The Caucasian Connection in the Avar Khaganate: A Comprehensive Analysis of Sample AU78077 (G-L1264) and the Genetic Legacy of the Migration Period

1. Introduction

The Migration Period in Europe, spanning roughly from the collapse of the Western Roman Empire in the 5th century to the consolidation of the Carolingian and Byzantine frontiers in the 9th century, represents one of the most dynamic and tumultuous eras in human history. Central to this epoch was the arrival of the Avars, a nomadic confederation of Inner Asian origin that established a powerful Khaganate in the Carpathian Basin around 568 CE. For over two centuries, the Avar Khaganate dominated Central Europe, serving as a geopolitical fulcrum between the Frankish West, the Byzantine South, and the Steppe East. While historical sources have long described the Avars as a polyethnic confederation incorporating diverse tribal elements, the precise biological composition of this entity has only recently begun to be unraveled through the application of high-resolution archaeogenetics.

The publication of *Ancient genomes reveal Avar-Hungarian transformations* by Gerber et al. (2024) in *Science Advances* marks a watershed moment in this endeavor. By sequencing 296 ancient genomes from the Carpathian Basin, the study provided the first large-scale genetic transect of the Avar period.[1] Within this massive dataset, one individual stands out as a singular anomaly: Sample AU78077, archaeologically cataloged as Grave 422 from the Mödling-Goldene Stiege cemetery in the Vienna Basin. This individual, a male dated to the Middle/Late Avar transition (c. 7th–8th century CE), was found to carry the Y-chromosome haplogroup **G-L1264**.

This finding is of profound significance. Haplogroup G-L1264 is not a lineage associated with the Rouran core of the Avar elite (who carried predominantly N1a and Q lineages), nor is it typical of the local Germanic or Slavic subject populations of Central Europe. Instead, G-L1264 is a quintessential marker of the Northwest Caucasus, linked intimately with the ancestors of modern Ossetians, Circassians (Adyghe), and Abkhazians.[2] The presence of a Caucasian warrior lineage in a high-status burial near Vienna offers the first direct, ancient DNA-based confirmation of the historical hypothesis that Alanic or North Caucasian auxiliaries played a critical role in the Avar military apparatus.

This report presents an exhaustive analysis of Sample AU78077 (MGS422). We synthesize the genetic data from Gerber et al. (2024) with deep phylogenetic analysis from the YFull and TheYtree databases, archaeological records of the Mödling excavation, and primary historical

accounts from Theophylact Simocatta. Our objective is to reconstruct the life history of this individual, trace the phylogeographic journey of his paternal lineage, and situate his existence within the broader context of the "Pseudo-Avar" phenomenon—the complex amalgamation of tribes that fled the Göktürks to forge a new identity in Europe. Through this single sample, we illuminate the intricate mechanisms of migration, assimilation, and social stratification that defined the Avar Khaganate.

2. The Historical and Genetic Landscape of the Avar Khaganate

To understand the anomaly of AU78077, one must first understand the structure of the society in which he lived. The Avar Khaganate was not a monolithic nation-state but a "Steppe Empire," a political confederation built on the dominance of a core nomadic elite over a vast and diverse periphery of subject peoples.

2.1 The Core and the Periphery

Recent archaeogenetic studies have fundamentally altered our understanding of Avar origins. The "Core Avars," primarily those buried in the elite cemeteries of the central Tisza region, have been shown to possess nearly 90–100% Ancient Northeast Asian (ANA) ancestry, genetically linking them to the Rouran Khaganate of Mongolia.[4] This confirmed the account of Theophylact Simocatta, who described the Avars as fugitives fleeing the rise of the Turkic Khaganate in the East.

However, as the Avars migrated westward, they did not travel alone. The "snowball effect" of steppe migration meant that the fleeing Rouran core absorbed numerous other tribal groups along the way. These included Oghuric Turkic speakers (such as the Kutrigurs and Utigurs), Slavic groups, and, crucially for this investigation, Iranian-speaking Alans and other Caucasian tribes from the Pontic-Caspian steppe. By the time they reached the Carpathian Basin in 568 CE, the "Avar" host was a multi-ethnic army united by political allegiance to the Khagan rather than a shared biological origin.

