Sumerian Contains Dravidian and Uralic Substrates Associated with the Emegir and Emesal Dialects

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Abstract: - Data mining the Sumerian vocabulary reveals a dichotomy of the cognate associations of the Emeĝir and the Emesal dialects, with the former having mostly Dravidian and the later mostly Uralic cognates, indicating that Sumerian arose by the combination of two languages from those language families. The data mining also reveals a distribution pattern of Proto-Uralic, Proto-Finno-Ugric, Proto-Ugric and Proto-Hungarian cognates that indicates that Sumerian is farther than Minoan from Hungarian, although all are West-Ugric.

Key-Words: - computational linguistics, data mining, Dravidian, language family, Emesal, Sumerian, Uralic

1 Introduction

Some early Sumerologists (Lenormant, Oppert, Rawlinson) already noted similarities between Sumerian and Hungarian [55]. That line of work was extended by Badinyi [3], Baráth [4], Bobula [8], Csőke [10], Gosztonyi [19], Götz [20] and Tóth [46]. Unfortunately, they largely ignored Uralic linguistics in their work [23]. Simo Parpola [34] recently presented Uralic etymologies for over three thousand Sumerian words. Parpola's idea of adding Sumerian to the Uralic language family is more credible. However, he did not consider the possibility that Sumerian is not only a Uralic language.

The idea that Sumerian may belong to several language families is inspired by our earlier work on the Minoan language, whose vocabulary was to a large extent adopted by the ancient Greek language. We analyzed the ancient Greek vocabulary by looking for cognates in the following layers established by Uralic linguists [26]:

1. Uralic
2. Finno-Ugric
3. Ugric
4. Proto-Hungarian

The comparison yielded 22, 31 and 91 cognate ancient Greek words that belong to the Uralic, Finno-Ugric and Ugric layers, respectively. Beekes [5, 6] regarded most of those ancient Greek words as Pre-Greek, indicating that they could be borrowings from the earlier Minoan language in the Aegean area. The Minoan language was written in the previously undeciphered Cretan Hieroglyph and Linear A scripts [12, 13, 14, 17, 18, 30, 31, 32, 33, 51, 52, 53] from which the earliest Greek script called Linear B developed [9, 49].

The surmised vocabulary, grammatical analysis, and some similarities within the *Cretan Script Family* [37], which includes the Minoan scripts, the Carian alphabet [2] and the Old Hungarian alphabet (called *rovásírás* in Hungarian) [15, 24, 43, 48], allowed the translation of over twenty texts (Revesz [38, 39, 40, 41]) with contents that fit into the Minoan cultural context [28]. Our translations suggested that Minoan, Hattic and Hungarian belong to a common (West)-Ugric branch of the Uralic language family [41].

Our work also implied that Greek is a descendant of two language families, i.e., both Indo-European and Uralic (see Fig. 3). That duality explains some of Greek's unique features with respect to other Indo-European languages. The example of Greek raised the possibility that Sumerian may also be a language that belongs to several language families. That would explain why Sumerian has some word similarities with many languages. For example, Muttarayan [29] found many word similarities between Sumerian and Tamil.

The rest of this paper is organized as follows. Section 2 presents an analysis of Sumerian and Uralic cognates that fall within the Uralic, Finno-Ugric, Ugric and Proto-Hungarian layers.

While doing the linguistic layer analysis, we discovered an interesting novel pattern. This pattern is that the Emesal dialect of Sumerian contains a

disproportionate number of the cognate words. Section 3 of this paper compares the Emesal and the Emeĝir dialects of Sumerian. The significant differences between these two dialects suggest an incomplete integration of two language families, namely, Dravidian and Uralic.

The natural question that arises is which of the two language families existed earlier in Mesopotamia and which came later to the area. Section 4 considers this question by analysis of the vocabulary of the Euphratic language, which was suggested by Whittaker [50] and others as a substrate of Sumerian.

Section 5 considers Sumerian and Hungarian phonetic correspondences. Section 6 considers Minoan and Hungarian language similarities and a parser for a subset of the Minoan language. Section 7 discusses the results and related work. Finally, Section 8 presents some conclusions and directions for future work.

2 Sumerian and Uralic Cognates

We collected possible Hungarian and Sumerian cognates by looking up the meaning of all the words that are listed as Uralic or Finno-Ugric by Zaicz [54] or are listed as Ugric by Honti [21] in the ePDS, the online version of the *Pennsylvania Dictionary of Sumerian* [44]. We also crosschecked all candidate cognates with the etymological dictionaries of Parpola [34] and Zaicz [54], the *Mansi Dictionary of Munkácsi and Kálmán* [27], the ancient Greek etymological dictionary of Beekes [5, 6], and the Hungarian-Greek dictionaries of Aczél [1] and Varga [47]. Table 1 shows the cognate groups that were collected.

In Table 1 and in the rest of this paper, when x and y are words, then the notation $x \sim y$ indicates that words x and y are cognates, $x > y$ indicates a derivation from x to y and $*x$ indicates a hypothetical form that is not attested in writing. The notation x^L *(m)* denotes that x occurs in language L and means m in English. The similar consonant sounds are highlighted in red, inserted glide consonants are highlighted in blue, and omitted sounds are indicated by underscores.

The third column in Table 1 is based on Parpola [34] and Zaicz [54] while the fourth column is based mostly on Beekes [5, 6] with a few minor additions. Our additions include in the row for 'three' the word háromszor$^{\text{Hungarian}}$ (thrice) and its Mansi connection based on [27], and in the row for 'sword' its connections, including a possible borrowing of this word from Ossetian based on [54]. We also added a row for 'lady, woman' based on [27], although it is commonly thought to be a borrowing from Alan language [54]. Finally, we also added the row for 'breeze' because the Hungarian and the Estonian words show a remarkable similarity, although Zaicz [54] claims that the Hungarian word is onomatopoeic in origin. In the Ugric group (shown by yellow color in Table 1), we extended Honti's list by the row for 'cry, yell.' Each number in the last column of Table 1 refers to the Sumerian entry number in Parpola [34]. The dash --- indicates that no corresponding entry was found in Parpola [34]. Such dashes were rare in the Uralic and the Finno-Ugric entries and tended to be more frequent in the Ugric entries, indicating that the Ugric part of Parpola's dictionary could still be significantly extended.

The presence of the fourth column for ancient Greek adds a corroborative element because Greek has borrowed many Pre-Greek words from the Minoan language, which we already identified as an Ugric language. The Greek and Sumerian word pairs in Table 1 do not indicate direct borrowings from Sumerian to Greek but parallel borrowings from a Uralic substrate that preexisted in Anatolia and near by regions before the arrival of Sumerians in Mesopotamia and Greeks in the Aegean area.

Table 2 and Fig. 1 compare the number of Hungarian and Sumerian cognates that were found with the number of Hungarian and ancient Greek or presumed Minoan cognates that were found in [41]. The total number of cognates found was nearly the same with 144 and 173, respectively. However, the ratio of Sumerian cognates divided by ancient Greek cognates showed an interesting pattern for the different layers They were 2.18 for the Uralic, 2.56 for the Finno-Ugric and only 0.51 for the Ugric layer.

At the same time, we found a few Hungarian words with unknown origin that may be cognate with Sumerian words or ancient Greek or Minoan words. We did not gather statistics on these because a systematic search would need to consider a huge set of words, that is, much more than the few hundred well-established words that belong to the Uralic, Finno-Ugric and Ugric layers. However, the number of words that are not shared also with the Ob-Ugric group of Khanty and Mansi languages suggests that there was a West-Ugric language that was a common origin of Proto-Hungarian, Proto-Minoan and Proto-Sumerian. This West-Ugric hypothesis seems initially puzzling in light of the sharp drop of percentages shown in Table 2. It suggests a different survival rate for the words in various layers. Discovering the reasons for this differentiated survival was a major motivation for the experiments described in Sections 3 and 4.

Table 1. Uralic (blue), Finno-Ugric (green), Ugric (yellow), Greek and Sumerian cognate words.

English	Hungarian	Other Uralic or Finno-Ugric	Greek	Sumerian	#
slaughter	_arat (harvest)	šir^{Zyrian} (cut, shear)		šar$_2$	---
father	atya	ättä^{Finnish}		ad-da	39
mother	anya	an^{Zyrian} (husband's mother)	ἀμμά	ama	102
hide (n.)	bőr (skin)	parva^{Finnish} (leather coat), pĕr^{Khanty}	βυρσα	bar	259
drop, drip	csorog	ćork^{Mansi}, šoro^{Finnish} (gurgle)		sur	2277
water	eső (rain) < esik (fall)	is^{Mansi} (come down), äs^{Selkup} (fall)	ὕσμα	eš	715
tree	fa	puu^{Finnish}, pō^{Selkup}		mu	1927
back, rear, tail	far	perä^{Finnish}	_ουρα	bar	241
trim with axe	farag	pār^{Mansi}, pārge^{Selkup}		bar	255
eye, face	fej (head)	uopī^{Khanty} (look), vop^{Mansi}	ὄψ < *ὄπις	i-bí	1209
axe	fejsze	päćt^{Mansi}, pīči^{Selkup}		pa-a-šu	---
fear (v.)	fél	pĕl^{Khanty}, pelkää^{Finnish}		bu-luh	356
half, half-liquid	fél	päl^{Mansi}, pal^{Udmurt}	πέλανος	bar	269
box, chest	fészek (nest)	pesä^{Finnish}		pisaĝ	1998
blow (wind)	fúj	pŏγ^{Khanty}, pow^{Mansi}	πνειν	bu$_7$	346
saw (n.)	fúr (drill) > fűrész	pura^{Finnish} (drill)	πριων	bùru (drill)	379
braid, weave[1]	fon	păn^{Khanty} (yarn), panne ^{Saami} (spin)	υφαινειν[1]	pan	1952
bend	fordul	porjal^{Votyak} (spin)		bùru	377
wave	hab (foam)	kump^{Khanty}, kop^{Mansi}	κυμα	gúb (snow)	867
destroy	hal (die)	kăla^{Khanty}, kāl^{Mansi}, koule^{Finnish} (die)	εκλειπειν	hulu	1164
fish	hal	koule^{Finnish}, kole^{Nganasan}, kul^{Zyrian}	ἰχθύς	ku$_6$	1423
walk, go	halad	koγel^{Khanty}, kulke^{Finnish}		kul	1446
three	háromszor > *hármuszor > *ammusz (thrice)	χūrèm śos^{Mansi} (thrice)		_am$_3$-mu-uš	---
boy	here (scrotum)	kar^{Khanty} (male)	κορος	ĝuruš	1092
raven, eagle[1]	holló	kolāk^{Mansi} kulé^{Selkup}	_ŏρνις	hurin[1]	1192
length measure	hosszú (long)	košew^{Mansi} (long), kuź^{Zyrian} (length)		_éše	712
urine	húgy	χŏs^{Khanty}		kaš$_3$	---
lie down	huny (rest, close eye)	kŏń^{Khanty}, koń^{Mansi} (close eyes)	κοιμάω	huna	1183
two	két	kit^{Mansi}, kaks^{iFinnish}		kad	1300
stone	kő	kaw^{Mansi}		kín	1392
sinew	_ín	tεn^{Mansi}, suoni^{Finnish}	τενων	sa	2054
piece	mar (bite)	murta^{Finnish} (break)	μερος	mir	1083
go	menni	miń^{Mansi}, mun^{Zyrian}, mene^{Finnish}	βαινειν	ma	---
spouse	meny (bride)	meń^{Khanty}, miń^{Mansi} (wife, bride)		mudna	---
what	mit ('t' is accus. suffix)	mitä^{Finnish}, mida^{Estonian}		_ta	2460
egg	mony	munuj^{Selkup}	ωον	nunuz	---
wash (hand)	mos (wash) > mosdik	moška^{Mari}	νιζειν	maš (purify)	1654
woman, bride[1]	nő, néné (elder sister)	nī^{Mansi}, naine^{Estonian}	νυμθη[1]	nu-nus	1917
kiss	száj (mouth)	sūp^{Mansi} (mouth), suu^{Finnish} (mouth)		še su-ub	---
run	szalad	suoti^{Finnish}		sar	---
eye, e. makeup[S]	szem	silmä^{Finnish}	οφ-θαλμος	šembi	---
heart	szív	sĕm^{Khanty}, šäm^{Mansi}		ša-ab	2286
sting	szúr	survaa^{Finnish} (stab)		sa	---
gather	talál (find)	tola^{Mari} (come)		dul	---
sea	tó (lake) < tavu	tu^{Zyrian} (rise), tulis^{Zyrian} (spring)	θαλασσα	idim	---
to fly	toll (feather)	tēl^{Mansi}, to^{Yurak} (feather, wing)		dal	425
road, street	út	āχt^{Mansi}, ηut^{Yurak}	οδος	tilla$_2$	---
be wide	vas (iron) > vastag (thick)	vaski^{Finnish} (copper), baza^{Kamas} (iron)		peš	1961
gift, present	ad (give)	anta^{Finnish} (give), ando^{Mordvinian} (feed)		at-ta	52
old person	_agg	šoηye^{Mari}		šu-gi	2422
brain	agy	anzêl^{Mari}	εγ-κεφαλος	ugu	2696
sleep	ágy (bed)	āηku^{Samoyed}		ù_	2633
a stand	_áll (to stand)	l'ūl^{piMansi} (to stand)		_ud-da	---
sleep	álo-m	udo-mo^{Mordvinian}		ù-di	2673

