Introduction

Hello, and welcome to the August 2013 issue of DNA Tribes® Digest. This month’s article continues the exploration of genetic relationships in West Eurasia, by examining the non-local genetic components of Middle Eastern regions based on autosomal SNP and STR data, including an Aegean-like genetic component found throughout the Middle East.

Located at the crossroads of three continents, the Middle East has been an important source and recipient of population expansions since early periods. In particular, the historical background section emphasizes the demographic processes that began with the Ubaid period of Mesopotamia, in which the world’s first urban civilization emerged and potentially reshaped the genetic structure of West Eurasia.

Best regards,
Lucas Martin
DNA Tribes

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The First Cities of Sumer and the Role of Early Population Strata in the Middle East

Historical Background: Three Phases of Sumerian Civilization

The Assyriologist Samuel Noah Kramer once wrote a book entitled, “History Begins at Sumer: Thirty Nine Firsts in Man’s Recorded History.” Sumer, located between the Tigris and Euphrates Rivers of West Asia, was the place where the universal basics of civilization were first developed, packaged, and distributed to surrounding areas.

Perhaps for this reason, the expressive yet unassuming faces of Sumerian sculpture (given a bright-eyed appearance from inlaid lapis lazuli) seem almost familiar, as if they would be immediately at home in any modern cosmopolitan city. Because of this urbane “everyman” quality, early Sumerian portraits contrast sharply with other art from the ancient world, such as the regally exotic portraiture of Amarna Art.

Despite the centrality of ancient Sumer, early Mesopotamia has rarely been discussed in the context of human genetic structure, and the effects of Sumerian expansions in reshaping the world genetic landscape remain to be discovered. However, the potential of urban centers using new technological toolkits (fueling population growth and giving an early demographic advantage over neighboring Mesolithic societies) suggests that Sumer might have played a formative role in West Eurasian demographic history. As ancient DNA continue to be studied in the coming years, the influence of early population expansions from the Sumerian heartland of the Fertile Crescent might become increasingly apparent.

To help establish a historical foundation for examining the multi-layered genetic structure of the Middle East, this article will outline three phases of Sumerian civilization: (1) Founding of urban settlements during the Ubaid period; (2) Dispersion of Sumerian populations to the Caucasus Mountains and Asia during the Uruk period (including related Kura-Araxes migrations, possibly related to the spread of satem IE languages); and (3) Back-migrations to the Fertile Crescent (in response to events at the periphery of the Sumerian world) during the Middle Bronze Age.

Ubaid Period Foundations (6,500 – 3,800 BCE)

The foundations of Sumerian civilization were laid during the Ubaid Period (6,500 – 3,800 BCE). In this period, the first Mesopotamian cities were founded, starting with the world’s first capital, Eridu. Probably under the guidance of a priestly bureaucratic elite, these settlements were organized in a tripartite hereditary social structure: integrating farm laborers, nomadic pastoralists (animal herders), and hunting-fishing peoples as urban citizens. This urban culture spread outwards to establish a vast “Ubaid horizon” (2,000 km across) between the Mediterranean Sea and Persian Gulf.

The flow of Ubaid material culture stimulated developments in more distant regions (see Figure 1). In the Northern Levant, the Ubaid civilization absorbed neighboring Halaf dry farming (non-irrigation) settlements (perhaps Afroasiatic speaking predecessors of the Akkadians and Assyrians).

Reaching even further beyond these rivers, Ubaid related (Hassuna-Samarra) pottery types and clay artwork have been found throughout the Aegean, Anatolia, and East Mediterranean. According to the archaeologist Marija Gimbutas, these shared craft forms appeared simultaneously in Southeastern Europe and West Asia around 6,700 – 6,500 BCE.
In Europe, this Ubaid related material culture was the basis of what Gimbutas dubbed the “Old European” civilization of the Balkan Peninsula and Central Europe, later splitting into local variant traditions around 5,000 BCE.¹ More recently, Evgeny Chernykh has documented evidence for a large Carpatho-Balkan Metallurgical Province (CBMP; see Figure 1) composed of densely settled communities (of up to 15,000 people each) connected by shared copper technology. This network of settlements flourished between 5,500 – 3,500 BCE, before dissolving around 3,200 BCE.

In the later part of the Ubaid period, another peripheral Copper Age culture emerged in South Asia: the Mehrgarh III or Togau Phase (4,300 – 3,800 BCE; see Figure 1) that brought an influx of new collective burial customs, ceramic styles, and copper technology (possibly from West Asia).² Other cultural centers that emerged during the Ubaid period included Nabta Playa in Africa, possibly constructed by early populations of the “Green Sahara” (Neolithic Subpluvial; c. 7,000 – 3,500 BCE), when the landscape of Northern Africa resembled the ecologically rich savannahs of present day Kenya, and the Badarian and Amratian (Predynastic Upper Egyptian) cultures emerged along the Nile River (see Figure 1).

Because of their “early adopter” status, these dense Ubaid period settlements in Mesopotamia, Southeastern Europe, and South Asia potentially played a key role in shaping later demographic history.