2.2 The "Pseudo-Avar" Question

A critical historiographical debate centers on the nature of the "Pseudo-Avars" (Varchonites). The Byzantine historian Theophylact Simocatta, writing in the early 7th century, recorded a letter from the Turkic Khagan to the Emperor Maurice, in which the Turk claimed that the people threatening Byzantium were not the "true" Avars (who had been destroyed or subjugated by the Turks) but "Pseudo-Avars," formed from the union of the **Uar** and **Chunni** tribes.[4]

> "The Pseudo-Avars (for it is more correct to refer to them thus) are divided in their ancestry, some bearing the time-honoured name of Var while others are called

Chunni." — *Theophylact Simocatta* [7]

This distinction has long puzzled historians. Was it merely Turkic propaganda to delegitimize the Avar Khagan? Or did it reflect a genuine demographic reality? The genetic evidence from sites like Mödling-Goldene Stiege suggests the latter. While the elite center of the Khaganate maintained a strict "True Avar" (Rouran) genetic profile for generations, the frontier regions were populated by the descendants of the "Pseudo-Avars"—the diverse coalition of Pontic and Caucasian peoples who had joined the confederation. Sample AU78077, with his Caucasian paternal line and mixed East-West heritage, appears to be the biological embodiment of this "Varchonite" element: a warrior of the Uar or Chunni (or their Alanic allies) who had become fully integrated into the Avar social fabric.

2.3 The Role of Auxiliaries

The survival of the Avar Khaganate for over 200 years depended on its ability to integrate these auxiliary populations. The Khaganate employed a system of "dual sovereignty" and layered administration, with the Khagan at the top, followed by the Tudun and Jugurrus. Below the central administration, tribal leaders of subject peoples were granted autonomy in exchange for military service. The Alans, renowned for their heavy cavalry, would have been prized assets. Historical sources document Alanic groups in the Pontic steppe and the Balkans during this period, and it is highly probable that Alanic units were stationed on the strategic western frontier of the Khaganate—the Vienna Basin—to guard against the encroaching Frankish and Bavarian forces. This is the precise location where AU78077 was found.

3. Comprehensive Profile of Sample AU78077 (MGS422)

Sample AU78077, identified in the archaeological record as individual MGS422, offers a unique window into the life of these auxiliary elites. Recovered from the Mödling-Goldene Stiege cemetery, the sample yields high-quality genetic data that allows for a detailed reconstruction of his ancestry and kinship.

3.1 Genetic Specifications and Quality

The sequencing of MGS422 was performed as part of the broader study by Gerber et al. (2024), utilizing ancient DNA hybridization capture techniques to maximize coverage of informative SNPs.

Table 1: Genetic Profile of Sample AU78077 (MGS422)

Feature	Specification	Source

Archaeological ID	MGS422 (Mödling-Goldene Stiege, Grave 422)	[8]
Laboratory ID	AU78077	[8]
Date	c. 650–750 CE (Middle/Late Avar Period)	[10]
Sex	Male	[8]
Coverage	29.68% (on 1240k SNP set)	[8]
Y-Haplogroup	**G-L1264 > G-Y142023 > G-FTH9**	[12]
mtDNA Haplogroup	**D4j11**	[8]
Autosomal Profile	Mixed: Approx. 20% East Eurasian / 80% West Eurasian	[9]
Contamination	Negligible (<5%)	[16]

3.2 The Maternal Line: D4j11 and the East Eurasian Connection

The mitochondrial haplogroup of MGS422 is **D4j11**. The D4 macro-haplogroup is overwhelmingly East Eurasian, found today at high frequencies in populations of Northern China, Mongolia, Japan, and Central Asia. The specific subclade D4j is common among Turkic-speaking populations of Siberia and Central Asia. Its presence in a male buried in Austria is a clear signal of admixture.

