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| RESEARCH ARTICLE

Observations on the Phonological Reconstructions of Proto-Semitic Consonants: A Comparative Approach

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| ABSTRACT
This paper describes the reconstruction of the Proto-Semitic (PS) consonantal phonemic inventory via comparative methods. Specifically, it illustrates the changes undergone by certain consonants over time and explains how other consonants were retained in the investigated languages (i.e., Classical Arabic, Hebrew and Aramaic). Twenty-nine consonants of PS phonemes were reconstructed in the form of cognate sets and correspondence rules that reflected the proto-consonants onto individual reflexes. The analysis revealed that the vast majority of PS phonemes were retained unchanged in the investigated languages. Moreover, the results indicated that Arabic, unlike Hebrew and Aramaic, retained the highest proportion of PS phonemes, as its consonants are identical to those in PS. The majority of fricatives in Hebrew and Aramaic have been merged, whereas they have been maintained in Arabic. The voiceless bilabial stop is the only sound change to have occurred in the PS labials, weakening to become a voiceless fricative (lenition). The velar fricatives /x/ and /ɣ/ were retained in Arabic and merged with the pharyngeal fricatives /ħ/ and /ʕ/ in Hebrew and Aramaic. In addition, while /*w/ has been retained in Arabic, it underwent a conditional sound change in both Hebrew and Aramaic, which initially transformed it into /y/.

| KEYWORDS

Semitic languages, proto-language, sound change, language contact

| ARTICLE INFORMATION

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1. Introduction

Every language changes over time, which results in transformations of a language's phonological system. These changes are of particular interest to historical linguists because they reveal a great deal about how languages have evolved over time. Historical linguists can examine the systematic correspondences between the sound systems of different languages to determine what sounds had to be present in ancestral languages (Tilahun, 2013). When classifying languages that are known to be related, the comparative method is used to find regular correspondence patterns at any linguistic level (e.g., phonology, morphology, syntax, semantics) (Campbell, 2004). Linguists deduce proto-forms—that is, for example, sounds of the proto-language—from these patterns. The lexicons of genetically related languages share structural similarities inherited from their ancestors. These similarities are formed by the correspondence of sounds in various languages across cognate words (List, 2019). For instance, English and German belong to the same proto-language. Thus, the English interdental /θ/ in a word like *thorn* is reflected as /d/ in German *dorn*. Therefore, by identifying regular sound correspondence patterns, we can form a basis for proving forms of genetic relatedness that would not be possible without the recognition of such patterns. The absence of certain consonants from a language cannot be a determining factor when reconstructing its ancestry, since the consonant may have developed later in a language and/or in a specific context (Juntunen, 2019). For example, the existence of nasal and interdental consonants in Celtic (i.e., a Westernmost Romance language) do not exist in old Latin (the proto-language). To explain certain regular sound correspondences between different descendant languages, each proto-phoneme is reconstructed by applying the comparative

method, which begins with phonology in the attempt to recreate the sound system and ultimately reconstructs the vocabulary and grammar of the proto-language (Campbell, 2013).

This paper investigates the consonantal phonemic inventory of Proto-Semitic (PS) through three of its main descendants—Classical Arabic (CA), Classical or Biblical Hebrew (CH), and Aramaic—and seeking to understand how these proto-phonemes were innovated or retained in these three languages. To this end, phonological reconstruction of consonant phonemes is performed based on data obtained from sound correspondences of the cognate sets. The paper has a twofold aim: first, to trace the phonological development in the descendants of these languages, and second, to investigate those sounds that have changed during their evolution.

1.1 Languages Under Investigation

This section provides a brief introduction to three Semitic languages: Arabic, Hebrew, and Aramaic. Semitic languages are a branch of "a large family that has come to be known as Afroasiatic" (Bennett, 1998, p. 2). According to Sáenz-Badillos (1996), the descriptor *Semitic* was first used by Leibniz (1710) to describe this group of languages based on the name of Shem, a son of Noah (pp. 2–3). The Semitic languages are often classified, following Versteegh's (2014) geographic division, into two main branches: East Semitic and West Semitic (see Figure 1).

