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**The Dissertation Committee for Bernice Varjick Hecker certifies that this is the
approved version of the following dissertation:**

The Biradical Origin of Semitic Roots

Committee:

Robert D. King, Supervisor

Robert T. Harms

Richard P. Meier

Esther L. Raizen

Peter F. Abboud

THE BIRADICAL ORIGIN OF SEMITIC ROOTS

by

Bernice Varjick Hecker, M.A., M.A.

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Dedication

To Mark Southern, who awakened and sustained my interest in the Ancient Near East.

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I would first like to thank Prof. Harms, who supervised my earlier paper, for teaching me that there is no way to conclusively prove a theory about an early stage of a prehistoric language but that it was possible to demonstrate its likelihood. His comments at an early stage of this work were invaluable in showing me how to go about doing so.

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The Biradical Origin of Semitic Roots

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Bernice Varjick Hecker, Ph.D.

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Supervisor: Robert D. King

Many scholars who have worked on reconstructing Proto-Semitic postulate that the original forms of the Semitic roots consisted of three radicals, with the occurrence of the infrequent biradical and quadriradical roots needing explanation (Bergsträsser, 1983). Other scholars such as Moscati et al. (1964) and Lipinski (1997) assert that Semitic roots had both biradical and triradical forms.

My hypothesis consists of two parts: 1) that all the words in the first language spoken by the Semitic peoples consisted of biradicals; 2) that the majority of the postulated biradicals entered the Semitic languages after being expanded by the addition of a third radical, with the resulting triradical having a semantic relation to the original biradical. In support of this hypothesis I develop a lexicon whose content has both to satisfy the assumed communication needs of an early people and to consist of productive biradical forms that generate triradical reflexes with associated meanings in some or all of the following languages: Akkadian, Biblical Hebrew, Aramaic, Arabic, Ge'ez, Sabaean, Mandaic, Ugaritic, and Syriac.

The following example illustrates how the lexicon items are generated. Preliminary inspection of Semitic roots yields the potential etymon **HM**¹ with the basic meaning *hot*

¹ **H, h** denote a voiceless velar fricative.

(Hebrew **xam**, Arabic **hamm**, Ugaritic **xm**, Akkadian **ememu**, and Aramaic **xamam**). But *hot* solely in the sense of temperature has too narrow a meaning for the biradical after other reflexes are identified:²

Arabic:	hamas : zeal; hammam : spa, hot bath; hamaša : enrage, infuriate; hummah : fever; humr : red, bloody, excited; humam : lava, embers; tahammus : fanaticism; hamaza : burn the tongue while tasting
Hebrew:	xemed : desire; xamar : become inflamed, agitated; xomaš : be ruthless; yaxem : be hot with anger or desire, conceive; xamas : do violence, injury
Mandaic:	hamida : hot passion; hamima : feverish, incensed; šxm : be red, blush; šxn : be inflamed by passion
Aramaic:	xemah : wrath; šaxam : burn to brownness; nxam : show warm feelings
Syriac:	xm : heated, glowing, fervent, violent; xmt? : anger; xm? : grow faint with heat
Ge'ez:	xename : passion, disaster; xemud : burnt to ashes; xamama : have a fever, be afflicted; xamz : rage, venom
Ugaritic:	xmt : venom; xmxmt : ardor

Consequently, the biradical **HM** is redefined as *hot, inflamed* because of these reflexes. The core of meaning is evident from the reflexes.

The following anomalies are discussed and accounted for within the framework of the hypothesis: that there exist biradicals in all these languages having the identical third radical and no others; that apart from the triradicals that are reflexes of the biradicals in the lexicon, there are many other triradical cognates.

Parallels in Indo-European are presented to bolster the theoretical basis of the work. The resulting lexicon is compared to Phoenician and Sanskrit attested glossaries, as well as to Eurasiatic and Nostratic word lists.

Since the postulated language was spoken much prior to the invention of writing, there is no means by which the hypothesis can be absolutely proven. However, this work will demonstrate that the biradicality hypothesis is both plausible and likely.

² When known variants between languages were taken into account.

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Glossary

ETYMON	A linguistic form from which a later form is derived
GENTILIC	A word that denotes members of a people or inhabitants of a place
HYPOCORISTIC	A word used as a pet name or a diminutive form of a name
LEXICOSTATISTICS	An approach to comparative linguistics that involves judging degrees of relationship on the basis of shared features, most often lexical data
MATER LECTIONIS	The name given to consonants that are used to indicate vowels in languages whose script includes consonants only. An example is the use of the consonant <i>w</i> for the vowel <i>u</i>
METATHESIS	An alteration in the normal sequence of elements in a linguistic structure
MIMATION	Use of the bilabial nasal <i>m</i> as a suffix to indicate plural in a Semitic language
MORPHEME	The minimal distinctive unit of grammar
NUNATION	Use of the dental nasal <i>n</i> as a suffix to indicate plural in a Semitic language
PRE-SEMITIC	A form of Semitic preceding Proto-Semitic (postulated in this work)
RADICAL	One of the consonants comprising a Semitic root
REFLEX	A linguistic form which is derived from a precursor form
SEMEME	A minimal unit of meaning
SEPULTURE	A chamber that is used as a grave
SPIRANTIZATION	Fricativization
TUMULUS	A heap of earth placed over prehistoric graves

Language Abbreviations

PS	Proto-Semitic
Pre-S	Pre-Semitic (defined in this paper)
Ak	Akkadian
Ar	Aramaic
Ab	Arabic
Gz	Ge'ez
Hb	Biblical Hebrew
Md	Mandaic
Ph	Phoenician
Sb	Sabaeen
Sy	Syriac
Ug	Ugaritic

Transcription Symbols

In keeping with the accepted practice of Semiticists, I have used the symbol ʃ for the IPA ʃ , ʔ for the glottal stop, ʕ for the voiced pharyngeal fricative, x for the voiceless pharyngeal fricative, and ħ for the voiceless velar fricative.

To indicate emphatic letters I have used a “ $\text{◌}̣$ ” symbol beneath a letter, as in ʃ̣ , instead of the familiar underlying dot, due to typographical difficulties. The symbols ħ and H are used to denote a voiceless velar fricative for the same reason.

In addition, for Sanskrit we have ç , a voiceless palatal median fricative, ñ (commonly written with a tilde), a voiced palato-alveolar nasal, and ṇ (commonly written with an overhead dot), a symbol not found in the IPA list but described in Whitney (1955, p. 70) as “an anusvāra, a nasal sound lacking in that closure of the organs which is required to make a nasal-mute or contact-sound.”

Chapter One. Introduction

1.1 THE SEMITIC ROOT SYSTEM

In the Semitic languages, most words are based on a triradical root consisting exclusively of consonants, although there do exist some biradical and quadriradical roots. These roots typically are expanded by a combination of affixes, infixes, and different vowel patterns to generate a system of related words whose meanings are often but not invariably expansions of the meaning of the root. For example, the consonants *KTB* form the root for “writing” in Hebrew. Using these radicals, there follow³ from it: *KoTeB* “to write,” *miKTaB* “a letter,” *KTaB* “handwriting,” *KaTaB* “a scribe,” *KtuBa* “a (written) marriage contract,” *KiTeB* “to engrave,” *KaTaBah* “a news article,” *hitKaTeB* “to correspond,” *KToBet* “an address,” and *hiKTeB* “to dictate,” etc. This is in addition to grammatical markings. For instance, *KaTaBti* “I wrote” has the same grammatical ending as *hitKaTaBti* “I corresponded.” The verbal systems of Semitic languages loosely follow a paradigm of “forms,” that is, a combination of specific affixes and vowels that are applied to a verbal root. There are forms that mark a given verb as basic, intensive, causative, reflexive, passive, or combinations thereof. Not every language has every form, nor are they used in exactly the same manner. Furthermore, very few if any verbs in these languages are instantiated in all the forms nor does the meaning of a verb in a specific form always faithfully reflect the form category meaning. In the above, *hitKaTeB* “to correspond,” is in the reciprocal form while *hiKTeB* “to dictate,” is in the causative form. In Arabic, *ŠaRiBa*⁴ “to drink” is in the simple, base form while *ŠaRRaBa* “to give someone something to drink” is in the causative-intensive form. On the other hand, in Hebrew, *MaLaT* “to escape, run away” has the causative form *HiMLiT* “to give birth to (animals only)” so the meaning of a form cannot always be predicted.

