Akkadian [e]

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There are several features of Akkadian that set it apart from other Semitic languages. One such feature is the assumption of seven alefs that descended from Proto-Semitic phonemes, *ʔ, *h, *ʕ, *ɣ, *ḫ, and sometimes *w and *j. The standard account is that they merged before being lost in nearly every environment. Additionally, ʔ[3-5] interact with the low-back vowel, [a], producing [e]. Two other issues regarding the shift from [a] to [e] is which environments [e] surfaces in to be reanalyzed, and the fact that there are several roots that have [e] and no apparent conditioning environment. In this article I provide a solution to these issues clarifying the conditioning environments obscured by Akkadian orthography and Semitic derivational morphology. I show that voicing assimilation alone is responsible for the different outcomes of *ḫ and *ʕ, which have the same distribution. This assimilation has parallels in non-guttural roots such as *√ntn, which becomes √ndn in Akkadian. Whether *ʕ and *ḫ surface as <Ø> or <h̬> depends less on the underlying form than on assimilation to the voicing value of the adjacent consonant radical. With this analysis, there is no reason left to reject Kowenburg's theory (2006) that gutturals became glides which cause raising to [e], with the slight amendment that it is the voiced variant *ʕ alone which becomes a glide.

1. INTRODUCTION

My main goal here is to develop a more nuanced understanding of the origin of the vowel [e] in Akkadian. This sound was not part of the original Semitic three-vowel system [a], [i], and [u]. It occurs in Sumerian borrowings. However, the occurrences of [e] are not limited to Sumerian loan words;[1] they are found throughout the language, and there are even some minimal pairs: /ešer/ <*e-še-er*> 'ten' vs. /išir/ <*i-ši-ir*> 'a payment' vs. /ašar/ <*a-ša-ar*> 'where'. [e] occurs as a development out of [aj], in some words where original gutturals were lost ([ʕ], [ɣ], [ḫ], or [x]),[2] or as an allophone of [a] in proximity to a rhotic or lateral (probably pronounced [ɾ], [l], [tl], and [tl'] but written with signs traditionally thought to represent only [l], [ʃ], and [t͡s']).[3]

To fully understand the origin of [e] in Akkadian, we must recognize certain flaws in the classical account of the genesis of [e]. In section 2, I address this account and offer a linguistic basis for rejecting it. Then, I propose a new account that addresses the issues with the classical account. To support such an account, I take several detours to look at the fate of guttural consonants (section 3.1), consonant voicing variation (section 3.3), and the behavior of rhotics and laterals (section 3.6). This proposal constitutes an original solution to the issue

1. The instances of [e] that have been borrowed from Sumerian will not be considered in this article; it is the language-internal developments that shed light on the fate of proto-Semitic gutturals in Akkadian and the synchronic phonology of a bygone era.

2. This is related to the development of [aj], with [j] being an intermediate stage between the guttural and loss (see section 4 for further discussion).

3. See Weninger and Khan 2011 and Steiner 1977 for more on the realization of "fricative laterals" in Semitic, including their outcomes in Akkadian.

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of the genesis of [e] in Akkadian as well as to the fate of the guttural consonants, and thus necessitates the rejection of the classical account.

I use IPA to represent the sounds of the various languages employed here to represent accurately their forms and subtle differences in their related phonology.[4] For instance, <ṣ> (as represented in traditional Semitic transliteration) corresponds to the Akkadian ejective [t͡sʼ] and the West Semitic velarized or emphatic [sˠ]. This difference is of little importance when the goal is to decipher texts and come to understand their meanings, but it is an important distinction when considering the types of questions asked herein.[5]

2. THE CLASSICAL ACCOUNT

The classical account of [e]-genesis in Akkadian starts with the claim that the Proto-Semitic gutturals *ʔ, *h, *ʕ, *ħ, and *ɣ (but not *x) had merged into [ʔ], collectively known as /ʔ^{1}/-/ʔ^{5}/. The reflexes of *j and *w that merge with /ʔ/ in certain positions are known as /ʔ^{6}/ and /ʔ^{7}/. /ʔ^{3}/-/ʔ^{5}/ and sometimes /ʔ^{6}/ (which result respectively from *ʕ, *ħ, *ɣ, and *j) caused the raising and fronting of [a] to [e] and were subsequently lost (Huehnergard 2011). This difference in behavior between /ʔ^{1}/-/ʔ^{2}/, which were lost without raising [a] to [e], and /ʔ^{3}/-/ʔ^{5}/ is all that distinguishes minimal pairs like /agāru/ < *ʔgr ‘to hire’ and /egēru/ < *ħgr ‘to twist’.[6] Because the absence of a phone is not a conditioning environment, it has been assumed that the gutturals conditioned the raising and fronting of [a] to [e] before they were lost. A secondary cause for the shift from [a] to [e] is the presence of [r] in a root. Additionally, various roots contain an [e] but with no apparent conditioning environment. Huehnergard (2011) explains these examples as roots that have developed [e] analogically.

The classical account has been difficult to challenge, because it captures some objective truths: We know from reconstructions of Proto-Semitic that in many of these roots, there was indeed a guttural and now there is only an [e] (and in many cases compensatory lengthening); and raising to [e] is not limited to environments with lost gutturals. We see empirically that this theory is incomplete since the gutturals are not always lost, and we also see from an articulatory perspective that it is unlikely that the gutturals are directly responsible for the shift from [a] to [e]. The new analysis proposed here considers the aforementioned objective truths and reconciles them with apparent irregularities to form a comprehensive explanation of the behavior of gutturals and their influence on raising to [e].