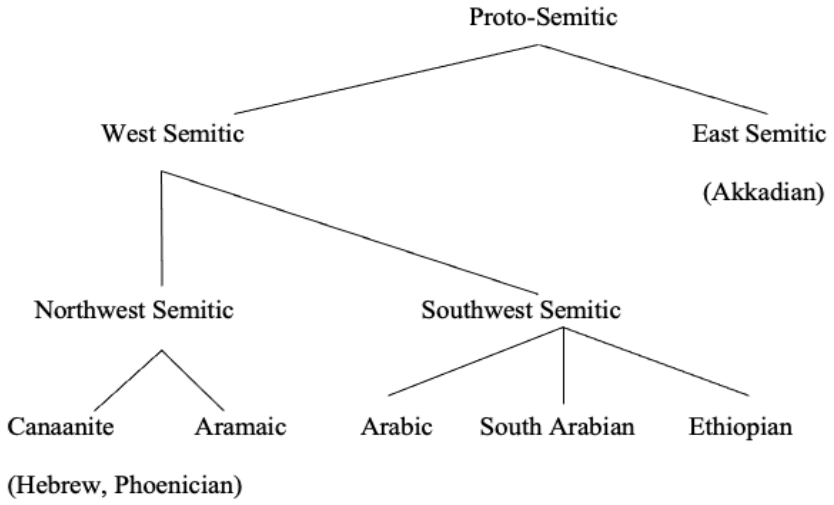

Figure 1. The Traditional Classification of the Semitic Languages (Versteegh, 2014, p. 45)

The East Semitic languages include Akkadian (and its dialects, Assyrian and Babylonian), while the West Semitic languages are further subdivided into Northwest Semitic and Southwest Semitic (see Figure 1). The Northwest Semitic languages include Canaanite and Aramaic, while the Southwest Semitic languages include Arabic, South Arabian, and Ethiopian (also known as Amharic). In contrast to Versteegh, Hetzron (1997) and Huenhnergard and Pat-El (2019) have considered Arabic a Central Semitic language. According to Shimron (2003), the Semitic language family extends to the western regions of Sudan, Ethiopia, and Saudi Arabia in the south; Syria in the north; and to Iraq, Iran, and the Mediterranean area, including Malta and the northern coast of Africa (e.g., Morocco, Tunisia and Algeria).

Versteegh (2014) has noted that many of the Semitic languages shown in Figure 1 died after the conquest of Islam. By the end of the sixth century BCE, the prophet Mohammed had established the Islamic religion across the Arabian Peninsula (Watson, 2002). Beyond the peninsula, this new religion expanded quickly to the Levant, Iraq, North Africa, India, Indonesia, and many other places. According to Watson (2002), the rise and spread of this religion involved not simply a religious or cultural conquest but also a linguistic one. Due to this conquest, within a few hundred years, Arabic was considered the primary language in all Muslim nations. In addition, it continues to be the language of the Quran and Muslims all over the world.

Although many Semitic languages, such as Phoenician and Akkadian, have become extinct, some remain living languages (Holes, 2004). Almost all of the Semitic languages still spoken today, such as Arabic, Aramaic, Hebrew, and Amharic (i.e., Ethiopian in Figure 1), are from the West Semitic language branch. The majority of contemporary speakers of Semitic languages

speak varieties of Arabic. According to Bishop (1998), Arabic, Hebrew, and Aramaic are the most widely spoken descendants of PS, which is the proto-language (mother) of the Semitic group of languages. These three common languages and other descendants are strongly interrelated. According to Ryding (2003), the similarities of structure among these languages has enabled linguists to reconstruct the parent language, PS. In reality, there was no language called PS (Jaber et al., 2021). Rather, PS is a construct, derived from its daughter languages, that refers to an early stage in the development of its descendants (Murtonen, 1967; Sáenz-Badillos, 1996). We now turn to an introduction of the languages considered in this study.

The first language under study is Arabic, a member of the Semitic language family, which, in turn, is a branch of a broader Afroasiatic language group (Huenhnergard & Pat-El, 2019). Many languages from the Middle East belong to this category. Arabic is spoken by approximately 300 million people across varied geographical regions that extend from Morocco to Yemen and from Iran to Lake Chad (Horesh & Cotter, 2016). In the modern era, Arabic is generally considered to have three forms: Classical Arabic (CA), the language of literature and religious heritage (Abu Absi, 1986); Modern Standard Arabic (MSA), which is commonly used in mass media and education; and an abundance of vernacular dialects. Arabic has 28 consonantal phonemes. According to Bishop (1998), Arabic is the sole language to have preserved most PS features. Moreover, it has preserved the PS phonology perfectly (Kaye & Daniels, 1997). In short, Arabic is a pivotal Semitic language in the reconstruction of PS.