³ These illustrative examples are taken from the modern language.

⁴ In keeping with the accepted practice of Semiticists, I have used the symbol *š* for the IPA *ʃ*, *ʔ* for the glottal stop, *ʕ* for the voiced pharyngeal fricative, *x* for the voiceless pharyngeal fricative, and *ħ* for the voiceless velar fricative.

1.2 THEORIES ABOUT SEMITIC ROOTS

It is generally accepted by many scholars who have worked on reconstructing Proto-Semitic that originally Semitic roots consisted of three radicals, with the occurrence of the infrequent biradical and quadriradical roots needing explanation (Bergsträsser, 1983, p. 206). Other scholars such as Moscati et al. (1964, pp.73-74) believe that the Semitic roots were both biradical and triradical, based on their observation of the following patterns: 1) “Ancient” biconsonantal nouns such as *dam* “blood,” *yad* “hand,” *yam* “sea,” etc. They consider that assigning these nouns to triconsonantal roots is “contrived and far-fetched.” 2) The so-called “weak verbs” exhibit many biconsonantal forms, such as the Hebrew *qam* “he rose” (root *qwm*) and the Arabic *ram(at)* “she threw” (root *rmy*). 3) Comparison with other Hamito-Semitic⁵ languages, such as Semitic *qtl* “to kill” with Cushitic *qal* and Semitic *pʕl* “to make” with Cushitic *fal*. They conclude that:

The data just set forth show that biconsonantal [biradical] roots in the Semitic languages are not a hypothesis relating to a prehistoric period but constitute an historical reality attested by a group of nouns and by a series of verbal forms; this is further supported by the semantic concurrence of many roots in two of their radicals. There is, however, no sufficient reason for maintaining, as some have done, that the entire Semitic stock of roots was entirely biconsonantal. It is a more likely supposition that originally there existed roots with either two or three consonants..... and that at a certain stage in the development of the Semitic languages the triconsonantal system prevailed — extending by analogy and thus bringing into line biconsonantal roots through the adoption of a third radical.

Lipinski (2001, p. 207) asserts:

The existence of biconsonantal roots in Semitic languages, besides the triconsonantal ones, cannot be denied, even apart from the roots that became biconsonantal in consequence of the dropping out of one of the radicals. Their number increases significantly if one accepts that only two of the three radicals of the triconsonantal roots are the main bearers of the meaning and the third one had at one stage the task of a determinant or modifier in very much the same way as occurs with vowels in the fully developed triconsonantal system.

⁵ The modern designation is Afroasiatic.

Kaye writes (2005, Vol. 64, p. 110):

As is known, the Semitic languages have many roots with the same meaning that have two consonants in common. Consider the Biblical Hebrew *qeṣ* “end,” *qaṣe* “end, border, extremity,” and *qaṣw* “border,” which illustrate the (existence of) the biradical *qṣ* and the triradical *qṣw*

Although there has been much speculation about the possibility of a biradical origin to some or all of Semitic roots, there has not been a systematic attempt before this to identify an early lexicon of biradicals and to trace their reflexes in the Semitic languages.

1.3 MY HYPOTHESIS

The hypothesis of this work is that virtually all the words in the first language spoken by the Semitic peoples, which I shall term Pre-Semitic (Pre-S), consisted of biradicals and that it was possible to meet all the communication needs of an early people solely with a lexicon based on biradicals. Further, I hypothesize that most of these biradicals entered the Semitic languages after being expanded by the addition of a third radical. The resultant triradicals⁶ retained the essential germ of meaning of the original biradical but differed from it by being specific or expanded, in contrast with the generalized meaning of the biradical. An example of this is the posited biradical *KB*, here defined as expressing the sememe “weighty.” Adding a third radical allowed specificity: there followed separate triradicals for “afflict, press hard,” “large, thick in the middle” “be great; noble,” “force a woman,” “to press, oppress.” This hypothesis is demonstrable by tracing these biradicals to their reflexes in nine Semitic daughter languages.

There is extensive evidence from the nine investigated Semitic languages of roots in which just two of the three radicals carry the primary meaning. Once those two radicals are identified, one then can identify triradical roots that are their extensions, both in form and meaning. The third radical is not necessarily identical across languages and there may be several different extensions within a single language.

⁶ The argument concerning triradicals is meant to include roots containing four or five radicals.

I posit and present a Pre-S lexicon (Appendix A) based on biradical roots, constructed from two sources. The first source is the assumed basic communication requirements for daily living of the Semitic people. The second source is a set of essential meanings garnered from a number of attested words that can be considered to stem from a common origin in nine Semitic languages. These languages are: Hebrew, Aramaic, Syriac, Ugaritic, Mandaic, Sabaean, Ge'ez, Arabic, and Akkadian. The format of Appendix A is shown below in (1) using the example of the sememe *restrain*:

(1)

Sememe	Biradical	Used to express
restrain	KL II	restrain, surround, contain

Appendix B presents the reflexes of the Pre-Semitic biradicals in the nine languages. Many rows in Appendix B have a cross-reference to Appendix C, which presents cross-language consonant correspondences and other phonological data. This is necessary in order to be able to identify cognates in different languages, e.g., *g* in Hebrew vs. *j* in Arabic. The Akkadian in Appendix B is primarily from Huehnergard (2002) and Black et al. (2000). Leslau (1987) is the source for Ge'ez. The sources for Hebrew are Brown (1951) and Davidson (1970). There are cross-referenced entries in Leslau and Brown to many of the other languages as well. The sources for Sabaean are Biella (1982) and Beeston (1984) and for Arabic are Cowan (1994) and Doniach (1972). The Mandaic is from Drower (1963) and the Ugaritic from Segert (1984), Huehnergard (1987), and del Olmo Lete, et al. (2003). The Syriac sources are Payne Smith (1908) and Goshen-Gottstein (1970). The Aramaic sources are Rosenthal (1961), Johns (1972), and Davidson (1970).

Together Appendices A and B link the proposed lexicon with its instantiation in the daughter languages. An example of the matching entry in Appendix B to the sememe *restrain* in Appendix A is shown below.

(2)

	Ak	Hb	Ab	Am	Sy	Md	Sb	Gz	Ug
KL II re-strain	kalu: surround, restrain; kallatu: closed bridal chamber	kalaʔ: surround, restrain; klub: cage; kalah: bride (one closed in or reserved for her husband); kul: contain; keleʔ: imprisonment; miklal: perfection, completion	kalaʕ: protect; takalluf: constraint, unnaturalness; mutakallaf: false, artificial, affected; kʔalaha: stern, austere, somber	klaʕ: to surround, restrain	kelaʔ: withhold; prohibit; kltʔ: bride	kla: hold back, withhold;	kl: give in marriage	kalʕa: hinder, forbid, restrain; kalkala: hinder, prohibit; kallala: surround for protection; kalsasa: bind sheaves; kaltexa: bind	kallat: bride

1.4 PARALLELS IN OTHER LANGUAGES

There is a further justification for this hypothesis in considering a similar situation in Indo-European. Proto-Indo-European (PIE) roots have the structure (C)CVC(C) and can be expanded with the addition of a “root enlargement,” whose form may be an infix, a suffix, or reduplication of the original form. Watkins (2000, p. 92) provides such an example:

(3)

PIE **teuə* “to swell,” with its extended forms:

- k > English *thigh* (Germanic **theuham* “swollen part of the leg”)
- s > English *thousand* (Germanic **thūs* + *hundi* “swollen hundred”)
- l > Greek *tulos* “lump”
 - > English *thole* (Germanic **thul* “oarlock”)
- m > English *thimble, thumb* (Germanic **thūmōn* “the thick finger”)

Beekes (1995, p. 162) asserts that these enlargement elements originally had a meaning but that it is no longer possible to recover them.