Table 1. continued

English	Hungarian	Other Uralic or Finno-Ugric	Greek	Sumerian	#
ebb (s.)	apály	šupal^{Zyrian} (dry out)	παλιρροια	šub	2405
father-in-law	após	op^{Mansi}, appi^{Finnish}	πενθερος	ab (old man)	29
cut, slaughter[1]	csap (hit)	čapa^{Finnish}	σφαζω[1]	ša-ab	2292
snatch	csen	sanda^{Mordvinian}		zi-in-zi-in	2991
shine (v.)	csillog	šŭlpi^{Khanty}, śülγ^{Mansi}	σελας	zalag	2926
bowl	csupor	ćipiš^{Zyrian}		zabar	---
wide	dagad (swell)	dundi^{Zyrian} (swell)		da-ma-al	420
a bird (crane)	daru (crane)	tareγ^{Khanty}, tarew^{Mansi}, turi^{Zyrian}		dur	---
copulate	dug (push into)	tongo^{Mordvinian}		<ĝeš> dug	---
gleam	ég	saχ^{Mansi} (to be scorched)	αυγη	šeĝ$_6$	2340
mongoose	egér (mouse)	hiiri^{Finnish} (mouse)		gilim	820
word	ének (song)	ääni^{Finnish} (sound, noise)		e-ne-èĝ	1264
watercourse	_ér (brook, vein)	sora^{Finnish} (melting ice)		sùr	2280
new year fest.	év	jákke^{Sami} (year), ikä^{Finnish} (age)		akiti	---
wall, brick[1]	fal	păl^{Khanty} (fish sieve)	πλινος[1]	ba-ar	1759
boy	fiú	püw^{Mansi}	παις	ibila	---
take captive	fog	pekat^{Khanty}, vangat^{Finnish}		pag	1941
harvest	fürt (bunch <of grapes>)	per^{Votyak} (bunch <of grapes>)		buru$_{14}$	---
onion plot	hagyma	kośem^{Mansi}		ki-šum-ma	---
to lie down	hál	kōl^{Mansi}, kel^{Votyak}		ku	---
ant	hangya	kaškēj^{Mansi}		kiši	1417
tail, rear	hanyatt (backward)	kuntst^{Mordvinian} (on back)		kun	---
angry	harag (anger)	χor^{Mansi} (quarrel)	χαλεπος	_úrgu	2818
bite	harap	kurćći^{Zyrian}	χαραγμα	kur$_8$	1476
home, dwell[1]	ház	kota^{Finnish}	οἴκησις[1]	gùd	875
to be dark	homály	χomχatas^{Mansi}, kimer^{Zyrian} (cloud)		kana$_6$	---
scratch	horzsol	karśel^{Mansi}, kural^{Zyrian}		hur	---
vulva	hölgy (lady)	kal^{Mansi} (female)		gal$_4$-la	---
twenty	húsz	kos^{Mansi}	εἴκοσι	i-iz (many)	---
ewe	juh	_uuhi^{Finnish}	_ŏις (ram)	_u$_8$	2644
sword	kard < kard^{Ossetian}	kēr^{Mansi} (iron), kärki^{Finnish} (blade)		ĝiri	1079
rare, valuable	kell (need)	kel^{Mari}, kol^{Zyrian} (need)	καλός (good)	kal	1317
bread oven, pottery	kenyér	keńir^{Votyak} ker^{Khanty}, küör^{Mansi}	 κεραμος	gar$_3$ gir$_4$-mah	---
to bend	kerül (go around)	kierä^{Finnish}		gur$_8$	---
hand	kéz	köt^{Khanty}, kät^{Mansi}		kišib	1420
sickle	könyök (elbow)	könηi^{Khanty} (elbow)		kin	1391
smith	kovács, cf. szép	seppä^{Finnish} (clever, smith)		simug	2192
tunic	köt (tie) > kötény (apron)	käti^{Mansi} (tie)	χιτον	kad (tie)	1302
dwell	lak (dwelling)	lakk^{Estonian}, lakka^{Finnish} (attic)		lug	1600
soul, breeze	lélek	lĕl^{Mansi}, lol^{Zyrian}		lil	1574
beat, kick[1]	lök (push, shove)	lykkää^{Finnish} (push)	λακτιζειν[1]	lah	2477
big, great	magas (tall), nagy (big)	naź^{Zyrian} (proud), mägi^{Estonian} (mount)	μεγας	mah	1628
twin	más (another)	māt^{Mansi} (another), med^{Zyrian} (image)		maš	1656
lord	menny (sky)	meńel^{Mordvinian} (sky), jumo^{Mari} (god)		umun	652
measure	mér	määritta^{Finnish}		mur-ra	1787
watch, guard	őriz	urs^{Mansi}		uraš	2810
lower body	segg (buttock)	säη^{Mansi}(groin)		sig-ba	2155
help	segít	čangode^{Mordvinian}		saĝ	2078
grass	sövény (hedging)	säw^{Mansi} (tress)		šu-mu-un	---
hasten, hurry	sürög	šurkala^{Mari}		sar	2112
dense, thick	sűrű	sūrä^{Mansi}, suuri^{Finnish}		sir-ra	2197
dry (adj.)	száraz	sor^{Khanty}	ξηρος	šarag (v.)	2310
border	szeg	śak^{Khanty}, ček^{Mari}		zag	2897
split, slit	szel	sil^{Mansi}, sali^{Finnish} (cut into pieces)		sil	2164

Table 1. continued

English	Hungarian	Other Ugric	Greek	Sumerian	#
good	szép (clever, beautiful)	seppä[Finnish] (clever, smith)		ze-eb	2945
scold	szid	šudala[Mari], sätti[Finnish]	στοβέω	šid	2381
lance, spear	szigony (harpoon)	śoχri[Mansi] (pointed knife)		šugur	2426
leather strap	szíj	sow[Mansi] (leather), sää[Finnish]		zà	2895
split, cleave	szil > szilánk (shred)	sil[Mansi], sali[Finnish]		sil	2164
dirge	sír (cry, lament)	sur[Finnish] (mourn)		zarah	---
breeze	sziszeg (hiss)	susisema[Estonian] (hiss)		sisig	---
kindle, excite	szít	sŏtat[Khanty]		zid	2961
hunger	szomjas (thirsty)	śumem[Votyak] (hungry)		išim	---
suck	szopik	sipγ[Mansi], šupša[Mari]		sub	---
border	szoros (strait)	sărt[Khanty] (narrow land strip)		sur	---
pitch	szurok	śir[Zyrian]		sar	703
level, lay flat	tapos (trample)	tapte[Mari] (hammer flat)		tab	2466
winter storm	tél (winter)	talvi[Finnish] (winter)		dal	429
put, sit down[1]	tesz	täj[Mansi] (weave)	τιθεναι	tuš[1]	2617
base (of plant)	tő	teŋ[Mari]		ten	2512
axe > tyrant[1]	tőr (dagger)	tir[Votyak]	τυραννος[1]	dur	598
pierce	tövik	täw[Mansi], töykki[Finnish]		te_	2505
ibex	türök/tülök (horn)	teura[Finnish] (deer)		durah	600
shoulder	váll	_olka[Finnish]		$murgu_2$	---
be	való (exists)	wăl[Khanty], vel[Zyrian]		ma-al	---
slice	vés	vänt[Khanty], vez[Zyrian]		$peš_6$	---
palm frond	vessző (twig)	waze[Mari] (twig)		peš	1967
voice, noise	zúg	šakte[Mari] (play music)	σιγμός (hiss)	$šeg_{12}$	---
meadow	alom (bed of straw)	ilem[Khanty] (grass in shoe)	λειμων	hirim (grass)	---
father	apa	op[Khanty], op[Mansi] (father in law)		abba	28
flood	_ár	lar[Khanty] (floodplain)	Ιλισός	illu	1239
daughter girl, slave girl[1]	ara (daughter-in-law)	år[Mansi] (maternal relative)	 κορη	ur_5 kiraš[1]	2805 ---
lady, woman	asszony ~ χsīn[Alan]	khåusä nē[Mansi] (whimsical w.)		ka-ša-an	---
axe	fokos	poγ[Khanty] (needle's eye)	πελεκυς	bulug (needle)	350
needle	fúl (sting, prick)	pulp[Mansi] (cork)		bulug	350
hot, heat	hamu	kolem[Mansi]		kúm	---
mound	hant	χomes[Khanty], khåmśel[Mansi]	χωμα	gan (rack)	751
split (v.)	hasad	kün-kaśmāt[Mansi]	δι-χοστατειν	haš	1129
a bird	hattyú (swan)	kotaŋ[Mansi] (swan)		$gud\text{-}du_7$	---
fat (adj.)	hízik (fatten)	katem[Khanty]	γαστρωδης	geš	1045
lift, carry	hord	kart[Mansi]		gur_3-ru	---
drag	húz	kåt[Mansi] (pluck, pull at)		gid	---
heir	ifjú (young man)	äj[Khanty] (small)+püw[Mansi] (boy)		ibila < bil	---
barley	köles (millet)	kolas[Mansi] (millet)	κριθη	kiraši	1407
joint, with[1]	íz	jäsen[Finnish], jöt[Khanty]	συν[1]	sa (sinew)	2054
watch	les	lāśi[Khanty], läć[Mansi]	φυλασσειν	igi la	---
sprout	maláta		βλαστημα	mu (grow)	1728
wet (v.)	márt (dip)	măra[Khanty], mur[Mansi] (sink)	βρεχειν	mar	1645
burn	meleg (warm)	mäli[Mansi] (warm)		bil_2	---
deep (adj.)	mély	měl[Khanty], mäl[Mansi]	βαρυς	burud	379
cowherd	mén (horse), ménes (herd)	vānt[Mansi] (herd)		munu	---
bride, spouse[1]	menyül (as a bride)	meń[Khanty], miń[Mansi]	νυμθη	mudna[1]	---
ladle	mer (scoop v.)	měret[Khanty] (sink)		emerah	---
lead, tin	_ólom	_olna[Khanty], wōlem[Mansi]	μολυβδος	anna	124
cry, yell	rí	räššĭ[Mansi]		ri	---
squeeze	sajtol (squeeze)	šojle[Khanty] (goes down)	θλιβειν	zaĝa	---
dark, black	sötét	šätep[Mansi] (get dark)	σκοτος	zud	3009
fall into pit	süpped (sink)	šēp[Mansi] (sink, drawn)		šub	2406