Classical Hebrew (CH), commonly classified as a West Central Semitic language, is the second language investigated in this paper. By the last half of the second millennium CE, Hebrew had developed in the northwestern regions of the Middle East, in particular from the River Jordan to the Mediterranean Sea. Culturally, CH would play a role not only in the history of the people who spoke it but also in Western culture as a whole. It is a central language of the Jewish religion, forming the language of the Torah and much Jewish literature, both prose and verse, and Jewish tradition holds that CH is, in fact, the first language—the language of creation (Sáenz-Badillos, 1996). Modern Hebrew was made the official language of Israel in the 20th century (Bar-Asher, 2016; Sáenz-Badillos, 1996). In phonological terms, CH contains 25 consonantal phonemes. The language has undergone a number of consonantal changes, and its phonological systems exerted considerable influence on Aramaic phonology (Suchard, 2019).

The third language examined herein is Aramaic, a Northwest Semitic language that is now spoken primarily in the geocultural region of Kurdistan (located in the northern regions of Iraq and Syria and southeastern parts of Turkey; Greenspahn, 2003; Gzella, 2015; Yildiz, 2000). Other speakers include some Jewish and Assyrian people in Iran. Hebrew and Aramaic are highly interrelated. As Koller (2020) explained, "Hebrew and Aramaic were in close contact for the centuries of their pre-history" (p. 440), and they share many common linguistic innovations and words. Like Hebrew, Aramaic has undergone several changes over time. Its phonological system consists of approximately 22 consonants.

1.2 Phonemic Inventory of the Proto-Language

Proto-Semitic has approximately 29 consonantal proto-phonemes (see Table 1) (Bergstrasser, 1983). Most linguists have agreed that the majority of these consonants have been faithfully preserved, albeit with certain modifications, in Arabic (Garr, 2005; Gray, 2006; Kaye & Daniels, 1997; Sáenz-Badillos, 1996).

Table 1. Proto-Semitic consonantal phonemes (Bergstrasser, 1983, p. 3)

		Labial	Interdental	Dental /Alveolar		Palatal	Velar	Pharyngeal	Glottal
				Central	Lateral				
Nasal		*m		*n					
Stop	VS	*p		*t			*k		*ʔ
	Vd	*b		*d			*g		
	Emph			*ṭ			*q		
Fricative or	VS		*θ	*š *s	*ś		*x	*ḥ	*h

Affricate	Vd		*ð	*z			*ɣ	*ʕ	
	Emph		*θ̣	*ṣ	*ś				
Trill				*r	*l				
Approximant		*w				*y			

1.3 Theoretical Framework

1.3.1 Comparative Method

Beginning in the early 19th century, according to Porkhomovsky (2017), the foundation of comparative linguistic approaches and linguistic reconstruction was laid based on examinations of data from Indo-European languages (e.g., Germanic, Slavonic). By the end of 19th century, a group of Indo-European linguistic experts known as Neogrammarians had formalized a new theoretical framework for comparative research that relied on regular sound correspondence patterns as data; such studies helped scholars interpret the ancient Semitic texts written on historic monuments (Porkhomovsky, 2017).

As stated above, the current study employs a comparative method, which provides essential techniques for tracking and recovering linguistic history through its explanations of language categorization and the prehistory of linguistics. Generally, linguists who employ the comparative method use this approach to (a) identify examples of genetic relatedness among the compared languages, (b) investigate the history of languages, and (c) develop theories of linguistic change. In language classification, for instance, the comparative method detects the genetic relationship between two or more languages by comparing their features with those of common ancestors (i.e., a proto-language), extrapolating backwards to infer their properties at all linguistic levels including phonology, syntax, morphology and semantics (Campbell, 2013). To explore potential genetic relationships among languages, we compare them feature-by-feature through an established set of procedures and ascertain the changes from the proto-language demonstrated by these languages. The first steps are comparing the basic vocabularies and identifying cognates among the compared languages (Garr, 2005). However, reliance on lexical comparisons alone is considered inappropriate by most linguists, since lexical similarities do not necessarily indicate relatedness (Velieva, 2021). Persian and Arabic, for example, share a highly similar lexicon but are unrelated; while Persian has heavily borrowed words from Arabic over the years, it did not descend from Arabic's "ancestor" language, Proto-Indo-Iranian (Velieva, 2021).