Chapter Two. The Semitic Languages and People

2.1 BACKGROUND ON THE CHOSEN SEMITIC LANGUAGES

Hetzron discusses the model of relationships among the Semitic languages (1997, pp. 6-13) and the justifications for classifying the major branches. He places each language within a branch, based on common innovations between languages such as the presence of a suffix conjugation used for the past tense (p. 8) as the primary innovation characterizing West Semitic. Although the families contain many more languages than are shown below, I have included only those languages that are cited in this work.

(4)

The Semitic Language Family (Hetzron, 1997, p.6).

East Semitic

Akkadian

West Semitic

Central Semitic

Arabic

Northwest Semitic

Hebrew (Phoenician)

Aramaic Syriac Mandaic

Ugaritic

South Semitic

Southwest Semitic

Sabaeen (Old South Arabian)

North Ethiopic

Ge'ez

Table 1. Language timelines.

Akkadian	Akkadian was written in cuneiform and was spoken from 2600 B.C.E. to the middle of the first century C.E. The dialect of the north was called Assyrian and it has been subdivided into three periods, ranging from 1950 B.C.E. to 600 B.C.E.: Old-, Middle- and Neo-Assyrian. The dialect of the south was called Babylonian and it was subdivided into four periods, ranging from 1950 B.C.E. to 50 C.E.: Old-, Middle-, Neo-, and Late-Babylonian. The classical language is considered to be Old-Babylonian (Marcus, 2002, p. 19).
Aramaic	The oldest texts found were from the 10 th to 7 th centuries B.C.E. and are labeled Ancient Aramaic. Official (or Standard) Aramaic was spoken from the 6 th to 3 rd centuries as the administrative language of the Persian Empire as well as the spoken language of much of the region. This is the dialect found in the Bible (Daniel, Ezra, and parts of Esther, Koheleth, Song of Songs, Job, Nehemiah, and Chronicles 1 and 2). Middle Aramaic was spoken from the first century B.C.E. to the first century C.E. and this was the dialect in the Dead Sea Scrolls and the New Testament. Late Aramaic was the language of various religious writings from the 2 nd to the 9 th centuries C.E. Modern Aramaic is spoken in some small communities up to the present time (Greenspahn, 2002, pp. 94-95).
Arabic	The earliest evidence of Arabic was found on inscriptions written in Nabatean and Palmyrene (although the script letters were Aramaic) and were from between the first centuries B.C.E. and C.E. There were several dialects of Old Arabic that predated Classical Arabic, which drew on the Qurʾan and pre-Islamic poetry in the 7 th century C.E. and is spoken up to the present, along with many dialects (Kaltner, 2002, pp. 62-65).

Biblical Hebrew	The oldest parts of the Bible, e.g., the Song of Deborah, may have been written in the period 1300-1200 B.C.E. and are considered Archaic Hebrew. The Hebrew used in most of the Bible is considered Classical Biblical Hebrew and covers the period from the first temple to the Babylonian exile. Late Biblical Hebrew covers the period of Persian domination, from 538 B.C.E. (post-exile) to 332 B.C.E., when the conquest of Palestine by Alexander of Macedon began the period of Hellene domination. (Saenz-Badillos, 1993, pp. 112-113).
Ge'ez	Epigraphic texts in Ge'ez have been found beginning from the 2 nd century C.E. at Aksum, which is in present-day Ethiopia. The language was spoken until the end of the 9 th century C.E. It remains a language of literature and of the Christian liturgy.
Sabaeen	Sabaeen epigraphs have been found from the 8 th century B.C.E. through the 6 th century C.E. The Kingdom of Saba was located in South Yemen. It is one of the Sayhadic (Epigraphic South Arabian) languages (Lipinski, 2001, p.83).
Mandaic	Mandaic had its origin in a sect of the Mandaeans, at first in Mesopotamia and then in southern Iraq and Iran. The earliest texts were from the 4 th century C. E. and later ones were dated to the 7 th century (Lipinski, 2001, p.70).
Syriac	There are literary works in Syriac that date from the 2 nd century C.E. It was replaced as a spoken language by Arabic from the 8 th century on. It has an extensive literature of Christian writings (Lipinski, 2001, p.70).
Ugaritic	This was the language of the city-state Ugarit during the period from 1360 to 1180 B.C.E.. It is written in an alphabetic cuneiform, that is, the cuneiform signs, unlike those in Akkadian, represent single consonants but with a few syllabic exceptions (Day, 2002, p. 223).

2.2 ORIGIN OF THE SEMITIC PEOPLE

In order to establish a basis for the Pre-S lexicon, the postulated precursor language to Proto-Semitic, we need to know both the approximate time range for it and the environment in which it was spoken. Since Proto-Semitic has been attested from the 6th millennium B.C.E., Pre-S would have to have been spoken from before then, starting from after the end of the Last Glacial Maximum, which lasted approximately 22,000 to 12,500 B.C.E. The period that is being considered in this work is the early part of the Holocene, between 10,000 and 7000 B.C.E.

The exact location of the Proto-Semitic speakers has not been definitively settled but Western Asia and Africa have been considered the most likely candidates. Lipinski (2001, p. 44) looks to linguistic data to place the Proto-Semitic speakers in Africa originally. The Semitic languages are classified as one of the five main families of Afroasiatic, the others being Egyptian, Cushitic, Libyco-Berber, and Chadic. There are about 70 languages that constitute the Semitic family and that have certain common features of phonology, morphology, syntax, and lexicon. That these features are exhibited by languages such as Akkadian and Ethiopic that were spoken in such distant areas from each other points to a common origin language, called Proto-Semitic (Lipinski, 2001, p. 43). Lexicostatistic studies of isoglosses between the five main Afroasiatic families point to the Egyptian and Chadic families having separated from the others the earliest, while the other language families maintained closer contact for a period. The preponderance of isoglosses and lexicostatistical convergences link the Libyco-Berber and Semitic families and suggest that the separation of these language families occurred later than the separation between the Semitic family and the other families. This puts the speakers of Proto-Semitic still in Africa in the fifth millennium B.C.E. (Lipinski, 2001, p. 44) when the Sahara's climate was much wetter and there were rivers, grass, and trees. There is evidence from rock drawings during this period both of animals that no longer live there and of the existence of human settlements.

In North Africa circa 3500 B.C.E. archaeological evidence shows the disappearance of vegetation and a process of desertification. This may be postulated as the period during which the Proto-Semitic speakers migrated from North Africa into

Western Asia in distinct waves (Lipinski, 2001, pp. 44-45). Lipinski cites the Palestinian tumuli from the 4th and 3rd millennia B.C.E., which are very similar to sepultures that characterize prehistoric North Africa, especially Algeria, and from the eastern Sahara, near Abu Simbel (dated from the 5th millennium B.C.E.). There are written documents and physical artifacts from this time showing traces of the Pre-S cultures in the regions in which the Semites settled. The earliest migrants (circa 3000 B.C.E.) were the Akkadians, who went the farthest, founding an empire in Northern Babylonia. Other groups followed, settling the fertile crescent (as far as Syria), Yemen, South Arabia, and Ethiopia. There is little evidence of instances in which the local language had modified the language of the incomers, except in the case of Sumerian in Mesopotamia (Lipinski, 2001, p. 47).

In a contrasting theory, Vycichl (1987, p.109) assigns the Semite homeland to the Middle East part of Asia, although he acknowledges that “it is easier to conceive the migration of a single group from Africa to Asia than that of four groups from Asia to Africa” (the four groups being Egyptian, Cushitic, Libyco-Berber, and Chadic speakers). Nevertheless, he believes that the four groups did in fact migrate westward. He presents as evidence (pp. 109-111) that in the 8th millennium a new human prototype,⁷ the proto-Mediterranean, appeared in North Africa. These proto-Mediterraneans are associated with a particular flint industry, named Capsian, which appeared in the east and then moved south and west. Vycichl asserts that the Capsian civilization derived from the Natufian, a Mesolithic civilization of Palestine and Southern Syria dating from circa 9000 B.C.E. He speculates that this is the origin of the Berbers, a fair-skinned, blue-eyed people.