The fact that MGS422 carries an East Asian maternal lineage indicates that his mother (or a direct maternal ancestor) was of "Core Avar" or Inner Asian descent. This is crucial for understanding his social position. He was not merely a foreign mercenary; he was biologically linked to the prestigious eastern lineages that formed the Avar ruling class. The combination of a Caucasian paternal line and an Asian maternal line suggests a pattern of **exogamy**, where high-status auxiliary males (Alans/Caucasians) were integrated into the Avar elite through marriage alliances with Avar women.

3.3 Kinship Analysis: The "MGS016 Clan"

One of the most impressive achievements of the Gerber et al. study was the reconstruction of biological kinship networks within the Mödling cemetery. MGS422 was not an isolated individual but a member of a prominent local family group, referred to here as the "MGS016 Clan".[15]

- **The Matriarch (MGS016):** The mother of MGS422 was identified as sample **MGS016**. She was a woman of significant social standing, carrying the D4j11 lineage. Crucially, her autosomal DNA profile showed approximately **20% Avar (East Asian) ancestry**, with the remainder being of local European/Steppe origin. This implies that MGS016 herself was the product of several generations of admixture, perhaps the granddaughter of an original Avar migrant and a local European.
- **The Sister (MGS021):** MGS422 had a sister, sample **MGS021** (AU77794), who also carried the D4j11 mtDNA and was buried in the same cemetery.[15]
- **The Father:** While the father of MGS422 was not identified in the cemetery (or not sequenced), his genetic legacy is preserved in MGS422's Y-chromosome. The father must have been the carrier of the **G-L1264** lineage. This suggests a marriage between a local matriarch of mixed Avar descent (MGS016) and a male of Caucasian origin.

This kinship structure reveals the mechanism of "becoming Avar." The immigrant Caucasian male (the father) married into an established, high-status local family with Avar ancestry. Their son, MGS422, inherited the Caucasian Y-DNA of his father and the Avar mtDNA of his mother, cementing the alliance between the auxiliary group and the established elite.

3.4 Archaeological Context: The Mödling-Goldene Stiege Cemetery

The cemetery of Mödling-Goldene Stiege is located in Lower Austria, south of Vienna. Excavated extensively in the 20th century, it is one of the largest and most important Avar-period sites on the western frontier.

- **Site Characteristics:** The cemetery contains hundreds of graves and exhibits a "mixed" cultural character. Unlike the "pure" Avar cemeteries of the Tisza region, Mödling shows a fusion of Avar, Germanic (Lombard/Bavarian), and local Romanized populations. This aligns with its location in the border zone.
- **Grave 422:** The burial of AU78077 was rich, signaling his free status and warrior rank.
    - **The Belt Set:** The most diagnostic artifact in the grave was a multi-piece belt set. The belt was the primary signifier of rank in Avar society. The set in Grave 422 is described as a **"younger variant of the Bülach type"** (*jüngeren Variante des Typs Bülach*).[11] The Bülach type, characterized by rounded plate ends and often decorated with silver inlay, is a Western (Alamannic/Frankish) style that was adopted by the Avar elite in the late 7th century. Its presence here dates the burial to approximately **680–700 CE**.[11]
    - **Ceramics:** The grave contained a beaker of **Straume form VIII**. This ceramic type has been linked to eastern or southeastern connections, potentially reflecting the occupant's diverse cultural affinities.[18]

- **Absence of Weapons:** Interestingly, while the belt signifies warrior status, the snippet does not explicitly list a sword or bow in the inventory. This is common in the Middle/Late Avar period, where the deposition of weapons in graves became less frequent due to changing ritual customs or inheritance laws, even for members of the military class.

4. Phylogeography of Haplogroup G-L1264

The identification of MGS422 as G-L1264 necessitates a detailed examination of this haplogroup's history. It is one of the most informative lineages for tracing connections between the Caucasus and Europe.

4.1 The Deep History of G2a in the Caucasus

Haplogroup G (M201) originated in the Near East or Caucasus roughly 40,000 years ago. Its primary subclade, G2a (P15), was the dominant lineage of the Early European Farmers (EEF) who brought agriculture to Europe in the Neolithic (c. 6000 BCE). However, the branch found in MGS422, **G-L1264**, is distinct from the Neolithic farmer lineages (which are typically G-L497 or G-L91).

