

# ***From Lip to Script: A New Theory on the Phonetic Roots of the Arabic Alphabet<sup>1</sup>***

*Muteb Alqarni*

*King Khalid University*

*Under Review*

[\(\[mutebalqarni@gmail.com\]\(mailto:mutebalqarni@gmail.com\); \[moteebalqarni@kku.edu.sa\]\(mailto:moteebalqarni@kku.edu.sa\)\)](mailto:mutebalqarni@gmail.com)

---

## **Abstract**

The current article introduces a novel hypothesis on the origin of the Arabic alphabet, challenging the traditional view that it evolved from the scripts of ancient languages like Syriac ([Gesenius 1815](#); [Taylor 1883](#); [Senner 1991](#)) or Nabataean ([Daniels 1990](#); [Healy, 1991](#); [Gruendler, 1993](#)). It argues that Arabic letters are designed based on articulatory phonetics, including the movement and positioning of the lips, tongue, teeth, and other articulators. For example, the letter ب (/b/) is depicted as a boat with a dot beneath, symbolizing the lower lip's shape and movement, while ث (/θ/) is shown with three dots above, reflecting the involvement of the upper teeth and tongue tip. This proposal suggests that the Arabic script is phonetically inspired, with each letter's form directly related to the physical act of its articulation. Despite some letters lacking clear phonetic representations, the majority support this hypothesis of sound-symbol mapping. The paper provides new insights that highlight the advanced phonetic knowledge of ancient Arabs, offering significant implications for Arabic alphabet pedagogy.

**Key words:** Articulatory Phonetics, Arabic Abjad, Sound-Symbol Mapping, Script Pedagogy

---

## **1. Introduction**

Although the exploration of writing systems has gained significant scholarly attention over the past decades ([Sampson, 1985](#); [Daniels, 1996](#); [Fischer, 2003](#); [Coulmas, 2012](#)), "very little is known about pre-Islamic Arabic writing (i.e., before 622 CE)" ([Rogers 2005: 151](#)). In this article, we aim to explore the origins of the Arabic alphabet or abjad (consonantary)<sup>2</sup>, challenging the widely held beliefs that Arabic is derived from Syriac ([Gesenius, 1815](#); [Taylor, 1883](#); [Wright, 1890](#); [Senner, 1991](#)) or Nabataean ([Daniels, 1990](#);

---

<sup>1</sup> The author acknowledges the use of ChatGPT services for copyediting assistance, similar to the engagement of human copyeditors in previous research endeavors. It is important to clarify that while ChatGPT provided support in refining the language of this manuscript, all the research, citations, arguments, data, illustrations, and structural organization of the paper remain the sole intellectual property of the author.

<sup>2</sup> It should be noted that writing systems are categorized into two types: (1) *alphabets*, where every phoneme, including both consonants and vowels, has a unique symbol (e.g., the English alphabet), and (2) *abjads*, a term coined by Daniels (1996), which resemble alphabets but document only consonants directly, leaving vowels to be indicated by diacritics, as seen in Arabic. Throughout this article, we will use the words 'alphabet' and 'abjad' interchangeably.

Healy, 1991; Gruendler, 1993). We propose an alternative hypothesis suggesting that Arabic was not inherited from any preceding language, but rather crafted anew. This innovative approach posits that the Arabic letters were intentionally designed to mimic the configurations of the mouth, lips, tongue, and facial angles.

The importance of the study follows from the fact that the Semitic languages played a vital role in the history of writing systems, "because the Semitic Akkadians were among the very first people to write, and because an early West Semitic speaker invented the abjad, from which ultimately descend all the non-Chinese writing systems in use today." (Rogers, 2005: 115). In this article, we speculate that the invention of the Arabic alphabet occurred between the fifth and sixth centuries CE and potentially influenced the development of Korean Hangul, another script known for its phonetic basis, created in 1445 CE. This influence may have followed the Mongol siege of Baghdad, the capital of the Islamic Abbassid caliphate, in 1258 CE.

The structure of the article will be as follows. Section (2) introduces the contemporary Arabic abjad, leading to a discussion in section (3) on the prevailing theories of Arabic's derivation from Syriac and Nabataean, and the critiques thereof. Section (4) will articulate our hypothesis of phonetic letteration, concluding with observations on the phonetic letter writing practices shared between Arabic and Hangul. Concluding remarks are given in section (5).

## 2. Contemporary Arabic

The Arabic script, written from right to left, comprises 28 letters that vary in form depending on their position: isolated (e.g., ا /a/), at the start (e.g., ب /b/), within (e.g., ب /b/), or at the end of a word (e.g., ب /b/). Consider Table 1, which displays the 28 letters alongside their International Phonetic Alphabet (IPA) symbols, showcasing the letters as they appear when written independently. The table demonstrates that the current Arabic letters follow a sequence (a, b, t, th, etc.), distinct from the abjad order (a, b, j, d) observed in Hebrew and other Semitic languages. This sequence, used in educational settings, groups similar-looking letters together, for example, ب, ت, ث (b, t, θ) are put in a set distinct from the set of ح, ج, خ (dʒ, ħ, x).





1	أ	/a/	8	د	/d/	15	ض	/dˤ/	22	ك	/k/
2	ب	/b/	9	ذ	/ð/	16	ط	/tˤ/	23	ل	/l/
3	ت	/t/	10	ر	/r/	17	ظ	/ðˤ/	24	م	/m/
4	ث	/θ/	11	ز	/z/	18	ع	/ʕ/	25	ن	/n/
5	ج	/dʒ/	12	س	/s/	19	غ	/ɣ/	26	هـ	/h/
6	ح	/ħ/	13	ش	/ʃ/	20	ف	/f/	27	و	/w/
7	خ	/x/	14	ص	/sˤ/	21	ق	/q/	28	ي	/j/

Table 1: Arabic Alphabet

While Table 1 excludes adjoined forms, these generally resemble their isolated counterparts. To form words, a connecting dash links letters, sometimes necessitating the removal of lower parts, as in ج /ʒ/ changing to ڃ /ʒ/ or ص /s/ rendering into ص /s/. Thus, ب (b) and ج (dʒ) can combine together to form ڃ (b-dʒ) or ڃ (dʒ-b). Notably, some letters, such as ا /a/, و /w/, ر /r/, ز /z/, د /d/, and ð /ð/, cannot connect from the left. Since Arabic typically uses adjoined writing, the script does not employ capital letters.

### 3. Origin of Arabic Alphabet

Arabic belongs to the West Semitic branch of the Afro-Asiatic language family, distinguishing it from East Semitic languages (e.g., Akkadian, Assyrian, Eblaite) and Southern Southern Semitic languages (e.g., Ethiopic, Old South Arabian). It shares lineage with West Semitic languages such as Phoenician, Hebrew, and Aramaic. The Arabic alphabet's origins are often attributed to either the Syriac language, prevalent from 300 BCE to 800 CE, or the Nabataean script, documented from 300 BCE to 350 CE. Understanding the historical context of these languages is crucial for exploring their influence on Arabic's development.

The alphabetic writing system emerged in the Middle East around 1000 BCE, with the Phoenicians developing a linear alphabet that they shared with the Israelites, Moabites, and Aramaeans, among others (Healey and Smith, 2012). This period also saw the influence of Egyptian and Mesopotamian writing systems, which utilized symbols and signs, such as shapes resembling a mouth (e.g. ) to signify the word "mouth," a box (e.g. ) for the word *betu* "house," bull horns (e.g. ) for the word *ʾp* "bull," and an eye shape (e.g. ) for the word *ʾayn* "eye" (Healey and Smith, 2012: 26-30). The Phoenician, Hebrew, and Aramaic scripts adopted the abjad system (a, b, j, d), from which the Greeks are believed to have also derived their alphabet (alpha, beta, theta), introducing vowels into the alphabetic system. In contrast, Semitic languages maintained a consonant-based system, employing diacritics to denote vowels (Healey and Smith, 2012: 34).

Around 700 BCE, the Aramean kingdom adopted the Phoenician alphabet for Aramaic, catalyzing the genesis of the Hebrew and Syriac alphabets. Aramaic rose to prominence as "an international language, a lingua franca of the ancient Near East, used extremely widely for diplomacy and commerce" (Healey & Smith, 2012: 38), becoming a language of prestige utilized for official documents. Its status was bolstered by the Arameans' dominion over diverse linguistic communities, making Aramaic the preferred language for literature and administration, even among the Greeks. However, Aramaic persisted in Greece until the arrival of Alexander the Great, who replaced Aramaic with a distinct Greek alphabet, marking a significant shift in linguistic practices.

In the Middle East, Aramaic is considered the progenitor of several local dialects, including Syriac. Originating from Middle Aramaic, Syriac emerged around 330 BCE with its own script, predominantly for Christian religious texts. It gained prominence during the Seleucid era in Syria and became the liturgical language following the conversion of the

Edessan king to Christianity. [Healey and Smith \(2012: 43\)](#) note that Syriac's expansion across the Middle East parallels the spread of Arabic with the Quran in regions previously non-Arabic speaking. A notable feature of Syriac is its adaptation of diacritical marks to differentiate sounds, leading to its distinctive calligraphic and cursive script where letters connect and adjoin together, as illustrated in Image 1 (taken from [Healey and Smith, 2012: 69](#)).