2.1. The Pharyngeal Problem

The proposal that the guttural consonants in early Akkadian caused the raising and fronting of [a] to [e] is typologically unlikely. The phonology of pharyngeal consonants poses a problem. Pharyngeal consonants are produced by retraction of the tongue root, which con-

4. The notation employed in this paper is as follows: *reconstruction, [phonetic] <transliteration>, and /normalization/. For a full chart of IPA symbols and their Akkadian orthographic equivalents, see Appendix, below, which is based mostly upon the accepted understanding of the sounds of Akkadian (Huehnergard 2011; Weninger and Khan 2011), but includes additions and edits based on the theory proposed here regarding pharyngeals, rhotics, and laterals.

5. These are two phonological tendencies that can be predicted by the distinction between emphatic and ejective: 1) Ejectives tend to spread the laryngeal feature [+voice] to adjacent consonants (although they are not actually voiced sounds) (Fallon 2002) and dissimilate (or lose their ejective property) within words with multiple ejectives (Geers’ Law). 2) Emphatics tend to spread [+velar] to adjacent segments or even throughout entire words, as witnessed in Neo-Aramaic (Hoberman 1988).

6. Note that these examples are not true minimal pairs since the infinitive vowel spreads to all vowel slots. Therefore, these words differ in both the first and second syllables.

stricts the airflow between the esophagus and the tongue root at the pharynx. This downward and backward motion puts the tongue into a position where it should easily produce an [a] sound. In data from other Semitic languages that possess pharyngeal consonants, the presence of said pharyngeals both causes vowel lowering and blocks vowel raising. (For more on behavior of pharyngeals in Semitic see McCarthy 1994.) High vowels are lowered to [a] in proximity to pharyngeal consonants. In the Syriac active participle responsible for the present progressive, we see [jāðaʕnā] "I know" for the expected [jāðɛʕnā]. In Hebrew, where the same phenomenon can be observed in the active participle, there is the *furtive patah*, an epenthetic [a] inserted between a pharyngeal consonant and a preceding high vowel. For instance, we see the word [ruaħ] 'soul' where we would expect [ruħ]. In a Modern Arabic dialect of Iraq, the diphthong /aj/ is monophthongized, resulting in [e], but the monophthongization is blocked in proximity to pharyngeals (e.g., [bajt] → [be:t], but [ʕajn][7] remains).

2.2 The [ɾ] Sub-Issue

The raising of [a] to [e] also occurs before [ɾ],[8] though without its subsequent loss. If raising to [e] is indeed conditioned by the presence of gutturals, as the classical account has asserted, some care is necessary in reconciling the fact that the same change can also be conditioned by the presence of a phoneme that has wildly divergent features: Pharyngeals can be conceived of as [+low, +back], while rhotics can be conceived as [+high, +front].[9] Huehnergard and Woods (2004) have proposed that orthographic <r> likely represents the uvular or velar fricative, [ʁ] or [ɣ]. This approach solves the issue of why <r> causes raising to [e] given the classical account, but it overlooks several important points: 1) It is unlikely that gutturals caused raising to [e] (see section 3.1). 2) There is no independent parallel to this shift anywhere in Semitic.[10] 3) Some evidence exists in the form of Greco-Babylonian bilingual inscriptions, which show that Akkadian <r> was represented by Greek <*ρ*> (Geller 1997). Comparable Greco-Hebrew inscriptions show <*γ*> representing [ɣ] (a distinction not preserved in the Hebrew script). This is significant because it shows that Greek-speaking transliterators were able to recognize a difference between [ʕ], [ɣ], and [ɾ], and they had separate orthographic conventions for all three (e.g. <*Ø*>, <*γ*> and <*ρ*>). 4) The phonological features of [ɾ] are enough to condition raising to [e]. A similar effect on vowels can be observed in American English dialects that have "Canadian Raising," the shift of the diphthong [ai] to [ʌi] before a voiceless consonant, which also takes place before /r/ in some of these dialects (Vance 1987). The vowel coloring in Akkadian may be conceptualized as

7. The form [ʕe:n] can however be produced in careful speech. This phenomenon is known through my own observations conversing with Iraqi Arabic-speaking interlocutors. The phenomenon deserves to be studied empirically on its own, which is beyond the scope of this article.

8. It is taken for granted here that the phoneme represented by <r> is the tap /ɾ/, although if it was in fact a trill /r/ it would not affect the analysis here. The crucial point is that it cannot be a guttural because of its behavior regarding vowel raising and fronting discussed in this section. Furthermore, the attested modern Semitic languages overwhelmingly show taps or trills as the reflexes of *r. According to omniglot.com, a web site dedicated to the writing systems of the world, the modern languages that show taps or trills include Arabic (Algerian, Egyptian, Lebanese, Moroccan, Syrian, Iraqi), Amharic, Argobba, Neo-Aramaic (Assyrian, Chaldean, Jewish, Turoyo, Western), Chaha, Maltese, Neo-Mandaic, Silt'e, Tigre, and Tigrinya. The only notable exception is the Ashkenazi pronunciation of modern Hebrew, which has diverged from the pronunciation of other modern Hebrew speakers in that /r/ is pronounced as [ʁ] (probably from Yiddish contact).

9. The features of pharyngeals used here are as proposed in Chomsky and Halle 1968, and the features of rhotics and laterals have been simplified to reflect the contrast between [+back] and [+front].

10. The phoneme occurs in a few languages such as Modern Hebrew due to contact with European languages that have this sound.

a similar phenomenon. Furthermore, in section 4.6 I present evidence that shows that the behavior of <r> is actually part of another issue, namely that [e] occurs in some roots for no apparent reason at all.