¹ See The Kurgan Culture and the Indo-Europeanization of Europe by Marija Gimbutas, pp. 121-128. Gimbutas considered the Chalcolithic “Old European” civilization pre-IE and suggested that the Proto-Indo-European (IE) languages emerged only later with “Kurgan” culture of the Eurasian steppe. However, this article suggests instead that the Proto-Indo-European language emerged in Ubaid period Southeastern Europe (possibly derived from older West Asian Indo-Hittite languages), later diverging into Eurasian satem and Mediterranean centum IE varieties after the collapse of the CBMP around 3,200 BCE. This would be consistent with linguistic evidence for PIE origins around 4,000 BCE and early contacts with the Uralic (North Eurasian), Caucasian (West Asian), and Afroasiatic (East Mediterranean) languages.

in West Eurasia. However, it is probable that no modern culture fully represents these ancestral founding populations. Nevertheless, traces of this ancestral population structure might to some extent be preserved in West Asian populations with a tradition of endogamy (such as Assyrian Christians, Druze, etc.). However, ancient DNA would be needed to examine these relationships in more detail.

This flourishing Ubaid period of technology spread and population growth ended approximately 3,800 BCE, which coincides with the “5.9 Kiloyear Event” (a climate change that brought abrupt aridification) that ended the Neolithic Subpluvial. Human populations adapted to these new arid conditions by gathering around life sustaining river systems (such as the Nile, Indus, Tigris, and Euphrates) and in some places (such as the Arabian Peninsula) abandoning semi-desert nomadism or seeking greener pastures in other regions.

Uruk Period Dispersions in the Caucasus Mountains (4,000 – 3,100 BCE)

In Sumer, the following Uruk period (4,000 – 3,000 BCE) see Figure 2 was characterized by large northward dispersions of migrants from the Mesopotamian heartland into the comparatively undeveloped region of the Caucasus Mountains. It is unknown why these populations chose to depart from the sophisticated Mesopotamian city-states for the wilderness areas to the north. However, Sumerian literature (such as the Atra-Hasis) suggests that class conflicts, environmental changes, and other social problems were beginning to degrade the quality of life in Mesopotamia.

In any case, archaeologists have documented several streams of Uruk emigrants that settled in all areas of the Caucasus, where new and innovative forms of culture quickly emerged. This northern cultural synthesis was exemplified by the rich burials of Maykop (in present day Adygea; see Figure 2), which integrated ideas from Central Europe (megalithic related), the Eurasian steppe, and West Asia (Mesopotamian, Eastern Anatolia, and the Southern Levant) to establish a new pattern of life based on cattle raising and symbolized by the golden bull of the Maykop kurgan (tumulus burial).

Figure 2: Map of West Eurasian cultures during the Uruk period. Sumer (the Ubaid heartland) is highlighted in red. Possible language families in neighboring areas are listed in italics.
In Maykop and other centers near the Black Sea, Uruk colonists might have spoken early *satem* IE languages (see Figure 2), possibly derived from the CBMP related cultures that were transitioning to a more pastoral (animal herding) based economy that would later flourish on the Eurasian steppes during the Bronze Age.

Another peripheral area that came into its own during the Uruk period was the Levantine coast (west of Sumer). Between 3,800 – 3,350 BCE, the Ghassulian culture emerged based on an economy specializing in smelting the copper that Sumerian (Uruk) cities imported from the Southern Levant and the Upper Euphrates. The Ghassulians also erected dolmen monuments, similar to megalithic burial structures found not only in Western Europe, but also in the Western Caucasus.

An unexpected link with the Uruk dispersions of the Caucasus has been suggested for the Nahal Mishmar “Cave of the Treasure” discovered in the Judean Desert. The fine metalwork discovered in this desert cache includes pieces crafted in a long period 5,000 – 3,500 BCE, as if this cache was buried to protect valuable cultural artifacts (possibly from temple sites) from robbers during the Ubaid-Uruk transition period. Adding to the archaeological mystery, the only comparable metalwork from this period has been discovered far away in the Maykop burial north of the Black Sea.

Archaeologists have also suggested Ghassulian contacts with the Aegean and Upper Egypt (Amratian culture), suggesting that these East Mediterranean copper smelters played a dynamic role connecting far flung cultures. Notably, the Ghassulian culture flourished at the time and location some linguists have suggested the Proto-Semitic languages first emerged (approximately 3,750 BCE, probably in the East Mediterranean). These later developed to become the Ugaritic, Phoenician, and Hebrew languages spoken not only in Canaan, but also throughout the Mediterranean, Arabian Peninsula, and Horn of Africa.

In Europe, this period was less favorable. The “Old European” civilization of the CBMP dissolved between 3,500 – 3,200 BCE, partly regrouping near the Aegean Sea (preserving the foundations for the seagoing Minoan-Mycenaean civilizations), and some adapting to new pastoral lifeways near the Black Sea (such as the Usatovo culture; see Figure 2). If early Proto-Indo-European (PIE) language emerged in a CBMP context, these events might relate to the *centum-satem* isogloss.

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3 In the Western Caucasus (present day Abkhazia), dolmen collective burials are possibly associated with the North Pontic (Dniepr Donets) culture. These dolmens were unlike the single burials of the Yamna culture and might reflect early Black Sea maritime links to Europe. See The Peoples of the Hills by C. Burney and D. Lang, pp. 78-85.


5 See “Bayesian phylogenetic analysis of Semitic languages identifies an Early Bronze Age origin of Semitic in the Near East” by Kitchen et. al. at [http://rspb.royalsocietypublishing.org/content/276/1668/2703.short](http://rspb.royalsocietypublishing.org/content/276/1668/2703.short).