Table 1. continued

English	Hungarian	Other Ugric	Greek	Sumerian	#
boil, cook	sül < süt	šit^{Mansi}	σιτοποιειν	zil	2981
wedge	szeg (nail, spike)	säηk^{Mansi}	σφην	saĝ	2072
side, edge	szél	sēl^{Mansi}		us	---
dry up (field)	szik	śäχ^{Mansi} (salt)	ισχναινειν	šeĝ	2340
song	szó (word)	sǎw^{Mansi}	ασμα	šumun-ša	---
extract	szül (give birth)	sēl^{Mansi} (get, seak)		zal	---
bowl	tál	tūl^{Mansi}		útul	2884
bury	temet	tåw^{Mansi}		túm	2597
space, chamber[1]	telek (farm)	tarimt^{Khanty} (lies on ground)	θαλαμος[1]	dal-ba-na	---
lamp (oil)	tidó	tujt^{Mansi} (moon)	δολος	itid (moon)	1278
needle	tű	tūγer^{Khanty}, tāl^{Mansi} (twig)		dálla	433
torch	tűz (fire)	tüt^{Khanty}, tāwt^{Mansi}	δας	dal	430
lord, ruler	_úr	śåpėr^{Mansi} (big, powerful)		še-er	---
woman	ük (ancestor w.)	ēkeMansi	γυνη, Γαια	gi-in (w. worker)	---
female (s.)	üsző (cow)	ěs^{Khanty} (female animal)	θηλεια	eze (sheep)	723
bury, hide	zug (nook, hiding place)	suη^{Khanty} (corner, nook)	σχιζειν	zé-èg	---

Table 2. Statistical summary of cognate words.

	Uralic	Finno-Ugric	Ugric	Total
Ancient Greek	22	31	91	144
Sumerian	48	79	46	173
$\frac{\textbf{Sumerian}}{\textbf{Ancient Greek}}$	2.18	2.56	0.51	1.2

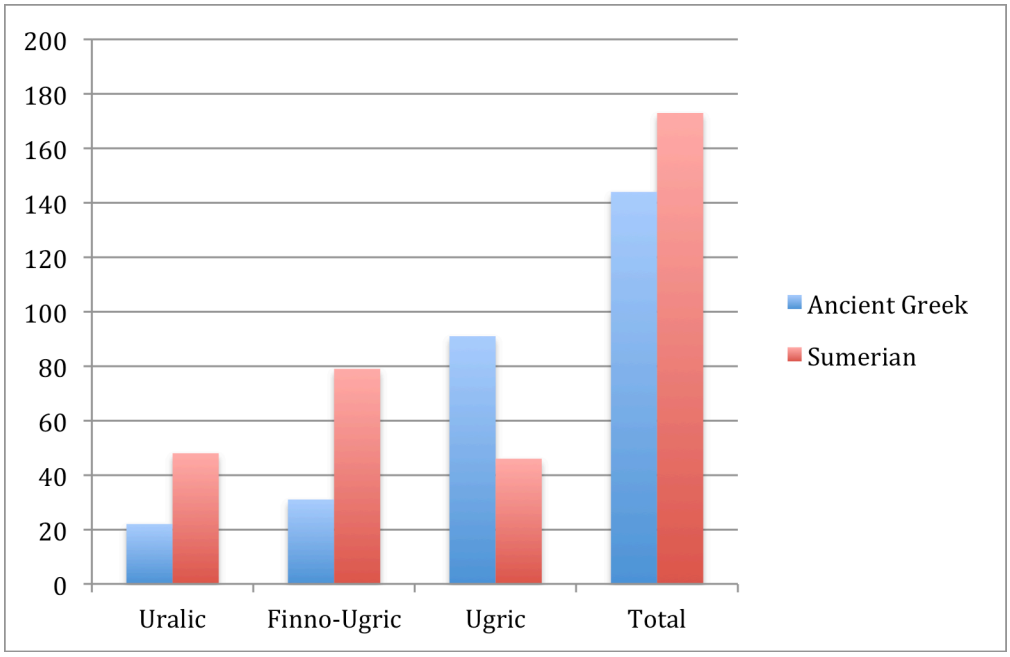


Fig. 1 The number of Uralic, Finno-Ugric and Ugric cognates with Ancient Greek and Sumerian

Table 3. Emesal and Hungarian (Uralic) cognates and Emeĝir and Tamil (Dravidian) cognates.

English	Hungarian or Uralic	Emesal	#	Tamil or Dravidian	Emeĝir	#
slave	ara (daughter-in-law)	ere	---		arad	
lady	asszony	ka-ša-an	---	peṇ	nin	1915
shepherd	csaba ~ çoban[Turkish]	su-ba	---	kāpari[Telegu]	gabar	---
wide	dagad (swell)	da-ma-al	420	paranta	barag (spread)	297
word	ének (song)	e-ne-èĝ	1264	pāṭal (song)	bala (converse)	1264
tree	fa	mu	1927	kāṭu (forest)	ĝeš	1046
wall	fal	ba-ar	1759	gōḍa[Telegu]	egar	633
eye	fej (head)	i-bí	1209	kaṇ (eye)	igi	1220
three	háromszor	am$_3$-mu-uš	---	mūḍu[Telegu]	peš	1961
bring	hoz, húz	ga	750	tīsukuni[Telegu]	de	---
bring	iramlik (go fast)	ir	---	tappiyōṭa (flee)	de	---
bird	madár	mu-tin	1803	paṟavai	buru$_4$	385
y. woman	manó (dwarf)	mutin	1803	koosu[Kannada] (child)	kisikil	---
scorpion	mar (bite)	mir	1083	koruku	ĝír	1083
cowherd	mén (horse) > ménes (herd)	munu	---	māṭu (cow)	unud	---
go	menni (go)	ma	---	naṭa	du, (ĝen)	516
lord	menny (sky)	umun	652	āṇ (man)	en	652
spouse	meny (bride)	mudna	---	thandhai (father)	dam	434
determine	mér (measure)	mara	1648		aĝ$_2$	---
what	mit (mi+'t' accusative suffix)	_ta	2460	enṉa	ana	115
lord	nem (breed) > nemes	nam$_2$[Emegir ?]	---	āṇ (man)	na (man)	1809
woman	nő	nu-nus	1917	peṇ	munus	1770
lament	sír	a-še-er	---	kaṇṇīr (tears)	anir	---
grass	sövény (hedging)	šu-mu-un	---	pul	bur	---
kiss	száj (mouth)	še su-ub	---	muttam	ne sub	---
good	szép (beautiful)	ze-eb	2945	nalla	mu	---
heart	szív	ša-ab	2286	/ʧaŋkɨ/[Malayalam]	šag	---
clear	tiszta, šåli[Mansi] (thin, clean)	šadi	---	melliya (thin)	na deg	---
sheep	üsző (young cow)	eze	723	āṭukaḷ	udu	2678
be	való (exists)	ma-al	---	unikilō[Telegu]	ĝal	1005
bury, hide	zug (nook, hiding place)	zé-èg	---	mūlai	ab-lal$_3$ (nest)	---

Table 4. Uralic (blue), Finno-Ugric (green), Ugric (yellow), uncertain origin (white), Euphratic and Tamil or Dravidian cognates.

English	Hungarian	Euphratic	#	Tamil or Dravidian
dark red	deres (grayishbrown) < dér (frost)	darah < duru (wet)	442	civappu
herd of wild a.	gulya (cattle herd)	gilim	---	muṅgisa[Telegu]
bull, ox	gida (kid, deer calf)	gud	---	kāḷai
fish	hal	ku	1423	min
raven	holló, kaarne[Finnish]	hurin (eagle)	1192	kaḻuku[Telegu] (eagle)
ruddy, furious	hús (meat)	huc	---	civanta
an animal	liba (goose)	irib	---	vāttu (goose)
ewe	juh	_u$_8$	2644	āṭukaḷ (sheep)
a pot	korsó (jar)	ukur	---	pāṉai
dog	kutya	ku	---	nāy
male, man	nőstény (female)	nitah	1901	āṇ
ladle	mer (scoop v.)	emerah	---	karaṇṭiyāl
lance, spear	szigony (harpoon)	šugur	2426	īṭṭi
dirge	sír (cry, lament)	zarah	---	iṟutiyañcali
ibex	türök/tülök (horn)	durah	600	malaiyāṭṭu
needle	tű	dálla	433	sūdi[Telegu]
lord	_úr	še-er	---	kaṭavuḷ
be wide	vas (iron) > vastag (thick)	peš	1961	paranta

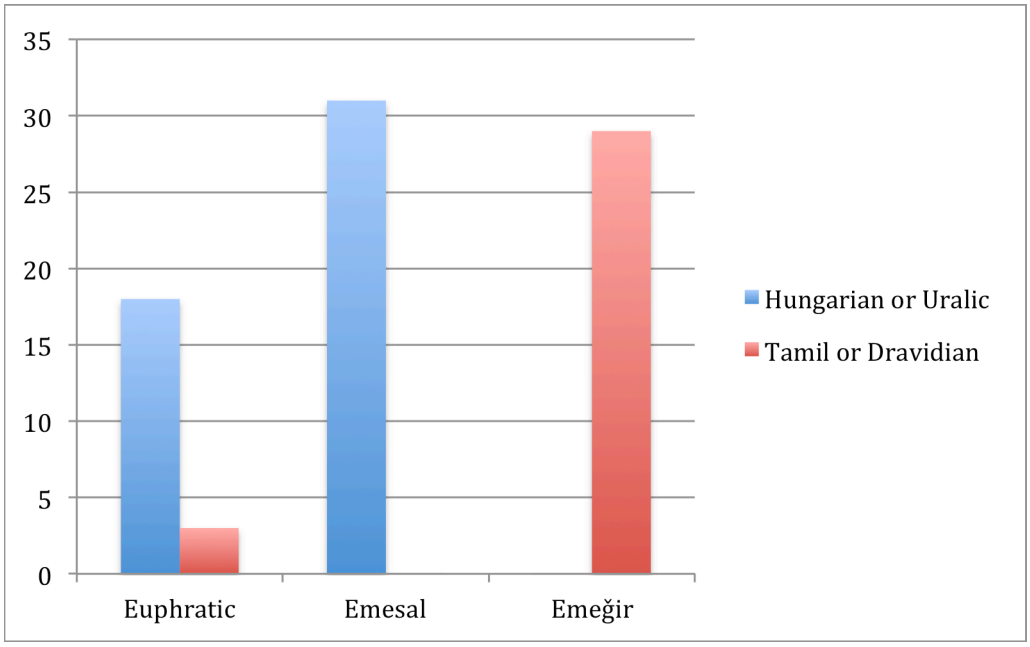


Fig. 2 The number of Euphratic, Emesal and Emeğir cognates with Hungarian or Uralic and Tamil or Dravidian

Table 5. Common suffixes between Hungarian and Sumerian.