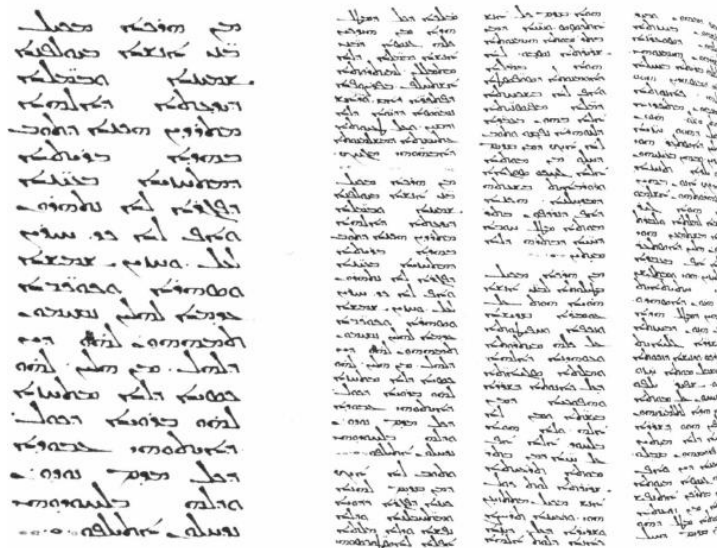


Image 1: Syriac Manuscript (dated 411 CE)

Parallel to the proliferation of Syriac, the Nabataeans, inhabiting southern Syria, the Negev, Sinai, and northern Hijaz, developed a unique writing system in the fourth century BC. This independent kingdom ended in 106 CE with its incorporation into the Roman province of Arabia. Despite the linguistic diversity within the Nabataean realm, Aramaic was the prevalent language among its people. [Reger \(2005\)](#), however, states, "the Nabataean Kingdom of Petra spoke Arabic, but the Nabataeans normally wrote in Aramaic, or they wrote Arabic texts in non-Arabic scripts" (p. 151).

Essentially, Syriac and Nabataean both derive from Aramaic ([Gruendler, 2006](#)). While Syriac served religious functions, Nabataean script was utilized for legal documents. Distinct from Syriac, Nabataean, as shown in Image 2, lacks diacritical marks and features letters that are primarily separate, though they may occasionally touch "more or less accidentally" ([Healey and Smith, 2012: 56](#)).

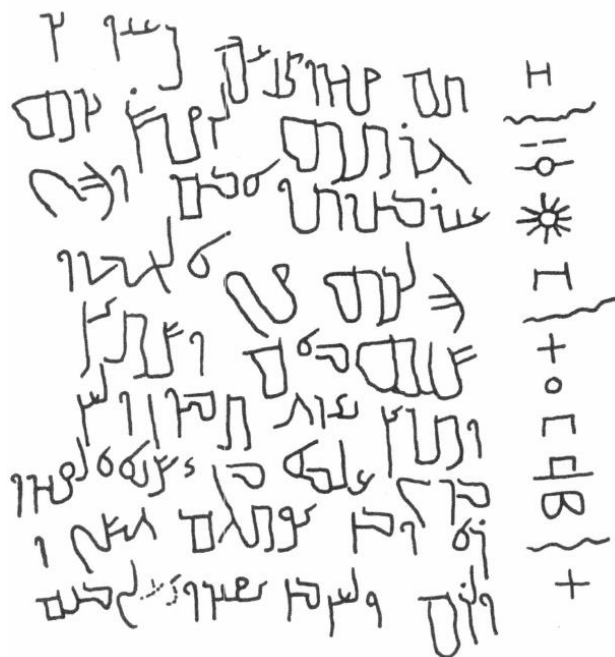


Image 2: Nabataean Inscriptions (dated 268 CE)

The Arabic alphabet, influenced by Islam, is believed to descend from either Syriac, associated with religious texts, or Nabataean, used for legal documentation. It is proposed that Muslim Arabs were introduced to the Syriac script upon their settlement in Syria in the mid-6th century AD, drawing inspiration from its calligraphic style. Supporting this, Syriac script is noted for aligning along imagined perfect lines, akin to modern Arabic, unlike the Nabataean script which appears to be random, described by [Healey and Smith \(2012\)](#) as "items of different lengths hanging from a fixed line" (p. 70). Furthermore, the use of dots in Arabic (e.g., ث, ت, ب) aligns more closely with Syriac, which employs a dotting system, than with dot-less Nabataean. Additional evidence for the Syriac hypothesis includes the resemblance of *Estrangela* Syriac to the Arabic Kufic style and their shared emphasis on calligraphic artistry (see Table 2 below).

While the theory supporting the development of the Arabic alphabet from Syriac script was widely accepted in the 18th century ([Genesius 1815](#); [Taylor 1883](#); [Giles 1910](#)) and persists to modern times ([Senner 1991](#)), the role of Nabataean in shaping the Arabic alphabet has gained credence following significant archaeological discoveries. The deciphering of Nabataean script by [Beer \(1840\)](#), identifying it as a local variant of Aramaic, and especially the uncovering of Nabataean papyri in 1954, labeled as "transitional Nabataean," have supported this perspective a lot further. This particular Nabataean form, noted for its cursive style and alignment on perfect lines akin to Arabic, as depicted in Image 3 (taken from [Healey and Smith, 2012: 55](#)), has emerged as a pivotal link to the current Arabic script.



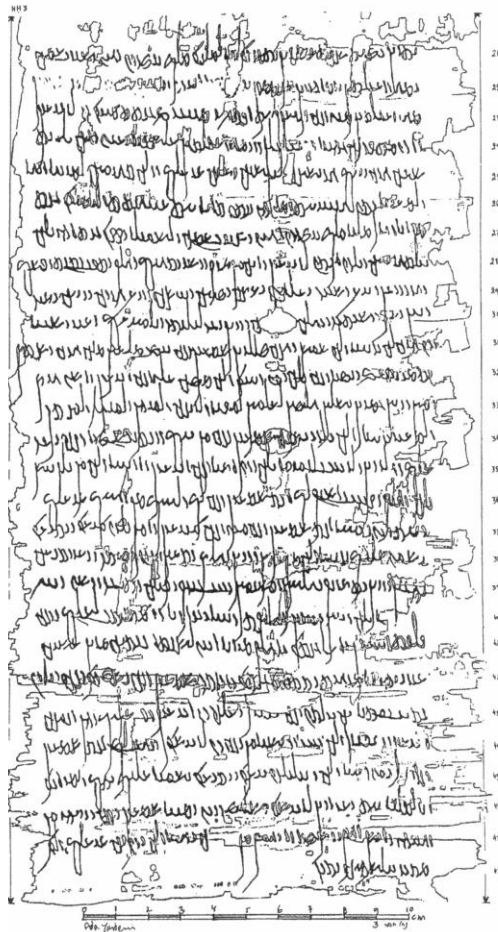


Image 3: Nabataean Legal Papyrus (97/98 CE)

Therefore, it is important to distinguish between two varieties of Nabataean scripts ([Naveh, 1979](#)): (1) the non-cursive, monumental Nabataean found on stones and tombs, as illustrated in Image 2, and (2) the cursive Nabataean on papyrus, shown in Image 3. The prevailing theory suggests Arabic evolved from the latter, though the influence of monumental scripts is still debated ([Gruendler 2006](#)). Despite the absence of dots in both Nabataean forms, the geographic proximity argument strengthens the case for Nabataean influence, as Nabataean usage in Jordan is closer to the Arabic language used in the Arabian Peninsula than to Syriac spoken in Syria ([Lewis and MacDonald, 2003: 47](#)).

Consequently, [Healy and Smith \(2012\)](#) posit that Arabic and Nabataean scripts share a close relationship. Their analysis draws on early Arabic inscriptions from the 3rd century, notably one discovered at Jabal Ramma near Aqaba, dated between 300-350 CE, as depicted in Image 4 (cf. [Healey & Smith 2012: 75](#)). [Bellamy \(1989\)](#) interprets this inscription as a declaration by a prosperous individual, proclaiming his achievements and challenging those who lack the ambition to do similarly. Further evidence of early Arabic

script is presented in Image 5 (cf. [Healey & Smith 2012: 76](#)), originating from Umm al-Jimal, dated to the 5th-6th century CE.