6 Echoing these early Ghassulian links, the Hebrew patriarchal narratives describe later Middle Bronze Age migrations between Canaan, Egypt, and more distant locations (such as *Ur Kasdim*). According to tradition, these migratory patriarchs married wives from northern areas (such as Rachel) and also from southern areas (such as Hagar, Keturah, Ziporrah, Asenath, etc.). This is consistent with modern evidence of partly shared Y-DNA (paternal) origins but differing mtDNA (maternal) origins for Hebrew and Arabic speaking cultures.

with *centum* languages developing in the Mediterranean and Western Europe,\(^8\) and *satem* languages developing near the Black Sea (see Figure 2).

**Kura-Araxes Expansions and Secondary States in Asia (3,000 – 1,900 BCE)**

Beginning around 3,000 BCE, the northward Uruk dispersions to the Caucasus Mountains came to an end. However, they were replaced by a new tide of Kura-Araxes expansions to the south, east, and west (2,500 – 2,000 BCE; see Figure 3). These Kura-Araxes migrations began among the progressive Caucasus Mountains societies (recently energized by Uruk period migrants) and spread outwards: first to Armenia, the Upper Euphrates, and Levant (Khirbet-Kerak); then to Dagestan and Western Iran; possibly even reaching Southwest Anatolia and Cyprus.\(^9\)

![Figure 3: Map of West Eurasian cultures during the period of Kura-Araxes expansions and Secondary States east of Sumer (3,000 – 1,900 BCE). Kura-Araxes expansions are highlighted in red.](image)

In the same period (around 3,000 BCE), the Maykop culture moved southeast from the Black Sea toward the Caspian Sea, possibly contributing to the formation of the Bactria-Margiana

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\(^8\) Although not accepted by most linguists, Theo Vennemann has suggested a Semitic superstrate in the Germanic languages related to words for weaponry, sea navigation, law, etc. [http://vennemann.userweb.mwn.de/#abstracts](http://vennemann.userweb.mwn.de/#abstracts); [http://www.sciencedirect.com/science/article/pii/S0024384105000690](http://www.sciencedirect.com/science/article/pii/S0024384105000690) (critical review).

One possible context for these language contacts could be the early links between the Mediterranean and South Scandinavia suggested by some archaeologists and now corroborated by ancient DNA. See The Rise of Bronze Age Society: Travels, Transmissions and Transformations by Kristiansen and Larsson and [http://www.sciencemag.org/content/336/6080/466](http://www.sciencemag.org/content/336/6080/466).

\(^9\) See P. Kohl, The Making of Bronze Age Eurasia, p. 97. The Kura-Araxes culture first emerged after an archaeological gap (period without local traces of settlement). *Ibid.* p. 216. Compare the similar gap prior to Iron Age of Kingdom of Urartu. See The Peoples of the Hills by C. Burney and D. M. Lang, p. 127. It is unknown whether these gaps reflect migrations between the Transcaucuses and other areas (such as Anatolia or Canaan).
Archaeological Complex (BMAC) of Central Asia (2,300 – 1,700 BCE). \(^{10}\) Although the reasons for these southward migrations are unclear, one related factor might have been the emergent Yamna culture north of the Black Sea. Notably, these Maykop and Kura-Araxes expansions might have provided a material context for the spread of the satem IE languages into West Asia, Central Asia, and the Eurasian steppe (see Figure 3).

East of Sumer, this period saw the emergence of several Uruk influenced “secondary states” in Asia that participated in early trade networks. These trade links were initially overland, but beginning with the Mature Harappan period (2,600 BCE), extensive maritime trade\(^ {11}\) is attested between Mesopotamia, South Asia, and the Arabian Peninsula (see Figure 3).

In South Asia, this period involved extensive founding of new settlements and introduced new and different technologies, including: bronze, baked bricks, mastery of sailing, faience, hydrological technology, stamp seals, and writing.\(^ {12}\) Chief among these secondary states were the Indus Valley cities of Harappa and Mohenjo-Daro (possibly “Meluhha” mentioned in Sumerian texts).

According to archaeologists, populations of the Mature Harappan (composed of several South Asian cultures) were similar to earlier populations resident in the Indus Valley, possibly descended from a mixture of indigenous South Asians and agriculturalist settlers who had expanded from the Fertile Crescent during the Copper Age. However, the population of Mohenjo-Daro was more cosmopolitan, with possible links to Central Asia and Africa.

For instance, the eclectic milieu of Mohenjo-Daro might have included satem IE speaking Bactrians, based on similarities between depictions of Bactrian elders and the Mohenjo-Daro “Seated Man” statue (L-950). Other Mohenjo-Daro figures have been suggested as Nubians (HR-5721 and DK-12728; popularly known as “Dancing Girl” statues but possibly representations of princesses or other high status women).\(^ {13}\) This suggests that Mohenjo-Daro had been in the first class of Bronze Age “world cities,” integrating cultures from Africa, Mesopotamia, and South Asia.

These “secondary states” east of Sumer were the culmination of the Middle Bronze Age world system, participating in international trade and probably cultural networks that transmitted the best of contemporary society and technology in a large area surrounding the Fertile Crescent. The remarkable level of economic specialization of this period is demonstrated by wool production in the Mesopotamian heartland in the late third millennium (2000’s) BCE, which generated large surpluses (substantially exceeding local demand) apparently for export to surrounding regions.\(^ {14}\)

**Seima-Turbino and the Collapse of Secondary States (circa 2,000 BCE)**

After a brief period of flourishing inter-regional trade, the secondary states east of Sumer apparently underwent a nearby simultaneous collapse and transition to diminished local economies after

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\(^ {10}\) For images of early Bactrians, including cattle (resembling the iconic golden bull statue of Maykop) and Greek-like human figures, see P. Kohl, *The Making of Bronze Age Eurasia*, pp. 211-213.