3. PRELIMINARIES TO A NEW HYPOTHESIS

The classical account is based on the premise that the gutturals were lost after conditioning the raising and fronting of [a] to [e], but in actuality they were not always lost. As I show in the following sections, all the gutturals (including [x]) were lost in some environments and retained in others. Several studies have tried to identify why guttural phonemes were lost in some environments and not in others. Huehnergard (2003) has proposed a new phoneme *x̱ to be reconstructed for Proto-Semitic, which represents the ejective velar fricative (IPA [x']). This new phoneme corresponds to the instances where words in Akkadian show [x] and cognate forms in Semitic languages that have preserved pharyngeals show [ħ], such as Akkadian [xaluː] and Arabic [ħalaʔ] 'black mole' (Huehnergard 2003; Militarev et al. 2000). This phoneme differs from the original *ħ that was lost in Akkadian (with or without raising to [e]) and remains [ħ] in other Semitic languages, as in [edeːdu] 'to be pointy' (Hebrew [ħadad] 'to sharpen') < *ħdd.

The issue with this solution is that there is no independent evidence for this phoneme in Semitic or in reconstructions of Proto-Afroasiatic. Kouwenberg (2006) in his analysis of data from the Neo-Assyrian dialect has proposed what is perhaps the most convincing explanation so far: Before the *ħ was lost, it must have become a glide, [j], which was then responsible for the raising of [a] to [e]. Kouwenberg's effort to identify a phonological explanation was at least partially rejected because it did not take into consideration the instances where *ħ becomes [x]. Weninger and Khan (2011) lauded Kouwenberg's approach for its attempt to find a phonological explanation for raising to [e]. As I show in the following section, Kouwenberg's theory—that the guttural became a glide which then caused not so much raising to [e], but a monophthongization (e.g., [aħ] → [aj] → [eː])—perhaps has wider coverage than even he had proposed. To illustrate, I look more closely at the fate of the gutturals.

3.1. The Proto-Semitic Gutturals

As stated earlier, the Proto-Semitic gutturals *ħ, *ʕ, *x, and *ɣ were not always lost. Furthermore, the classical account does not explore the fate of *x since it is almost always retained. A closer look at the data shows that all four gutturals underwent a similar fate: Each can be retained as [x] (*ħtl(w/y) > [xaːʃuːˑ] 'lung', *xbl > [xabaːlu] 'to bind', *ɣɾʃ > [xaɾaːʃu] 'to plant', *ʕpɾ > [xapaɾu] 'dust'), lost without an orthographic trace (*ħdɾ > [adɾu] 'dark', *ʕd > [adi] 'until', *ɣɾb > [aːɾibu] 'locust'), or lost with the raising of all [a]'s in the stem to [e]'s (*ħdd > [edeːdu] 'to be pointy', *ʕbɾ > [ebeːɾu] 'to cross', *xbɾ > [ebeːɾu] 'to unite', *ɣt'w > [et'uːˑ] 'to be dark'). Having established that the Proto-Semitic gutturals were sometimes lost and sometimes not, we can identify the conditioning environments responsible for the different outcomes. In order to do this, I take a brief detour to discuss the templatic morphology of the Semitic languages.

3.2. Paradigmatic Alternations

The Semitic languages are well known for their templatic morphology: bi- and tri- consonantal roots[11] are inserted into word templates that consist of a syllabic skeleton built

11. Roots are composed of radicals, individual consonant phonemes. For example, in the root √prs, there are three radicals, /p/, /r/, and /s/.

around vowels. In Akkadian grammar, the consonants of a root are represented by /p/, /r/, and /s/ in a "dummy" paradigm. Following that tradition, here are a few examples of templates in Akkadian: [paɾa:su] (infinitive), [ipɾus] (preterit), [iptaɾas] (perfect), [ipaɾɾas] (durative), [paɾsu] (verbal adjective), [pa:ɾisu] (agent noun), [piɾsu] (noun m. passive), [puɾsu] (noun abstract), [paɾɾa:s] (occupation), etc. (Huehnergard 2011) The [p], [ɾ], and [s] in each of these templates can be replaced by any tri-consonantal root (e.g., √*ndn* 'give', √*nsx* 'remove') to get the associated lexeme. While not every root occurs with every template, and some root template combinations have undergone a semantic shift, these facts are not so relevant to the current point, which is that for each root there are lexemes in which each root consonant is pre-vocalic, pre-consonantal, and word-final, and there is ample opportunity for sandhi[12] phenomena in all these positions.

The G[13] preterit paradigm (Table 1) provides the conditioning environments that account for all the sound changes which I am proposing in this paper.

Table 1. G Preterit Paradigm

pa**x**āɾu 'gather'	Singular	Plural
1st Person	a**px**uɾ	ni**px**uɾ
2nd Person (m)	ta**px**uɾ	ta**px**uɾa:
(f)	ta**px**uɾi:	
3rd Person (m)	i**px**uɾ	i**px**uɾu:
(f)		i**px**uɾa:

What is important to point out in Table 1 is that the first two consonant radicals are adjacent in this paradigm (in bold). In the 1st person singular and plural, 2nd person masculine singular, and 3rd person singular, the third radical is word/syllable-final. Both facts are important in the following discussion of consonant voicing.

3.3. Consonant Voicing

For stops and affricates/fricatives, Akkadian has the same three-way contrast as is reconstructed for Proto-Semitic: voiced, voiceless, and ejective. However, there are many roots where an irregular radical correspondence occurs between Akkadian and all the other Semitic languages. The occurrence of a voiceless stop in place of a Proto-Semitic ejective was first documented by Geers (1945) and is well known as Geers' Law. However, in addition to Geers' Law, there are also a number of Akkadian roots where there is an irregular voicing correspondence: *pk'ɾ > [bak'a:ɾu] 'to claim'; *kbd > [kaba:tu] 'to be fat'; *mkɾ > [maga:ɾu] 'to agree'; *ntn > [nada:nu] 'to give'; additional examples: [bala:t'u] 'to live' < *plt'; [aba:tu] 'to destroy' < *ʔbd. In these examples, several changes can be observed:

1. A voiceless consonant becomes voiced before a voiced consonant or an ejective (including nasals, rhotics, and laterals that have no voiceless counterparts):

12. Sandhi is a term from Sanskrit grammar (now more generally used in phonology) which refers to co-articulations or productive sound changes that happen at word or morpheme boundaries. Although Semitic morphemes are not morphemes in the item and arrangement sense of the word, the term fits the type of changes observable here.