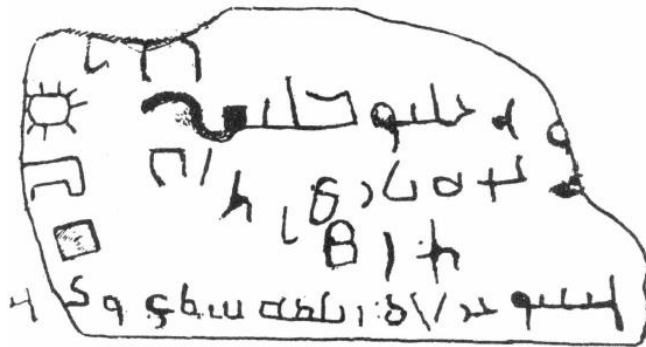


Image 4: Early Arabic Inscriptions (dated 300-350 CE)

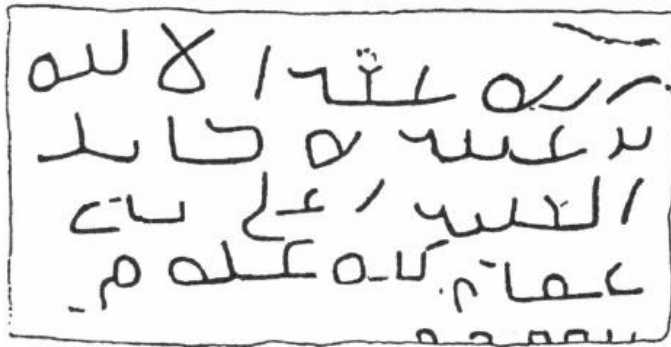


Image 5: Early Arabic Inscriptions (dated 500-600 CE)

Despite the latter inscription being a recognizable example of Arabic, with many Arabs able to identify the name عبيد الله 'Ubaid Allah' within it, the earlier one (cf. [Bellamy, 1989](#)) presents several puzzles. Its characters do not resemble modern Arabic, making it undecipherable for Arabic speakers, including myself. This suggests it might represent a distinct writing system, possibly unique to the Nabataeans. [Healey and Smith \(2012\)](#) use these specific inscriptions (from Cursive Syriac, *estrangela* Syriac, Monumental Nabataean, Papyrus Nabataean, Early Arabic and Modern Arabic) as a basis to offer Table 2 (cf. [Healey & Smith 2012: 59](#)).

Transliteration	Printed Jewish Aramaic	Early Syriac Cursive	Printed <i>estrangela</i> Syriac	Monumental Nabataean	Cursive Nabataean	Early Arabic Papyri	Printed Arabic (most relevant form is cited)
ʾ	ܐ	ܐ	ܐ	ܐ ܐ	ܐ ܐ	ܐ	ا
b	ܒ	ܒ	ܒ	ܒ	ܒ	ܒ	ب
g	ܓ	ܓ	ܓ	ܓ	ܓ	ܓ	ج
d	ܕ	ܕ	ܕ	ܕ	ܕ	ܕ	د
h	ܚ	ܚ	ܚ	ܚ	ܚ	ܚ	ه
w	ܘ	ܘ	ܘ	ܘ	ܘ	ܘ	و
z	ܙ	ܙ	ܙ	ܙ	ܙ	ܙ	ز
ḥ	ܚ	ܚ	ܚ	ܚ	ܚ	ܚ	ح
ṭ	ܬ	ܬ	ܬ	ܬ	ܬ	ܬ	ط
y	ܝ	ܝ	ܝ	ܝ	ܝ	ܝ	ي
k	ܟ	ܟ	ܟ	ܟ	ܟ	ܟ	ك
l	ܠ	ܠ	ܠ	ܠ	ܠ	ܠ	ل
m	ܡ	ܡ	ܡ	ܡ	ܡ	ܡ	م
n	ܢ	ܢ	ܢ	ܢ	ܢ	ܢ	ن
s	ܣ	ܣ	ܣ	ܣ	ܣ	ܣ	س
ʿ	ܥ	ܥ	ܥ	ܥ	ܥ	ܥ	ع
p	ܦ	ܦ	ܦ	ܦ	ܦ	ܦ	ف
š	ܫ	ܫ	ܫ	ܫ	ܫ	ܫ	ص
q	ܩ	ܩ	ܩ	ܩ	ܩ	ܩ	ق
r	ܪ	ܪ	ܪ	ܪ	ܪ	ܪ	ر
š	ܫ/ش	ܫ	ܫ	ܫ	ܫ	ܫ	س
t	ܬ	ܬ	ܬ	ܬ	ܬ	ܬ	ت

Table 2: A Comparison of Syriac, Nabataean and Arabic Alphabets

Based on Table 2, it is evident that the correlation between Arabic, Nabataean, and Syriac scripts is not entirely consistent across all characters, though Syriac bears a closer resemblance to Arabic compared to Nabataean. While a small number of letters share similarities, many others diverge significantly. A key inquiry pertains to the letter count, with Syriac and Nabataean comprising 21 letters and the phonemic inventory of Arabic featuring 28, the origin of the additional seven letters in Arabic remains a topic of curiosity (Edzard 2013). The table conspicuously lacks the following seven letters ث /th/, خ /x/, ذ /th/, ش /sh/, ض /dh/, ظ /th2/, and غ /gh/. The question then becomes: How did the Arabs create these missing letters from scratch, and what criteria did they use in their invention? To our knowledge, scholars advocating for the Syriac and Nabataean origin theories have not addressed these challenging cases.

Moreover, not all Arabic letters are similar to those from Syriac or Nabataean. For example, the Arabic letter ت /t/ markedly differs from its Nabataean (ܬ or ܬ) and Syriac (ܬ or ܬ) counterparts. Similarly, the Arabic cursive ز /z/ does not resemble its straight Nabataean (ܙ or ܙ) or Syriac (ܙ or ܙ) versions, and the orientation of the cursive letter ر varies from those in Nabataean (ܪ or ܪ) and Syriac (ܪ or ܪ). Furthermore, the complete form



of the Arabic ﺱ bears no similarity to its Nabatean (𐤓 or 𐤔) or Syriac (ܣ or ܥ) equivalents. The Arabic letter ب/b/ does not neither share similarities with its counterparts in Syriac (ܒ or ܥ) or monumental Nabatean (𐤁), raising questions about the genuineness of the cursive Nabatean /b/ (𐤁) especially that [Healey and Smith \(2012\)](#) admit that “these cursive forms of Nabataean writing are much more difficult for us to read” (p. 57). The Arabic ﺕ is not an exception as well, being distinct from both Syriac (ܬ or ܬ) and Nabatean (𐤕 or 𐤖) versions, with only a single variant in Nabatean showing a faint resemblance (𐤗). The sound /s/ in Nabatean (𐤓 or 𐤔) and Syriac (ܣ or ܥ) also shows no connection to the Arabic sound /s/ which is written as ﺱ/s/. At times, a character may align with Nabatean yet diverge from Syriac, or vice versa. For instance, the letters ﺱ and ﺕ in Arabic may match the Nabataean ones (𐤕 and 𐤖) but do not match their Syriac equivalents (ܣ or ܥ) and (ܒ or ܥ) respectively. Conversely, the Arabic ﺕ may also be similar to the Syriac one (ܬ) but show no similarity with the Nabatean ones (𐤕 or 𐤖). Put differently, the issue isn't just the absence of certain letters; the more significant problem lies in the fact that numerous Arabic letters bear suspicious, if not no, resemblance to their supposed counterparts in Syriac or Nabataean. It is important to note that this discussion acknowledges some similarities in Table 2; otherwise, allowing for a highly skeptical view could lead to the raising of additional issues.

A final observation that challenges these two hypotheses involves questioning the motivation behind the significant alterations Arabs made to their script, making it distinct from their ancestral scripts. Why would the Arabs go to great lengths to modify their letters, diverging significantly from those of their predecessors? Logically, one would anticipate that the Arabs, like the English who adopted the Latin alphabet with minimal modifications, would maintain the script they inherited with only slight differences. This deviation in Table 2 raises questions about the underlying reasons for such a comprehensive transformation in the Arabic script, suggesting a deliberate effort from their part to create a distinct Arabic identity to fulfill specific linguistic needs unmet by the previous existing scripts.

#### 4. The Phonetic Roots of Arabic Alphabet

In this section, we will outline our primary hypothesis that the Arabic alphabet's letterforms are inspired by the phonetic articulation involving the mouth, lips, tongue, and facial angles. Before proceeding, however, let us explore the inspirations that guided us toward developing this hypothesis and examine its possible historical context.

In assessing the genesis of the Arabic script, we postulate that the Arabic alphabet's creation transpired between the fifth and sixth centuries. The proclamation of Islam by the prophet Muhammad (570 CE – 632 CE) in the early seventh century catalyzed a period of literacy emergence among the Arabs. As Islam's central text, the Quran (called *Al-Kitab*, the book, and literally translated as ‘the written’), was revealed, contemporaneous Muslims commenced recording its verses on various materials (such as stones, animal skins, papyri etc), aided by designated scribes of the prophet, a practice underscored by historical sources (see e.g. [Ibn Al-Nadim, ch. 1](#)).

A pivotal piece of evidence supporting the early establishment of the Arabic script is a manuscript from Egypt, dated 643 CE, one year prior to the assassination of the second Islamic caliph, Umar ibn Al-Khattab (Image 6)<sup>3</sup>. This document, which is a transactional receipt issued by Arab commander 'Abdallah ibn Jabir, possesses distinctive calligraphy, including teeth-like marks on س /s/ and ش /ʃ/ and varied dot placements for different letters, exemplifying early Arabic script's cursive style and use of diacritics. The document, readable to modern Arabs, itemizes the allocation of fifty sheep to military troops where the words "أخذنا" (we took) and "شاه" (sheep) exhibit a fully developed dotting system, indicative that such a system existed by at least 643 CE.