English	**Hungarian**	**Suffix**	**Sumerian**	**Suffix**	#
		-g (frequentative)		**-g, ĝ**	
word	ääni[Finnish] (sound)	ének (song) < *éneg	mu_7 (make sound)	e-ne-èĝ	1264
shine (v.)	csill-an (gleam)	csillog		zalag	2926
needle	fúl (sting, prick)			bulug	350
breeze	susisema[Estonian] (hiss)	sziszeg (hiss)		sisig	---
dry (adj.)	szár-az			šarag (v.)	2310
smith	szép (clever)			simug	2192
voice, noise; breath	szip (sniff)	szipog		zi-pa-a$ĝ_2$	---
		-k (adjective former)		**-h**	
dark red	dér (frost)		duru (wet)	darah	442
male	nőst-ény (female)			nitah	---
ladle	mer (scoop v.)			emerah	---
dirge	sír (cry, lament)			zarah	---
ibex	tű	türök/tülök (horn)	dálla (needle)	durah	600
		-mány/mény, -vány/vény (noun former)		**-mun**	
lord	jumo[Mari] (god)	menny (sky) < *um-vány	an (sky)	umun	652
grass	sző (weave)	sövény (hedging)		šu-mu-un	---
		-r (frequentative)		**-r**	
herd		csokor, ćuker[Zyrian]	$šah_2$ (pig)		---
bowl	csepp (drop of water)	csupor		zabar	---
lance, spear	szeg (spike, nail) szig-ony (harpoon)		saĝ (wedge)	šugur	2426

Table 6. Regular consonant sound correspondences within the West-Ugric group of languages: Minoan as shown by borrowings in Greek, Hungarian, and Sumerian. The West-Ugric consonant is the likely common origin. The reconstruction also needs to consider the context of other vowels and consonants. See the text for details.

#	West-Ugric	Greek	Hungarian	Sumerian	Initial	Medial	Final
1	š /ʃ/	τ	-	s	τενων ~ ín ~ sa		
		-		š /ʃ/	αυγη ~ ég ~ šeĝ$_6$		
2	/tʃ/	σ	cs /tʃ/	s	csorog ~ sur		
				š /ʃ/	σφαζω ~ csap ~ ša-ab		
				z	σελας ~ csillog ~ zalag		
3	s	σ	s /ʃ/	š	σκοτος ~ sötét ~ šuš	ὕσμα ~ eső ~ eš	más ~ maš
				z	σιτοποιειν ~ sül ~ zil		
		σ	sz /s/	s	szalad ~sar	sziszeg ~ sisig	
				š /ʃ/	στοβέω ~ szid ~ šid	hosszú ~ éše	
		θ		z	szeg ~ zag	θηλεια ~ üsző ~ eze	
		σ	z	s		συν ~ íz ~ sa	
				š /ʃ/	σιγμός ~ zúg ~ šeg		kéz ~ kišib
				z	σχιζειν ~ zug ~ zé-èg		
4	d	λ, τ	d	d	daru ~ dur	δολος ~ tidó ~ itid	στοβέω ~ szid ~ šid
5	t	τ	t		τυραννος ~ tőr ~ dur		két ~ kad
				t	τιθεναι ~ tesz ~ tuš		
			ty /c/	d		atya ~ ad-da	
6	β	β	b	b	βυρσα ~ bőr ~bar		
7	mp	μ					κυμα ~hab ~ gúb
8	p	π, -	f	b	πριων ~ fúr ~ bùru	παις ~ ifjú ~ ibila	
		φ		p	υφαινειν ~ fon ~ pan		
			p	b		apa ~ abba	szép ~ ze-eb
9	h	χ	h	-	χαλεπος ~ harag ~ úrgu		
		κ, -		h	κοιμάω ~ huny ~ huna		
10	k	χ		g	χωμα ~ hant ~ gan		
		κ		ĝ /ŋ/	κορος ~ here ~ ĝuruš		
		χ		k	χαραγμα ~ harap ~ kur$_8$		
			g	g		szigony ~ šugur	zúg ~ šeg$_{12}$
				ĝ /ŋ/		segít ~ saĝ	szeg ~ saĝ
		γ, κ	k	g	κεραμος ~ kenyér ~ gar$_3$	γυνη ~ ük ~ gi-in	lak ~ lug
				k	καλός ~ kell ~ kal		
11	l	λ	l	l	lak ~ lug	σελας ~csillog ~ zalag	toll ~ dal
		ρ		r		ὄρνις ~ holló ~ hurin	fal ~ ba-ar
12	r	λ, ρ	r		rí ~ ri	χαλεπος ~ harag ~ úrgu	βυρσα ~bőr ~bar
13	m	β	m	b	βαρυς ~ mély ~ burud		
		μ		m	μερος ~ mar ~ mir	hamu ~ kúm	alom ~ hirim
			ny /ɲ/			ἀμμά ~ anyu ~ ama	
14	n	ν	n	n	νυμθη ~ néné ~ nu-nus	ménes ~ munu	υφαινειν ~fon ~ pan
		μ	ny /ɲ/			κοιμάω ~ huny ~ huna	menny ~ umun
15	v		v	m	való ~ ma-al	sövény ~ šu-mu-un	tavu ~ idim
				p	vas ~ peš		
16	-	-	j	-	ὅις ~ juh ~ u$_8$		szíj ~ zà

3 Emesal Ugric and Emeĝir Dravidian

This section presents a dialect analysis of the Sumerian language. The Sumerian language is known to have two major dialects, namely the Emeĝir dialect and the Emesal dialect, which differ on several important words. The existence of several words for the same concepts commonly results from borrowing words from another language. For example, English is a Germanic origin language with an extensive borrowing from Romance languages due to its developmental history. As a result English has many word pairs for the same concept, such as freedom and liberty, food and aliment etc. Hence the question naturally arose whether Emeĝir and Emesal manifest a similar phenomenon or do the same.

Table 3 shows that many Emesal words have Uralic cognates. For example, ma[Emesal] (to go) seems cognate with menni[Hungarian] (to go), while du[Emeĝir] (to go) is not cognate with Uralic words. However, du[Emeĝir] (to go) may be cognate with naṭa[Tamil] (to go).

Similarly, mu[Emesal] (tree) seems cognate with puu[Finnish] (tree), while ĝeš[Emeĝir] (tree) may be cognate with kāṭu[Tamil] (forest).

Table 3 shows a total of 31 Emesal-Emeĝir word pairs that show the same distribution. The Emesal words are all cognate with Hungarian words while the Emeĝir words are all cognate with Tamil or other Dravidian words.

The finding in Table 3 explains why Sumerian is difficult to classify. Sumerian seems to be a language that inherited features from both the Uralic and the Dravidian language families, which is a combination that is not seen in other languages. In addition, Sumerian is known only from writing, and most of the extant Sumerian writing was done not by the Sumerians themselves but by Akkadians and Babylonians, who may have conformed some Sumerian words to their own preferred pronunciations. Therefore, it is rather remarkable to detect the emergent pattern in Table 3.

It is probably difficult to identify with complete confidence what words are of Dravidian and Uralic origin because these two languages were already fairly well integrated in Sumerian society. However, some words by their meaning may be more naturally associated with the north than with the Indian subcontinent. For example, dur[Sumerian] (a bird) may be cognate with daru[Hungarian] (crane). Cranes are migrating birds and Uralic people from the north would have been familiar with them and could have brought their name to Mesopotamia. Similarly, the word dér[Hungarian] (frost), which describes a condition that is rare in Mesopotamia, may have become duru[Sumerian] (wet). Similarly, the words su-ba[Emesal] (shepherd) and munu[Emesal] (herd) are commonly associated with the herding large groups of animals on the Eurasian Steppe and not with the agricultural life along the riverbeds of Mesopotamia. Hence their Hungarian etymologies are not surprising. Nor is it surprising that su-ba[Emesal] (shepherd) may be cognate with çoban[Turkish] (shepherd) because some Turkic people may have shared the Eurasian Steppe shepherding lifestyle.

As another example, šu-mu-un[Emesal] (grass) is cognate with sövény[Hungarian] (hedging), which is derived from sző[Hungarian] (weave) and vény[Hungarian] (noun forming suffix). It is possible that this 'grass' was hemp or some other crop, whose fibers were used to weave cloth. Such plants may have been planted at the edge of fields as hedging. A Sumerian word related to cooking is ki-šum-ma[Sumerian] (onion plot), which may be cognate with kośem[Mansi] (onion) + mə̄[Mansi] (land) and maa[Finnish] (land). The hemp and onion plants also may have come to Mesopotamia from the north.

Metallurgy was more developed in the mountain regions of the north, where metals could be mined. Therefore, the Sumerians may have borrowed simug[Sumerian] (smith) from the people in the north, and it is likely cognate with seppa[Finnish] (clever, smith) as also described in item 2192 of Parpola [34].

4 Euphratic is an Ugric Language

Since Sumerian apparently resulted from a combination of two language families, it raises the question of when the two languages arrived to Mesopotamia. What was the original language of Mesopotamia? Whittaker [50] identified an early substrate language within Sumerian that he called Euphratic. The Euphratic language vocabulary seems to be a set of words that occur in the earliest extant Sumerian texts and share certain characteristic endings and morphologies.

We have considered the set of Euphratic words as identified by Whittaker [50]. Table 4 and Fig. 2 show that at least eighteen Euphratic words have Uralic etymologies. We also considered whether these eighteen words have Dravidian etymologies, but we found some resemblance only in three cases. The case for 'eagle' being a cognate is weakened by the fact that it is not found in Tamil but only in Telegu. Moreover, there is a mismatch between the /n/ in hurin[Euphratic] and the /k/ in kaluku[Telegu]. The word holló[Hungarian] seems to omit an earlier /n/ ending as suggested by kaarne[Finnish]. In āṇ[Tamil] the similarity is only one letter. Finally, the gud[Euphratic] and kāḷai[Tamil] may indeed be cognate. Cattle were

likely introduced from one area to the other. Hence the name for cattle may be a trade word that spread widely at the earliest stages of cattle domestication. Therefore, even if these words are cognate, they are more likely to be associated with the movement of cattle as a trade good than with the movement of a large number of people.

We also made some effort to identify the other Euphratic words in Whittaker [50] as either Dravidian or Uralic but failed to find more cognates. Hence, Euphratic is most likely Uralic.

5 Sumerian and Hungarian Regular Phonetic Correspondences

Parpola [34] did not present regular phonetic correspondences. Below we give a reconstruction of West-Ugric phonetics and show regular phonetic correspondences among three of its members: Hungarian, Minoan and Sumerian. It is only appropriate to talk about phonetic correspondences, denoted by ~, among those three, while it is possible to talk about phonetic changes, denoted by >, from West Ugric to them.

Table 6 summarizes the sixteen main phonetic correspondences among Greek words with Pre-Greek, that is Minoan origin, and Hungarian and Sumerian based on the cognates collected in Table 1. We reconstructed the West-Ugric phonemes by considering all members, the Ob-Ugric forms, and the assumed phoneme repertoire at the beginning of the Proto-Hungarian period [26]. Table 6 gives the International Phonetic Alphabet notation, where the pronunciation may not be obvious.