\(^ {11}\) See P. Kohl, *The Making of Bronze Age Eurasia* p. 214. Notably, the Sumerian narrative *Enmerkar and the Lord of Aratta* describes an overland journey through mountain terrain; in contrast, Rigvedic hymns emphasize riverine travel and the role of the *Saptasindhu* (“Seven Rivers”).


\(^ {13}\) See G. Possehl, *The Indus Civilization*, pp. 113-116. In Sumerian and Assyrian texts, *Meluhhan* cultures are associated with Asia and also locations near Egypt (either Northeast Africa or the Arabian Peninsula). Although seldom discussed, the early king lists of Kush (Nubia) include several satem IE-like names.

\(^ {14}\) See P. Kohl, *The Making of Bronze Age Eurasia* p. 221.
2,000 BCE. This transition seems to have first taken place in the cosmopolitan Mature Harappan cities of South Asia, resulting in the abandonment of Mohenjo-Daro and Harappa around 1,900 BCE.

Although any causal relationship is unclear (perhaps related to geological or climate changes), it was in the same period that the Seima-Turbino Phenomenon swept across Northern Eurasia. Little understood, Seima-Turbino rapidly transmitted East Asian metal technology from east-to-west from Mongolia to Finland and also southward to mainland Southeast Asia.

The processes involved in this cultural transition are unknown. However, archaeologists have noted that the subsequent Late Harappan (Localization Era) populations were similar to their Mature Harappan predecessors, so internal cultural processes were probably a factor. The only clue to this phenomenon might be apparent cultural differences between Cemetery H (Harappan) populations practicing open burials and those practicing jar or urn burials.

It is worth noting that early jar burials are attested in Southeast Asia (among other areas) and that rice agriculture underwent a similar rapid transmission (probably from Southern China) to Southeast Asia, India, and Nepal around the same time (the late 3rd millennium BCE). For instance, this might relate to a resurgence of Asian related subcultures within the Harappan network that replaced western Mohenjo-Daro and Harappan trade with eastern-linked forms of culture based on rice farming.

Between 2,000 – 1,800 BCE, the Central Asian BMAC underwent a decline and localization similar to Harappa’s accompanied by increasing influences from the simpler Andronovo material culture of Siberia (possibly itself relocating south in response to Seima-Turbino expansions).

In the Middle East, a series of Middle Bronze Age migrations into Anatolia and the Aegean took place during the same period (around 1,900 BCE). One possibility is that this disintegration of trade east of Sumer initiated a pattern of back-migrations of Uruk related South Asian and Central Asian populations (such as the cosmopolitan inhabitants of Mohenjo-Daro) in search of better living conditions around the Fertile Crescent and introducing cultural forms from secondary states of the east (such as the Indic-like names attested in the Hittites-Mitanni treaties).

Early Hebrew literature might record traces of these back-migrations in the narrative of Avram’s migration from Ur Kasdim to the East Mediterranean. Notably, this narrative emphasizes Avram’s abandonment of the cultural traditions of Terach (perhaps representing the cosmopolitan Middle Bronze Age cultures attested in the archaeological record) and leadership in a successful revolt in alliance with his nephew Lot against a West Asian imperial state led by the Elamite king Chedorlaomer.

Although settlement in the Mesopotamian heartland was declining in this period, these Middle Bronze Age back-migrations from Asia potentially transmitted new complexity of languages, ideas, institutions, and technology from the secondary states east of Sumer to western Mar.tu lands that would...

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15 Ibid., p. 231.
18 For instance, the “Plain of Jars” of Laos and Sa Huynh culture; compare Cemetery H (South Asia); European (Urnfield) traditions; the Jar-Burial culture (Transcaucasus); burial urns of Bronze Age Canaan. Jar or urn burial appeared in Megalithic Southern India and Sri Lanka several centuries BCE.
19 Cf. similar ethnonyms, such as Teucer, Tochar, Trtsu, and Teresh.
20 Cf. Lydia, associated with IE Luwian (Indo-Hittite related) cultures of Anatolia.
become ancient Canaan.21 The resulting contacts between formerly dispersed cultures perhaps laid the foundations for the “Amarna Age Synthesis” expressed in the Late Bronze Age of Canaan and Egypt.22

Over the course of several millennia, the first civilization builders of Sumer and their dispersions in the Caucasus Mountains and more distant parts of Asia faded into literature and legend. However, these early inter-cultural contacts (eventually coalescing in the East Mediterranean) generated the seeds for the Greco-Roman and Hebrew cultures that would later emerge in the Iron Age to become the basis for Western civilization.

In a genetic context, these expansions since the Ubaid period potentially reshaped the genetic landscape of West Eurasia by founding early population centers in which early settlers or colonists mixed with indigenous communities, spreading outwards due to early population growth and periodic dispersions.

**STR Analysis of Non-Local Components in the Middle East**

Non-local genetic contributions to Middle Eastern related regions and population groups were identified based on autosomal STR data.23 Results are summarized in Table 1 and mapped in Figure 4.

![Figure 4: Non-local genetic components of Middle Eastern related regions, excluding percentages of local Mesopotamian, Arabian, North African, Indus Valley, and Horn of Africa components.](image)

**Discussion:** Results in Table 1 indicate several non-local genetic components in the Middle East, including African, European, North Eurasian, South Asian (Indian Subcontinent), and Asian-Pacific components. Most of these components were found in multiple regions around the Middle East.