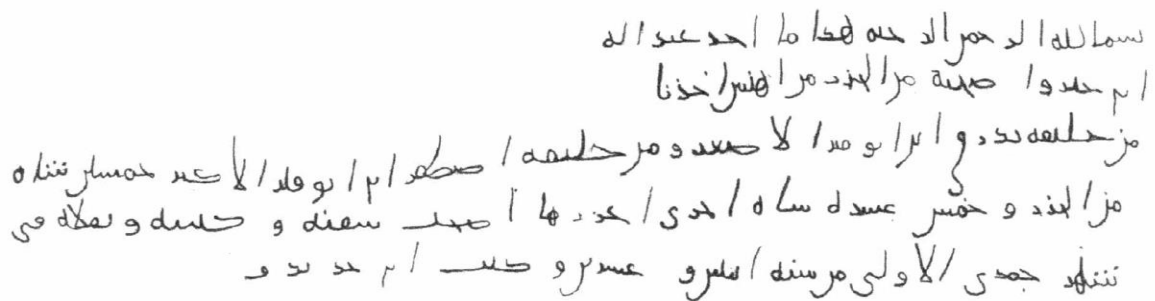


Image 6: Earliest Known Arabic Papyrus (dated 643)

This papyrus strongly suggests that the creation of the Arabic alphabet predates the post-prophet four caliphates, aligning closer to the lifetime of Umar. Intriguingly, historical accounts from As-Siraafi (d. 978 CE) and Ibn al-Nadim (d. 994 CE) mention that Abu Al-Aswad Ad-Du'ali (603-688) and Ali ibn Abi Talib (601-661) collaborated on the implementation of diacritics in Quranic text. Their method, inspired by the movements of the mouth, involved placing dots relative to lip articulation—a process indicating a sophisticated awareness of phonetics. According to As-Siraafi and Ibn al-Nadim, Abu Al-Aswad Ad-Du'ali (603-688) initially sought the assistance of thirty individuals for the task of diacritic placement in the Quran, eventually narrowing the group to ten, and finally selecting a scribe from Abd Qays. He provided this scribe with specific instructions for diacritic notation as follows:

Take the manuscript and a dye that contrasts with the intended color. When I open my lips, place a single dot above the letter; when I purse my lips, place the dot beside the letter; and when I tilt them in that manner, put the dot below it. If any of these movements are accompanied by a nasal sound, place two dots ([Al-Sirafi, 1966:12](#), [Ibn al-Nadim, 1997:60](#)).

While traditions regarding diacritics have not been widely interpreted as evidence for the concurrent invention of letters, we propose that Abu Al-Aswad's phonetic considerations suggest the Arabic alphabet was similarly inspired. If we accept the Egyptian letter dated

<sup>3</sup> Note that the prophet Muhammad died in 632, followed by the first Islamic caliph Abu Bakr (573-634) and then by the second Islamic caliph Umar (584-644). After Umar, Uthman (576-656) became the third caliph, and Ali (601-661) succeeded him as the fourth caliph.

to 643 CE as a reference point, and consider the phonetic methodologies employed by Abu Al-Aswad, it becomes plausible that the Arabic alphabet was phonetically conceived within the first half of the seventh century (600-650 CE), possibly during the lifetime of the prophet Muhammad. This timing also aligns with the readable early Arabic inscription dated (500-600) in Image (5) cited by [Healey & Smith \(2012: 76\)](#).

Beside historical incidents, another motivation for our current hypothesis follows from the the striking resemblance between the shapes of the Arabic letters and the configurations of the mouth during speech production, suggesting a deliberate design rather than mere coincidence. The consistent correlation between specific articulatory movements and the corresponding letter forms underscores the idea that these representations are rooted in a deep understanding of phonetics. This pattern of similarity, too systematic to be accidental, strongly indicates that the creators of the Arabic script were inspired by the physical act of speech itself.

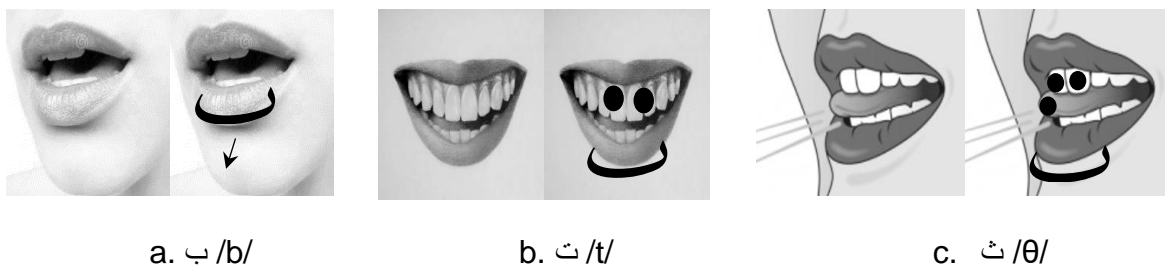
So, to enhance understanding of the phonetic basis for Arabic letter forms discussed in the following sections, it is instructive to personally articulate sounds (e.g., babababa, tatatata etc) as a means to comprehend how these phonemes might have been conceptualized by the script's originators. While certain correlations between sounds and symbols may appear intuitive, others necessitate further conjecture. This study posits that the original architects of the Arabic alphabet considered articulatory phonetics, particularly in the placement of dots, which correlate significantly with the tongue's positioning within the oral cavity, and sometimes with the airflow involved in sound generation.

In the following sections, we categorize the letters into distinct shapes: boat-shaped letters (ب، ت، ث، ن، ي) in section (4.1); rake-shaped letters (س، ش) in section (4.2); circle-shaped letters (و، م، ف، ق) in section (4.3); curve-shaped letters (ز، د، ذ) in section (4.4); sickle-shaped letters (ح، خ، ج، ع، غ) in section (4.5); (4.6) drop-shaped letters (ص، ض، ط) in section (4.6); and other letters (ا، هـ، هـ، ك، ك) in section (4.7). A final note on Korean Hangul and Arabic pedagogy will be given in section (4.8) and (4.9) respectively.

#### 4.1. Boat-Shaped Letters (ب، ت، ث، ن، ي)

The letters (ب، ت، ث، ن، ي) (/b/, /t/, /θ/, /n/, /j/) adopt a boat shape, symbolizing the mouth's lower lip, with dots indicating the involvement of the tongue or teeth. These letters should be viewed from a frontal angle of the face, as illustrated in example (1). Consider the representations of the initial three boat-shaped letters (ب، ت، ث) below.

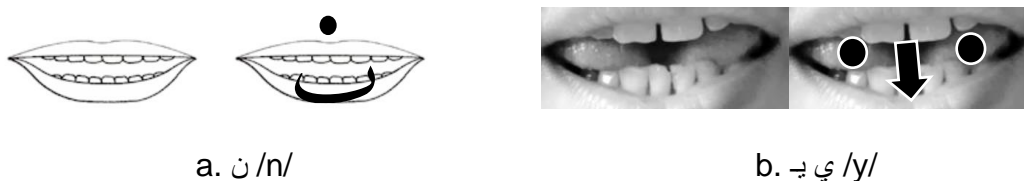
1. The representation of the letters ب /b/, ت /t/ & ث /th/



As shown above, the production of the letter ب (/b/), a voiced bilabial plosive, requires both lips with the lower lip descending post-articulation. In depiction, ب mirrors this action, embodying a boat-like form with a dot below to signify the downward lip movement as in (1a) above. Conversely, ت (/t/), a voiceless alveolar stop, is produced with the tongue's tip contacting the alveolar ridge and lightly the upper two teeth. Thus, ت is rendered similarly as a boat shape, but with two dots above, likely symbolizing the touch points of the upper two teeth as illustrated in (1b) above. For ث (/θ/), a voiceless interdental fricative, the tongue extends between the teeth, allowing airflow with slight friction. This letter, too, adopts a boat shape, with three dots above representing the interaction of the tongue tip and the upper two teeth, suggesting a phonetic rationale behind the dot distribution (but see section 4.2 for a different proposal for the distribution of the dots in the letter ث).

Considering the adjoined forms (ب، ت، ث) of the letters (ب، ت، ث), it is pertinent to include (ن، ي) (/n/, /j/) in this category due to their similar adjoined configurations (ن، ي), distinguished solely by dot distribution. The representations of these two letters are illustrated in example (2) below.

## 2. The representation of the letters ن /n/ & ي /j/



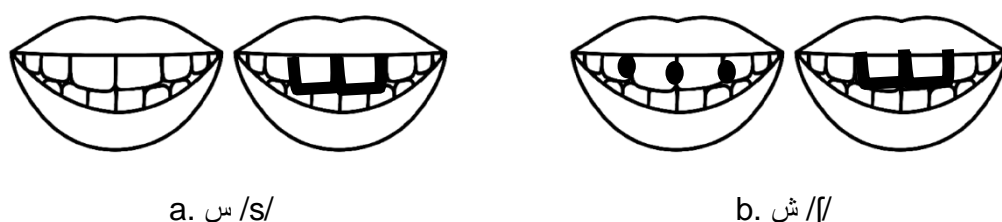
The letter ن (/n/) is articulated as a voiced alveolar nasal, with the tongue's tip contacting the alveolar ridge, allowing airflow through the nasal cavity. In its representation, ن mirrors the lower lip's boat shape, with the upper dot potentially signifying either the tongue's contact point against the alveolar ridge or airflow from the nose during /n/ sound production, as depicted in (2a). Conversely, the letter ي (/j/), a voiced palatal approximant, involves initial contact between the tongue's tip and the lower teeth or gum, as illustrated in (2b). The dual dots beneath ي may symbolize the tongue's bifurcation upon lowering against the lower dental region, a detail observable by producing /j/ in front of a mirror. The placement of these dots below ي, akin to ب among others, aids in differentiating it

from similar sounds, adapting a semi-boat shape to indicate the subtle lateral mouth movement accompanying the final /j/ articulation.