G-L1264 is a subclade of **G2a2b** (L30). It formed approximately **4,800 years ago (c. 2800 BCE)** [2], a date that corresponds remarkably well with the **Maikop Culture** and the transition to the Early Bronze Age in the North Caucasus. The Maikop culture was a hub of metallurgy and trade, linking the Mesopotamia civilizations with the Steppe nomads. It is likely that G-L1264 expanded during this period, becoming a foundational lineage of the Northwest Caucasian populations.

4.2 Modern Distribution and the "Caucasian Cluster"

Today, G-L1264 is heavily concentrated in the Northwest Caucasus. It is a major lineage among:

- **Adyghe (Circassians):** Found at very high frequencies, often exceeding 40-50% in some tribal groups.
- **Abkhazians:** Also a dominant lineage.
- **Ossetians:** Present, particularly among the Digor Ossetians, though G2a1 (L293) is more common in the Iron Ossetians.[19]

This strong geographic association makes G-L1264 one of the most reliable genetic proxies for Northwest Caucasian ancestry. Its presence in ancient samples outside this region is almost always indicative of migration from the Caucasus.

4.3 Precise Subclade Determination: The G-FTH9 Branch

A critical question posed by this investigation is the precise phylogenetic position of MGS422

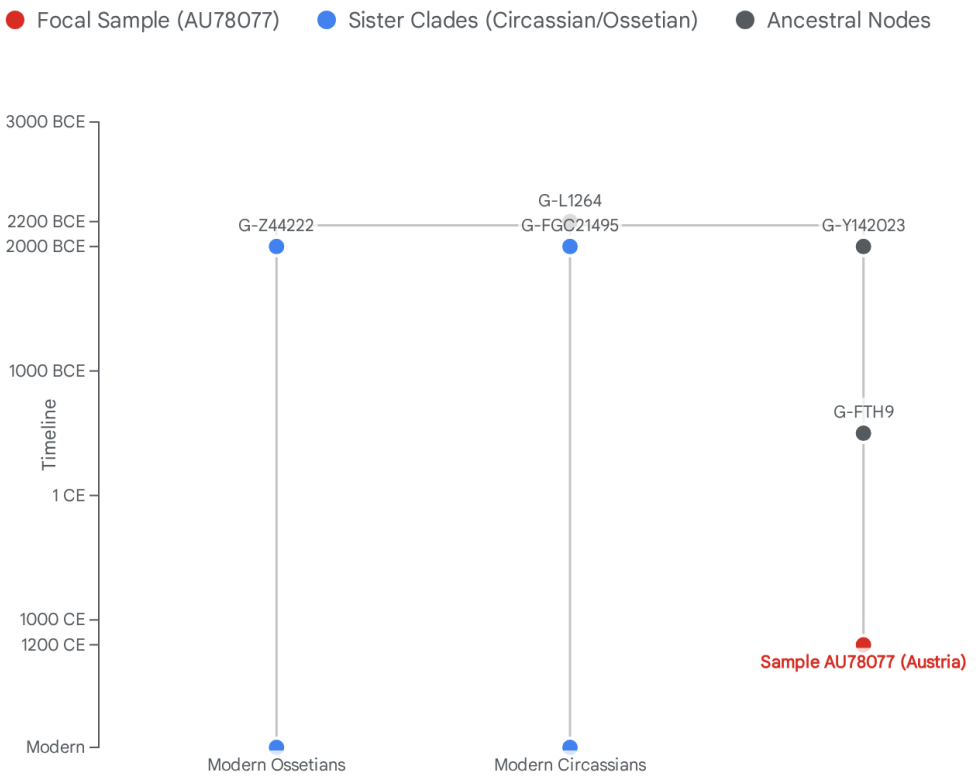
relative to modern populations. Is he an ancestor of modern Circassians, or does he represent a distinct branch?