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22 For more information, see The Common Background of Greek and Hebrew Civilizations by Cyrus H. Gordon.
23 For more information about DNA Tribes® STR based 22 and 26 Marker Kit tests, see [http://dnatribes.com/index.html](http://dnatribes.com/index.html).
However, the only non-local component shared by all studied regions and populations was from the Greek sub-region of Europe, which includes populations of present day Greece and Southern Italy (including Sicily).

Among studied Middle Eastern populations, **Greek-like genetic components** were largest in Azerbaijan (82.6%) and Armenians (82.5%); Greek components were smallest in the Horn of Africa (20.1%) and the Indus Valley (21.9%). However, this does not necessarily suggest a settlement of the Middle East directly from the Aegean, because present day populations of both Europe and the Middle East have potentially been affected by later demographic processes since the Neolithic period.

It is also not known whether early Ubaid settlers in Mesopotamia were descended from local populations or instead were (for instance) settlers from elsewhere or an early trans-national isolate population active in multiple parts of the Middle East and Europe during the Neolithic period and early Copper Age.

Nevertheless, these results suggest that populations near the Aegean are related to a widespread component of Middle Eastern genetic structure. Because this Greek-like component is shared across such a wide geographic area, it might represent an early founding stratum pre-dating the Semitic, Berber, and satem Indo-European languages that predominate in these regions today.

One possibility is that this Greek-like genetic component is related to early founding populations of the Ubaid culture that established dense population centers able to sustain population growth, influencing demographic processes throughout the Middle East in the past several millennia. Additionally, these Ubaid populations might in turn have been in part related to earlier Pre-Pottery Neolithic and Pottery Neolithic cultures (originating in the Northern Levant and Anatolia, not discussed in this article).

Notably, the high levels of this Greek-like component in Armenian and Azerbaijani populations suggest that the Caucasus Mountains might have acted as a refugium for early West Eurasian genetic structure. For this reason, other populations with a history of geographical isolation or cultural endogamy might retain traces of ancient population structure that has been subsumed elsewhere by later migrations.

The extension of this component at the geographical extremes of North Africa (53.6%), the Horn of Africa (20.1%), and the Indus Valley (21.9%) might reflect early periods of expansion from the Fertile Crescent, such as the Kura-Araxes expansions and Uruk related secondary states in Asia between 2,600 and 1,900 BCE (see historical background section of this article). As with previous autosomal STR and SNP analysis, these results suggest that Indo-European expansions in Asia might have involved populations that are to some degree represented by present day Southeast Europeans.

Results also included **Sub-Saharan African genetic components** in several populations. These included: Tropical West African percentages, largest in the North African region (7.8%); Sahelian percentages, largest in the Horn of Africa region (13.5%); and African Great Lakes percentages, largest in the Horn of Africa region (47.1%). Generally, the largest African percentages are expressed along the Mediterranean and Red Sea coasts of Africa (North African and Horn of Africa regions), and in the Arabian Peninsula.

However, African components are also expressed in populations near the Persian Gulf, such as the African Great Lakes percentage in Gulf Arabs (26.8%), the Southern African percentages in Persian (5.2%) and Indus Valley (2.7%) populations. This might reflect early maritime contacts between Africa and Western South Asia via the Arabian Sea, suggested by Sumerian records of the Meluhhan sea trade and African cultural links in Mohenjo-Daro.

In addition, the Greek-like components found throughout the Middle East, **Basque-like components** are expressed for some studied populations, including the Horn of Africa (12.3%), North
Africa (6.2%), Egypt (5.2%), and the Levant (2.2%), but not found in other parts of the Middle East. The geographical distribution of these Basque components might reflect an early “Green Sahara” links between African and Iberian populations during the Neolithic Subpluvial period, when the Nabta Playa monument was erected near the Nile Valley.

**North Eurasian genetic components** are expressed for some studied populations. These included a Urals genetic component in the Indus Valley (8.0%). Urals links with the Indus Valley might reflect early patterns of contact between Eastern Europe, West Siberia, and Central Asia dating to the Mesolithic Kelteminar culture and Bronze Age Andronovo culture (possibly introduced to India with Iron Age Saka-Shakya related expansions).²⁴

Results also included Siberian components in Turkey (6.5%) and Azerbaijan (2.9%). These are relatively restricted in their geographic distribution and might reflect Mongol and Turkic expansions during the medieval period, when the studied regions of the Middle East and South Asia were already thickly populated (thus limiting the demographic impact of even large migrations).

**South Asian (Indian Subcontinent) components** are more widespread. These include South India percentages, largest in the Indus Valley (48.8%) and Gulf Arabs (12.5%), but also found in the Levant (3.7%), Saudi Arabian (2.3%), Persian (2.0%), and Turkish (1.3%) populations. The distribution of these components might reflect South Asian maritime trade with Mesopotamia and the Arabian Peninsula since the Mature Harappan period.

The geographical distribution of Eastern India components is somewhat different. The largest Eastern India percentages are expressed for the Indus Valley (10.5%), but also were expressed in North African (8.3%), Persian (4.0%), and Armenian (4.0%) populations. Unlike South India components, these Eastern India percentages are not expressed in a smooth geographic cline that increases with proximity to South Asia. One possibility is that this relates to more archaic components of Middle Eastern population structure that have been pushed outwards by subsequent demographic processes and preserved in outlying territories.²⁵

**East Asian related genetic components** are also expressed for several parts of the Middle East. These include: Southeast Asian percentages (6.7% in Persian populations); Tibetan percentages (16.2% in Egyptian populations); and Japanese percentages (9.4% in Azerbaijan).