#### 4.2. Rake-Shaped Letters (س، ش)

The letters س (/s/) and ش (/ʃ/) are depicted with a rake-like form (س، ش), symbolizing the teeth's role in their articulation. Viewing these representations from a frontal perspective, as illustrated in example (3) below, highlights their dental association.

##### 3. The representation of the letters س /s/ & ش /ʃ/

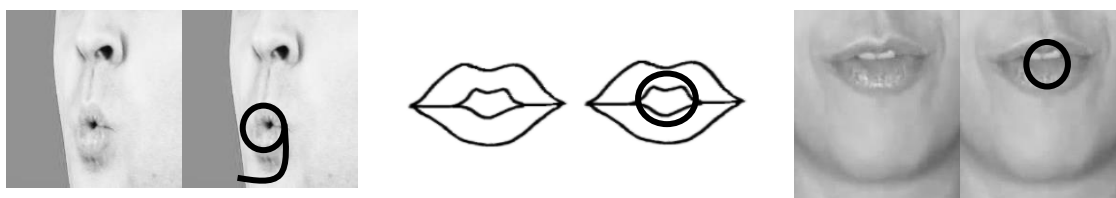


The letter س (/s/) is articulated as a voiceless alveolar fricative, with the tongue's tip or blade making minimal contact with the alveolar ridge. It is visually represented as س/س, mimicking a three-tined rake to resemble the dental structure, as detailed in (3a). Notably, the Arabic term for 'tooth,' سن (/sin/), incorporates this letter, reinforcing its dental association. Meanwhile, ش (/ʃ/) is a voiceless alveo-palatal fricative, with the tongue's blade lightly touching both the alveolar ridge and the palate, allowing unobstructed airflow through the teeth. The letter ش is depicted similarly as ش/ش, a three-tined rake shape, as shown in (3b), aligning with the dental configuration. The presence of three dots in ش (/ʃ/) and ث (/θ/), both fricatives, may suggest a symbolic representation of fricative airflow, offering an alternative rationale for the tri-dot annotation in these letters, uniquely featured in the Arabic script.

#### 4.3. Circle-Shaped Letters (م، و، ف، ق)

The letters م or م (/m/), و (/w/), and ف (/f/) are characterized by a circular form, emblematic of the rounded position of the lips during their production. As labial phonemes, /w/, /m/, and /f/ necessitate the circular configuration of the lips, a feature best appreciated from a frontal facial viewpoint, as demonstrated in example (4) below.

##### 5. The representation of the letters و /w/, م /m/ & ف /f/.





a. و /w/

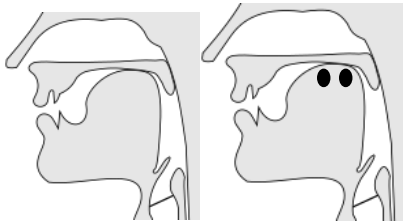
b. م /m/

c. ف /f/

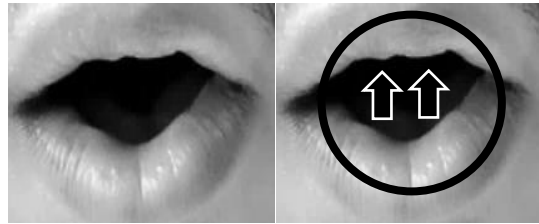
The letter و (/w/) is articulated as a voiced labial-velar approximant, characterized by the rounding of the lips, and is depicted as و (a circle) to mimic the rounded lip shape, as in example (5a). The letter م (/m/), a voiced bilabial nasal, involves the lips coming together then parting, represented as م (isolated) or م (adjoined) in either a circular or semi-circular form, reflecting the lip rounding during the /m/ sound production, shown in (5b). Similarly, the letter ف (/f/), a voiceless labiodental fricative, is produced with the lower lip against the upper teeth, allowing unobstructed airflow, represented by ف (a circle), indicative of the semi-rounded lip posture. The presence of an upper dot with ف may symbolize the unimpeded airflow characteristic of the fricative sound and its passage over the upper teeth.

While the letter ق (/q/), a glottalized velar stop, is primarily categorized with emphatic sounds (refer to section 4.6), it is worthwhile that it shares similarities with ف (/f/) that justify its inclusion in this group. The initial production of ق involves a rounded shaping, as depicted in (6b). It adopts a relatively round form with two dots symbolizing the dorsum of the tongue's movement towards the velum, as demonstrated in (6a), distinguishing it from the visually similar letter ف (/f/).

#### 6. The representation of the letter ق /q/



a. ق /q/

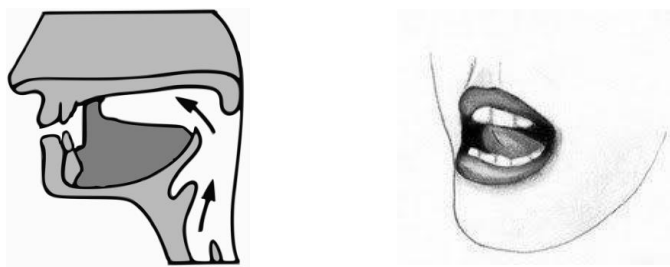


b. ق /q/

#### 4.4. Curve-Shaped Letters (ر، ز، ل، د، ذ)

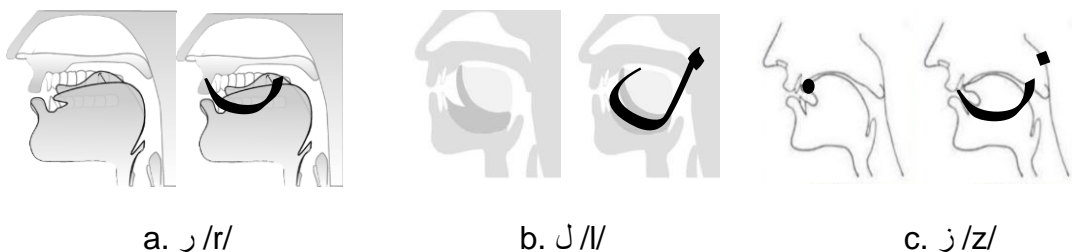
The letters ر (/r/), ل (/l/), ز (/z/), د (/d/), and ذ (/ð/) are characterized by a curved form, mirroring the tongue's shape during articulation. These instances are best observed from a lateral facial perspective, as illustrated in example (7) below.

#### 7. The movement of the tongue representing (ر، ز، ل، د، ذ)



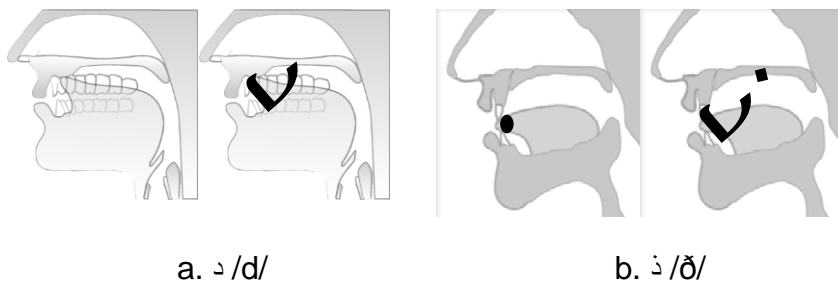
The letters ر (/r/) and ل (/l/) are classified as liquid approximants, with ر (/r/) being a voiced alveolar retroflex requiring the tongue's tip to contact the alveolar ridge, and ل (/l/), a voiced post-alveolar lateral, involving the tongue's tip touching the post-alveolar ridge. Both letters share a similar shape, embodying the tongue's curved elevation. However, ل (/l/)'s depiction as curvier in (8b) arises from the tongue's tip elevation against the post-alveolar region in Arabic. The representation of ر (/r/) and ل (/l/) mirrors this curved tongue positioning. Regarding ز (/z/), a voiced alveolar fricative, its resemblance to ر (/r/) is distinguished by an upper dot, reflecting their shared alveolar articulation point but differentiating ز (/z/)'s fricative nature, where airflow is unobstructed, necessitating an upper dot possibly symbolizing the tongue blade's upward motion in (8c), as opposed to the static blade position in the /r/ sound in (8a).

