberia and the British Isles), as well as contacts mediated by the Bell-Beaker trading cultures of the Bronze Age and later historical contacts. Because present day British Isles populations retain some genetic links with North Caucasus populations,<sup>10</sup> the Celtic contribution might also reflect traces of Iron Age migrations between the Black Sea and Western Europe.

Results further included Norse genetic links (13.3%), which might relate to mixed Bronze Age cultures of North-Central Europe that expanded into Eastern Europe (such as Globular Amphora and Corded Ware cultures).

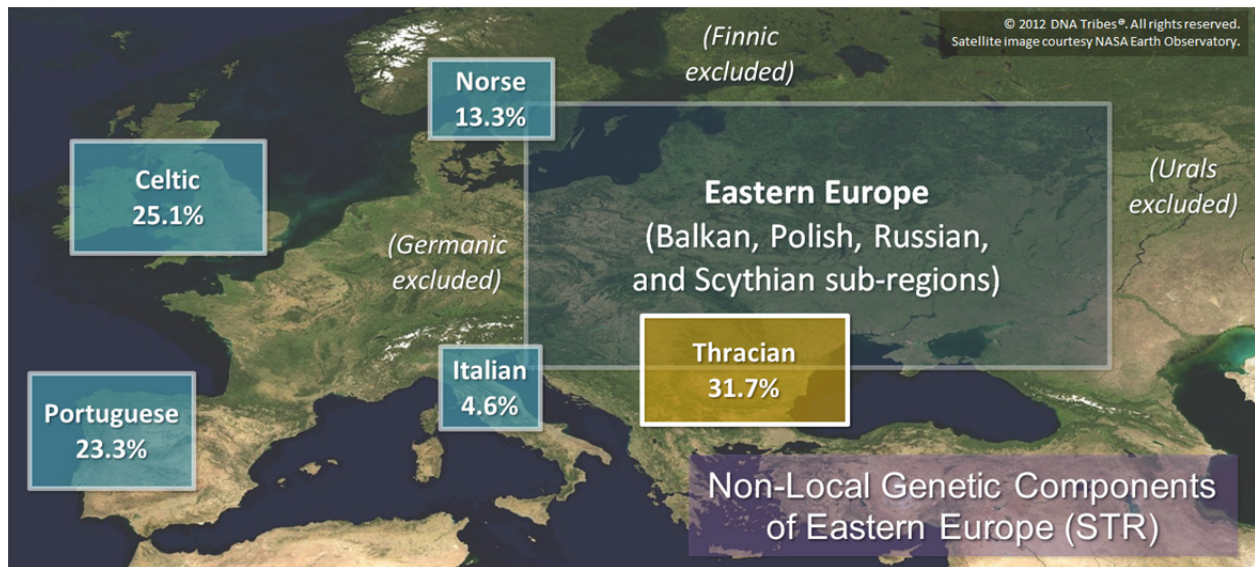
<sup>8</sup>For more information about DNA Tribes® STR based 15, 21, and 27 Marker Kit tests, see <http://dnatribes.com/index.html>.

<sup>9</sup>The term “Thracian” is used as a geographical reference for purposes of analysis, and does not necessarily suggest (nor exclude) a specific ethnic link with the classical Thracians described by Greco-Roman writers.

<sup>10</sup> See <http://dnatribes.com/dnatribes-digest-2012-08-01.pdf>.

Similarly, results also include Italian genetic links (4.6%), which might in part reflect Amber Road patterns of trade contact between the Baltic Sea and Adriatic populations of Italy.

In summary, STR analysis of Eastern Europe is consistent with a variety of links historic links between this region and other parts of Europe. Notably, the largest link (31.7%) is with the Thracian sub-region that includes present day Romania and Moldova (highlighted in yellow in **Figure 3**). This might reflect the importance of population growth from early farming settlements of the Balkan Peninsula in shaping the genetic landscape of Eastern Europe.



**Figure 3:** STR based genetic contributions to Eastern Europe (including the Balkan, Polish, Russian, and Scythian sub-regions). This analysis excluded contributions from the related Germanic, Finnic, and Urals sub-regions.

## SNP Analysis of Eastern European Populations

Regional components of Eastern European populations were identified based on autosomal SNP data (**excluding local Baltic-Urals admixture components**).<sup>11</sup> Results are summarized in **Table 2** and illustrated in **Figure 4**.