Of all non-local component expressed in the Middle East, these East Asian percentages are the most difficult to characterize. However, it should be noted that these might to some degree reflect early contacts with ancestral populations that are no longer extant, but are to some degree represented by present day East Asians. For instance, a Munda (Austroasiatic) related substratum (possibly related to Munda speaking communities in Mehrgarh or Harappa) has been suggested for the Indic languages.

Because of its location near the center of Neolithic expansions, the Middle East might retain aspects of archaic population structure from periods when Eurasian populations were less geographically differentiated. Nevertheless, more data and advanced analytic techniques (including ancient DNA from multiple areas around the Fertile Crescent) can potentially clarify these relationships.


²⁵ Although little discussed by modern historians, the Classical historian Sallust recorded a Carthaginian tradition of a pre-Phoenician migration that included early “Medes” and “Armenians” in North Africa. See [http://dnatribes.com/dnatribes-digest-2012-02-01.pdf](http://dnatribes.com/dnatribes-digest-2012-02-01.pdf). However, it should be noted that these ancient ethnonyms do not necessarily correspond to modern populations.
**Population Group or Region (STR)** | Tropical West African | Sahelian | Southern African | African Great Lakes | Basque | Greek | Urals | Siberian | South India | Eastern India | Southeast Asian | Tibetan | Japanese | Other
---|---|---|---|---|---|---|---|---|---|---|---|---|---|---
**Armenian** | 0.0% | 7.3% | 0.0% | 0.0% | 0.0% | 82.5% | 0.0% | 0.0% | 4.0% | 0.0% | 0.0% | 0.0% | 6.1%
**Azerbaijan** | 4.0% | 0.0% | 0.0% | 0.0% | 0.0% | 82.6% | 0.0% | 2.9% | 0.0% | 0.0% | 0.0% | 0.6% | 9.4% | 0.5%
**Egypt** | 0.0% | 1.4% | 0.0% | 22.5% | 5.2% | 49.0% | 0.0% | 0.0% | 0.0% | 0.9% | 16.2% | 1.2% | 3.5%
**Gulf Arabs** | 0.4% | 0.0% | 0.0% | 26.8% | 0.0% | 58.4% | 0.0% | 0.0% | 12.5% | 0.0% | 0.0% | 0.0% | 0.3% | 1.6%
**Levant** | 0.0% | 0.0% | 0.0% | 7.7% | 2.2% | 74.5% | 0.0% | 0.0% | 3.7% | 1.8% | 3.6% | 4.4% | 2.1% | 0.0%
**Persian** | 2.2% | 0.0% | 0.0% | 5.2% | 0.0% | 73.4% | 0.0% | 0.0% | 2.0% | 4.0% | 6.7% | 0.9% | 2.2% | 3.4%
**Saudi Arabian** | 0.0% | 0.0% | 0.0% | 17.4% | 0.0% | 71.4% | 0.0% | 0.0% | 2.3% | 0.0% | 8.3% | 0.0% | 0.6%
**Turkey** | 0.0% | 0.0% | 0.0% | 4.3% | 0.0% | 77.0% | 0.0% | 6.5% | 1.3% | 3.3% | 0.0% | 4.9% | 0.0% | 2.7%
**Yemen** | 0.0% | 0.0% | 0.0% | 20.4% | 0.0% | 71.2% | 0.0% | 0.0% | 0.0% | 0.0% | 8.5% | 0.0% | 0.0%
Horn of Africa STR region | 0.0% | 13.5% | 0.0% | 47.1% | 12.3% | 20.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 3.4% | 3.6%
Indus Valley STR region | 0.0% | 1.9% | 2.7% | 0.0% | 0.0% | 21.9% | 8.0% | 0.0% | 48.8% | 10.5% | 0.0% | 0.0% | 0.0% | 6.1%
North African STR region | 7.8% | 5.2% | 0.0% | 14.7% | 6.2% | 53.6% | 0.0% | 0.0% | 0.0% | 8.3% | 4.3% | 0.0% | 0.0% | 0.0%

**Table 1:** Non-local genetic components of Middle Eastern related regions, excluding percentages of local Mesopotamian, Arabian, North African, Indus Valley, and Horn of Africa components. Populations labeled with double asterisks (**) include more specific populations or population groups within regions.
SNP Analysis of Non-Local Components in the Middle East

Non-local genetic contributions contributions to Middle Eastern related regions and population groups were identified based on autosomal SNP data. Results are summarized in Table 2 and illustrated in Figure 5.

Figure 5: Non-local genetic components of Middle Eastern related regions, excluding percentages of local North African, Arabian, Horn of Africa, Mesopotamian, and Indus Valley components. Note that some SNP regions differ from the more specific regions used in the DNA Tribes® STR based 22 and 26 Marker Kit tests. Specifically, the Arabian SNP region includes both the Arabian and Levantine STR regions.

Discussion: Results in Table 2 express several non-local components in the Middle East. However, similar to STR results (see previous section), the only component shared by all studied regions was Mediterranean. Mediterranean genetic components are largest in the Arabian (81.4%), Mesopotamian (78.9%), and North African (73.9%) SNP regions.