#### 8. The representation of the letters ر /r/, ل /l/ & ز /z/



The letters د (/d/) and ذ (/ð/) share a similar form, reflecting the tongue's shape. Since د (/d/) and ر (/r/) are alike in their alveolar articulation, and د (/d/) distinctly involves a stop with a more pronounced contact at the alveolar ridge, it is depicted with a pronounced curve, as illustrated in example (9) below. The letter د (/d/) is classified as a voiced alveolar stop, where the tongue blade is positioned slightly lower during its articulation compared to the letter ر (/r/), as seen in comparisons between (8a) and (9a). This subtle difference in tongue placement may contribute to their distinct representations.

#### 9. The representation of the letters د /d/ & ذ /ð/

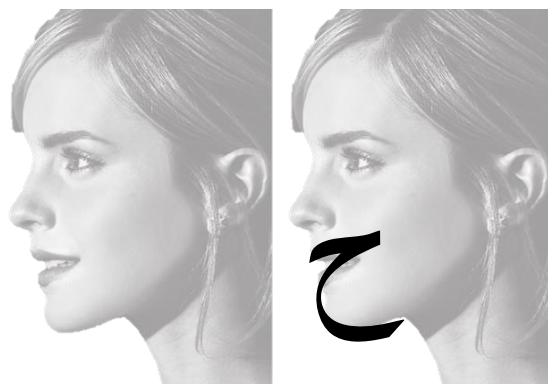


As for the letter ذ (/ð/), it is characterized by the tongue tip's intrusion, features a dot possibly symbolizing the mouth's tip or reflecting its fricative nature, given that airflow in fricatives is occasionally denoted by dots. However, it's important to note that not all letters with dots, such as ب (/b/), ت (/t/), ن (/n/), ي (/j/), ق (/q/), and others, represent fricative sounds.

#### 4.5. Sickle-Shaped Letters (ح، خ، ج، ع، غ)

The letters ح (/ħ/), خ (/x/), and ج (/ʒ/) adopt a sickle shape that mirrors the configuration of the mouth and the involvement of the jaw in their production. Analogous to the previously mentioned curved letters, these examples are best viewed from a lateral facial angle, as depicted in example (10) below.

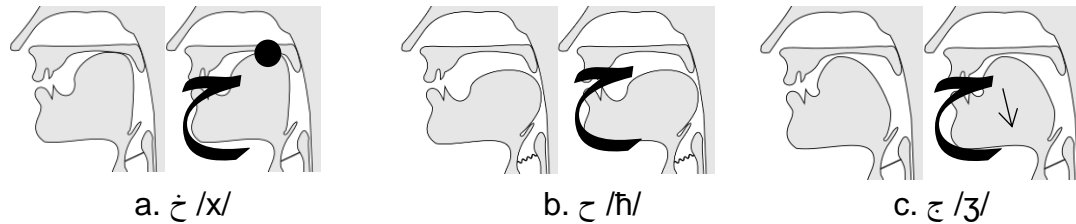
#### 10. The representation of the letters ح، خ، ج



The letter خ (/x/) is a voiceless velar fricative, produced by elevating the back of the tongue against the velum. This specific articulatory gesture is symbolized by an upper dot, as shown in (11a). Conversely, the letter ح (/ħ/) is a voiceless pharyngeal fricative, involving the tongue root's movement towards the pharynx. Since neither the tip, blade, nor dorsum of the tongue moves significantly in a vertical direction during /ħ/ sound production, this letter does not feature a dot, as indicated in (11b). The letter ج (/ʒ/) is a voiced alveo-palatal fricative, created by elevating the tongue's middle portion against both the alveolar ridge and palate before descending. This subsequent downward movement may also function to differentiate the letter ج (/ʒ/) by its lower dot. Therefore, with خ (/x/) marked by

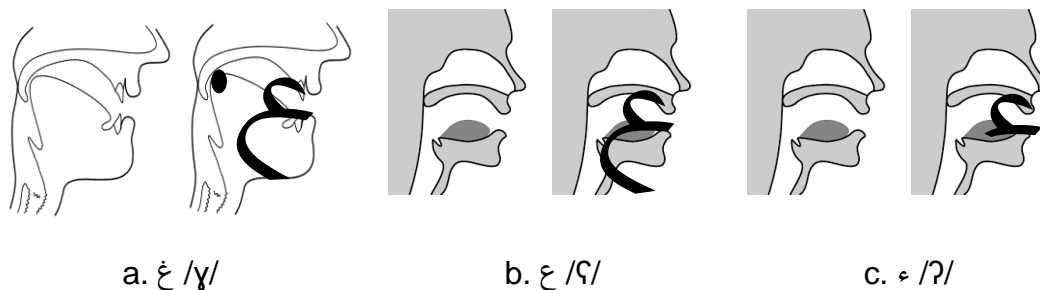
an upper dot and ح (/ħ/) lacking dots, the lower dot on ج uniquely signifies the tongue's downward trajectory post-articulation, as illustrated in (11c).

#### 11. The representation of the letters د /d/ & ð /ð/



Like the letters ح (/ħ/), خ (/x/), and ج (/ʒ/), the letters ع (/ʕ/) and غ (/ɣ/) are fricatives that adopt a sickle shape, reflecting the configuration of the mouth and the involvement of the throat in their articulation. These examples are best observed from a lateral facial perspective, as demonstrated in example (12) below.

#### 12. The representation of the letters غ /ɣ/, ع /ʕ/ & ء /ʔ/.



In these phonemes, the upper segment of the letters ع (/ʕ/) and غ (/ɣ/) mimics the form of the mouth or lips, while the lower segment indicates the throat, their articulation site. For غ (/ɣ/), a voiced velar fricative, the tongue's rear contacts the velum, with the dot above symbolizing this high-back articulatory position, as shown in (12a). Conversely, ع (/ʕ/) is a voiced pharyngeal fricative produced by moving the tongue's root towards the pharynx, and since there's no significant vertical tongue movement, no dot is present, as indicated in (12b). In the Arabic script, the initial letter (ا) can accommodate a hamza (ء), a glottal stop diacritic (/ʔ/). This hamza, resembling the top of ع (/ʕ/), acts as a condensed form of ع. It appears above ا as أ (/ʔa/) or below as إ (/ʔi/). The similarity between hamza ء (/ʔ/) and ع (/ʕ/), both throat-generated sounds, suggests a shared representation, with the hamza's depiction following the top part of ع, as demonstrated in (12c)).

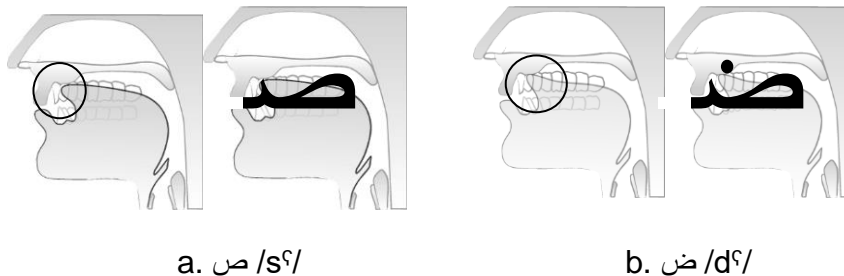
#### 4.6. Drop-Shaped Letters (ص، ض، ط، ظ، ق)

The letters ص (/s/) and ض (/d/) versus ط (/t/) and ظ (/ð/) feature a distinctive drop shape, specifically illustrated as ص. This shape potentially symbolizes the obstruction of airflow within the oral cavity during articulation, as these phonemes are emphatic, incorporating

a glottal stop (/ʔ/). The drop form could signify the constrained airflow characteristic of their production, with the positioning of the dots reflecting the tongue's movement.

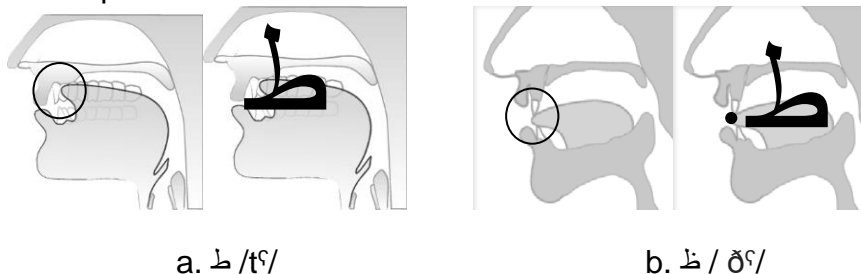
The letters ص (/sʕ/) and ض (/dʕ/) share a similar drop shape, with the primary distinction being the dot on ض (/dʕ/). This dot is attributed to ض (/dʕ/), a glottalized alveolar stop, because the tongue's tip contacts the alveolar ridge more prominently during its articulation compared to the fricative ص (/sʕ/), which is a glottalized alveolar fricative. The more pronounced contact in the production of ض (/dʕ/) necessitates marking this letter with an upper dot, as depicted in (13b) below.

### 13. The representation of the letters ص /sʕ/ & ض /dʕ/



The letters ط (/tʕ/) and ظ (/ðʕ/) share a visual similarity, each adopting a drop shape with an additional upper line (ʾ). To distinguish ط (/tʕ/), a glottalized alveolar stop characterized by a pronounced contact with the alveolar ridge, from ص (/sʕ/), which involves lighter contact, an upper line (ʾ) is added above the drop. This delineation is necessary since the dot has been utilized for the letter ض (/dʕ/). It is noteworthy that ط (/tʕ/) and ض (/dʕ/) both represent emphatic alveolar stops (/t/ and /d/, respectively, but with glottalization); however, the former is indicated by a line to signify the tongue's engagement with the alveolar ridge, while the latter employs a dot, as shown in (14a). For ظ (/ðʕ/), which entails the tongue's intrusion, an additional dot is applied, as illustrated in (14b).