Accordingly, the comparative method is optimal for testing and determining how languages are related within the same language family. Linguists follow several steps in applying this method, beginning with the essential first step of assembling a potential cognate set. Campbell (2013) defined a cognate set as a group of words or morphemes that are inherited from a single word or morpheme of the proto-language and are connected to one another throughout the sister languages. Following this, the cognates (e.g., words/morphemes) are listed in rows, particularly those that are considered basic vocabulary items, such as basic numerals, body parts, and kinship terms. The process begins with such word types because these words are more resistant than other lexical items to borrowing.

Next, sound correspondences are established, in which linguists focus on the phonemic representation of the sound rather than how the word is spelled. The different sounds in the sound correspondence set represent a single proto-language sound that has been inherited by the various daughter languages; in some daughters, this sound is reflected unaltered or largely unchanged, although more frequently, it will have undergone changes differentiating it from the original proto-sound in some or even all of the daughter languages (Campbell, 2013). As an example, let us consider the data (Latin *capra* 'goat') taken from Campbell (2013, p. 125) representing Romance languages (e.g., Italian, Spanish, Portuguese, and French). The cognates in these languages begin either with *k-*, as in the cognate /kapra/ in Italian, Spanish, and Portuguese, or with *ʃ-*, as in the cognate /ʃɛvr(ə)/ in French. In this case, to ascertain whether a sound correspondence is genuine and reflects sounds inherited in words from the proto-language as opposed to merely an accidental similarity, we must specify whether such correspondence recurs in other cognate sets (Rankin, 2017). To return to the above example, this particular Romance sound correspondence recurs initially in other words, as in (Latin *canis* 'dog'), which has the cognates /kane/ (Italian), /kan/ (Spanish), /kaw/ (Portuguese), and /ʃjɛ/ (French) (Campbell, 2013). Based on this repeated pattern across cognate sets, we can assume that the sound correspondence *s-* is genuine and not merely accidental. This step can be repeated until we have discovered every sound correspondence between the languages under comparison. Furthermore, when considering recurring sounds in a correspondence set, the form that appears in the greatest number of the compared languages can be considered as the proto-sound. Hence, in the above cognate set of Romance languages (Latin *capra* 'goat', *canis* 'dog'), *k-* appears in all the compared languages except French, which has *ʃ-*. Therefore, based on the majority assumption, we can presume that **k* is the proto-sound, while French underwent a sound change from **k > ʃ*.

Our understanding of the directionality of sound changes can offer additional clues for phonological reconstruction. Linguists regularly apply the concept of naturalness and sound change typologies when deciding among multiple possibilities

for reconstruction (Rankin, 2017). That is, some recurring sound changes occur in one direction (A > B) but not another (B > A), and such changes appear naturally with more ease and frequency cross-linguistically than other changes. For instance, if we have two sister languages with a sound correspondence of *s*- for language 1 and *h*- for language 2, then it is convenient to reconstruct **s* rather than **h* and assume that the directionality in language 2 is **s* > *h*, not **h* > *s* since the latter runs counter to the natural directionality of sound change. To return to the above example of Romance sound correspondence, it is plausible to assume that *k* > *ʃ* in French adheres to the natural directionality as observed in other languages, but not vice versa. Overall, directionality is motivated cross-linguistically or phonetically.

Another guiding approach for phonological reconstruction is factoring in phonetic features that are shared among the reflexes. These mirror, as closely as possible, the actual phonetic form of the sound as it was used in the proto-language (Campbell, 2013; Rankin, 2017). The more information is available about the reconstructed sound, the more precise the reconstruction can be. Accordingly, linguists should balance the multiple strategies for reconstruction and test the reconstructed sound from the perspectives of majority assumption, sound change directionality, and the shared features among the targeted reflexes. To apply this approach, consider the data in Table 2.

Table 2. Cognate sets of selected Romance languages (Campbell, 2013, p. 125).