This is consistent with a widespread layer of Middle Eastern genetic structure that is to some extent represented by present day populations of Mediterranean Europe. However, the ancestral range of the populations that spread this genetic component in the Middle East and Southern Europe might include areas that have been subsequently reshaped by later migrations and other demographic processes. Nevertheless, one possibility is that these Mediterranean-like percentages throughout the

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26 For information about DNA Tribes® SNP (previous genome data required), see [http://dnatribes.com/snp.html](http://dnatribes.com/snp.html).
Middle East might reflect shared ancestry from early founder populations active in the Fertile Crescent during the Neolithic period, including early Ubaid city founders in Mesopotamia.

<table>
<thead>
<tr>
<th>World Region (SNP)</th>
<th>West African</th>
<th>Nilotic</th>
<th>Mediterranean</th>
<th>Northwest European</th>
<th>Slavic-Baltic</th>
<th>Siberian-Arctic</th>
<th>South India</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabian</td>
<td>0.0%</td>
<td>9.3%</td>
<td>81.4%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>9.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Caucasus Mtns.</td>
<td>0.0%</td>
<td>0.3%</td>
<td>57.7%</td>
<td>3.9%</td>
<td>17.2%</td>
<td>3.1%</td>
<td>17.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Horn of Africa</td>
<td>0.0%</td>
<td>60.7%</td>
<td>35.5%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>2.6%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Indus Valley</td>
<td>0.8%</td>
<td>1.0%</td>
<td>25.2%</td>
<td>3.7%</td>
<td>11.1%</td>
<td>5.1%</td>
<td>53.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Mesopotamian</td>
<td>0.0%</td>
<td>2.3%</td>
<td>78.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>18.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>North African</td>
<td>10.5%</td>
<td>15.6%</td>
<td>73.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Figure 5: Non-local genetic components of Middle Eastern related regions, excluding percentages of local North African, Arabian, Horn of Africa, Mesopotamian, and Indus Valley components. Note that some SNP regions differ from the more specific regions used in the DNA Tribes® STR based 22 and 26 Marker Kit tests. Specifically, Arabian SNP region includes both the Arabian and Levantine STR regions.

West African components are expressed for the North African region (10.5%) but are comparatively low for other studied regions. In contrast, Nilotic percentages are expressed for most studied regions, including the Horn of Africa (60.7%), North African (15.6%), Arabian (9.3%), Mesopotamian (2.3%), and Indus Valley (1.0%) regions. This suggests widespread patterns of contact (direct or indirect) between the Middle East and Sub-Saharan Africa, probably mediated through the Mediterranean, Red Sea, and Arabian Peninsula.

Northern European and North Asian components are expressed for some regions. These included relatively small Northwest European percentages in the Caucasus Mountains (3.9%) and Indus Valley (3.7%). This might reflect contacts between Central Europe and Caucasus (such as Dniepr-Donets or Catacomb cultures discussed in the historical background section of this article) in contact with Kura-Araxes related populations that expanded to South Asia, but not otherwise typical for the Middle East.28

Somewhat more substantial Slavic-Baltic components are expressed for the same regions: Caucasus Mountains (17.2%) and Indus Valley (11.1%). These are accompanied by Siberian-Arctic percentages in both cases: Caucasus Mountains (3.1%) and Indus Valley (5.1%). These components might reflect early contacts between Eastern Europe, Western Siberia, Central Asia, and South Asia dating to early periods (including the Kelteminar and later Andronovo related expansions).29 However, these components were not expressed for other studied regions of the Middle East.

South Asian (Indian Subcontinent) components are expressed for the Indus Valley (53.0%), Mesopotamian (18.8%), Caucasus Mountains (17.8%), and Arabian (9.2%) regions. This suggests widespread contacts between the Middle East and South Asia, possibly including Sumerian contacts with the Mature Harappan civilization discussed in this article. South India components were lower in the Horn of Africa (2.6%) and not expressed for North Africa, suggesting South Asian links were less typical of these areas.

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Conclusion

Both autosomal STR and SNP analysis expressed widespread non-local genetic components in the Middle East that are related to populations of present day Mediterranean Europe. This included Greek-like STR components and more general Mediterranean-like SNP components, which in each case were the only non-local component shared by all studied Middle Eastern populations (including outlying regions such as North Africa and the Indus Valley). This widely distributed Greek-like genetic component might reflect shared ancestry from Neolithic founding populations. For instance, this might express shared ancestry from Ubaid settlers in Sumer that reshaped Middle Eastern genetic structure through demographic growth fueled by new agricultural technologies.

This Greek- or Mediterranean-like genetic component in the Middle East corresponds to the West Asian (Anatolia-South Caucasus and also Greek-like) genetic component found throughout Europe. These results highlight a possible key role for early populations from Southeast Europe and Anatolia in reshaping West Eurasian genetic structure since the Neolithic period.

Other components found in the Middle East included links with Sub-Saharan African and South Asian (Indian Subcontinent) populations. These might in part reflect contacts with Fertile Crescent populations and their neighbors during the periods of settlement, dispersion and mixture, and back-migration described in the historical background section of this article.

However, STR and SNP results differed in that STR results expressed East Asian percentages among the non-local components of Middle Eastern populations that are difficult to characterize in terms of known population history in the Middle East. One possibility is that this could express traces of early relationships between relatively undifferentiated populations (prior to the transformation of Eurasian genetic structure since the Neolithic period) that are preserved in parts of the Middle East. For instance, this might reflect traces of shared ancestry from early populations that left descendants in parts of both the Middle East and East Asia but are no longer extant today.