In the second part of his argument (1987, p. 109) Vycichl states that “all specific Hamito-Semitic features at their most complete are found in Semitic and not in the Hamitic groups.” One of his main arguments is that the Semitic roots are in general triradical while Hamitic roots are biradical (cf. Semitic *lšn* “tongue” with Berber *iles*, Chadic *lisi*). He postulates that the Hamites lost the third radical. But it is just as

⁷ A form of early man found in the Mediterranean.

reasonable to postulate that third radicals were added by the Semites, especially if it can be shown that sets of differing triradical reflexes had a common biradical antecedent.

Renfrew (1996, pp. 79-80) also hypothesizes that the Afro-Asiatic language family spread into North Africa from its nuclear area in Western Asia as part of the farming dispersal. This farming dispersal took place as a result of three conditions: ecological suitability of the new region for the transplantation of plants (and sometimes animals); increased birth rate and reduced infant mortality; and greater intensity of production permitted by the new economy. Renfrew writes:

For there is general agreement that it is in this region (Western Asia) that the goat and possibly the sheep exploited in North Africa, as well as wheat and barley, were domesticated... .

In contrast, although Hassan (2002, p. 61) supports the hypothesis that farming and herding practices were introduced into North Africa by emigrants from Western Asia, he postulates that these emigrants were single families or groups of families carrying with them small animals and some grains. They mingled with the existing inhabitants, who were herders and foragers, introducing new food production methods. Since they were so few, they intermarried with them and melted into the population. This hypothesis gives support to the theory that the Semitic people came from Africa and not Western Asia, since the groups of non-Semitic emigrants spreading the new farming technologies westward to Africa were small in number.

Lipinski's arguments together with Hassan's hypothesis have convinced me that the origin of the Semites was in Africa, specifically the Sahara and North Africa. Along with Lipinski's linguistic arguments, it seems to me that migration from a less fertile to a more fertile region during increasing desertification makes more sense than the opposite. The development of agriculture, animal domestication, tool-making and pottery occurred in both places, although in different periods and under different conditions.

Postulating an African origin of the Semites with a more limited development (no evidence of agriculture or animal domestication) from 10,000 to 7000 B.C.E. will lead to a smaller set of needed environmental and cultural sememes needed than from postulating a Western Asian origin.

2.3 LIFE IN THE SAHARA AND NORTH AFRICA 10,000-7000 B.C.E.

Given the hypothesis of an African origin of the Semites, some knowledge of the features of life in the Sahara and North Africa during the early Holocene is necessary in order to construct a putative lexicon of Pre-S.

Waves of climate changes over thousands of years in the Sahara have been cited as explanatory evidence showing large groups of people settling in regions which are today completely desertic. From about 10,000 to 9000 B.C.E. lakes rapidly appeared in this region (Holocene wet periods). Archaeologists have been able to date human occupation of the desertic regions from about 8000 B.C.E. Roset (1987, p. 211) refers to the “huge villages littered with stone tools and flakes, arrowheads, grinding stones for the grinding of seeds, and ceramic vessels for their storage.” He further reports archaeological excavations that have found the remains of huge fish and also rock art depicting elephants, giraffes, rhinos and lions, as well as cattle. Although it has been established without any doubt that pottery was known in Africa at very early times, finding evidence of it and grinding stones does not necessarily imply true agriculture. They might just as well be used in connection with gathering and foraging of wild plants (Roset, 1987, 230-231).

In the South Eastern part of Libya there were found many examples of rock carvings displaying an African ancient buffalo, called the Bubalus (Lutz and Lutz, 1996, p.137). These carvings, sometimes reworked, cover most of the period of the Holocene, in particular, the period from 10,000 to 7000 B.C.E. A few of these engravings depict hunters as well as animals.

Schild and Wendorf (1984, pp.373-375) report the findings of the Combined Prehistoric Expedition,⁸ whose purpose was to reconstruct the paleoenvironments of the

⁸ Begun in 1972.

Western Desert of Egypt, part of the Sahara. Among the numerous faunal remains were found small and large gazelles, hares, hyenas, wild cats, and bovids. There was scant floral evidence in these areas, limited to traces of acacia, tamarisks, a date palm, and several varieties of wild grasses and weeds.

Hassan (2002, p. 62) states that African cattle were independently domesticated in the western desert of Egypt during the 8th millennium B.C.E. according to archaeological and zooarchaeological research on bones found there. Although the bones might have belonged to wild buffalo, the ecological argument supporting domestication rests on the assumption that the climate was too dry to support wild cattle without human intervention.

Chapter Three. Theoretical Basis

3.1 ASSUMPTIONS

3.1.1 Background

One purpose of this paper is to demonstrate that it is quite possible to build an adequate working lexicon of biradical roots meeting the basic communication needs of the Pre-S people. This is not a claim that the lexicon created in this work is the Pre-S lexicon. Rather, the claim is that such a lexicon is possible and that it would have to have had a majority of the content presented in this work. The morphemes posited to express the needed meanings cannot be arbitrary but must have reflexes in some or all of the daughter languages. It is clearly evident that choosing the indispensable set of actions, conditions, substances, ideas, and feelings to construct the sememes in this lexicon is an imprecise undertaking.

The archaeological findings for this area during this time period lead me to believe that the Pre-S lexicon must at a minimum have provided means of expressing the following: tool, flint, pottery, seeds, rock, hunting, gathering, grinding, drawing or carving on rocks and pottery, graves and tumuli, water, lake, arrows, fish, cattle/buffalo, rhino, lions, gazelles, hares, mountain goats, foxes, wild grasses and barley.

Many conditions could have been defined by the absence of the opposite condition (“crippled” could be expressed by “not straight” and “blind” by “not seeing”). Another researcher approaching this same problem in the same manner might come up with a somewhat different set of lexical items but the preponderance would no doubt be the same, because they would stem from the basic communication needs of an early people. A different set of morphemes might have been posited to express them, but most would be the same because of the very striking similarities of some of the roots in the various Semitic daughter languages.

The morphemes in the proposed Pre-S lexicon were chosen by inspecting words in the various Semitic languages that were related to the essential concepts identified in the postulated lexicon, taking into account known phonological changes and

correspondences. From these reflexes it was possible to select a biradical morpheme. A lexicon built in this manner might very well fail to include some words, but every word in it must be justifiable, both by the need for it in the Pre-S speaking society as I have construed it and by its reflexes in the daughter languages. Of course, our knowledge of the needs of such a society is limited. In later periods, when we have physical evidence of a language, we often reason that a language-community must have had XXX because there was a word for XXX in their language. In this case, I must reverse the procedure, that is, I assume that a society must have had YYY and so attempt to find evidence in the shared partial roots that would provide plausible forms for the expression of YYY. That assumption must be grounded in what is known or surmised about culture and life in the early Holocene. In addition, there would have been no sharp cutoff between the stage of reliance on biradicals and the stage of expansion to triradicals. There most probably was a period of overlap.

Any member of the Pre-S speaking society who grew frustrated by the insufficiency of biradicals alone to express more complicated needs or to give specificity to a general concept could have added a third radical, an innovative step. Once this was recognized as the useful invention that it was, the lexicon no doubt grew very fast. Although we cannot know exactly the process by which this came about, we have some modern examples of deliberate word coining as examples. Finns will often discuss words and suggest new forms related to old forms.⁹ When Hebrew was revitalized at the beginning of the 20th century there were committees charged with inventing and redefining words. In the Pre-S speaking society, the pressure to expand the lexicon must have been intense.