Each row of Table 6 can be taken as a separate correspondence rule between Hungarian and Sumerian and two derivation rules, one from West-Ugric to Hungarian and another from West-Ugric to Sumerian.

Rule (1): The following triplets in Table 1 demonstrate that West-Ugric preserved the word initial /ʃ// as did Sumerian, while Hungarian lost it:

_agg$^{\text{Hungarian}}$ ~ šoŋγe$^{\text{Mari}}$ ~ šu-gi$^{\text{Sumerian}}$
_arat$^{\text{Hungarian}}$ ~ šir$^{\text{Zyrian}}$ ~ šar$_2^{\text{Sumerian}}$
_ér$^{\text{Hungarian}}$ ~ sora$^{\text{Finnish}}$ ~ sùr$^{\text{Sumerian}}$
_ín$^{\text{Hungarian}}$ ~ suoni$^{\text{Finnish}}$ ~ sa$^{\text{Sumerian}}$
_úr$^{\text{Hungarian}}$ ~ śåpėr$^{\text{Mans}}$ ~ še-er$^{\text{Sumerian}}$

It may be supposed from the third and fourth examples that in West-Ugric and Sumerian even the world initial /s/ could have been preserved. In that case those /s/ had to change to /ʃ/ before the Hungarian sound change sequence /ʃ/ > /h/ > /_ / began.

Rule (2): West-Ugric word initial /t͡ʃ/ was likely preserved in Hungarian, changed to /s/, /ʃ/, or /z/ in Sumerian and to σ in Greek.

Rule (3) West-Ugric word initial /s/ Hungarian, changed to /s/, /ʃ/, or /z/ in Hungarian and Sumerian and to σ or may be θ in Greek.

Rule (4): The West-Ugric /d/ is preserved in both Hungarian and Sumerian.

Rule (5): The West-Ugric word initial /t/ is always preserved in Hungarian. It is also preserved in Sumerian when the following consonant is a bilabial /b/, /p/, /v/ or a nasal /m/ or /n/:

tapos$^{\text{Hungarian}}$ ~ tapte$^{\text{Mari}}$ ~ tab$^{\text{Sumerian}}$
temet$^{\text{Hungarian}}$ ~ tåw$^{\text{Mansi}}$ ~ túm$^{\text{Sumerian}}$
tövik$^{\text{Hungarian}}$ ~ täw$^{\text{Mansi}}$ ~ te_$^{\text{Sumerian}}$
tő$^{\text{Hungarian}}$ ~ teŋ$^{\text{Mari}}$ ~ ten$^{\text{Sumerian}}$

Sumerian changes the West-Ugric word initial /t/ to /d/ when the following consonant is /l/ or /r/:

talál$^{\text{Hungarian}}$ ~ tola$^{\text{Mari}}$ ~ dul$^{\text{Sumerian}}$
tél$^{\text{Hungarian}}$ ~ talvi$^{\text{Finnish}}$ ~ dal$^{\text{Sumerian}}$
telek$^{\text{Hungarian}}$ ~ tarimt$^{\text{Khanty}}$ ~ dal-ba-na $^{\text{Sumerian}}$
toll$^{\text{Hungarian}}$ ~ tēl$^{\text{Mansi}}$ ~ dal$^{\text{Sumerian}}$
tőr$^{\text{Hungarian}}$ ~ tir$^{\text{Votyak}}$ ~ dur$^{\text{Sumerian}}$
türök$^{\text{Hungarian}}$ ~ teura$^{\text{Finnish}}$ ~ durah$^{\text{Sumerian}}$
tű$^{\text{Hungarian}}$ ~ tāl$^{\text{Mansi}}$ ~ dálla$^{\text{Sumerian}}$

If an initial vowel is inserted, then the /t/ does not change in Sumerian even if the following consonant is /l/ or /r/:

tál$^{\text{Hungarian}}$ ~ tūl$^{\text{Mansi}}$ ~ útul$^{\text{Sumerian}}$
tidó$^{\text{Hungarian}}$ ~ tujt$^{\text{Mansi}}$ ~ itid$^{\text{Sumerian}}$

A West-Ugric word medial /t/ undergoes palatalization to /c/ in Hungarian:

atya$^{\text{Hungarian}}$ ~ ättä$^{\text{Finnish}}$ ~ ad-da$^{\text{Sumerian}}$
hattyú$^{\text{Hungarian}}$ ~ kotaŋ$^{\text{Mansi}}$ ~ gud-du$_7^{\text{Sumerian}}$

In the first example the gemination is preserved even as /t/ changes to a /d/. In the second example the West-Ugric and the Ugric forms probably had also a geminate /t/, which is preserved in both Hungarian and Sumerian.

A West-Ugric final /t/ is preserved in Hungarian and changes to /d/ in Sumerian:

két$^{\text{Hungarian}}$ ~ kit$^{\text{Mansi}}$ ~ kad$^{\text{Sumerian}}$
sötét$^{\text{Hungarian}}$ ~ šätep$^{\text{Mans}}$ ~ zud$^{\text{Sumerian}}$

or changes to a fricative /ʃ/ or /z/ in Hungarian or both:

húz^{Hungarian} ~ kåt^{Mansi} ~ gid^{Sumerian}
kéz^{Hungarian} ~ kät^{Mansi} ~ kišib^{Sumerian}

The last example suggests either an incipient word final /t/ to fricative change in West-Ugric, which was continued only in Hungarian, or more likely an influence from the ib^{Sumerian} (hips; middle) suffix. While kéz^{Hungarian} normally means the palm of the hand, kišib^{Sumerian} more likely meant the wrist or forearm.

Rule (6): West-Ugric word initial *β is preserved in both Hungarian and Sumerian:

bőr^{Hungarian} ~ pěr^{Khanty} ~ bar

The presence of word initial /b/ not only in the Hungarian and Sumerian words but also in the cognate ancient Greek work βυρσα^{Greek}, suggests that the change from /p/ to /b/ already occurred West-Ugric and it was not a separate event in Hungarian and Sumerian.

Rule (7): The West-Ugric word final consonant cluster /mp/ changes to /b/ in both Hungarian and Sumerian:

hab^{Hungarian} ~ kump^{Khanty} ~ gúb^{Sumerian}

Rule (8): The West-Ugric word initial /p/ always changes to /f/ in Hungarian, while in Sumerian it changes to /b/ if the consonant following it is a liquid /l/ or /r/:

fal^{Hungarian}	~ păl^{Khanty}	~ ba-ar^{Sumerian}
far^{Hungarian}	~ perä^{Finnish}	~ bar^{Sumerian}
farag^{Hungarian}	~ pār^{Mansi}	~ bar^{Sumerian}
fél^{Hungarian}	~ päl^{Mansi}	~ bar^{Sumerian}
fél^{Hungarian}	~ pěl^{Khanty}	~ bu-luh^{Sumerian}
fokos^{Hungarian}	~ poγ^{Khanty}	~ bulug^{Sumerian}
fordul^{Hungarian}	~ porjal^{Votyak}	~ bùru^{Sumerian}
fúl^{Hungarian}	~ pulp^{Mansi}	~ bulug^{Sumerian}
fürt^{Hungarian}	~ per^{Votyak}	~ buru$_{14}^{Sumerian}$

The West-Ugric word initial /p/ is preserved in other cases:

fa^{Hungarian}	~ puu^{Finnish}	~ pa^{Sumerian}
fejsze^{Hungarian}	~ päćt^{Mansi}	~ pa-a-šu^{Sumerian}
fészek^{Hungarian}	~ pesä^{Finnish}	~ pisaĝ^{Sumerian}
fog^{Hungarian}	~ pekat^{Khanty}	~ pag^{Sumerian}
fon^{Hungarian}	~ păn^{Khanty}	~ pan^{Sumerian}

The Hungarian change from /p/ to /f/ occurs only word-initially, except in compound words:

ifjú^{Hungarian} = i^{Hungarian} (young) + fiú^{Hungarian} (male)

A version of the above compound word could have been formed even in West-Ugric, that is, before the Hungarian word initial /f/ to /p/ change took place. Therefore, it looked like the following:

*ipiu$^{West-Ugric}$

In the above word the medial /p/ would have changed to /b/ in Sumerian, which is a regular phenomemnon:

apa^{Hungarian}	~ op^{Khanty}	~ abba^{Sumerian}
csupor^{Hungarian}	~ ćipiš^{Zyrian}	~ zabar^{Sumerian}
ifjú^{Hungarian}	~ *ipiu$^{West-Ugric}$	~ ibila^{Sumerian}

The West-Ugric word final /p/ also changes regularly to /p/ in Hungarian and /b/ in Sumerian:

süpped^{Hungarian}	~ šēp^{Mansi}	~ šub^{Sumerian}
szép^{Hungarian}	~ seppä^{Finnish}	~ ze-eb^{Sumerian}
szopik^{Hungarian}	~ sipγ^{Mansi}	~ sub^{Sumerian}
tapos^{Hungarian}	~ tapte^{Mari}	~ tab^{Sumerian}

Rule (9): West-Ugric word intitial /h/ is either preserved or omitted. The omission seems more common in longer words.

hal^{Hungarian}	~ kăla^{Khanty}	~ hulu^{Sumerian}
háromszor^{Hungarian}	~χūrėmśos^{Mansi}	~ am$_3$-mu-uš$^{Sum.}$
holló^{Hungarian}	~ kolāk^{Mansi}	~ hurin^{Sumerian}
horzsol^{Hungarian}	~ karśel^{Mansi}	~ hur^{Sumerian}
hosszú^{Hungarian}	~ košew^{Mansi}	~ éše^{Sumerian}
huny^{Hungarian}	~ kŏń^{Khanty}	~ huna^{Sumerian}

All of the above examples are from the Proto-Uralic layer except horzsol^{Hungarian}, which is from the Finno-Ugric layer. That suggests that the initial /k/ already underwent lenition to /h/ in Proto-West-Ugric. Moreover, in the second example the Mansi word also underwent partial lenition.

An alternative would be to assume that West-Ugric words did not have an initial /h/ but only an initial /k/. In that case, they underwent lenition idependently in Hungarian and Sumerian as discussed in the next rule.

Rule (10): The West-Ugric initial /k/ has underwent various degrees of lenition. In Hungarian, word initial /k/ changes to /h/ when it followed by a back vowel:

hab^{Hungarian}	~ kump^{Khanty}	~ gúb^{Sumerian}
hagyma^{Hungarian}	~ košem^{Mansi}	~ ki-šum-ma$^{Sumer.}$
hal^{Hungarian}	~ koule^{Finnish}	~ ku^{Sumerian}
hál^{Hungarian}	~ kōl^{Mansi}	~ ku^{Sumerian}
halad^{Hungarian}	~ koγel^{Khanty}	~ kul^{Sumerian}

hamu^{Hungarian}	~ kolem^{Mansi}	~ kúm^{Sumerian}
hanyatt^{Hungarian}	~ kuntst^{Mordvin}	~ kun^{Sumerian}
hangya^{Hungarian}	~ kaškēj^{Mansi}	~ kiši^{Sumerian}
harap^{Hungarian}	~ kurćći^{Zyrian}	~ kur$_8$^{Sumerian}
hattyú^{Hungarian}	~ kotaŋ^{Mansi}	~ gud-du$_7$^{Sumerian}
ház^{Hungarian}	~ kota^{Finnish}	~ gùd^{Sumerian}
here^{Hungarian}	~ kar^{Khanty}	~ ğuruš^{Sumerian}
homály^{Hungarian}	~ χomχatas^{Mansi}	~ kana$_6$^{Sumerian}
hord^{Hungarian}	~ kart^{Mansi}	~ gur$_3$-ru^{Sumerian}
hölgy^{Hungarian}	~ kal^{Mansi}	~ gal$_4$-la^{Sumerian}
húgy^{Hungarian}	~ χŏs^{Khanty}	~ kaš$_3$^{Sumerian}
húz^{Hungarian}	~ kåt^{Mansi}	~ gid^{Sumerian}

In all of the above examples, the middle column has always a back vowel. In addition, at least either the Hungarian or the Sumerian cognate also has a back vowel after the word intitial consonant. These suggest that their Proto-West-Ugric ancestors also had a back vowel after the word initial /k/. The deep vowel nature of the West-Ugric word for here^{Hungarian} is further confirmed by the cognate κορος^{Greek}.