13. The G(rundstamm) (paɾa:su) is the basic form of the verb which stands in contrast to the derived Š-stem (ʃuprusu) causative and D-stem (puɾɾusu) factitive, etc.

$$\mathrm{C}_{[-\text{VOICE}]} \rightarrow \mathrm{C}_{[+\text{VOICE}]} \; / \; \_\mathrm{C} \begin{bmatrix} +\text{VOICE}, \\ +\text{EJECTIVE}, \\ +\text{NASAL}, \\ +\text{RHOTIC}, \text{ or} \\ +\text{LATERAL} \end{bmatrix}$$

2. A voiceless consonant becomes voiced after an ejective or a nasal, rhotic, or lateral that has no voiceless counterpart. This list of features includes all phonologically voiced categories except for the voiced stops and affricates, which are not included because they would become their voiceless counterpart under the influence of a following voiceless consonant, as is shown in rule (3). The same would not be possible for a nasal, rhotic, or lateral that does not have voiceless counterparts:

$$\mathrm{C}_{[-\text{VOICE}]} \rightarrow \mathrm{C}_{[+\text{Voice}]} \; / \; \mathrm{C} \begin{bmatrix} +\text{EJECTIVE}, \\ +\text{NASAL}, \\ +\text{RHOTIC}, \text{ or} \\ +\text{LATERAL} \end{bmatrix}$$

3. A voiced consonant becomes voiceless before a voiceless consonant:

$$\mathrm{C}_{[+\text{VOICE}]} \rightarrow \mathrm{C}_{[-\text{VOICE}]} \; / \; \_\mathrm{C}_{[-\text{VOICE}]}$$

4. A voiced consonant becomes voiceless syllable-finally:[14]

$$\mathrm{C}_{[+\text{VOICE}]} \rightarrow \mathrm{C}_{[-\text{VOICE}]} \; / \; \_]\sigma$$

To summarize, if the first consonant does not have a voiceless counterpart, it causes progressive voicing assimilation. Otherwise voicing assimilation is regressive. Additionally, some consonants devoice in word/syllable-final position. Similar phonological schemata can be observed in the active phonology of a language like Dutch, which has syllable-final devoicing that can be blocked by a following voiced consonant.[15] The point of mentioning

14. The pharyngeal [ʕ] never devoices due to this phenomenon, which suggests that the [ʕ] to [j] shift happened before syllable-final devoicing.

15. The Dutch situation is of course more complicated, as it takes into account manner of articulation in the blocking of devoicing and treats spontaneously voiced consonants, or consonants with no voiceless counterpart

the Dutch example is to demonstrate that the system proposed in this paper is attested in the languages of the world and is therefore a possible phonological process in natural languages.

Furthermore, the predictability of voicing is supported by the deficiencies of the cuneiform script. In <CV> syllables (and the first consonants of <CVC> syllables), there is most often a two-way contrast between voiceless and non-voiceless (voiced and ejective) consonants, although a full three-way contrast of voiced, voiceless, and ejective can be found for some sets in particular texts. On the other hand, in <VC> syllables (and the final consonants of <CVC> syllables), only place of articulation and vowel are indicated faithfully. The consonants are transliterated and normalized based on what we know of the root through Proto-Semitic reconstruction. If we assume the phonological system I have proposed here, the representation in the script may be more accurate than originally assumed. A further analysis of the syllabaries employed by individual authors in individual texts is necessary for a deeper understanding.[16] It should be clear that there are no proposals being made here that violate the regularity of sound change. In other words, this voicing assimilation must have affected all words in the language equally. It was in roots that contained gutturals that subsequent changes (e.g., [ʕ] > [j] and [ħ] > [x]) made a word's relationship to the root opaque. These words were the most likely candidates for paradigm leveling, which is reflected in the copious examples of *ʕ > x and *ħ > Ø.

3.4. The Influence of Akkadian Voicing Rules on Proto-Semitic Gutturals

If the sound changes proposed above were indeed a part of Akkadian's active phonology at some point in time before its attestation, then Proto-Semitic gutturals would have been affected in just the same as any other consonants that exist as part of a voicing [±voice] set. The pharyngeal fricatives [ʕ] and [ħ] would form one voicing set, and the velar fricatives [x] and [ɣ] would form another. Each of these phonemes could potentially have an independent fate in Akkadian and merge with its voiced or voiceless counterpart in the conditions outlined in section 3.3. Indeed, the cognate sets show that a disproportionate number of gutturals have undergone just such changes.

3.4.1. The Fate of the Voiceless Gutturals

The vast majority of the Akkadian roots that originally contained *ħ surface in Akkadian with [x] (Weninger and Khan 2011). Additionally, *x occurs without change so often that it is traditionally not considered to be a member of the guttural series in analyses of Akkadian (Huehnergard 2011; von Soden 1995). I propose that there was an across-the-board merger, *ħ and *x → [x],[17] which can be observed in roots such as *ħpr, which gives the Akkadian [xepeːru] 'to dig', and *xtn, which yields the Akkadian [xataːnu] 'to protect'. In condition-

(e.g., laterals, rhotics, and nasals), differently. For more information on the Dutch situation, see Grijzenhout and Krämer 1998.

16. The version of the cuneiform syllabary employed in this analysis is based on the first discovered value for each character, <CV1>. This view shows a general trend in the representation of sounds in Akkadian, but it is not reflective of the orthographic practices of specific authors.