Afterwards perhaps personal pronouns were affixed to many of the morphemes in the lexicon. Moscati writes (1964, p.137): “Semitic verbal inflexion is effected by means of personal prefixes and suffixes, probably of pronomial origin (as shown by their external form).” Perhaps even at the biradical stage prepositions were prefixed to the morphemes, as in *B-BT*¹⁰ “in the house.”

⁹ Personal communication (2005).

¹⁰ See the lexicon in Appendix A.

The existence in the Semitic languages of parallel grammatical characteristics such as constructs and similar stem systems for verbs strongly indicates that there was a stage after Pre-S before the dispersal of the Semitic peoples and the development of separate languages. This stage began the expansion into triradical forms, as the plethora of triradical cognates across the languages proves. We can see that in most cases the original germ of meaning entered the daughter languages and was instantiated in multiple words. Sometimes the original biradical survived as a separate word along with its augmented triradicals.

It is not sufficient to build the lexicon to test the hypothesis of biradicality. After all, the existence of a cognate for a morpheme in many Semitic languages does not necessarily point to a biradical root. The next step is to show that the morpheme is productive, that is, it generates different but related words in the daughter languages. When corresponding reflexes (taking into consideration phonological differences between languages) that are semantically similar are identified that contain the same biradical form, it means that we have to abstract a plausible original meaning from these reflexes. As an example, I have identified the morpheme *HM* as having the basic meaning of “hot, inflamed,” because the reflexes not only include *xam* “hot” (Hebrew), *hama* “heat” (Arabic), *ememu* “be hot” (Akkadian), *xamam* “heat” (Aramaic) but also *šxm* “be red-hot, blush” (Mandaic), *xemame* “passion, disaster” (Ge’ez), *hama* “zeal” (Arabic), *xemah* “wrath” (Aramaic), *xomeš* “be ruthless” (Hebrew), *xm P* “grow faint with heat” (Syriac), and *xmt* “venom,” *xmxmt* “ardor” (Ugaritic) among others.

3.1.2 Probable development path for morphemes

The easiest task of assigning morphemes for sememes would have been for those entities that could be pointed to and for those actions that would be unambiguous from gesture and context. Other needed morphemes, for entities or actions that were not so obvious, would have been a little slower in coming but their very importance would guarantee their eventual invention and acceptance, once there was general agreement about the meaning of the new morpheme. Different words for a single meaning would

often have been coined but eventually one would have prevailed, perhaps because of the relative status of the coiner or because it was easier to pronounce.

Creation of means to express the numbers 1 (“sole, only”) and 2 (i.e., “repeat, another”) and not other numbers probably sufficed in the early stages of the language. If there developed a need to express “five” or “ten,” I postulate that it could have been done by using *YD* “hand” or *YD YD* “hand + hand”.

Let us examine the primary plural morphemes in the languages under examination.

(5)

	Ak	Hb	Ab	Am	Sy	Md	Sb	Gz	Ug
masc. plural	mima- tion, nun- ation absent	-im	-una, broken plurals	-in	-i(n)	-in	-h, -n	-an, broken plurals	case vowel lengthening + -mi

This array demonstrates some correspondences between The plural morphemes in these languages all have a nasal stop, with the exception of Akkadian. It is possible that there arose plural morphemes at this early era from which the above were derived but, alternatively, it is also possible that the morpheme *RB* “many” was used to indicate plurals or the morpheme itself was simply repeated, as in *NŠ II NŠ II* “a human.” Lipinski (2001, p. 250) writes: “The repetition of the root morpheme is probably one of the oldest methods to express the plural.” There are examples of such plurals surviving in the daughter languages, such as *meme* “waters,” which reduplicates the construct form for “water” in Hebrew, *qasaqisatu* “priests” in Arabic, and *daqdqqe* “little ones” in Syriac.

At the stage of Pre-S there was probably no overt differentiation between verbs and nouns nor most other grammatical categories. We can see in the Hebrew lexicon of the Bible that most verbs have an identical nominal form that differs from the verbal form only in the vowels and vowel lengths. This is true of many languages, including English, but it is very common in the Semitic languages. For example, in Hebrew, *baʕāl* “to

marry, have dominion over” is a verb and *bāʿal* “owner, husband” is the corresponding noun. Gray (1934, p. 34) asserts that (in the Semitic languages):

Nouns and verbs are connected in that, for the most part, they are evolved from identical bases which are in themselves neither nominal nor verbal, and which possess only a fundamental meaning of the vaguest and most general type.

That nouns and verbs evolved from identical bases is demonstrable. Therefore, in the proposed Pre-Semitic lexicon, the biradical *LD* could serve for both “child” and “giving birth,” for example. Of course, the underlying grammatical concepts must have existed in speakers’ minds, and their intention of employing a given word in either its verbal or nominal sense would be clear both to the speakers and their auditors.

The morphemes *QD I* “before” and *XR* “after, later” might have been sufficient to indicate the time frame for the speaker and listener, if they were needed at all. Morphemes would have been given multiple but related meanings in an organic way, as a simple concept was expanded to meet a speaker’s need. It could then have been done in such a way that the listener could easily grasp the expanded meaning. As an example, the morpheme *ŠN* at first might have only meant “change” but quickly might have come to mean “second,” “another,” and “two.”

3.2 BUILDING THE LEXICON

3.2.1 Importance of the lexicon content

The driving force behind identifying the biradicals in the lexicon was the requirement to find a means of expression for the sememes that I have judged to have been indispensable. I had to find a biradical for every sememe in the lexicon, even if it had no third-radical extension in the daughter languages.

What was not done was to search for biradicals with triradical reflexes in the languages and to discard those without any. The requirement of matching to a lexicon is the crux of the matter. The central statistic that evaluates the correctness of the hypothesis has to have a base established by the lexicon of sememes needed for communication. Only then is it possible to calculate the percent of this base which has

productive reflexes in the nine Semitic languages chosen. Without this base, it would be easy to create a list of biradical-to-triradical mappings with 100% matching and it would be meaningless.

3.2.2 Deriving the lexicon

I started with a list of the actions, events, and entities that would need to be expressed in the lexicon. Let us look at the process, using the following as an example. There almost certainly needed to be a way to express “snow,” “lightning,” “hail,” etc. In order to discover a potential biradical etymon, I searched for the corresponding morphemes in the nine languages. I found the following expressions for them in several daughter languages:

lightning: *BRQ* in all nine languages

hail: *BRD* in eight languages

cold, snow: *BRD* in Arabic, Syriac, Mandaic, Sabaean, Hebrew, and Ge’ez

From this I posited the biradical etymon *BR* with the sememe “storm” and entered the following into the lexicon:

(6)

Sememe	Biradical	Used to express
storm	BR II	storm, cold, snow, hail, lightning

Although there are many other triradicals in the Semitic languages with *BR* as two of the three radicals, their meanings do not make them candidates to be added to this sememe. Some examples are: Akkadian, *baru* “having an eye defect, *baranu* “rebel,” *baramu* “seal up,” *barsillu* “a garment;” Mandaic, *bar* “country outside towns, desert,” *bargapa* “stagnation,” *barnia* “dates of good quality,” *barqa* “pen, stable, enclosure,” *birsum* “clover,” *biruqta* “cataract.” There are hundreds of examples of words that cannot be made to fit the sememe, even with expanded meaning.

Let us take another example. I considered that the concept “dream” needed a means of expression and searched for it by inspecting the corresponding morphemes in

the nine languages. *HLM* was the morpheme for “dream” in all the languages except Akkadian. When I searched for variations, I found the following:

(7) *in Akkadian:*

HL: grief, sickness

in Hebrew:

XL?: be sick, diseased;

XLH: be sick, weak;

XLŠ: be weak, prostrate;

XLKH: hapless, unfortunate

and in Arabic:

HLM: a vision;

HLK: gloomy, murky

MHLL: weakened, exhausted

and in Ge'ez:

XLPP: be sick:

ZXLL: grow weak, be sluggish

The biradical *HL* then was expanded to encompass a general meaning for the antecedent of the above. I defined the sememe as “not fully aware.”