In addition, the ki-šum-ma^{Sumerian} (onion plot) probably derives from:

kośem^{Mansi} (onion) + mə̄^{Mansi} (plot, land)

because the Mansi forms seems to preserve well the original West-Ugric forms. It is likely that the later Sumerians did not understand that in the above compound word the syllable mə̄ meant 'plot, land.' Instead, they were expecting the beginning of the word to mean land, which is ki^{Sumerian} (place). Therefore, by folk etymology the following change could have occurred:

*kośem+mə̄ > *kiśem+mə̄ > ki-šum-ma^{Sumerian}

There is no lenition of /k/ in Hungarian when it is followed by a front vowel:

kéz^{Hungarian}	~ kät^{Mansi}	~ kišib^{Sumerian}
kell^{Hungarian}	~ kel^{Mari}	~ kal^{Sumerian}
könyök^{Hungarian}	~ könŋi^{Khanty}	~ kin^{Sumerian}

Rule (11): The West-Ugric word initial /l/ is always preserved. However, the West-Ugric word medial and final /l/ could either stay /l/ or change to an /r/. Here are a few examples for the latter:

fal^{Hungarian}	~ păl^{Khanty}	~ ba-ar^{Sumerian}
fél^{Hungarian}	~ päl^{Mansi}	~ bar^{Sumerian}
holló^{Hungarian}	~ kolāk^{Mansi}	~ hurin^{Sumerian}
szalad^{Hungarian}	~ suoti^{Finnish}	~ sar^{Sumerian}
váll^{Hungarian}	~ _olka^{Finnish}	~ murgu$_2$^{Sumerian}

In the fourth example, there is a /t/ for the Finnish word, but a Finnish medial /t/ often corresponds to an Ugric /l/. Hence it can be assumed that the Proto-West-Ugric form also had a /l/ sound.

Rule (12): The West-Ugric /r/ is always preserved in Hungarian and Sumerian, although it could change to a λ in Greek:

arat^{Hungarian}	~ šir^{Zyrian}	~ šar$_2$^{Sumerian}
bőr^{Hungarian}	~ pĕr^{Khanty}	~ bar^{Sumerian}
csupor^{Hungarian}	~ ćipiš^{Zyrian}	~ zabar^{Sumerian}
daru^{Hungarian}	~ tarew^{Mansi}	~ dur^{Sumerian}
ér^{Hungarian}	~ sora^{Finnish}	~ sùr^{Sumerian}
far^{Hungarian}	~ perä^{Finnish}	~ bar^{Sumerian}
farag^{Hungarian}	~ pār^{Mansi}	~ bar^{Sumerian}
fordul^{Hungarian}	~ porjal^{Votyak}	~ bùru^{Sumerian}
fürt^{Hungarian}	~ per^{Votyak}	~ buru$_{14}$^{Sumerian}
harap^{Hungarian}	~ kurćći^{Zyrian}	~ kur$_8$^{Sumerian}
here^{Hungarian}	~ kar^{Khanty}	~ ğuruš^{Sumerian}
hord^{Hungarian}	~ kart^{Mansi}	~ gur$_3$-ru^{Sumerian}
mer^{Hungarian}	~ měret^{Khanty}	~ emerah^{Sumerian}
tőr^{Hungarian}	~ tir^{Votyak}	~ dur^{Sumerian}
türök^{Hungarian}	~ teura^{Finnish}	~ durah^{Sumerian}
úr^{Hungarian}	~ śåpėr^{Mans}	~ še-er^{Sumerian}

Rule (13): The West-Ugric word initial /m/ can be preserved or changed to /ɲ/ in Hungarian, and it can be preserved or changed to /b/ in Sumerian when the following consonant is a liquid:

meleg^{Hungarian} ~ mäli^{Mansi} ~ bil$_2$^{Sumerian}

Rule (14): The West-Ugric word initial /n/ can be preserved or changed to /ɲ/ in Hungarian, and it is always preserved in Sumerian.

Rule (15): The West-Ugric word initial /v/ is always preserved in Hungarian, and it can change to either /m/ or /p/ in Sumerian. The change from /v/ to /b/ occurs when the following consonant is a liquid /l/ or /r/ or a nasal /m/ or /n/:

sövény^{Hungarian}	~ säw^{Mansi}	~ šu-mu-un^{Sumerian}
váll^{Hungarian}	~ _olka^{Finnish}	~ murgu$_2$^{Sumerian}
való^{Hungarian}	~ wăl^{Khanty}	~ ma-al^{Sumerian}

Rule (16): A West-Ugric word initial or word final hiatus, that is a lack of consonant, is preserved in Sumerian but may be filled in by /j/ in Hungarian. For example:

juh^{Hungarian}	~ uuhi^{Finnish}	~ u$_8$^{Sumerian}
szíj^{Hungarian}	~ sow^{Mansi}	~ zà^{Sumerian}

Rules (1-16) give a convincing proof that there

are regular phonetic correspondences between Sumerian and Hungarian. Next we give more detailed arguments that show that Hungarian, Minoan and Sumerian belong to the West-Ugric group of languages.

5.1 Finno-Ugric η > Ugric ηk > West-Ugric g

Honti [22] lists the Finno-Ugric η > Ugric ηk change as item 4 among the evidences for a common Ugric language. The $ηk^{Ugric} > g^{Hungarian}$ change occurs regularly. Below we show some examples that suggest that Minoan and Sumerian also shared the ηk > g change with Hungarian. Hence this change occurred in Proto-West-Ugric.

*äηε$^{Finno-Ugric}$ > *äηkε^{Ugric}
> jaηlel^{Khanty} (burn)
> *ägε$^{West-Ugric}$
> αυγη^{Greek} (torch)
> ég^{Hungarian} (burn)

*šiηere$^{Finno-Ugric}$ > *šiηkere^{Ugric}
> täηker^{Mansi} (mouse)
> *šegér$^{West-Ugric}$
> ζεγέριες^{Greek} (mouse)
> eger^{Hungarian} (mouse)
> gilim^{Sumerian} (mongoose ?)

*suηε$^{Finno-Ugric}$ > *suηkε^{Ugric}
> suη^{Khanty} (crack)
> *sugε
> σχιζειν^{Greek} (crack, v.)
> zug^{Hungarian} (crack, n.)
> zé-èg^{Sumerian} (bury, hide)

*ϑäηε$^{Finno-Ugric}$ > *ϑäηkε^{Ugric}
> taw^{Mansi} (bough)
> jaγi^{Khanty} (bough)
> *ägε$^{West-Ugric}$
> ἀκρέμων^{Greek} (bough)
> ág^{Hungarian} (bough)

In each of the above four examples, the ancient Greek and Sumerian words are closer to the Hungarian words than to the Khanty and Mansi words because they also contain /g/ or the similar phonemes /k/ or /x/.

Furthermore, the ancient Greek and Sumerian words preserve some archaic features that probably existed in West-Ugric but were lost in Hungarian. These archaic features include the presence of an ending vowel in αυγη^{Greek} and the initial fricative consonant in ζεγέριες^{Greek}. These support the hypothesis of a West-Ugric branch within the Finno-Ugric family that included both Minoan (from which ancient Greek borrowed the above words) and Hungarian.

5.2 Finno-Ugric lm > Ugric m = West-Ugric m

Honti [22] lists the $lm^{Finno-Ugric} > m^{Ugric}$ change as item 5 among the evidences for a common Ugric language.

*ćolme$^{Finno-Ugric}$
> solmu^{Finnish} (knot)
> *ćome$^{Ugric, West-Ugric}$
> ἀμμα^{Greek} (knot)
> csomó^{Hungarian} (knot)

The lm > m change did not occur in some Ob-Ugric words perhaps because of a vowel insertion between the /l/ and the /m/, but it occured in the West-Ugric words. Here is an example:

*kuδ'mε$^{Finno-Ugric}$
> kulov^{Mordvinian} (ash)
> kōlem^{Mansi} (ash)
> *kumε$^{West-Ugric}$
> κόνις^{Greek} (dust)
> hamu^{Hungarian} (ash)
> kúm^{Sumerian} (hot, heat)

5.3 The Ugric -kVj Suffix

Honti [22] lists the Ugric -kVj suffix as item 19 among the evidences for a common Ugric language. This suffix appears in the word for woodpecker.

*karε-kVj^{Ugric} (woodpecker)
> kar-kāj^{Mansi}
> *karε-kVj$^{West-Ugric}$
> κραυ-γός^{Greek} (woodpecker)
> har-kály^{Hungarian} (woodpecker)

6 West-Ugric Grammar Similarities

The Sumerian grammar is already described in several textbooks, for example by Foxvog [16], Gosztonyi [19] and Thomsen [45]. Among those authors, Gosztonyi [19] gives a detailed comparison between Sumerian and the Hungarian grammars. While Sumerian clearly does not fit neatly into the Uralic family tree, Gosztonyi's list of similarities supports the hypothesis that Sumerian is a mixed Dravidian and Uralic language. The Dravidian and Sumerian grammatical comparisons also need to be

developed and listed in a similar manner to [19] before being able to decide which language family's grammatical features are present and to what degree. Complicating the picture somewhat is the fact that Dravidian and Uralic languages are both agglutinative and share some other features. For these common features one cannot decide whether they are inherited from one or the other language family.

To strengthen the proposal of a West-Ugric branch of the Uralic language family [41], we list some of their grammatical similarities. We focus on the similarities between Minoan and Hungarian because the Sumerian grammar is already compared with Hungarian as noted before.

6.1 West-Ugric is an Agglutinative Language

Sumerian [19] and the Uralic languages [26] are agglutinative, that is, they append suffixes to word roots without changing those roots. Duhoux [12] already identified Minoan to be also an agglutinative language. As further evidence, in Table 6 we display some blocks of the Phaistos Disk and the Arkalochori Axe that reveals an agglutinative structure, in particular the following:

1. There are eight different endings that each occurs at least two different times.

2. Some endings are apparently optional. For example,  is optional because it occurs in block 6 but does not occur in block 2. Similarly,  is optional because it occurs in block 36 but not in block 44.

3. Some endings are replaceable with another ending. For example, blocks 29 and 38 have the same apparent root but end with  and  , respectively. Similarly, blocks 33 and 40 have the same apparent root but end with  and  , respectively.

4. Whenever the endings are attached to a root, the root does not change. Table 6 indicates by red some of the apparent roots.