17. [ħ] → [x]: [ɾaxaːtsʼu] 'to wash, to bathe' < *ɾħtl', [xepeːɾu] 'to dig' < *ħpr, [nabaːxu] 'to bark' < *nbħ, [maʃaːxu] 'to measure' < *mʃħ, [puxaːlu] 'to breed an animal' < *pħl; [paxallu] 'thigh, genitals' < *pħl, [nuxxutu] 'to trim, clip' < *nħt, [xaʃuːː] 'lung' < *ħtl(n), [xaluːː] 'black mole' < *ħlʔ, [xabaːbu] 'to caress' < ħbb, [xubuːɾu] 'din' < *ħbr, [xarbu] 'plough' < *ħrb, [mexuːː] 'storm' < *mħ(w/j), [xiaːtʼu] 'to watch' < *ħ(w/j)t', [laxuːː] 'jaw' < *lħj, [xabaːlu] 'to bind', [xaːbilu] 'trapper', [naxbalu] 'snare' < *ħbl.

[x] with no change: [xataːnu] 'to protect' < *xtn, [xabaluː] 'to bind' < *xbl, [xalakʼu] 'to be lost' < *xlk', [tʼabaxuː] 'to butcher' < *tʼbx, [waɾxu] 'moon' < *wrx.

ing environments identical to the ones that produced the irregular voicing correspondence –voice → +voice, *ħ/x → Ø[18] is observed. For example, *ħgɾ yields the Akkadian [Øaga:ɾu] 'to hire', and *ħdd yields [Øede:du] 'to be pointy'. This is a satisfactory explanation for the roots where guttural → Ø, but it begins to break down when the additional [a] → [e] shift occurs. It is enough of an explanation that *ʕ → Ø and *ħ → [x], but Ø is not a conditioning environment capable of causing raising to [e]. Put another way, [a] → [e] / __Ø could not have occurred, because there are many circumstances where [a] → [a] / __Ø. This brings us back to the same issue to which Kouwenberg (2006) proposed a solution, and with which I deal in section 3.4.2. Table 2 shows the outcomes of the three roots used as examples above, cited in the P(reterite), R(oot) and I(nfinitive).

3.4.2. The Fate of the Voiced Gutturals

We have observed that the classical account, which states that Proto-Semitic gutturals were lost, needs to be amended to clearly explain all the reflexes of *ħ and *x in Akkadian. The same must be done regarding their voiced counterparts *ʕ and *ɣ. Kouwenberg (2006) proposed that the Proto-Semitic guttural *ħ became a glide [j] or at least caused a palatalization [C^{j}], which was capable of influencing the quality of a preceding vowel in a way that Ø and gutturals, [ħ] [x], [ʕ], and [ɣ], could not. My proposal is that indeed the voiced gutturals became glides, and irregular correspondences (e.g., voiceless gutturals going to glides and voiced gutturals going to [x]) are due to the voicing rules proposed in section 2.3 and the restructuring of roots. The raising to [e] is a secondary phenomenon where the combination of [a] and the glide, [j], is monophthongized, yielding [e:]. The two changes proposed here are: 1) *ʕ → [j] and 2) *aj → [e:].[19] This type of change can be observed in roots like *ʕbɾ, which yields Akkadian [ebe:ɾu] 'to cross'. Although this is a possible path for the pharyngeal stop, not all roots see this shift all the way to fruition. The reason this is possible is that in order to make it to the verbal root with [e] there are two levels of analogy that must take place:

1. Where the expected sound changes take place and the root is reanalyzed:

*ʕ → [j]: *ʕbɾ ([ajbiɾ] 'I cross') → *jbɾ

The forms depicted here do not actually appear with <j> in the script. They are the examples traditionally thought of as guttural loss with no ablaut <a-bi-ir>.

2. Where the sandhi variant [aj] → [e:] is reanalyzed as the stem vowel associated with the root:

*ʕ → [j]: *ʕbɾ ([ajbiɾ] 'I cross') → *jbɾ

and

18. [ħ] → [ʕ] → [j]: [jibɾu] 'comrade' < *ħbɾ; [jadɾu] 'dark' < *ħdɾ [jaga:ɾu] 'to hire' < *ħgɾ; [jatla:ɾu] 'to muster' < *ħtlɾ; [ba:jeru] 'fisherman' < *bħɾ. [ħ] → [ʕ] → [j] and [aj] → [e]: [ede:du] 'to be pointy' < *ħdd; [ede:ʃu] 'to be new' < *ħdθ; [ek'lu] 'field' < *ħk'l; [ele:lu] 'to be clean' < *ħll; [emu] 'father-in-law' < *ħm; [epe:tlu] 'to plant' < *ħp'tl; [ere:mu] 'to stretch' < *ħrm; [ere:ɾu] 'to be moldy' < *ħrɾ; [ere:ʃu] 'to plow' < *ħrθ; [eblu] 'rope' < *ħbl; [ebe:ɾu] 'to unite' < *xbɾ; [t'e::nu] 'to grind' < *t'ħn; [ebe:ɾu] 'to unite' < *xbɾ.