Using the latest data from TheYtree and YFull (v13.05), we can refine the classification of AU78077 beyond the broad G-L1264 label.

- **Parent Clade:** G-L1264 (TMRCA ~2200 BCE).
- **The Split:** Around 2000 BCE, G-L1264 split into several major branches. The most populous modern branches are **G-FGC21495** and **G-Z44222**.[19] These contain the vast majority of modern Circassian and Ossetian samples.
- **The MGS422 Lineage:** MGS422 does **not** belong to these major modern clusters. Instead, he falls into a sister clade defined by the SNP **G-Y142023** (TMRCA ~2000 BCE).[20]
- **The Terminal Variant:** Within G-Y142023, MGS422 is the primary sample defining the terminal subclade **G-FTH9**.[13]

This phylogentic position is revealing. It indicates that the lineage of MGS422 separated from the main trunk of the Caucasian population very early—around 2000 BCE, likely during the initial Bronze Age expansions. This specific branch (G-FTH9) does not appear to have experienced the same massive demographic expansion in the Caucasus as its sister clades. Instead, it may have been associated with a specific tribal group (such as the Alans or a specific Sarmatian faction) that migrated westward, leaving few descendants in the homeland. MGS422 is therefore not a direct ancestor of most modern Circassians, but a "distant cousin" sharing a common ancestor from the Maikop era.

Phylogenetic Position of AU78077 within Haplogroup G-L1264



The lineage of AU78077 (MGS422) diverges from the primary Caucasian clusters (Z44222 and FGC21495) at the G-Y142023 node, dated to approximately 2000 BCE. The sample defines the G-FTH9 branch, indicating a distinct lineage that separated from the main Caucasian population prior to the Migration Period.

Data sources: Genetic History of the Caucasus, FamilyTreeDNA (G-L1264), Phylogeographer, FamilyTreeDNA (G-FTH9), FamilyTreeDNA (G-Y142023)

5. The "Pseudo-Avar" Hypothesis Revisited: Integrating Genetics and History

The discovery of a Caucasian G-L1264 lineage in the Avar Khaganate provides a powerful new tool for testing the "Pseudo-Avar" hypothesis.

5.1 The Alanic Vector

The Alans are the most likely vector for this lineage. An Iranian-speaking nomadic confederation, the Alans dominated the Pontic-Caspian steppe in the early first millennium CE. They were neighbors to the Northwest Caucasian speakers (ancestors of Adyghe/Abkhaz)

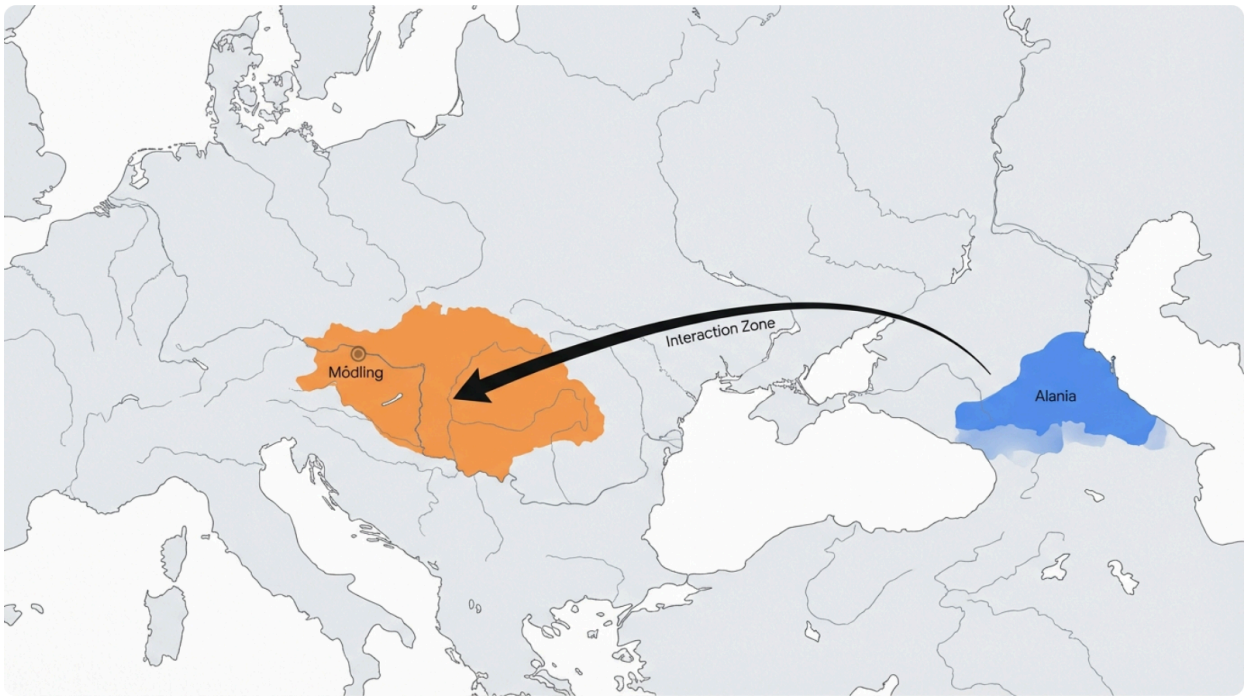
and heavily admixed with them. It is well-documented that as the Huns and later the Avars moved west, they incorporated Alanic tribes into their armies.