Population	Northwest European	Iberian	North Caucasus	Indus Valley	West Siberian	East Siberian	Arctic	Other
Belarus	69.9%	17.2%	7.0%	2.2%	3.0%	0.0%	0.0%	0.7%
Chuvash	50.4%	8.8%	7.8%	3.3%	<u>11.3%</u>	<u>12.2%</u>	<u>4.8%</u>	1.3%
Finland	<u>79.2%</u>	7.8%	0.0%	1.5%	5.3%	3.2%	2.0%	0.9%
Hungary	74.7%	15.5%	4.8%	0.4%	1.0%	0.0%	0.0%	3.6%
Lithuania	78.5%	13.6%	2.6%	3.4%	0.5%	0.0%	1.5%	0.0%
Mordvin	64.2%	10.3%	<u>9.9%</u>	3.4%	9.1%	0.2%	1.3%	1.6%
Poland	67.9%	<u>24.0%</u>	3.3%	1.4%	3.3%	0.0%	0.0%	0.2%
Russia General	66.9%	14.3%	9.4%	3.2%	4.3%	0.0%	0.0%	1.9%
Slovenian	76.7%	17.0%	1.3%	2.0%	0.0%	0.0%	0.5%	2.5%
Ukraine	64.8%	21.6%	5.1%	<u>5.0%</u>	3.2%	0.0%	0.1%	0.1%
Vologda Russia	69.0%	9.3%	5.1%	2.8%	10.4%	1.3%	0.6%	1.5%
<b>Average</b>	69.3%	14.5%	5.1%	2.6%	4.7%	1.5%	1.0%	1.3%

**Table 2:** SNP regional components of Eastern European populations (excluding local Baltic-Urals components). Maximum percentages for each component are underlined.

**Discussion:** Results in **Table 2** indicate several SNP regional genetic components for Eastern European populations. For all studied populations, the largest component is Northwest European (average 69.3%). The Northwest European component is largest in Finland (79.2%) and smallest in Chuvash (50.4%). However, the proportion of the Northwest European component is similar for most studied populations, indicating a substantial relationship between Eastern European and Northwest European populations.

The Northwest European components in Eastern Europe might to some extent reflect contacts dating to the Mesolithic period, as well as subsequent expansions from mixed North-Central European cultures that expanded in Eastern Europe during the Bronze Age. Since the Northwest European region also (to some extent) characterizes Central European and Balkan Peninsula populations (such as Slovenians and Hungarians)<sup>12</sup>, these genetic links might in part reflect contacts with the Copper Age Balkan-Carpathian farming settlements that dispersed around 3,000 BCE (described in the historical background of this article).

A second Western European related component identified is from the Iberian genetic grouping (average 14.5%), which includes populations of present day Spain and Portugal (including Basque

<sup>11</sup> The analysis in this article is based on regional components of whole populations (not individuals). For more information including analysis of average individuals in these populations not excluding local components, see <http://dnatribes.com/dnatribes-snp-admixture-2012-08-01.pdf>.

<sup>12</sup> The Northwest European region itself possibly represents the result of ancient mixtures between Mesolithic, agricultural, and pastoralist related populations. See <http://dnatribes.com/dnatribes-digest-2012-08-01.pdf>.



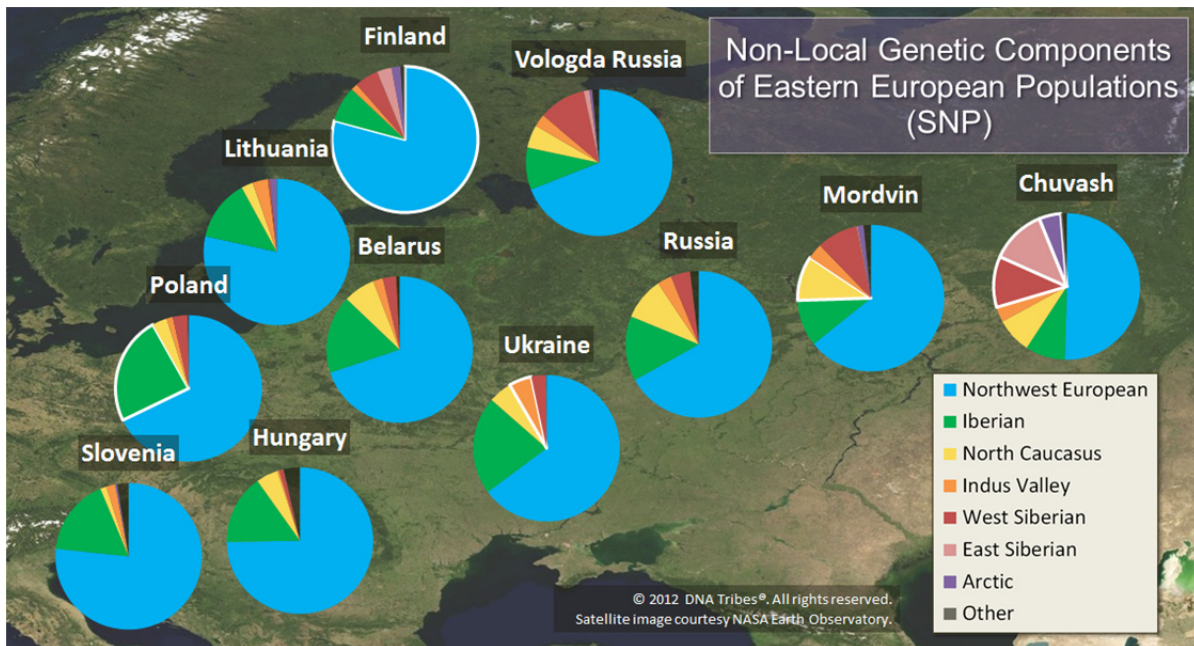
populations), as well as West Mediterraneans (such as Sardinians) and to some extent French, Italian, and Balkan Peninsula populations. In Eastern Europe, the Iberian components are largest in Poland (24.0%) and Ukraine (21.6%) and smallest in Finland (7.8%). This suggests genetic continuity with Southern Europe, which might in part reflect genetic links with Balkan-Carpathian and Cucuteni-Trypillian farming settlements, as well as other (possibly older) contacts between European populations.