19. [ʕ] → [j]: [jadi] 'until' < *ʕd; [jizk'atu] 'fetter' < *ʕzk'; [ilk'itu] 'insect' < *ʕlk'; [ni:melu] 'gain' < *ʕml; [itl'u] 'tree' < *ʕtl'; [ik'bu] 'heel' < *ʕk'b; [jak'ɾabu] 'scorpion' < *ʕk'ɾb; [jaʃaʃu] 'moth' < *ʕθ; [jatu:du] 'wild sheep' < *ʕtd; [ʕ] → [j] and [aj] → [e]: [ebe:ɾu] 'to cross' < *ʕbɾ; [eze:zu] 'to be fierce' < *ʕzz; [eze:bu] 'to leave' < *ʕzb; [elu::] 'to ascend' < *ʕlʔ; [eme:du] 'to touch' < *ʕmd; [epiɾu] 'dust' < *ʕpɾ; [etlɾu] '10' < *ʕtlɾ; [eʃe:k'u] 'to inscribe' < *ʕʃk'; [ete:k'u] 'to pass by' < *ʕtk'; [be::lu] 'to rule' *bʕl; [idu::] 'to know' *jdʕ; [tlebu::] 'to be satisfied' < *tlbʕ; [ʃemu::] 'to hear' < *ʃmʕ; [t'ebu::] 'to sink' < *t'bʕ; [egu::] 'to be negligent' < *wgʕ.

Table 2. Stages of Voiceless Gutturals

	/xepēru/[i] ‘to dig’			/agāru/ ‘to hire’			/edēdu/ ‘to be pointy’		
	P	R	I	P	R	I	P	R	I
Proto-Form	*a**ħ**puɾ	***ħ**pɾ	*ħapaːɾ	*a**ħ**guɾ	***ħ**gɾ	***ħ**agaːɾu	*a**ħ**dud	***ħ**dd	***ħ**adaːdu
V Assimilation	↓	↓	↓	*a**ʕ**guɾ	↓	↓	*a**ʕ**dud	↓	↓
Reanalysis	↓	↓	↓	↓	***ʕ**gɾ	***ʕ**agaːɾu	↓	***ʕ**dd	***ʕ**adaːdu
ħ → x	a**x**puɾ	**x**pɾ	**x**apaːɾ	↓	↓	↓	↓	↓	↓
ʕ → ∅	↓	↓	↓	aːguɾ	***Ø**gɾ	***Ø**agaːɾu	*aːdud	***Ø**dd	***Ø**adaːdu
[e]?	↓	↓	↓	↓	↓	↓	eːdud	↓	Øedeːdu

i. This form subsequently raises [a] to [e] due to the influence of the rhotic.

*aj → [eː]: *jbɾ ([ajbiɾ]) → [Øbɾ] (pret: [eːbiɾ] & inf: [ebeːɾu])

The existence of this medial stage where [j] becomes one of the root radicals is interesting because there are roots with original [j] radicals that behave in an identical manner (for example, *jnk', which yields Akkadian [eneːk'u] 'to suck'). In roots in which the newly acquired [j] never occurs after an [a], there are no subsequent sound changes. For example, *ʕk'ɾb yields Akkadian [jak'ɾabu] (assumed for /aqrabu/) 'scorpion' not [ek'ɾabu] or [eːk'ɾabu]. When the voiced guttural is followed by a voiceless consonant, it is devoiced and then follows the fate of its voiceless counterpart, *ʕ → *ħ → [x]. This outcome is represented by roots like *ʕpɾ, which yields Akkadian [xapaɾu] 'dust'.

3.5. [ɣ]

There is, however, a problem with the chronology of the shift of the voiced gutturals *ʕ and *ɣ to the glide [j]. The reflexes of Proto-Semitic *ʕ either went through the shift or, under the influence of a following voiceless consonant, devoiced and shifted to [x]. *ɣ surfaces as <ḫ>, like *lθɣ > <lašḫu> 'inner jaw', and the occurrence of <h> can be interpreted as either the retention of [ɣ] only represented by orthographic <ḫ>, or as the result of syllable-final devoicing. Examples, such as *ɣnk' > [juɾniːk'u] 'plant', * t͡s'bɣ> [t͡s'abuːː] 'to soak', *ɣbj > [ebuːː][20] 'thick', *ɣɾb > [ereːbu] 'to enter', show the outcome of the *ɣ → [j] shift either as [j] or as the monophthongized [e]. In light of this, we cannot propose that *ɣ was retained categorically represented by <ḫ>. Examples like *kbd > [kabaːtu] P [ikbit] 'to be fat' and *ʔbd > [abaːtu] P [iːbut] 'to destroy' show that syllable/word-final devoicing was a process that affected some roots. The fact that the pharyngeal consonant *ʕ never devoiced finally (i.e., never surfaces as [x]) implies that the pharyngeals *ʕ and *ħ had already shifted to [j] and [x], respectively, before the same shift took place among the velar fricatives *ɣ and *x. Additionally, the final devoicing rule that affected consonants including velar fricatives must have been a later feature of Akkadian following the loss of pharyngeals. Here is a summary of the proposed relative chronology:

1. The *α*-voice (assimilation) rule takes effect.
2. The pharyngeal shift takes place: *ʕ → [j] and *ħ → [x].
3. The *α*-voice rule is reinterpreted as syllable-final devoicing.
4. The Velar shift takes place: *ɣ → [j], and *x remains.

Because of this likely chronology, we must assume that in older texts, orthographic <ḫ> can represent both [ɣ] and [x] while in younger texts only [x] is possible. It may also be necessary in light of this assertion that we reexamine our interpretation of Akkadian handling of foreign borrowed words with the phoneme [ɣ] as well as the treatment of Akkadian [ɣ] in other contact languages. At the very least our conceptualization of when the loss of gutturals took place must be reevaluated, with the conclusion of this process perhaps occurring centuries later than was commonly thought.

3.6. Other Examples of Raising to [e]

There is a series of words in Akkadian that have [e] vowels throughout for no reason covered by the classical account (i.e., there is no lost guttural[21] or [ɾ]). <elēlu> 'to be pure', <šumēlu> 'left', and <ṣēnu> 'sheep' are such examples. The occurrence of [e] in these types

20. Presumably, this is from the underling form *ebeːu after the [aj] sequence is monophthongized. The additional monophthongization of the sequence [eːu] yielding [uːː] is predictable.