- **The "Varchonites":** Simocatta's "Varchonites" (Uar and Chunni) were located in the region of the Aral Sea and the North Caucasus before fleeing to Europe. This is precisely the zone where an admixture of Turkic, Iranian (Alan), and Caucasian peoples would occur.
- **The Genetic Signature:** If the "True Avars" were Northeast Asian (N1a/Q), then the "Pseudo-Avars" described by Simocatta were likely the western wing of the migration—the Alanic and Caucasian tribes who adopted the Avar name. MGS422 fits this profile perfectly. His paternal line is Caucasian (local to the "Pseudo-Avar" homeland), while his maternal line (D4j) links him to the broader Steppe network.

5.2 Social Integration and the "Belt of Rank"

The archaeological evidence from Grave 422 supports the idea of full social integration. MGS422 was not buried as a foreigner with distinct "Alanic" rites (such as catacomb burial or specific amulets); he was buried in an Avar cemetery with standard Avar-period dress. The **Bülach belt** is particularly significant. It represents a fashion that was current among the military elite of the Western Avar frontier, shared with the Merovingians and Bavarians. By wearing this belt, MGS422 was signalling his adherence to the supra-regional military culture of the Avar borderlands. He was an Alan by blood, but an Avar warrior by profession and social identity.

From the Caucasus to the Danube: The Alanic-Avar Migration Corridor (550-700 CE)



Map illustrating the proposed migration route of Caucasian auxiliary groups (carrying Haplogroup G-L1264) alongside the Avar advance. The 'Interaction Zone' in the Pontic Steppe highlights where Alanic tribes (Pseudo-Avars/Varchonites) were incorporated into the Khaganate before settling in the Vienna Basin (Mödling).

6. Comparative Analysis: Caucasian Lineages in the Avar Dataset

To determine if MGS422 is a unique outlier or part of a larger pattern, we must examine the broader dataset from Gerber et al. (2024).

6.1 Frequency of Caucasian Markers

Based on the analysis of 296 sequenced individuals [8], the occurrence of distinct Caucasian lineages is remarkably low.

- **G-L1264:** AU78077 (MGS422) is the **sole** carrier of this lineage identified in the published dataset snippet. This suggests that the specific "Adyghe/Northwest Caucasian" element was a minor component of the Avar migration, perhaps limited to specific high-ranking families or small auxiliary bands.
- **Other G2a Lineages:** While other G2a samples exist in the Migration Period record (e.g., G-L497), these are typically of local European Neolithic or Roman origin. They do not

share the specific Steppe/Caucasus trajectory of G-L1264.

- **Other Caucasian Haplogroups:** Lineages such as J2a (specifically J-M67 or J-Z6046) and J1, which are also common in the Caucasus (among Chechens, Ingush, and Dagestanis), are similarly rare or absent in the "Core Avar" cemeteries, appearing only sporadically in mixed contexts.