In this context, it should be noted that SNP mixture analysis expresses relative relationships among sampled genomes (in this case, present day populations of the Middle East) and does not directly identify admixture between ancestral populations. That is, low or absent levels of a component in SNP admixture results for an individual or population do not necessarily rule out early gene flow from that population. This point bears repeated emphasis, due to the tendency (in both commercial and research contexts) to emphasize results that correspond to present day concepts of ethnicity and to sometimes neglect discussion and further study of the unexpected or difficult to understand genetic relationships that characterize world population structure.

To fully understand the early processes that have shaped present day global genetic structure (including founding populations related to multiple world regions), both additional forms of analysis (such as formal admixture tests) and eventually direct ancient DNA evidence will be needed. It is likely that as new data (ancient DNA in particular) continue to become available, unexpected relationships in human genetic structure will challenge perceptions and preconceptions of identity and race, including genetic relationships between populations that are not usually thought of as related.

DNA Tribes® Announcements for August 2013

Sale for New 22 Marker and 26 Marker Kit STR Tests

DNA Tribes® is pleased to introduce our new 22 Marker Kit and 26 Marker Kit tests using enhanced STR technologies at great prices. These new STR testing options replace 15, 21, and 27 Marker Kit lab tests. However, updates incorporating new populations and world region definitions for 15, 21, and 27 Marker Kit results are available.

Each 22 and 26 Marker Kit tests includes your Autosomal STR Profile for industry standard markers used in DNA fingerprinting around the world, together with DNA Tribes® Native Population Match, Global Population Match, and World Region Match analysis. Both kits options include the most detailed and comprehensive comparison of your autosomal DNA to world populations available anywhere.

**New DNA Tribes® 22 Marker Kits (Sale Price $139.99)** test the following autosomal STR markers:

Amelogenin, CSF1PO, D13S317, D16S539, D18S51, D21S11, D3S1358, D5S818, D7S820, D8S1179, FGA, Penta D, Penta E, TH01, TPOX, vWA, D19S433, D2S1338, D10S1248, D12S391, D1S1656, D22S1045, and D2S441.

**New DNA Tribes® 26 Marker Kits (Sale Price $159.99)** test the following autosomal STR markers:

Amelogenin, CSF1PO, D13S317, D16S539, D18S51, D21S11, D3S1358, D5S818, D7S820, D8S1179, FGA, Penta D, Penta E, TH01, TPOX, vWA, D19S433, D2S1338, D10S1248, D12S391, D1S1656, D22S1045, D2S441, F13A1, F13B, FES/FPS, and LPL.31

More information and new 22 and 26 Marker Kit test orders are available through our secure online checkout system at [http://www.dnatribes.com/order.html](http://www.dnatribes.com/order.html).

Upgrade testing for customers who have previously tested using DNA Tribes® 15 or 21 Marker Kit tests are available at [http://dnatribes.com/order_upgrades.html](http://dnatribes.com/order_upgrades.html).

Updates incorporating new populations and world region definitions for previous 15, 21, or 27 Marker Kit tests (including all previously ordered add-on reports) are available using the $24.99 “Update Your STR Analysis” option at [http://dnatribes.com/order_addons.html](http://dnatribes.com/order_addons.html).

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31 26 Marker Kit test all markers previously included in 27 Marker Kits, with the exception of SE33, at a substantially lower test cost.
About DNA Tribes® SNP (genome data required)

Do you have genome data from a SNP test? DNA Tribes® SNP is a detailed "deep ancestry" analysis that can be performed based on your genotype raw data from any of several SNP microarray tests. (Genome Data from Previous Testing Required)

DNA Tribes® SNP reports [http://dnatribes.com/snp.html] include:

- **Admixture Percentages**
  - Continent, Region, Native Population, and Global Population Percentages.

- **Multi-Dimensional Scaling (MDS) Graphs**
  - Continent, Region, Native population, and Global Population.

- **Total Similarity**
  - Compare your Genotype to over 280 Populations in our SNP Database.

<table>
<thead>
<tr>
<th>Population</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoruba Nigeria</td>
<td>26.9%</td>
</tr>
<tr>
<td>Bambara West Africa</td>
<td>9.6%</td>
</tr>
<tr>
<td>Igbo Nigeria</td>
<td>6.7%</td>
</tr>
<tr>
<td>Kaba Chad</td>
<td>5.2%</td>
</tr>
<tr>
<td>Fang Cameroon</td>
<td>5.1%</td>
</tr>
<tr>
<td>Bantu South Africa</td>
<td>5.0%</td>
</tr>
<tr>
<td>Kongo</td>
<td>4.2%</td>
</tr>
<tr>
<td>Tunisia</td>
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</tr>
<tr>
<td>Herero Namibia</td>
<td>3.6%</td>
</tr>
<tr>
<td>Hausa Nigeria</td>
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<tr>
<td>Dogon West Africa</td>
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</tr>
<tr>
<td>England</td>
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</tr>
<tr>
<td>France</td>
<td>2.5%</td>
</tr>
<tr>
<td>Pima Mexico</td>
<td>2.4%</td>
</tr>
<tr>
<td>Mandenka Senegal</td>
<td>2.4%</td>
</tr>
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</table>

More information (including sample reports) and orders are available at: [http://dnatribes.com/snp.html].