(8)

Sememe	Biradical	Used to express
not fully aware	HL	not fully aware, dreaming, feverish, seeing visions

3.3 CRITERIA FOR EVALUATION OF RESULTS

3.3.1 Plausibility, not proof

What constitutes a proof of this hypothesis? The truth of the matter is that it is not possible to prove this in the sense of a scientific proof. Rather it must be demonstrated that the hypothesis accounts for certain characteristics of a set of reflexes in the daughter languages in a plausible manner. It is, of course, possible to disprove the hypothesis. The

absence of no more than isolated examples of expansions of the postulated biradicals bearing the same or similar meanings would disprove it.

Not every biradical morpheme need be productive in creating multiple reflexes within the daughter languages but a good number of them must be in order to make this hypothesis plausible. Some languages might have these multiples and some not. It is interesting to note that some of the most ancient biradicals such as *YM* “day,” whose cognates are found in almost all Semitic languages, are not themselves productive in generating triradicals.

3.3.2 Judging the biradical-to-triradical mapping

Appendix B contains my judgment of what constitutes the reflexes of the biradicals in the daughter languages. To have validity, each reflex set for a given biradical must meet certain criteria: Each reflex in the set must clearly originate from that biradical; its meaning must be a plausible extension of the original sememe; language variants or grammatical affixes do not count as triradical extensions..

There are two types of extensions that have significance. One type is an extension of meaning and the other is an extension of form. An example of an extension of meaning is in the postulated biradical *NH* “stream,” some of whose reflexes are shown below.

(9)

Ak	Hb	Ab	Am	Sy	Gz	Ug
naxlu: stream; naru: river	nahar: river; nahal: lead to a watering place	nahr: river; manhal: spring, pool; nahara: to flow copiously	nhar: river; naxla: stream	nahraʕ: river	nahar: river	nhr: river, nhl: torrent, wadi

Although the extensions *r* and *l* shown above are commonly interchanged and generally not considered true variants, in this case the bifurcation in meanings does seem to be evidence of a significant variation. C8.1 and C8.4 in Appendix C explain why *NX*, *N-*, and *NH* are considered reflexes of *NH*.

There are many examples of variations in form. One example is the postulated biradical *KRI* “round.” The following array, (10), shows variations in third radical (note that the third radical may be a prefix, infix, or suffix). The suffixed extensions are *š*, *k*, *b*, *x*, and *ś*, the sole prefix is *k*, and there are three examples of reduplication, with the Arabic and Ge’ez meanings differing from the Akkadian. Note that the *m* in *mkurbal* and the *n* in *nak^wark^war* are grammatical affixes.

(10)

Ak	Hb	Ab	Am	Sy	Gz
karšu: belly; kakkaru: round loaf of bread, round met- al disk	mkurbal: girded, clothed; kareš: belly; kikar: round loaf of bread	kariš: belly; karkar: turn around; kura: ball	krax: surround, wrap round; karša? belly	krax: surround, wrap round; karša: belly, paunch	karś: belly, interior of a ship; nak^wark^war: rotation, whirlpool

3.3.3 Characterizing the Results

In the following sections I use the term “nongenerating” to refer to biradicals that have come into the daughter languages solely as biradicals, “monogenerating” for those biradicals whose reflexes consist only of a single third radical extension (excluding known phonological variants across languages), and “multigenerating” for those biradicals that are found to have more than one third-radical extension.

(11)

a. Example of a nongenerating biradical: **𐎶𐎶** “brother”

Akkadian: **axu:** brother

Hebrew: **אָח:** brother;

Arabic: **أَخ:** brother; **أُخُوَّة:** brotherhood

Aramaic: **אָח:** brother, colleague

Syriac: **ܐܚܐ:** brother

Mandaic: **ܐܚܐ:** brother

Sabaean: **ʔaxa:** brother

Ge'ez: **ʔex^w:** brother, kinsman; **taʔaxa:** friendship

Ugaritic: **ʔax:** brother

The biradical has not generated triradical reflexes since its variants are either known inter-language correspondences or fixed grammatical affixes.

(12) b. Example of a monogenerating biradical: **KK** “star”

Akkadian: **kakkabu:** star

Hebrew: **kokab:** star

Arabic: **kawkab:** star

Aramaic: **kokbaʔ:** star

Syriac: **kwkbʔ:** star, planet, comet, Venus

Mandaic: **kukba:** star

Ge'ez: **kokab:** star

Ugaritic: **kbkb:** star

This is a clear instance of a monogenerating biradical morpheme. It has a single radical extension *b* and the same meaning in eight of the nine languages.

(13) c. Example of a multigenerating biradical: **RGI** “use the feet”

Akkadian: **raqadu:** skip, dance; **lakadu:** run

Hebrew: **regel:** leg, foot; **ragal:** go about (maliciously, as slander); **raqad:** skip about, dance; **raqaʔ:** beat, stamp out; **rakal:** go about (trade)

Arabic: **rijl:** foot; **rajila:** go on foot, march; **rakaḍa:** race, run, stamp; **raqaṣa:** dance, prance (horse); **rakala:** kick; **raqada:** run, leaping; **ʔarağ:** lameness

Aramaic:	raglaʔ : foot; rqad : skip about
Syriac:	regla : foot
Mandaic:	ligra : foot (metathesis); rgala : fetter the feet
Sabaeen:	rglhw : foot; rgly : foot soldier
Ge'ez:	ragaḏa , ragaša : trample, stamp, kick; ʔargada : perform a ritual dance
Ugaritic:	rigla : foot, rqš : jump, leap

Hebrew *g* corresponds to Arabic *j*, while *k*, *q* and *ḡ* are common variants for *g*. The Mandaic *ligra* is considered to be a metathesis of *rgl*.¹¹ We see that the base form $R(L, G, K, Q, Q)$ is augmented with suffixes *L*, *D*, *ʕ*, *Z*, *Ḍ*, *Ṣ*, *W* and prefix *ʔ*. In the Aramaic *raglaʔ*, the final *ʔ* is a fixed grammatical form. I consider this to be a multigenerating morpheme.

3.3.4 Criterion for evaluating the plausibility of the hypothesis

As a measure of the plausibility of the hypothesis, I calculate the percent of multigenerating biradicals out of the total number of biradicals in the lexicon. A further measure that is meaningful is the sum of nongenerating and multigenerating biradicals as a percent of the total number of biradicals.

¹¹ Drower and Macuch, p. 424.

Chapter Four. Methodology

4.1 LEXICON AS DRIVER

In furtherance of the initial task of building the lexicon, I started with the Swadesh List, as found in Bennett (1998), p. 40. This is a list of 200 basic lexical items developed by Morris Swadesh that is often used in comparing languages. For some of the items I defined a sememe that incorporated them under a more general meaning, e.g., “storm” encompassing “hail, lightning, etc.” and “inner essence,” which includes “heart, mind, will, courage,” and added items such as “drug, poison” and “not fully aware,” which includes “dreaming, feverish, hallucinating.” Note that I have included “circumcise” as one of the possible uses for the biradical *GD I* “cut” and “anoint” as one of the possible uses for the biradical *MS* “wipe, smear.” This is not an assertion that these cultural practices existed at that time but rather that ritual cutting and anointing¹² of any sort would have a means of expression through the lexicon. Lexical items describing the cultural and environmental aspects of the Sahara and North Africa during the early Holocene, 10,000-7000 B.C.E., were added and the resulting list was the driver for the process. The lexicon did change occasionally as I worked on it (see discussion in Sec. 3.6). However, in no case was a basic sememe deleted.

For every sememe in it I needed to find cognates in some or all of the nine languages that expressed its basic meaning. Then, if possible, I had to identify a biradical part of the set of cognates that had been expanded by adding one or more radicals. Only those expansions that I judged were semantically related to the given sememe were defined as their reflexes.

¹² “Anoint” appears, e.g., as the gloss of a reflex in most of the nine selected languages.