English gloss	(Latin)	Spanish	Portuguese	French	Italian
goat	capra	/kapra/	/kapra/	/ʃɛvr/	/kapra/
head	caput	/kabo/	/kabu/	/ʃɛf/	/kapo/

These languages share the 'labial' phonetic feature, such as *b* in Spanish and Portuguese, *v* in French, and *p* in Italian. Moreover, the 'stop' feature appears in Spanish, Portuguese, and Italian. Taken together, these observations suggest that the proto-sound is likely from the 'labial stop' category, either *p* or *b*. Based on the majority assumption strategy, we expect to reconstruct (*b), a voiced labial stop, rather than a voiceless labial stop since the voiced feature appeared in reflexes in French, Spanish, and Portuguese. However, the directionality principle contradicts this assumption, since it is much more common to observe *p* > *b* / V-V. In phonetic terms, it is difficult to pronounce *p* between vowels since the vocal folds need to pause for *p* and then continue vibrating for the second vowel. Therefore, the vibration spreads for voicing the *p*, changing it into *b*. Accordingly, based on this directionality, the optimal choice for reconstruction is *p, not *b.

One final strategy commonly employed by linguists in reconstructing sounds, particularly when devising boundaries for the inventory of reconstructed sounds, is to examine whether the individual sounds proposed as representing the various sound correspondences align with the general phonological scheme as well as with universal linguistic and typological criteria. In addition, the linguist must examine the proposed inventory of reconstructed sounds for gaps that may need to be filled and explained by another phoneme change. The proposed proto-sounds must also be evaluated in comparison with the general pattern of sound typology. That is, it is necessary to ensure that the proposed proto-sounds occur frequently in world languages and to avoid proposing sounds that rarely occur in human language. For instance, we cannot reconstruct glottalized consonant or nasalized vowels in a proto-language without having their plain counterparts. Thus, it is recommended to develop a set of inventories that are supported by the sound systems of many languages (Campbell, 2013). These strategies are employed repeatedly until all of the recurrent sound correspondences have been investigated, and potential proto-sounds for each have been proposed. Through this approach, we will ultimately be able to rebuild the entire list of sounds in the proto-language.

2. Data

The cognate sets examined in this paper are based mostly on descriptions provided by Semitic language researchers (e.g., Bergstrasser & Daniels, 1983; Gray, 2006; Finegan & Frommer, 2007; Jastrow, 2015). The dataset presented in Table 3 comprises the consonants of three Semitic languages: Classical Arabic (CA), Classical Hebrew (CH), and Aramaic. These words are ordered such that the corresponding sounds of all words are placed in one row. The identification of regular sound correspondences in the languages under study relies on the identification of similar patterns that are repeated in different related sets. This dataset will enable anyone to recognize the PS consonants that have been retained and those that have changed among the consonants of these three languages.

Table 3. Comparative correspondence patterns for Proto-Semitic reflexes of consonants in Arabic, Hebrew, and Aramaic

Arabic	Hebrew	Aramaic	English Gloss
diːn	diːn	diːn	'religion'
zamaːn	zmaːn	zman	'time'
ðahab	zaːhaːb	dhab	'gold'
ṭaːb	ṭoːb	ṭaːb	'good'
ʕamiːq	ʕaːmoːq	ʕamiːq	'deep'
salaːm	ʃaːloːm	ʃlaːm	'peace'
zuruːʕ	zeruːʕ	zraʕ	'seed'
θalaːθ	ʃaloːʃ	tlaːt	'three'
fassara	peʃer	pʃar	'interpret'
daur	doːr	daːr	'generation, period'
jaktub	jiktoːb	jiktub	'he writes'
ṣadaqa	ṣdaːqaː	ṣidqa	'charity'
ʔarḍ	ʔereṣ	ʔarʕaː	'earth'
qaṭaltu	qaːṭalti	qiṭlet	'I killed'
xalaːq	ħeleq	ħlaq	'share'
baɣa	baːʕaː	bʕaː	'he asked for'
ðabħ	zebaħ	dbaħ	'slaughter'
dʒamal	gāmāl	gamlā	'camel'
ṣafara	ṣaːpar	ṣipar	'he whistled'
ʃāma	śūm	śūm	'put or place'
xamar	ħemer	ħmar	'wine'
ħaqlun	ħelɛq	ħaqlā	'field'
θaldʒ	ʃeleg	tlag	'snow'
saliːṭ	ʃaliṭ	ʃaliːṭ	'ruler, firm, mighty'
bahaq	bōhaq	bōhaqa	'a kind of skin disease'
bayḍ	bēṣā	bēʕā	'egg'
yamīn	yāmīn	yamīnā	'right'
ṭawVy	ṭVwVy	ṭVwVy	'fold'
dVrVs	dVrVs	dVrVs	'study'
nVẓVr	nVṣVr	nVṭVr	'look'
Riway	rVwVy	rVwVy	'abundant water'
whb	yVhVb	yVhVb	'give'