Table 2: Comparative Y-Haplogroups in the Mödling-Goldene Stiege Cemetery

Sample ID	Y-Haplogroup	Classification	Inferred Origin
AU78077 (MGS422)	**G-FTH9** (G-L1264)	**Caucasian/Alan**	**Pontic-Caspian Steppe**
AU78082 (MGS446)	I-S9952 (I1)	Germanic	Local/North European
AU78081 (MGS438)	R-Y17176 (R1a)	Slavic/Balto-Slavic	Eastern Europe
AU78079 (MGS430)	J-Z597 (J2b)	Mediterranean	Balkans/Southern Europe
AU78078 (MGS426)	R-L1280 (R1a)	Slavic	Eastern Europe

Data derived from.[8]

This table highlights the cosmopolitan nature of the Mödling community. In just five samples, we see representatives of Caucasian, Germanic, Slavic, and Mediterranean lineages living and being buried together. This diversity stands in stark contrast to the genetic homogeneity of the Avar elite centers in the Tisza plain, supporting the view of the Western Avar frontier as a "melting pot" of military auxiliaries.

6.2 The Fate of the Caucasian Lineage

The absence of G-L1264 in modern Austrian or Hungarian populations at any significant frequency suggests that this lineage did not leave a lasting demographic impact. With the collapse of the Avar Khaganate in the early 9th century—precipitated by Charlemagne's campaigns and the Krum of Bulgaria's attacks—the Avar elite and their auxiliaries faced a grim fate. They were either killed, fled back to the Steppe, or were rapidly assimilated into the growing Slavic and German populations, losing their distinct genetic and cultural identity. The G-FTH9 lineage of MGS422 appears to have been a "dead end" in Central Europe—a genetic echo of a lost empire.

7. Broader Implications and Future Directions

The identification of AU78077/MGS422 has significant implications for our understanding of the Migration Period.

1. **Validation of Historical Sources:** The genetic confirmation of a "Pseudo-Avar" demographic—distinct from the Rouran core but integrated into the Khaganate—validates the nuance of Byzantine historiography. Theophylact Simocatta's distinction between "True" and "Pseudo" Avars was not merely rhetorical but reflected a biological reality.
2. **Complexity of Steppe Migrations:** The presence of a Caucasian lineage in Austria underscores the complexity of Steppe migrations. These were not mass replacements by a single ethnic group, but multi-stage processes involving the accretion of diverse allies. The "Avar" who arrived in Europe was, genetically speaking, a composite organism.
3. **Future Research:** The specific identification of the **G-FTH9** subclade provides a precise target for future research. Archaeogeneticists should screen for this specific marker in:
    - **Saltovo-Mayaki Culture:** The archaeological culture of the Khazar Khaganate, which had a strong Alanic component. Finding G-FTH9 here would confirm the link.
    - **Lombard Pannonia:** To check if Alanic groups arrived earlier with the Huns or Goths.
    - **The Caucasus:** To identify the precise ancestral population of the MGS422 lineage among ancient North Caucasian remains.

8. Conclusion

Sample AU78077 (MGS422) is more than just a data point; he is a biological witness to the rise and fall of the Avar Empire. Born into a lineage (G-L1264 > G-FTH9) that originated in the Bronze Age Caucasus, he was the descendant of warriors who joined the Avar confederation in the Pontic Steppe. He lived his life on the western frontier of the Khaganate, in the Vienna Basin, where he was buried with the belt of a high-ranking warrior and the genetic legacy of a mixed marriage between an Alanic father and an Avar-descended mother.

His existence proves that the Avar Khaganate was a diverse, integrative polity that successfully absorbed Caucasian auxiliaries into its highest social strata. Yet, the disappearance of his lineage from the modern genetic landscape of Europe also serves as a reminder of the fragility of these Steppe empires. When the political structure collapsed, the "Pseudo-Avars" vanished, leaving behind only their graves and, now, their genomes to tell their story.

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