4.2 LANGUAGE CORRESPONDENCES

At this point it was mandatory to recognize the phonological differences between the reflexes in the different languages in order to find cognates. For instance, it has been postulated by many Semiticists that there existed a Proto-Semitic consonant *ś*, which was rendered in Hebrew as *š* but whose pronunciation eventually became *s*, while in Akkadian and Arabic it surfaced as *š*. The word “left” in Arabic is *šim ʔal* while it is *śim ʔol* in Hebrew, thus pointing to an *Ś* as part of the original biradical *ŚM* for “left, unlucky, north.”

Table 2 shows the reconstructed Proto-Semitic consonant system with their customary transliterations together with the reflexes of those consonants in the nine daughter languages under investigation. Most of the table is taken from the work of Lipinski (2001), p. 157. In addition, I have added the correspondences for Aramaic from Rosenthal (1961), p. 7, and for Mandaic from Drower and Macuch (1963), frontispiece. The accepted system of reconstructed Proto-Semitic consonants, although phonologically plausible, is only conjectural. However, for the purposes of this paper, what is important is the set of corresponding reflexes of a particular consonant in those languages and not the detailed phonetic reconstruction of its putative parent. That set allows us to group related words into families, not just by meaning but by phonological correspondences. In addition, we know some of the history of the development of these languages, and this provides more clues for relating families of words.

Table 2. Proto-Semitic consonants and their manifestations in selected Semitic languages.

*PS	*Phonetic description	Ak	Ug	Hb	Hb	Ar	Ar	Sy	Md	Ab	Ab	Sb	Gz
ʔ	glottal stop	ʔ/-	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ	ʔ
b	voiced bilabial stop	b	b	b	𐤁	b	𐤁	b	b	b	𐤁	b	b
g	voiced velar stop	g	g	g	𐤂	g	𐤂	g	g	j	𐤃	g	g
d	voiced dental stop	d	d	d	𐤄	d	𐤄	d	d	d	𐤄	d	d
<u>d</u>	voiced interdental fricative	z	d	d	𐤄	d	𐤄	d	<u>d</u>	<u>d</u>	𐤄	<u>d</u>	z
h	voiceless glottal fricative	h	h	h	𐤅	h	𐤅	h	h	h	𐤅	h	h
w	voiced labial-velar approximant	w	w	w	𐤆	w	𐤆	w	w	w	𐤆	w	w
z	voiced alveolar fricative	z	z	z	𐤇	z, d	𐤇	z, d	z, d	z	𐤇	z	z
ħ	voiceless velar fricative	ħ	ħ	k	𐤈	k	𐤈	x	x	ħ	𐤈	ħ	ħ
x	voiceless pharyngeal fricative	ʔ/-	x	x	𐤉	x	𐤉	x	x	x	𐤉	x	x
ṭ	voiceless emphatic dental stop	ṭ	ṭ	ṭ	𐤊	ṭ	𐤊	t	t	ṭ	𐤊	ṭ	ṭ
ṣ	voiceless emphatic interdental fricative	ṣ	ṣ	ṣ	𐤋	ṭ	𐤊	t	t	ṣ	𐤋	ṣ	ṣ
y	voiced palatal approximant	y	y	y	𐤌	y	𐤌	y	y	y	𐤌	y	y
k	voiceless velar stop	k	k	k	𐤍	k	𐤍	k	k	k	𐤍	k	k
l	voiced alveolar lateral approximant	l	l	l	𐤎	l	𐤎	l	l	l	𐤎	l	l
m	voiced bilabial nasal	m	m	m	𐤏	m	𐤏	m	m	m	𐤏	m	m

*PS	*Phonetic description	Ak	Ug	Hb	Hb	Ar	Ar	Sy	Md	Ab	Ab	Sb	Gz
n	voiced dental nasal	n	n	n	ن	n	ن	n	n	n	ن	n	n
s	voiceless alveolar fricative	s	s	s	س	s	س	s	s	s	س	s	s
ʕ	voiced pharyngeal fricative	ʕ/-	ʕ	ʕ	ع	ʕ	ع	ʕ	ʕ	ʕ	ع	ʕ	ʕ
g	voiced velar fricative	h	g	ʕ	ع	ʕ	ع	ʕ	ʕ	g	غ	g	ʕ
p	voiceless bilabial stop	p	p	p	پ	p	پ	p	p	f	ف	f	f
ʃ	voiceless emphatic dental fricative	ʃ	ʃ	ʃ	ش	ʃ	ش	ʃ	ʃ	ʃ	س	ʃ	ʃ
ð	voiced emphatic interdental fricative	ʃ	ʃ	ʃ	ش	ʔ, q	ʔ, ع	ʃ	ʃ	d	ض	d	d
q	voiceless emphatic uvular stop	q	q	q	ق	q	ق	q	q	q	ق	q	q
r	voiced rolled dental approximant	r	r	r	ر	r	ر	r	r	r	ر	r	r
ʃ	voiceless lateral dental fricative	ʃ	ʃ	ʃ	ش	ʃ	ش	ʃ	s	ʃ	ش	ʃ	ʃ
ʃ	voiceless post-alveolar fricative	ʃ	ʃ	ʃ	ش	ʃ	ش	ʃ	ʃ	s	س	ʃ	s
t	voiceless dental stop	t	t	t	ت	t	ت	t	t	t	ت	t	t
t̤	voiceless interdental fricative	ʃ	t̤	ʃ	ش	t̤	ت	t	t̤	t̤	ت̤	t̤	s

4.3 THE SEARCH FOR COGNATES

In searching for cognates, it is important to justify choosing a particular reflex among those with similar meanings. In the majority of cases the differences are phonologically identifiable for true cognates. Some universal variants are the *p/b*, *d/t*, *k/g* and *l/r/n* alternations. Spirantization has taken place in some languages and not in others. The consonant *f* has almost wholly replaced *p* in Arabic, Ethiopic, and South Arabian. Emphatic consonants are lost in some languages but persist in others. Some languages have lost all gutturals while others have maintained them. The consonants *ʔ* (aleph) and *ʕ* (ayin) are sometimes interchanged. An example is the *ʕ* in *ʕma* “mother” in Mandaic but *ʔ* in the word for “mother” in the eight other languages. More often both *ʔ* and *ʕ* are completely lost in some languages. The sibilants in the sister languages do not always correspond, even after the known variations are taken into account. Often the lack of correspondence is a valuable pointer to the original consonant. Arabic *ǧ* becomes a guttural or goes to *g*. Some languages have developed spirantization while others have not.¹³ The semivowels may interchange or become vowels. Hebrew *z* may correspond to Aramaic *d* or *z*, *š* to *t* or *š*, and *ṣ* to *t*, *q*, *ʕ* or *ṣ*.

4.4 STANDARD SEMITIC NOUN PATTERNS

Knowledge of standard preformatives and affirmatives in Semitic is necessary in judging whether the added third radical has an independent existence or is merely a semantic or grammatical affix. As an example, the preformative *m-* is seen widely in the Semitic languages and is used to indicate the means by which an action is carried out or the time or place of the action. However, when such affixes as these are attached to a biradical root they do not constitute a genuine third radical. An example is the Akkadian word *abutu* “fatherly attitude” from the word *abu* “father.” The inserted *ut* denotes an abstract quality and so is not a third radical. Although a number of them are included in

¹³ Spirantization was a later development in some Semitic languages.

the data in order to demonstrate broadening of meanings in the daughter languages, they never are counted as a separate instantiations of the expansion of a biradical root. Thus it is vital to recognize such affixes.

Noun patterns can in some cases help in deciding which of two radicals of a Semitic triradical cognate are the core biradical. As an example, *maqom* “place” in Hebrew, Arabic, and Ge’ez has the preformative of place *m*. On stripping the *m* we are left with *qom*, which means “rise, stand up” in these languages and others. Clearly the *m* is not part of the biradical.