3. Analysis

Based on the current data, each PS sound was reconstructed to elucidate a certain pattern of sound correspondence in the investigated languages. The PS /*p/ has been retained in Hebrew and Aramaic, as in the Hebrew word /ṣaːpar/ and the Aramaic word /ṣipar/ 'he whistled'. This sound, however, shifted to /f/ in Arabic, as in the Arabic word /ṣafara/ 'he whistled'. According to Bennett (1998) and Sáenz-Badillos (1996), the Arabic phoneme /f/ is a reflex of the PS /*p/. Accordingly, in Arabic, the voiceless bilabial stop in the PS weakened to become a voiceless fricative through a process known as lenition; this is evidenced by the absence of the voiceless bilabial stop /p/ from the Arabic language. Kaye and Daniels (1997) asserted that the voiced bilabial stop /b/ is devoiced in Arabic if it is followed by a voiceless sound. For instance, Arabic speakers pronounce the voiced bilabial stop in the word /kabs/ 'push' as a voiceless bilabial stop. This sound change is the only such change of the PS labials to have occurred within these three Semitic languages.

The data in Table 3 also indicate that the reflexes of the PS voiceless interdental fricative /*θ/ have been retained unaltered in the Arabic language, as evidenced by the Arabic word /θalaːθ/ 'three'. In contrast, in Hebrew, this proto-phoneme underwent a shift to /ʃ/, and /*θ/ no longer exists in any Hebrew dialect (Kaye & Daniels, 1997). Thus, in Hebrew, the word /θalaːθ/ 'three' (which is unaltered in Arabic) became /ʃaloːʃ/. In Aramaic, this proto-sound shifted to /t/ (Bennett, 1998), as evidenced by the Aramaic word for 'three', /tlaːt/. According to Kaye and Daniels (1997), the PS interdentals shifted into dentals in Aramaic. In brief, the /*θ/ sound has remained unaltered in the Arabic language but shifted to /ʃ/ in Hebrew and to /t/ in Aramaic.

As another example, the PS voiced interdental fricative /*ð/ has three reflexes in these three languages. First, it remains unaltered in Arabic, as evidenced by the word /ðahab/ 'gold'. In contrast, in most Hebrew dialects, Kaye and Daniels (1997) have

stated that it shifted to /z/, although in a few dialects it shifted to /d/. In the dataset in Table 3, /*ð/ shifted to /z/ in Hebrew, as indicated by the word /za:ha:b/ 'gold'. In Aramaic, as stated, the PS interdentals shifted to dentals (Kaye & Daniels, 1997), which is reflected in the shift of the proto-phoneme /*ð/ to /d/ in the Aramaic word /dhab/ 'gold'.

Arabic is not the only Semitic language to have retained some PS proto-phonemes largely unaltered. For example, the proto-phoneme /*ʃ/ has been retained in Hebrew and Aramaic, as demonstrated by its presence in the Hebrew word /ʃa:lo:m/ 'peace' and the Aramaic word /ʃla:m/ 'peace'. In contrast, this proto-sound underwent a shift to /s/ in Arabic, resulting in the Arabic pronunciation /sala:m/ 'peace'. These examples align with Gray's (2006) assertion that the Hebrew phoneme /ʃ/ is equivalent to the Aramaic phoneme /ʃ/ and the Arabic phoneme /s/.

The proto-phoneme /*g/ is another that has been retained unchanged in both Hebrew and Aramaic, as illustrated by the words /gāmāl/ (Hebrew) and /gamlā/ (Aramaic) 'camel' in the dataset. In contrast, the PS proto-phoneme /*g/ underwent a change in Classical Arabic to /dʒ/ (Ferguson, 1997). This shift is illustrated by the Arabic word /dʒamal/ 'camel'. Interestingly, the /*g/ phoneme still exists in certain Arabic dialects as an allophone of the Arabic phoneme /dʒ/. For instance, in the Egyptian and Yemeni dialects, the Arabic word /dʒamal/ is pronounced /gamal/.