6.2 Minoan has a CVCV Root Structure

Linear B, the immediate descendant of Linear A, has a mostly syllabic writing with CV type syllables, where C is a consonant and V is a vowel [9, 49]. Hence Linear A was expected to have a similar structure as was verified in [41]. The CV type syllables fit well with Proto-Uralic word roots that generally have two syllables with a CVCV structure [26] as shown by the following examples:

*kala > hal (fish)
*käte > kéz (hand)
*mete > méz (honey)

Words with a CVCV structure can be written down conveniently using two CV syllabic symbols, which may have influenced the Linear A script to develop as a syllabic script. Table 6 already shows several roots that contain two Linear A symbols, including  and  and  .

6.3 The -g Frequentative Suffix

Table 5 shows that Hungarian and Sumerian words share the –g suffix, which suggests that the Euphratic language also had this suffix. The –g suffix is a frequentative suffix that derives from a Finno-Ugric *ŋk suffix (Zaicz [54]). Here are some examples:

szipog$^{\text{Hungarian}}$ (sniff) ~ zi-pa-aĝ$_2^{\text{Sumerian}}$ (breath)
sziszeg$^{\text{Hungarian}}$ (hiss) ~ sisig$^{\text{Sumerian}}$ (breeze)

6.4 The -k Adjective Former Suffix

Table 5 shows that Hungarian and Sumerian words share the –k adjective former suffix, which can be traced back to a *-k Finno-Ugric suffix. In some early written documents in Hungarian, this suffix appears as –h, although it later changed to an –ó/ő suffix by assimilation to the vowels at the end of root words (Zaicz [54]). It is possible that the following two words are cognate:

tű$^{\text{Hungarian}}$ (needle) ~ dálla$^{\text{Sumerian}}$ (needle)

The above suggests that the Hungarian word was originally either *tűr or *tűl. It probably meant not only needle but horn too. The ibex is an animal that is notable for its large horn. Hence a synonym for ibex may be horny, with a literal meaning of having a prominent horn. That explains the following word pairs:

türök$^{\text{Hungarian}}$ (horn) ~ durah$^{\text{Sumerian}}$ (ibex)

6.5 The -mány/-mény Noun Former Suffix

Table 5 shows that Hungarian and Sumerian share the –mány-/mény, noun former suffix, which can also appear in the form of -vány/vény, as shown by the following examples:

sövény[Hungarian] (hedging) ~ šu-mu-un[Sumerian] (grass)

As mentioned above, the Hungarian word derives from sző (weave) and sövény may have meant some grassy plant, whose fibers were used for weaving. Another example is the pair:

menny[Hungarian] (sky) ~ umun[Sumerian] (lord)

The menny[Hungarian] may derive from *um-vány, where the /v/ assimilates to the preceding /m/ and yields umun[Sumerian]. The original meaning may be god, who is assumed to dwell in the sky, that is, a heavenly person. Later this was generalized to mean lord, which is the dictionary entry for Sumerian word.

6.6 The -r Frequentative Suffix

Table 5 also shows that Hungarian and Sumerian also words share the –r frequentative suffix, which can be traced back to an *-r Finno-Ugric suffix. For example:

csupor[Hungarian] (bowl) ~ zabar[Sumerian] (bowl)

The above apparently derives from csepp[Hungarian] (drop of water). Hence csupor[Hungarian] initially meant a bowl that collected drops of water, perhaps rain drops. A nail and a spear are similar to each other in both having a pointed end. A nail is normally used only once during a construction of something. In contrast, a spear is used several times. Hence it needs a frequentative suffix:

szeg[Hungarian] (spike, nail) ~ šugur[Sumerian] (spear)

Similarly, a Sumerian word that means a single pig can be put together with a Hungarian word that means herd as follows:

csokor[Hungarian] (herd) ~ $šah_2$[Sumerian] (pig)

Since csokor[Hungarian] is cognate with ćuker[Zyrian], the word derives from West-Ugric to Sumerian and not vice versa. That makes sense because pigs were first domesticated in Anatolia and not in Mesopotamia.

6.7 Other Suffixes Ending with /k/

A problem with a pure syllabic script is that many suffixes do not fit into a CV structure. For example, consider the following Hungarian suffixes that end with a /k/ phoneme. We also give some examples, as they appear in the earliest Hungarian language documents. One of the frequently consulted documents is the 12th century *Halotti Beszéd* (Funeral Sermon) [7], which will be referenced as HB below.

1. /-ak, -ek, -ok/ are for the plural of words that end in a consonant. The vowel is chosen according to vowel harmony rules. Some examples are *hal-ak* (fishes) and *kez-ek* (hands) and *ablak-ok* (windows).

2. k/ is the plural of words that end in a vowel. For example, *falu-k* (villages) or *kapu-k* (gates).

3. /-k/ is the 1st person singular present tense verbal suffix in the indeterminate case.

4. /-juk, -jük/ is the 1st person plural present tense verbal suffix in the determinate case. For example, *tümet-jük* (we bury) appears in HB. As another example, present Hungarian uses *számol-juk a pénzt* (we count the money).

5. /-juk/ is also the 3rd person plural possessive suffix. For example: *kutyá-juk* (their dog).

6. /-muk/ is the 1st person plural present tense verbal suffix in the indeterminate case. This appears as *vogy-muk* in HB. This suffix appears to be simply the composition of the /-om, em/ first person singular verbal suffix in the determinate case and the plural /-k/, ex: *olvas-unk* (we read a book).

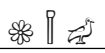
7. /-nak, -nek/ is the third person plural present tense verbal suffix in the indeterminate case, for example, *esz-nek* (they eat).

8. /-nak, -nek/ is also a marker of the possessor of an object. For example, a ló-nak a lába (the horse's leg).

9. /-nak, -nek/ is also a lativus suffix. For example, *fal-nak megy* (goes to a wall), *hegy-nek fordul* (turns towards a mountain).

10. /-omk/ is the 1st person plural possessive suffix, which appears as *uromc* [ur-omk] (our lord) in HB. Etymologically, this suffix appears to be simply the composition of the first person possessive /-om, -am, -em/, as in *ház-am* (my house) and the plural /-k/. Today, this suffix appears as /-unk, -ünk/, as in *ház-unk* (our house).

Table 7. Some blocks of the Phaistos Disk and the Arkalochori Axe inscriptions arranged to reveal repeatedly used suffixes and word roots. The Arkalochori Axe symbols are transliterated into the Phaistos Disk symbols using [39].

Block	Possible Root (red)	Possible Suffix (blue)	Block	Possible Root (red)	Possible Suffix (blue)
12					
45					
51					
59					
Ark. 3					
3					
6			2		
9					
10			7		
20					
22					
24					
27					
61					
34					
Ark. 1					
28					
29			38		
33			40		
43					
47					
49					
37					
39					
52			30		
25					
26					
50					
60					
36			44		
53					
58					
Ark. 2					
8					
46					

The Minoan  symbol represents not a syllable but some single phoneme because it is used only at the end of the words with one exception. According to Table 7, in the Minoan language about half of the suffixes end with a  symbol. Remarkably, about half of the suffixes end in /k/ in Hungarian. Therefore, it is tempting to associate Minoan  with Hungarian /k/. Moreover, the above Hungarian suffixes could be grouped into three groups: (1-3), which have the form /Vk/, where the vowel V is optional, (4-5), which have the form /jVk/, and (6-10), which probably had the form /-mVk/ assuming m > n or n > m changes in some cases. These groups seem to match a natural grouping of the Minoan words into those that end with  , with  and with  , respectively.

Old Hungarian contains two letters that denote the /k/ phoneme:  and  . According to some researchers one letter was used only within the words and the other was used only at the end of words. When carving the symbols into wood, a diamond is a convenient simplification of a circle, which may have denoted a human head [48].

Therefore, the shapes of the Minoan  symbol and the Old Hungarian  symbol have a connection. Moreover, the Minoan symbol depicts the head of a man with prominent hair. The Mansi word for man is /kom/, while the ancient Greek word for hair was /komi/, which may have been borrowed from Minoan. This shows a /k/ or a /ko/ phonetic connection between the two symbols.

6.8 Conjunction

Table 8 shows another pair of blocks that allows us to suspect that the symbol  is a conjunction symbol, meaning "and," a disjunction symbol, meaning "or," or it is some prefix. The shape of this symbol read from left-to-right suggests that it may denote two paths that merge together, that is, a conjunction.

When rotated ninety degrees, the symbol also reminds one of the Old Hungarian  symbol, which denotes the /ʃ/ phoneme and occurs in the Hungarian words *s* and *és* that both mean "and."

6.9 Assimilation by Consonant Doubling

Table 9 shows the doubling of some symbols before the hypothetical suffixes. The doubling of consonants before suffixes is common in Hungarian and result from assimilation between the last

Table 8. Possible Minoan conjunction or affix.

Block	Conjunction or Prefix	Root	Suffix
6			
31			

Table 9. Two blocks contain a doubling of some symbols right before possible suffixes.

Block	Possible Root	Doubling	Possible Suffix
3			
49			

Table 10. Hungarian assimilation with consonant doubling.

Root + juk Suffix	Assimilation
mosjuk (we wash)	/ʃ ʃ/
úszjuk (we swim)	/s s/
főzjük (we cook)	/z z/
hagyjuk (we let)	/ɟ ɟ/
hunyjuk (we close [eyes])	/ɲ ɲ/
bátyjuk (their older brother)	/c c/

Table 11 Hungarian assimilation without doubling.

Root + juk Suffix	Assimilation
mondjuk (we say)	/ɟ/
fonjuk (we weave)	/ɲ/
futjuk (we run)	/c/

Table 12. Minoan assimilation without doubling.

Block	Root	Assimilation	Suffix
22			
Ark. 3			

Table 13. Minoan and Old Hungarian script similarities.

Symbol	Grammatically Identified Phoneme	Old Hungarian Letter	Old Hungarian Phoneme
	/k/		/k/
	/j/		/j/ or /ʎ/
	/ʃ/		/ʃ/
	/s/, /z/, /ɟ/, /ɲ/ /c/		/s/, /ʒ/
	/s/, /z/, /ɟ/, /ɲ/ /c/		/z/

consonant of the root and the beginning consonant of the suffix. Table 10 shows some examples.

Therefore, the Minoan  and  symbols behave similarly to the Hungarian doubled consonants and likely denote one of the consonants that is doubled in Hungarian except /ʃ/, which we already associated with  .

6.10 Assimilation by Palatalization

Assimilation can occur without a doubling in case of some consonants. Table 11 gives some examples from Hungarian.

The palatalized sounds in Table 11 may not have been originally used in the Hungarian language within word roots, but they tend to occur naturally with the addition of suffixes that start with /j/. It is likely that in the Minoan language the palatalized sounds also first occurred as a result of assimilation.

Table 12 shows that in block 22 a palatalization during assimilation can be suspected because the apparent assimilation yields a symbol that is rarely used. Moreover, it is never used at the beginning or the end of words, where palatalization is absent. It is also noticeable that it occurs only before  , which we already associated with the /–juk, -jük/ suffix. Compare Phaistos Disk block 22 with the Arkalochori block 3, where there is no assimilation sound in a similar context before  which we associated with the /–Vk/ suffix.

The above grammatical comparisons enable the identification of the phonetic values of some of the Phaistos Disk symbols as shown in the first two columns of Table 13. It is apparent from Table 13 that the Old Hungarian alphabet has a strong connection with the Minoan symbols. After such a realization, the logical step was the thorough comparison of all Minoan and Old Hungarian symbols to identify possible phonetic values of the Minoan symbols [37]. The script comparison was recently extended to the Indus Valley Script [11].