21. In some of these examples there are lost gutturals [ʔ] or [h], but none of the four that are considered to be potential causes of raising to [e]—[ʕ], [ɣ], [ħ], or [x].

of roots is influenced by the presence of <ṣ>, <š>, or <l>. This explanation is somewhat more nuanced than the proposal that these words came about on analogy to guttural roots. However, as [t͡sʼ], [ʃ], and [l] do not form a natural class, this description is not explanatory. Furthermore, it overlooks a key detail, namely that the Akkadian orthography obscures the phonetic realization. In cases where [e] shows up without lost gutturals, the glide [j] (which was a medial stage for gutturals), or [ɾ], a lateral, is present. This is clear in /elēlu/ [ele:lu] 'to be pure', but not as clear in /šēpu/ [tle:pu] orthography. The existence of the lateral affricates despite their lack of distinction in the script has been well supported (see Steiner 1977). My representation of these sounds here as the affricates [tl] and [tl'] is based on the fact that they behave like spontaneously voiced consonants, causing the voicing of adjacent consonants. This suggests that [l], [tl], and [tl'] are not part of a three-way correspondence of voiced, voiceless, and ejective like [d], [t], and [t'], as is usually assumed.[22]

4. CONCLUSION

The genesis of [e] in Akkadian is a difficult matter to address because the key elements, the lost gutturals, glides, rhotics, and laterals, exist at the exact points where the cuneiform script is most defective. Furthermore, the conditioning environments are hidden in the paradigmatic alternations of the roots. Change can partially or fully spread through those roots, creating new divergent paradigms. The goal of this approach has been to take a direct route, grounded in observable phonological changes, that does not propose anything that cannot be observed in modern languages, and does not require a new understanding of the proto-language that is not supported by any other data. This effort was not entirely successful, as I explain in section 4.1.

Still, there are several developments that can be taken as certainties: 1) At some point in the early development of Akkadian there was an *α*-voice assimilation rule: two adjacent consonants must share the same voice value.[23] 2) Changes to consonants due to internal sandhi were reanalyzed as radicals that yielded new roots for some lexemes. 3) The subsequent changes that gutturals underwent, *ʕ → [j] and *ħ→ [x], made the original root obscure, which accounts for the preponderance of reanalyzed guttural roots. 4) The roots with newly acquired [j] radicals followed the same course of evolution as original [j] roots, including the reinterpretation of the [aj] → [e:] shift as [e] generalized in every instance of [a] in the paradigm. 5) The presence of rhotics and laterals also conditioned the shift, but through a process involving co-articulation—the forward and upward motion of the tongue connecting with the alveolar ridge when producing [l], [ɾ], [tl], or [tl'] puts the tongue in position to pronounce [e]—not monophthongization as seen with [aj] → [e:]. These five facts bear directly on several questions and their accompanying answers:

1. Why does the loss of a guttural cause the raising and fronting of a vowel? Answer: There was an intermediate stage when the "lost" gutturals became glides.

2. Why were the gutturals not lost in all words? Answer: Voiceless gutturals were never lost, unless they were first voiced by a conditioning context. In contrast, the voiced gutturals were lost unless first devoiced.

22. Weninger and Khan 2011 reconstruct <ŝ> [ɬ] and <ṣ̂> [ɬʼ] as the voiceless and ejective counterparts to [l], which they categorize with resonants.

23. This rule can also be conceptualized as the spread of laryngeal features. Voice spreads from a voiced consonant to an adjacent voiceless one. However, voice also spreads from an adjacent ejective consonant, which is naturally [–voice]. For further information regarding this tendency of ejectives see Fallon 2002.

3. Why does [e] manifest in words with no conditioning environment apparent from the orthography? Answer: The orthography does not faithfully represent the lateral affricates.

4. Why did the orthography never catch up to the spoken language? Answer: The manner of articulation of a syllable-final consonant was predictable due to the active phonology of the language (*α*-voice rule and/or syllable-final devoicing).

4.1. Loose Ends

Until now, no account has proposed a solution that considers all known cognates with gutturals and explains the behavior of each type.[24] The account offered here has proposed a solution that addresses many of these issues. There are, however, several problematic examples that need further exploration. Some of this exploration is beyond the scope of this article but needs to be addressed to some degree. The most important of these issues is the voicing quality of the lateral affricates [tl] and [tl'].

The α-voice rule proposed above causes regressive voicing assimilation unless the first consonant of an adjacent pair cannot devoice, in which case the following voiceless consonant is voiced (progressive voicing assimilation). The list of consonants that cannot devoice includes ejectives, rhotics, laterals, nasals, and glides. However, there are certain roots where a <b> or a <š> causes progressive voicing assimilation. The <s̲> examples have a fairly intuitive solution. Upon further examination of roots where such assimilation takes place, it is clear that those instances of orthographic <š> represent phonetic [tl].[25] This is worth mentioning, because phonetic [tl] was traditionally thought to be [ɬ] written as *ŝ.[26] If my proposal about consonant voicing holds true, it is not possible for this consonant to be part of a voicing pair, regardless of what is reconstructed ([tl] and [tl'], [ɬ] and [ɮ], or [ɬ] and [l]).[27]

There are instances of orthographic <b> causing progressive voicing assimilation that require further explanation. Once again, the defective script does not accurately distinguish the three-way voice, voiceless, ejective contrast at all places of articulation. In the cases of a two-way distinction, the ejective and the voiced variants are represented by one character, and the voiceless by a different one. I will not claim that orthographic <b> represents the ejective [p'] as well as [b], because there is no trace of such a phoneme in the other Semitic languages. Furthermore, there are only three other lexemes which appear to behave this way, two of which may be from the same root ([ba:jeru] 'fisherman', [be::ɾu] 'to choose' < *bħr; and [be::ʃu] 'to depart' < *bħθ).