The two velar fricatives in PS are considered /*x/ and /*ɣ/. These two proto-phonemes have been preserved in the Arabic language. The dataset in Table 3 confirms this retention through the Arabic words /xamar/ 'wine' and /baɣa/ 'he asked for'. In Hebrew and Aramaic, however, these proto-phonemes underwent changes and merged, respectively, with the pharyngeal fricatives /ħ/ and /ʕ/ (Bergstrasser & Daniels, 1983; Kaye & Daniels, 1997). These shifts are evidenced by the vocabulary dataset, in which the word for 'wine' (/xamar/ in Arabic) has become /ħemer/ in Hebrew and /ħmar/ in Aramaic. Similarly, the word for 'he asked for' is /baɣa/ in Arabic but /baːʕaː/ in Hebrew and /bʕa:/ in Aramaic.

Unlike the above examples, the interdental emphatic /*θ̣/ in PS underwent changes into reflexes in all three languages. In line with Kaye and Daniels's (1997) assertion that the PS interdentals shifted to dentals in Aramaic, this proto-phoneme /*θ̣/ became /ṭ/ in Aramaic, as evidenced by the Aramaic word 'look', which is pronounced /nVṭVr/, in contrast to the original PS word /nVθ̣Vr/. In Hebrew, this proto-phoneme shifted to /ṣ/, as in the Hebrew word /nVṣVr/ 'look'. This evidence aligns with Sáenz-Badillos's (1993) claim that the PS interdental emphatic /*θ̣/ shifted to /ṣ/ in most Hebrew dialects and to /ṭ/ in a few others. In Arabic, the PS /*θ̣/ shifted to /ẓ/, as evidenced by the Arabic word /nVẓVr/ 'look' in the dataset. Moreover, Al-Ani and Woodhams (2015) reported that most modern Arabic speakers do not realize /*θ̣/ = /ḍ/ with lateralization, except in certain Arabic dialects (e.g., Hadramawt spoken in Yemen); additionally, this sound is described in Classical Arabic as a voiced emphatic dental stop. Hence, as demonstrated by the evidence from our dataset, none of these languages preserved this PS proto-phoneme.

A similar transformation is observed for the proto-phoneme /*ś/, as realized in the PS word /*ʔarś/ 'earth' (Bennett, 1998). As noted by Sáenz-Badillos (1993), /*ś/ shifted to /ṣ/ in most Hebrew dialects, which is demonstrated by the Hebrew word /ʔereṣ/ 'earth' in our dataset. In some Hebrew dialects, /*ś/ shifted to /q/ or to /ʕ/ (Kaye & Daniels, 1997). This sound also shifted to /ʕ/ in Aramaic (Bennett, 1998), as illustrated by the Aramaic word /ʔarʕaː/ 'earth'. In Arabic, this proto-phoneme also shifted, becoming the voiced dental emphatic stop /ḍ/, as observed in the Arabic word /ʔarḍ/ 'earth'. Among most modern Arabic native speakers, however, this phoneme /ḍ/ is commonly pronounced as the interdental emphatic sound /ẓ/, indicating further evolution of this sound.

The PS fricative lateral proto-phoneme /*ś/ also underwent transformations in Arabic and Aramaic but not in Classical/Biblical Hebrew (CH). In Arabic, this proto-phoneme shifted to /ʃ/, as in the Arabic word /ʃāma/ 'place'. A similar shift occurred in Aramaic, transforming /*ś/ into /s/, as in the Aramaic word /sām/ 'place'. The status of this proto-phoneme in Hebrew, however, is more complicated. Gray (2006) confirmed that CH has retained the PS /ś/, which corresponds to /s/ in Aramaic and /ʃ/ in other Semitic languages such as Arabic. This retention is evidenced by the CH word /śūm/ 'place'. However, over time, the Hebrew the voiceless lateral fricative /ś/ shifted to a sibilant and merged with /s/, likely in Late Biblical Hebrew (Bergstrasser & Daniels, 1983). Thus, the PS phoneme /ś/ shifted to /ʃ/ in Arabic and /s/ in Aramaic, whereas it was retained unaltered in Hebrew for a period of time before it merged with /s/.