Fig. 3 shows our proposal [40] to place Minoan into West-Ugric branch of the Uralic language family. Fig. 3 implies that Minoan and Hungarian share not only the characteristic Ugric features but also the characteristic West-Ugric features, that is, the language innovations that occurred after the separation of West-Ugric and Ob-Ugric and before the separation of Minoan and Hungarian. Linguists call Proto-Hungarian (*ősmagyar* in Hungarian) the language that separated from the Ob-Ugric branch and progressed toward present day Hungarian until the end of the 9th century [21, 26]. Hence these characteristic West-Ugric features can be none other than some of the Proto-Hungarian linguistic innovations that were previously considered to be pertinent only to the evolution of the Hungarian language. Hence the precise identification of the characteristic West-Ugric features is tantamount to dividing the *ősmagyar* period into an early phase, which is applicable to Minoan too, and a later phase, which is not applicable to Minoan but only to Hungarian. Below we give some features that are shared by Minoan and early Proto-Hungarian. These shared features support putting these two languages into a common West-Ugric branch of the Uralic language family.

6.11 The Ugric Root+Possessive+Case Order

Finally, Honti [22] lists the word structure:

Root + Possessive + Case

order as item 20 among the evidences for a common Ugric language.

The translation of the Arkalochori Axe [40] includes the word *szem-jöd-nek* (for your eye), which has the root+possessive+case order. Hence Minoan also has this structure. According to Foxvog [16] p. 28, Sumerian has the same structure. Hence West-Ugric probably had the same structure too.

6.12 A Parser for Minoan Possessive Phrases

Both Minoan and Hungarian possessive phrases are composed of a possessor followed by the possessed object. Both the possessor and the possessed object are indicated by suffixes. The possessor is indicated by a /-nak/ suffix, while the possessed object is indicated by an /-a/ suffix. Similarly, in Sumerian the possessor is indicated by a /-ak/ suffix (Foxvog [12], p. 39). In Minoan and Hungarian, the possessor suffix /-nak/ is optional and can be omitted. Table 14 shows that the Phaistos Disk contains two examples of this structure. Although we identified  with /-nak/, the  symbol has the syllabic value /na/, hence the combination  is another way of writing the /-nak/ suffix.

A computer program can be also written to look for adjacent pairs of blocks with the first ending in /nak/, expressed in any form, and the second ending with /-a/. A context-free-grammar [36] or a constraint query language [25] can be used to express Minoan possessive phrases. In terms of a

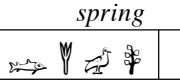
context-free-grammar the Minoan possessive phrases can be expressed as follows:

Pphrase → Possessor Possessed
Possessor → Nd –nak | Nh –nek | Nd | Nh
Nd → NdSingular | NdPlural
Nh → NhSingular | NhPlural
NdSingular → NdC | NdV
NhSingular → NhC | NhV
NdPlural → NdC -ak | NdV –k
NhPlural → NhC -ek | NhV –k
NdC → <deep vowel nouns ending in consonant>
NhC → <high vowel nouns ending in consonant>
NdV → <noun with deep vowels ending in vowel>
NhV → <noun with high vowels ending in vowel>
Possessed → PossessedSingular | PossessedPlural
PossessedSingular → NdC –a | NdV –ja |
NhC –e | NhV -je
PossessedPlural → PossessedSingular -i

In the above grammar, the terminals are indicated by brackets < >, choices by |. Each time a possessive phrase is parsed, the grammar starts at Pphrase, which stands for "possessive phrase." The possessive nouns can be either singular or plural. Plural possessive nouns ending with a vowel have a /-k/ suffix, while those ending with a consonant have either an /-ak/ or an /-ek/ suffix according to vowel harmony rules. Similarly, the vowel harmony rules require an /-a/ or an /-e/ to indicate being possessed. In addition, the phoneme /j/ is inserted before the last two as a gliding sound if the noun ends with a vowel.

The possessed object or objects take first the /-a/ suffix, indicating belonging to the preceding possessor and then the plural marker /i/. The different plural marker and the different order with respect to the main suffixes, that is, preceding /nak/ but following /-a/ also help distinguish between possessor and the possessed object(s). For example,

Table 14. Minoan possessive phrases. Each Minoan phrase consists of two blocks. The translations are in Minoan below that in English (in italics).

Blocks	Possessor	-nak	Possessed	-a
7-8				
	fény *light's*		tavasz-a *spring*	
45-46				
	más-nak *king's*		húsz lány-a *daughter*	

to possessive phrase "embereknek házai" (people's houses) can be parsed as follows:

Pphrase → Possessor Possessed
Possessor → Nh –nek
Nh → NhPlural
NhPlural → NhC -ek
NhC → ember
Possessed → PossessedPlural
PossessedPlural → PossessedSingular -i
PossessedSingular → NdSingular –a
NdSingular → NdC
NdC → <ház>

The above gives "ember-ek-nek ház-a-i," which is the correct parsing of this possessive phrase.

7 Related Works and Discussion

Section 1 already mentioned many of the prior researchers who worked on identifying Sumerian and Hungarian parallels. Similar to them, Aczél [1] and Varga [47] worked on Greek and Hungarian parallels, building large dictionaries. Although they also ignored Uralic linguistics, their work called for an explanation. Our earlier work [41] found an explanation by recognizing that some of the word parallels may be due to a common proto-language of Minoan and Hungarian.

Now the picture of language evolution can be further completed as shown in Fig. 3. The figure explains that Minoan and the related Hattic language belong to the Uralic family tree. Moreover, Greek is a descendant from both Indo-European and Uralic, while Sumerian has both Dravidian and Uralic ancestors.

Fig. 3 implies some modification of the chronology of Uralic language evolution because West-Ugric had to exist before Sumerian and Minoan became separate languages. The precise chronology is often one of the hardest problems to identify in comparative linguistics. A comparison of two languages tells little directly about the chronology.

Róna-Tas [42] estimated the separation of the Ob-Ugric languages from the rest of the Uralic family tree to have occurred between 3000 and 2000 BC. This is somewhat farther back in time then many other linguists' estimates, but the time may still need to be pushed back more than a thousand years to accommodate the known Sumerian and Aegean chronologies.

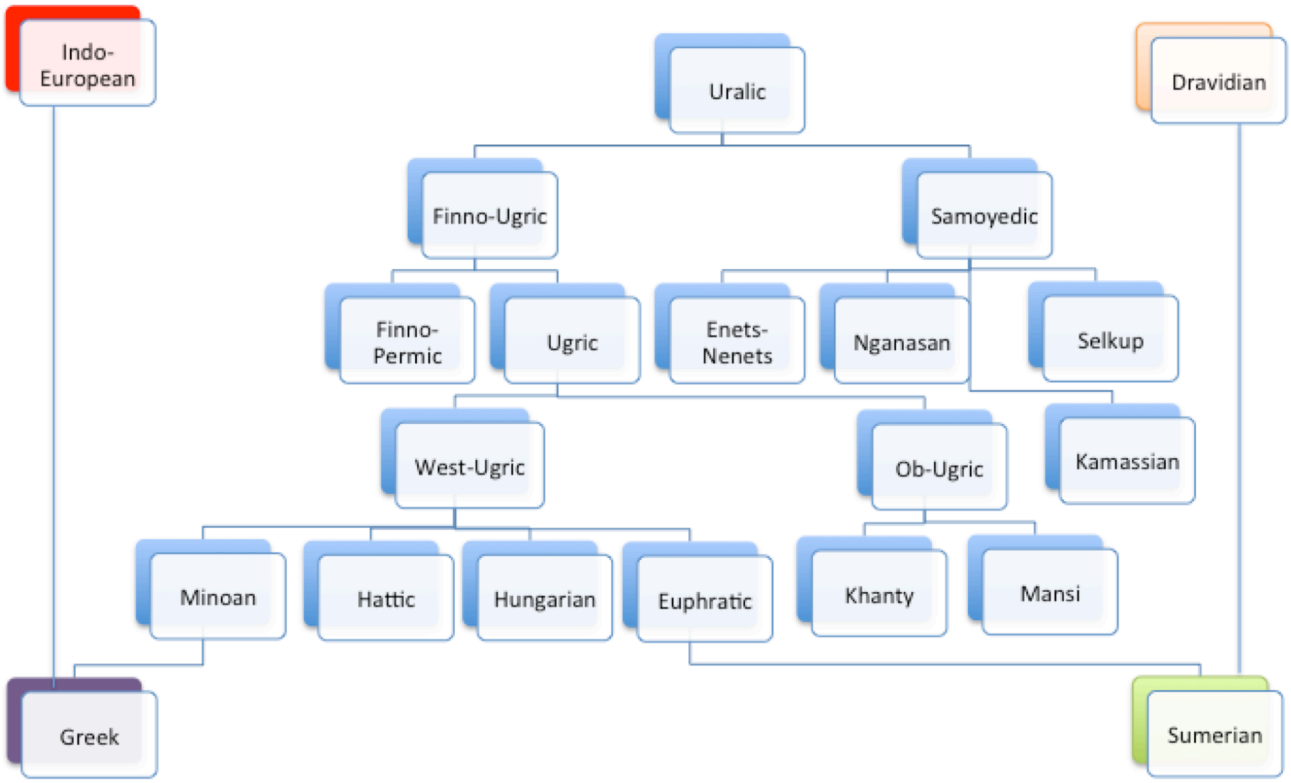


Fig. 3. A partial diagram showing the Dravidian (yellow), Indo-European (red) and the Uralic (blue) language families. Note that the Greek (purple) and the Sumerian (green) languages descend from two different language families.

The basis of Róna-Tas' estimate is actually far more interesting than the estimate itself. Róna-Tas makes the observation that certain processes of sound change could only occur in a sequence and not in parallel. For example, the process of word-initial /ʃ/ > /h/ > /_ / changes, that is, the gradual loss of the initial /ʃ/ must have occurred before the process of word-initial /k/ > /h/ changes, when /k/ is followed by a back vowel, started. Otherwise, the /k/ initial would have also completely disappeared.

Clearly, if the first process lasted x number of years, the second process lasted y number of years, then we can conclude that the evolution of a language in which both processes occurred in a sequence took at least $x + y$ number of years. However, we cannot derive any upper bound because there could have been some number of extra years before the first process ended and the second process started. While the elapse time of a process could be estimated relatively well, estimating the extra years seems highly uncertain. Therefore, Róna-Tas' work implies that the separation of the Ob-Ugric languages from the rest of the Uralic family tree occurred *at least 2500 BC* (± 500 years for various uncertainties in estimating the duration of the sound change processes).

8 Conclusions and Future Work

It has always looked counterintuitive to have Sumerian be a language isolate given its location in Mesopotamia, which is essentially at the intersection of three continents. It turns out that instead of being a language isolate, Sumerian is actually the combination of at least two major language families. In this paper we identified Dravidian and Uralic and in particular Proto-Tamil and Proto-Hungarian, respectively within those two language families as major contributors to the development of Sumerian. It cannot be excluded currently that a third language to be still identified also contributed to Sumerian. It seems that the great difficulty in classifying the Sumerian language was not its isolation but its varied interconnections with several other languages.

There still remains much work to be done to fill in the details of the picture shown in Fig. 3. In particular, as Section 9 mentioned, the chronology of the development of Sumerian and its related languages needs to be worked out in detail. It is hoped that the complete settling of the Sumerian language will shed a major light on the origins and prehistory of languages in general [35].

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