Results further indicated a North Caucasus component (average 5.1%) that is identified for some (but not all) studied populations. This was largest in the Mordvin (9.9%) and general Russian (9.4%) populations and absent in Finland (0.0%). This component might in part relate to expansions from the North Caucasus, when pastoralists (such as the Yamna, Catacomb, and Maykop cultures) played a role in shaping early trade networks and societies not only in Europe, but also in the Transcaucasus, Siberia, and Central Asia.

Another component related to Central Asia is from the Indus Valley genetic grouping (average 2.6%). The Indus Valley component is largest for Ukraine (5.0%) and smallest for Hungary (0.4%). This might reflect contacts with Central Asian populations that date to the Mesolithic period hunting-fishing Keltiminar culture, as well as later periods (such as the Bronze Age metallurgical trade networks linking Eastern Europe with West Asia, Central Asia, and Siberia).

Similarly, West Siberian links (average 4.7%) are identified for most studied populations. This component is highest for Chuvash (11.3%) and absent for Slovenia (0.0%). As with Indus Valley links, this component might to some extent reflect early contacts with Siberia dating to the Mesolithic period, as well as later migrations (such as the Bronze Age Seima-Turbino expansion).

Other small components identified for some (but not all) populations included East Siberian and Arctic, which are both largest for Chuvash (East Siberian 12.2%; Arctic 4.8%) and Finland (East Siberian 3.2%; Arctic 2.0%). The restricted distributions of these components suggest that a more specific historical process of migration (such as Seima-Turbino) might have influenced these genetic links.



**Figure 4:** Genetic components of Eastern European populations (excluding local Baltic-Urals admixture components). For more information about DNA Tribes® SNP analysis, see <http://dnatribes.com/snp.html>.



## Conclusion

In summary, both STR and SNP analyses identify substantial genetic links between Eastern Europe and both Northwest Europe and Southern Europe. These include British Isles (Celtic) and Western Iberian (Portuguese) genetic links identified by STR analysis, as well as Northwest European and Iberian genetic links identified by SNP analysis. These genetic links might in part date to the Mesolithic period, and also relate to later expansions of farming and pastoralist populations since the Copper Age and Bronze Age periods.

Additionally, STR analysis identified a more specific genetic link with Eastern Balkan (Thracian) populations. This might in part reflect demographic processes related to the expansions of Copper Age Balkan-Carpathian and Cucuteni-Trypillian farming populations that dispersed around 3,200 – 3,000 BCE (see historical background section of this article). Future research might further explore the role of early population growth fueled by agriculture and periodic dispersals related to climate change in shaping the genetic landscape not only of Europe, but of West Eurasia generally and other parts of the world.

Although comparable North Caucasus STR data are not currently available, SNP analysis identified a genetic link with North Caucasus populations. This might reflect expansions of Bronze Age pastoralist cultures, which influenced contemporary societies of Europe, the Transcaucasus, Central Asia, and Siberia.

SNP analysis also identified additional links for some Eastern European populations with Siberian (West Siberian, East Siberian, and Arctic) and Central Asian related (Indus Valley) regions. These links were most pronounced in northern and eastern parts of Eastern Europe and might reflect contacts dating to the hunting-fishing Keltiminar culture that expanded from Central Asia, as well as later migrations (such as the Bronze Age Seima-Turbino phenomenon).

However, STR analysis did not identify Siberian or Central Asian related genetic links for Eastern Europeans as a whole (including Balkan and Central European populations). This suggests that east-to-west migrations affected some populations (such as Chuvash) to a great degree than others (such as Hungary or Slovenia). Further, these links might also reflect local genetic traces of early populations (possibly no longer extant) that expanded into parts of Europe, Siberia, and Central Asia.

As more data become available, a more geographically comprehensive SNP analysis might clarify some of the larger links (such as the Thracian component identified by STR analysis), as well as smaller genetic links identified for some Eastern European populations (such as Indus Valley and East Siberian components).



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