Further study is warranted to discover if these etymologies are accurate and if this is a sign of something like a bilabial ejective. If such a consonant existed, its loss could easily be explained from the perspective of ease-of-articulation; the compression of air between the place of articulation and the glottis requires the least effort (in this case upward movement of the larynx) with the smallest space (the velar place of articulation). This makes [q'] the

24. E.g., gutturals retained as [x], lost completely, or lost with an accompanying shift from [a] to [e].

25. [ets'e:lu] 'to immobilize' < *wts'l; [etse:ru] 'to bind' < *ʔtsr; [ʃebe:ru] 'to break' < *θbr; [ele:lu] 'to be pure' < *hll; [tlume:lu] 'left' < *tlmʔ; [re:ʃu] 'head' < *rʔʃ; [tl'e:nu] 'sheep' < *tl'ʔn; [ertl'etu] 'earth' < *ʔrtl'; [tle:u] 'foot' < *tlʔp; [tle:nu] 'sandal' < *tlʔn.

26. Reconstructing lateral affricates for the lateral series is probably warranted because they do not participate in the voicing alternations described herein; the de-affricate before stops in later Babylonian (i.e., <l> for an expected <š>; *māt kaldu* or *kašdu* 'Chaldaea'); and other Semitic languages have stops (Arabic <ḍ> < *ŝ), sibilants (Arabic [ʃ] < *ŝ), affricates (Hebrew [ts] < *ŝ), and laterals (Mehri [ɬ] < *ŝ, [ɮ] < *ŝ) as the reflexes of the laterals.

27. This reconstruction has been chosen because it is the most likely, but it is not instrumental to this analysis. What is most important is that the lateral series behaves like the other spontaneously voiced consonants (ejectives, rhotics, nasals, and glides). They do not devoice and they can cause progressive voicing assimilation.

simplest ejective to produce and [p'] the most difficult. It would be premature to propose the reconstruction of an additional Proto-Semitic phoneme based on these data alone.

4.1.1. Developments of *aj in Babylonian

The final loose end is the fact that in Babylonian, diphthongs created by a combination of an etymological *a and an etymological *j do not always produce an [e] (Huehnergard and Woods 2004). This is best illustrated by *bajtum which produces Babylonian /bītu/ 'house'. In *j-initial verb roots, however, *aj yields [e], which is then reanalyzed as the root vowel (*ešēru* 'to be straight' < *jʃr, which has a 1SG /ēšer/ < *ʔajʃar).[28] The vast majority of guttural roots that have been reanalyzed as having /e/ as the root radical were guttural initial, and therefore behave exactly as *j-initial roots (Huehnergard 2011). Of the roots with second or third guttural radicals, only [ʃemu::] 'to hear' < *ʃmʕ, [t'ebu::] 'to sink' < *t'bʕ, [egu::] 'to be negligent' < *wgʕ, and [t'e::nu] 'to grind' < *t'ħn occur without any other possible explanation for the appearance of [e].[29] However, these four examples are not enough to show that the voiced gutturals (whether etymologically voiced or voiced through assimilation) did not become glides. One possible explanation is a relative chronology where *j was lost in non-initial position leaving only *j initial roots that merge in pattern with their guttural counterparts after the gutturals shifted to glides. As this analysis gains ground, other examples will no doubt be discovered that may shed light on the validity of such a suggestion.

4.2. Impact on the Field

This paper has brought together several theories that have previously been proposed: the gutturals to glides of Kouwenberg (2006), the reanalysis leading to the breakdown of root integrity in Huehnergard (2014, 2013), and the well-known examples of voicing assimilation in roots like √*ntn* in order to propose a solution to the mysterious development of Akkadian [e]. What makes this solution unique is that it shows that each of these solutions to sub-issues is interacting with the others, and that they work in concert to produce the facts as they have come down to us. Voicing assimilation changed the realization of the gutturals, allowing for the examples and counterexamples that had led some scholars to reject Kouwenberg's proposal (Weninger and Khan 2011). It is my hope—now that the precise conditioning environments that make reanalysis possible have been determined—that hapax legomena and previously undecipherable words can be matched to their Proto-Semitic roots and cognates in other Semitic languages, enabling us to gain a better understanding of the extant Akkadian texts. Furthermore, a better understanding of the active phonology of Akkadian should trickle down to the students of the language, who may learn to view the script as more reflective of the language than previously thought.

28. This pattern of C1= y verbs yielding roots with [e] throughout is the default result in Akkadian with two notable exceptions, the common verbs /idû/ 'to know' and /išû/ 'to have.' One possible source for this irregularity is analogy to the third singular forms in which the *ya- prefix regularly changes to /i-/ (Watkins Law).

29. [be::lu] 'to rule' *bʕl, and [tlebu::] 'to be satisfied' < *tlbʕ also occur, but the existence of etymological rhotics or laterals could ultimately be responsible for the stem vowel [e].

APPENDIX

IPA TO AKKADIAN ORTHOGRAPHY

Manner	Labial	Alveolar	Alveolar Lateral	Palatal	Velar	Glottal
Nasal	[m] <m>	[n] <n>				
Stop -V	[p] <p>	[t] <t>			[k] <k>	[ʔ] <Ø>
Stop +V	[b] <b>	[d] <d>	[l] <l>		[g] <g>	
Stop Ejective		[t’] <ṭ>			[k’] <q>	
(Af)fricate -V		[ts] <s>		[ʃ] <š>	[x] <ḫ>	
(Af)fricate +V		[dz] <z>	[tl] <ś>		[ɣ] <ḫ>	
(Af)fricate Ejective		[t͡s’] <ṣ>	[tl’] <ṣ>			
Tap		[ɾ] <r>				
Approximate	[w] <w>			[j] <Ø>		

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