### 14. The representation of the letters ط /tʕ/ & ظ /ðʕ/

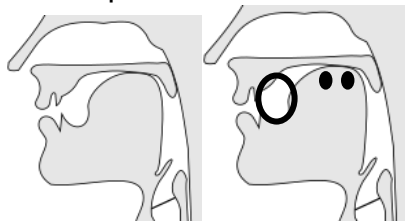


Given its classification as an emphatic sound (a glottalized velar stop), ق (/q/) adopts a circular form, distinct from the drop shape associated with other emphatic phonemes (ص, ض, ط, ظ). Despite this shape difference, both the drop and circle may similarly represent airflow restriction within the oral cavity, characteristic of emphatic sounds. The circular shape of ق (/q/) likely symbolizes this blockage. The presence of two dots above ق (/q/)



might reflect the action of the tongue's back elevating towards the velum, as illustrated in (15). A single dot cannot sufficiently denote the ق (/q/) sound, as it is already assigned to other phonemes like ف (/f/) or ض (/dʕ/) (revisit section 4.3 for an alternative explanation).

#### 15. The representation of the letter ق /q/

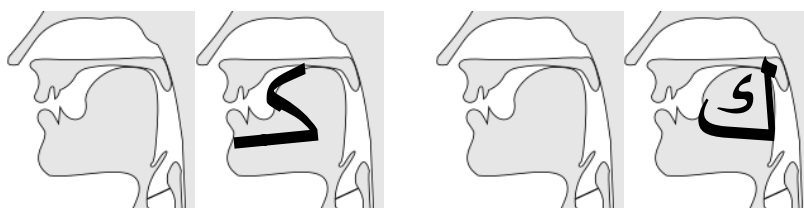


ق /q/

#### 4.7. Other sounds (ك/ك, هـ/هـ, ا)

The final set of letters to be addressed includes ك/ك (/k/), هـ/هـ (/h/), and ا (/a/). The letter ك /k/, a voiceless velar stop, is depicted as ك, possibly to illustrate the dorsum of the tongue's movement against the velum. The upper portion of ك /k/ symbolizes the tongue's rear contacting the velum, as depicted in (16a). Notably, ك /k/ assumes the form ك when isolated and ك in a connected format. The foundational shape of ك resembles the letter ل /l/, featuring a diminutive ك within it, often misinterpreted by many Arabic speakers as a hamza ء, yet it is indeed a miniature ك /k/. The precise representation of ك remains subject to revision, potentially as demonstrated in (16b).

#### 16. The representation of the letter ك or ك /k/

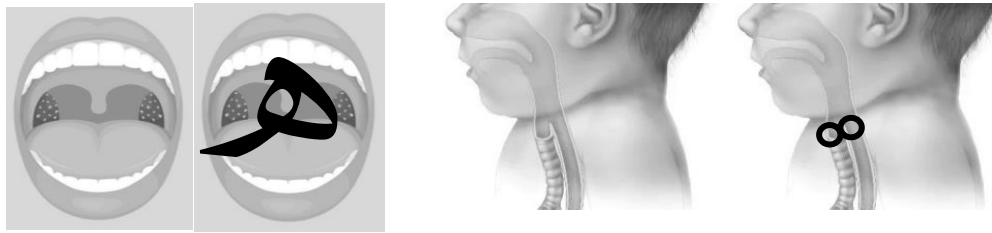


a. ك /k/

b. ك /k/

The letter هـ or هـ (/h/), a voiceless glottal fricative, is depicted in Arabic with two loops either in isolation (هـ) or within a word (هـ). Given the glottal origin of the /h/ sound, these loops might symbolize the throat's anatomy, correlating to the dual pathways within the throat: the trachea (air passage) and the esophagus (food passage). It is conceivable that ancient Arabs, possibly through observations from animal dissections or post-battlefield examinations, were familiar with throat anatomy. This anatomical knowledge might have inspired the representation of هـ /h/, suggesting an attempt to visually capture the throat's structure as it generates the /h/ sound, as illustrated in (17).

17. The representation of ه or هـ /h/

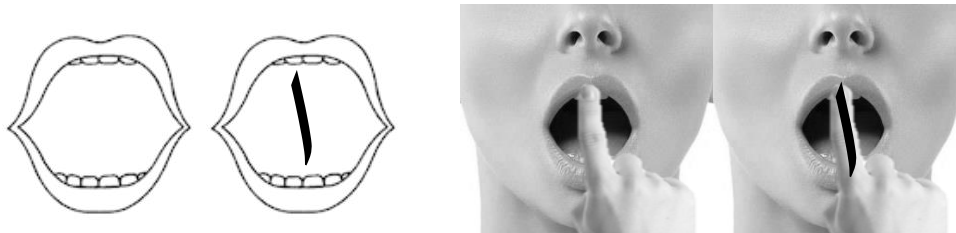


a. ه /h/

b. هـ /h/

The final letter under discussion, and the first in the Arabic alphabet, is ا (/a/). This study proposes that its representation as ا (resembling the numeral "1") mimics the open-mouth posture necessary for its articulation. As a straightforward vowel sound /a/ that is articulated without significant movement of the tongue or lips, its form (ا) is conceptualized to symbolize the mouth in an open state, as depicted in (18) below.

18. The representation of the letter ا (/a/)



a. ا /a/

b. ا /a/

Drawing from the similarities previously mentioned, we infer a strong possibility that Arabic is expressed through phonetic articulations. This approach is not entirely novel but is also observed in other alphabetic systems, such as the Hangul language.

#### 4.8. Hangul Language

Hangul, or sometimes termed Hankul, is a Korean writing system written invented in the fifteenth century (Sampson 1985). It is credited to King Sejong (1397-1450 CE), who showed considerable personal investment in its creation. King Sejong, deeply invested in the welfare and education of his people, recognized the challenges that the complex Chinese script posed for common Koreans. In response, he commissioned a team of scholars to create a more accessible and efficient system of writing. The result was Hankul, introduced to the public in 1445 through the document *Hunminjeongeum*, which means "The Correct Sounds for the Instruction of the People." (King 1996; Ahn 1997). This new script was ingeniously designed to reflect the shapes made by the mouth, tongue, and teeth when producing sounds, making it the most common alphabets in the world with such a phonetic basis as shown in Image 7 below (cf. Roger, 2005: 71):

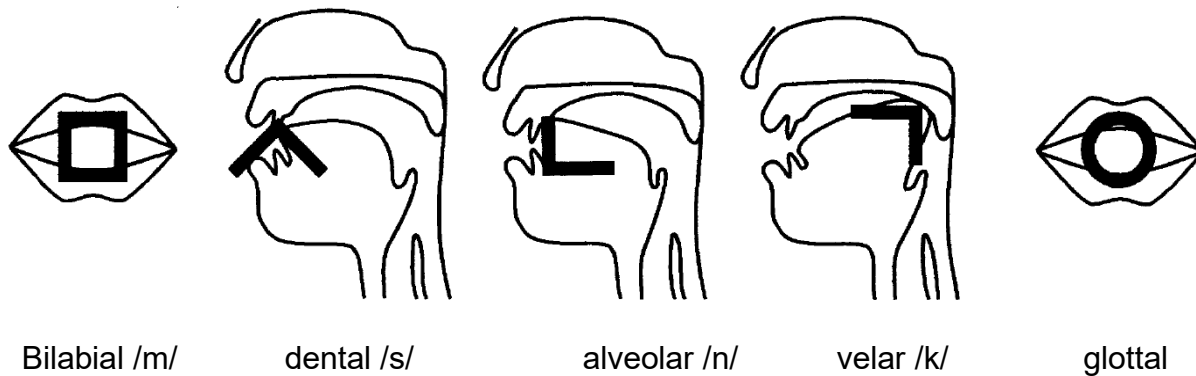


Image 7: Representation of Sounds in Hangul

As indicated by [Roger \(2005\)](#), a key inquiry pertains to the extent to which the creation of Hangul was shaped by existing alphabetic systems. Given the prominence of Buddhism in Korea during its inception, it is plausible that the creator of Hangul had knowledge of Indian scripts, which are commonly linked to Buddhist scriptures. Additionally, the Mongolian script was utilized in regions just north of Korea. These scripts could have potentially influenced the design of Hangul. However, there are no definitive features in the symbol designs or usage rules that strongly suggest a direct influence.