Proto-Semitic also has two semivocalic consonants: the bilabial /w/ and the prepalatal /y/ (Sáenz-Badillos, 1996). These semivocalics underwent a number of changes in various languages over time, such as the development of /w/ to /y/ in the initial position in the Northwest Semitic languages. The dataset in Table 3 indicates that the PS semivowel /*w/ exists in all three languages; however, it underwent significant changes in both Hebrew and Aramaic, becoming the initial /y/, whereas it was retained in Arabic. As another example, the triconsonantal root of the PS word /*whb/ 'give' illustrates how the PS phoneme /*w/ developed in these three languages. The Hebrew and Aramaic word /yhb/ confirms that the PS /*w/, when the initial sound of a word, shifted to /y/. In contrast, Arabic retained this sound unchanged, as evidenced by the PS word /*whb/ remaining in use by Arabic native speakers. To conclude, this conditional sound change in PS, in which the PS proto-phoneme /*w/ became /y/

initially in Hebrew and Aramaic but was retained in Arabic, offers further evidence that Arabic is arguably the most conservative of the Semitic languages, as its phonological system has made the fewest deviations from its proposed PS ancestor (Pietrzak, 2018).

In contrast to these patterns of sound change, some sets of sound correspondences demonstrate no change from PS proto-sounds, instead confirming the universality of these sounds. For these unchanged sets, the process of finding the PS phoneme is much easier: The linguist must reconstruct the segment, which is found in all the reflexes of the proto-phoneme. The following proto-segments are identical in all three languages (Arabic, Hebrew and Aramaic):

/*b/, /*m/, /*n/, /*t/, /*d/, /*ṭ/, /s/, /*z/, /*ṣ/, /*l/, /*r/, /*y/, /*k/, /w/, /*ʔ/, /*h/, /*q/, /*ħ/, /*ʕ/

Consequently, since these reflexes exist in all three languages with no alteration or exception, it is easy to posit these phonemes as the proto-phonemes of their parent (PS). Table 4 summarizes these sound correspondence patterns.

Table 4. Sound correspondence patterns of Proto-Semitic consonants

PS	Arabic	Hebrew	Aramaic
1. * p	f	p	p
2. * θ	θ	ʃ	t
3. * ð	ð	z	d
4. * ʃ	s	ʃ	ʃ
5. *g	dʒ	g	g
6. * x	x	ħ	ħ
7. * ɣ	ɣ	ʕ	ʕ
8. * θ̣	ẓ	ṣ	ṭ
9. * ś	ḍ	ṣ	ʕ
10. *ś	ʃ	ś	s
11. * w	w	w	w
12. * d	d	d	d
13. *n	n	n	n
14. * z	z	z	z
15. *m	m	m	m
16. *h	h	h	h
17. * b	b	b	b
18. * ṭ	ṭ	ṭ	ṭ
19. * ʕ	ʕ	ʕ	ʕ
20. * q	q	q	q
21. * l	l	l	l
22. * r	r	r	r
23. * y	y	y	y
24. * ṣ	ṣ	ṣ	ṣ
25. * ʔ	ʔ	ʔ	ʔ
26. * ħ	ħ	ħ	ħ
27. * k	k	k	k
28. * t	t	t	t
29. * s	s	s	s

4. Conclusion

Proto-Semitic is a member of a large family tree known as the Afroasiatic languages. It has a considerable number of daughters (descendants), some of which have become extinct while others remain living languages today. The most popular daughters—and the languages examined in this paper—are Classical Arabic, Classical or Biblical Hebrew, and Aramaic. The PS consonantal system consists of 29 consonants. Overall, as illustrated by the dataset presented in Table 3, most PS proto-phonemes have been retained, unchanged, in the languages under investigation. Among the changes observed in these three languages, the Arabic

language has seen the fewest changes to its phonological system from that of its PS ancestor. It is also clear that many PS proto-phonemes have undergone changes in Hebrew and Aramaic. For instance, most fricatives have merged in Hebrew and Aramaic, whereas Arabic has retained the majority of the reconstructed fricatives. The only change in the labials, which occurred only in Arabic, is to the voiceless stop, which weakened to a fricative through the process of lenition. In Hebrew and Aramaic, the pharyngeal fricatives /ħ/ and /ʕ/ merged with the velar fricatives /x/ and /ɣ/, respectively. Furthermore, the analysis revealed that /*w/ underwent a conditional change into /y/ in the initial position in Hebrew and Aramaic.

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