Building upon Roger's insight that "the Mongolian script was used not far to the north," (p. 70), this article proposes an intriguing possibility that Hangul was shaped by Mongolian influence after the Mongolian conquest of the capital of the Islamic Abbasid Caliphate, Baghdad, in 1258, two centuries before the creation of Hangul in 1445. This hypothesis suggests that the Mongolians, during their interactions with the Arabs in Baghdad, might have been inspired by the phonetic intricacies of Arabic script. Despite the silence of old and contemporary Arabic literature on the invention of Arabic alphabet on a phonetic basis, the possibility of Arabic alphabet being invented remains a captivating mystery, especially considering the reported destruction of Baghdad's House of Wisdom and other libraries by the Mongols ([Al-Khalili 2011: 233](#)). The destruction of Baghdad by the Mongols was thorough and "legends state that the river waters turned black and red from the ink of Baghdad's destroyed libraries and the blood of the slain Baghdadis" ([Wheeler, 2012: 38](#)). The loss of these books during the Mongol invasion may contain answers to this puzzle regarding the phonetics-based evolution of Arabic alphabet that we do not reach in the modern days, and this interaction between Mongolians, Arabs, and Koreans underscores the profound impact of cultural exchanges and the untold stories of script evolution.

#### 4.9. A Note on Arabic Pedagogy

The new hypothesis posited regarding the phonetic underpinnings of the Arabic script holds significant implications for the pedagogy of the Arabic language, offering innovative avenues for teaching and learning. By framing Arabic letters as visual representations of phonetic articulation, educators can adopt a more intuitive approach to literacy instruction,

enabling learners to grasp the connection between letter shapes, dot placement, and the corresponding sounds of speech. This method can demystify the learning process for beginners, making the acquisition of reading and writing skills more accessible and engaging. For instance, understanding that the shapes of certain letters are inspired by the positioning of the tongue, lips, and throat during sound production can help learners internalize the sounds associated with these letters more naturally. This phonetically informed pedagogy not only enhances phonemic awareness but also fosters a deeper appreciation of the language's rich linguistic heritage.

Furthermore, this hypothesis encourages the development of teaching materials and strategies that emphasize the phonetic and articulatory aspects of the Arabic script. By incorporating visual aids, animations, and interactive exercises that highlight the physical aspects of sound production, educators can create a more immersive learning environment. Such resources can visually illustrate the link between articulatory phonetics and script, making abstract concepts more tangible for students. This approach can also aid in pronunciation and spelling, as students become more aware of the nuances of Arabic phonetics and the logic behind the script's structure. Overall, adopting this phonetic perspective in Arabic language education could revolutionize teaching methodologies, making learning more rooted in linguistic insights and thereby more effective and enjoyable for students.

## **5. Conclusion**

While this study presents a novel hypothesis regarding the phonetic and articulatory basis for the representation of Arabic letters, particularly focusing on the placement and rationale behind the use of dots, it does not assert these interpretations as definitive truths. Rather, these propositions should be viewed as inspirational insights, offering a fresh perspective on the potential phonetic considerations that might have influenced the original design of the Arabic script, especially that the current held views lack convincing evidence (i.e. that Arabic is borrowed from Syriac ([Genesius 1815](#); [Taylor 1883](#); [Senner 1991](#)) or Nabataean ([Daniels 1990](#); [Healy, 1991](#); [Gruendler, 1993](#))). In other words, the suggestions posited herein aim to spark further discussion and exploration into the intricate relationship between sound production and script formation. Therefore, it should be noted that the hypothesis offered does not hinge solely on the accuracy of each letter's proposed representation but seeks to underscore a broader conceptual framework that links articulatory phonetics with written symbols.

By examining the historical and linguistic contexts in which the Arabic alphabet evolved (as is the case with Abu Alaswad Adu'ali's ways of inventing the diacritics), alongside comparative analyses with other scripts (like Hangul), this study encourages a reevaluation of conventional narratives surrounding script origin theories. Through this lens, even if specific representational claims are contested, the overarching idea—that the design of Arabic letters, and particularly the strategic placement of dots, reflects a deep-seated awareness of phonetic articulation—remains compelling. This approach

invites a more nuanced understanding of script development, emphasizing the sophisticated linguistic acumen of early Arabic script designers. Hence, while the hypothesis presented regarding the Arabic script may seem novel in the context of Semitic languages, it aligns with a broader linguistic phenomenon observed across different language families. This cross-linguistic perspective not only bolsters the plausibility of the proposed hypothesis but also situates the Arabic script within a wider, global context of phonetically inspired writing systems, affirming the ingenuity and intentionality underlying script development across cultures.



## References

- Ahn, Pyonh-Hi. 1997. 'The principles underlying the invention of the Korean alphabet', in Kim-Reynaud Young-Key (ed), *The Korean Alphabet: Its History and Structure* (p. 89-105). Honolulu, Hawaii: University of Hawai'i Press.
- Al-Khalili, Jim. 2011. *The House of Wisdom: How Arabic Science Saved Ancient Knowledge and Gave Us the Renaissance*. New York, USA: Penguin Press.
- Al-Sirafi, Abu Sa'id. 1966. *Akhbar al-Nahwiyyin al-Basriyyin* (Stories of Basra Syntacticians). Cairo, Egypt: Sharikat Maktabat wa Matba'at Mustafa al-Babi al-Halabi wa Awladuhu bi-Misr.
- Beer, Eduard F. 1840. *Studia Asiatica III: Inscriptiones veteris litteris et lingua hucusque incognitis ad Montem Sinai in magno numero servatae*. Leipzig: Barth.
- Bellamy, James A. 1989. 'The Arabic alphabet', in Wayne Senner (ed), *The Origins of Writing* (pp. 91-102). Lincoln, NE: University of Nebraska.
- Coulmas, Florian. 2012. *Writing Systems: An Introduction to their Linguistic Analysis*. Cambridge, UK: Cambridge University Press.
- Daniels, Peter T. 1990. Fundamentals of Grammatology. *Journal of the American Oriental Society*, 110: 727-730.
- Daniels, Peter T. 1996. 'The study of writing systems', in Peter T Daniels & 'William Bright (eds), *The World's Writing Systems* (pp. 3-17). Oxford, UK: Oxford University Press.
- Edzard, Lutz, 2013. 'The Philological Approach to Arabic Grammar', in Jonathan Owens (ed), *The Oxford Handbook of Arabic Linguistics* (pp. 160-176). Oxford, UK: Oxford University Press.
- Fischer, Steven. 2003. *History of Writing*. Reaktion Books.
- Gesenius, Wilhelm. 1815. *Geschichte der hebräischen Sprache und Schrift: Eine philologisch-historische Einleitung in die Sprachlehren und Wörterbücher der hebräischen Sprache*. Leipzig: Vogel.
- Giles, Peter. 1910. 'Alphabet', in Hugh Chisholm (ed), *Encyclopædia Britannica*, Vol 1 (pp. 723–732). Cambridge: Cambridge University Press.
- Gruendler, Beatrice. 2006. 'Arabic Alphabet: Origin', in Kees Versteegh (ed), *Encyclopedia of Arabic Language and Linguistics*, Vol 1 (pp. 148-155). Leiden, Netherlands: Brill.
- Gruendler, Beatrice. 1993. *The Development of the Arabic Script: From the Nabataean era to the first Islamic century according to dated texts*. Atlanta, USA: Scholars Press

Healey, F. John. 1991. "Nabataean to Arabic: Calligraphy and script development among the pre-Islamic Arabs". *Manuscripts of the Middle East* 5: 41-52.

Healey, John F. & G. Rex Smith. 2012. *A Brief Introduction to The Arabic Alphabet*. London, UK: Saqi.

Ibn al-Nadim, Muhammad. 1997. *Al-Fihrist*. Beirut, Lebanon: Dar al-Ma'arif.

King, Ross. 1996. Korean writing. In Peter Daniels and William Bright (eds), *The World's Writing Systems* (pp. 218-27). Oxford: Oxford University Press.

Lewis, N. N. and M. C. A. Macdonald. 2003. "W. J. Bankes and the identification of the Nabataean script". *Syria* 80: 41–110.

Naveh, Joseph. 1979. "A Nabataean incantation text". *Israel Exploration Journal*, 29: 11-119.

Nehmé, Laïla. 2010. "A glimpse of the development of the Nabataean script into Arabic based on old and new epigraphic material". In M. C. A. Macdonald (ed), *The Development of Arabic as a Written Language*, (pp. 47–88). Oxford: Archaeopress for the Seminar for Arabian Studies.

Rogers, Henry. 2005. *Writing Systems: A Linguistic Approach*. Oxford, UK: Blackwell Publishing.

Sampson, Geoffrey. 1985. *Writing Systems: A Linguistic Introduction*. California, USA: Stanford University Press.

Senner, Wayne M. 1991. *The Origins of Writing*. University of Nebraska Press.

Starcky, Jean. 1955. "The Nabataeans: A Historical Sketch". *The Biblical Archaeologist*, 18(4): 81-106.

Taylor, Isaac. 1883. *The alphabet: An Account of the Origin and Development of Letters*. London, UK: Kegan Paul, Trench.

Wheeler, J. Tia. 2012. "Baghdad, Fall of to Mongols", in Andrea Stanton (ed), *Cultural Sociology of the Middle East, Asia, & Africa: An Encyclopedia* (pp. 137-138). Los Angeles, USA: Sage Publications, Inc.

Wright, William. 1890. *Lectures on the comparative grammar of the Semitic languages*. London, UK: Macmillan Publishers.