Familiarity with the common affixes in Semitic languages can aid in deciding whether a third radical is an independent consonant or not. The following material is taken from Lipinski (2001, pp. 221-234).

4.4.1 Preformatives *ʔ*-, *ya*-, *m*-, *t*-, and *š*-

Patterns with a prosthetic vowel introduced by *ʔ* are often found in Arabic in relatives such as *ʔakram* “nobler,” from *karim* “noble,” in color names such as *ʔaḥmar* “red”, and to express bodily qualifications such as *ʔaḥṣraḡ* “lame.” There are examples of this preformative in Hebrew, Ge’ez, and Aramaic also. Broken plurals in Arabic often begin with *ʔa*, such as in *ʔawlʔad* “boys” from *walad* “boy.” The preformative *ya* is used for names of animals, as in *yaḥmur* “deer”, plants as in *yabruḥ* “mandrake”, and proper names such as the Yarmuk River in Aramaic, Hebrew, and Arabic. The preformative *m* + vowel has an instrumental function, denoting the means by which an action is carried out, as in *mapte-ax* “key” from *ptx* “open” in Hebrew, or it indicates place, as in *miškab* “bed, grave” from *škb* “lie down” in Aramaic and Hebrew. This prefix appears extensively in the Semitic languages and also Chushitic and Egyptian. It is the most widespread of the preformatives. The preformative *t* + vowel often characterizes professional or social situations. Akkadian has for example *tadabilu* “interpreter” from *dabbala* “to repeat”, while Hebrew has *talmid* “disciple, student” from

lmd “learn.” Verbal nouns in *t-* denoting actions are found in Ge’ez as in *taḥṣam* “completing” and *taḥdira* “help.” The preformative *š* often gives a causative meaning to a root as in the East Semitic *šubultu* “present” from *wabalu* “bring”.

4.4.2 Afformatives a/o/un, a/u/it, o/a/i, ya, awi, akku

The suffix *-an* often indicates an adjectival form, as in *raxman* “merciful” in Aramaic and *kaslan* “lazy” in Arabic. Verbal nouns and abstracts often have *-an* or *-on* endings, as in *šulmanu* “greeting, present, bribe” and *zbln* “sickness” in Ugaritic. Diminutives in *-an* or *-on* occur such as in *ṣaqraban* “small scorpion” in Arabic from *ṣaqrab* “scorpion.” In Akkadian are found nouns of agent formed from active particles with the addition of *-an*, such as in *šarraqanu* “thief.” They are found in gentilics, added with *i/y*, as in Hebrew *qadmoni* “ancient” from *qdm* “the East.” Broken plurals in Arabic often end in *-an* as in *ḡizlan* “gazelles,” plural of *ḡazal*.

The gentilic suffixes *-iy*, *-ay*, *-awi*, *-ya*, *-iyya*, called the *nisba*, identify a member of a social group, as in *Miṣri* “Egyptian” from *Miṣr* “Egypt” in Hebrew and Arabic. The suffixes *-at*, *-ut*, *-it* have an abstract or collective meaning, as in the Ge’ez *qadsat* “holiness” from *qds* “holy,” and in some cases form the feminine of a masculine root. These suffixes are quite common in several of these languages: *šarrutu* “kingship” in Akkadian and *malkut* “kingship” in Aramaic, for example.

4.5 DEFINING THE BIRADICALS

If cognates were found in several languages, it generally was easy to identify which of the three or more radicals carried the putative essential biradical morphological core, by exploring the various possibilities. Using this core and cross-references in a number of dictionaries made it possible to search for words with tri- or quadriradical roots that carried a similar lexical value but expanded it. Sec. 4.2.4 gives some examples

of the results of choosing another consonant pair out of three consonants other than the pair I chose.

A simplified example: the sememe “foot” is *regel* in Hebrew, *rijl* in Arabic, *rglhw* in Sabaean. This would not indicate which two radicals form the biradical antecedent until we see in Ge’ez *ragaša*, *ragaḏa*: “trample, stamp, kick”; *Ṕargada*: “perform a ritual dance”.

4.5.1 Slots in the lexicon

Early Semitic has been considered to have three distinct vowels: open back velar [α], closed front [i], and closed back velar [u]. Bergsträsser writes “... an older stage [of the Semitic languages] is still clearly recognizable, in which [i] and [u] were functionally equivalent as varying realizations of a reduced grade, and together were opposed to the vowel [α], the single full short vowel” (1983, p. 5).

Early on in this work it became clear that duplicates and triplicates had to be postulated in order to account for, on the one hand, all the needed sememes, and, on the other hand, the persistence of certain radical pairs within the reflexes in the daughter languages. An example of this is *QD* “before” and *QD* “holy.” The first therefore appears in the Pre-S lexicon as *QD I* and the second as *QD II*. But this is predictable for the following reason. In the Semitic languages, the root is comprised solely of consonants. Nevertheless, each biradical must also be associated with one or more vowels in order to be able to pronounce it. As a hypothetical example, perhaps “before” was expressed by **QaD* and “holy” by **Q(u/i)D*. Another example is the five variants of *ŠM*: *ŠM I* “put,” *ŠM II* “flourish,” *ŠM III* “name,” *ŠM IV* “sky,” and *ŠM V* “heed.” Another hypothetical example disambiguates the pronunciation: “put” expressed by **Š(u/i)M*, “flourish” expressed by **(u/i)ŠM(u/i)*, “name” by **aŠM*, “sky” by **ŠaMa*, and “heed” by **ŠMa*. This is the most complicated case. Most variants are similar to the *QD* example. I am not asserting that we know what those vowels were, rather that these simple patterns would allow a clear pronunciation difference between the five variants of *ŠM*.

The number of possible mathematical permutations of a consonant-pair with two vowels is twenty-seven but probably the following forms: CaC, C(u/i)C, CaCa, and C(u/i)C(u/i) were most often found, with some sporadic occurrences of variants in which a vowel precedes or follows the two radicals (vCC or CCv).

4.5.2 Permissible Semitic consonant juxtapositions

In choosing a biradical morpheme from a triradical reflex, it is often the case that the first and second radicals constitute the core of meaning. In forming a triradical root, there are structural “principles” about which radicals may be chosen for each position that are generally accepted by Semiticists. For example, Moscati et al (1964), p. 74 assert:

In no Semitic language can two identical consonants — or two consonants with a similar point of articulation — appear next to each other in first and second position; and it is rare for such consonants to be found as first and third radicals, (e.g., Akkadian *ḥašaḥu* “to desire”). In positions two and three, identical consonants are frequently found but not different consonants with a similar basis of articulation.

I believe that this may be a general characteristic but it is not completely valid. There are many counter-examples, as in the following. From Hebrew we have *gag* “roof,” *sus* “horse,” *ṣuṣ* “gaze, peep,” *sas* “moth,” and *dat* “faith,” religion.” From Akkadian we have *bābu* “gate,” “door,” *kakku* “weapon,” *dadmu* “settlements,” *gagu* “cloister,” *lalu* “desire,” *qaqqadu* “head,” and *zazu* “to separate.” It seems that mainly gutturals (and some other consonants) follow the principle. Because of these examples I did allow some deviations. Since these forms were so well attested: *DD* “beloved,” *KK* “star,” and *LL* “night.”

4.5.3 Absence of a common reflex for a biradical

When no single morpheme is used to express a sememe across the nine languages it is possible that an early biradical existed and was lost but I consider it fairly unlikely that it would not have been conserved in at least one language. However, it is still necessary to provide a means of expressing the sememe if it is considered indispensable

to the lexicon. When no such common morphological core is identifiable for a given sememe, then there exist several possibilities for solving the problem within the framework of the biradicality hypothesis. The most obvious choice is to associate the problematic sememe with another one that does have a common morphological core, that is, at least partial cognates in the daughter languages, and to broaden its meaning to include the meaning of the problem sememe. For example, there needed to be a means of expressing the concept “to fear, be in awe.” But investigation of the words that express this in a number of the languages pointed to the fact that there was no common origin:

(14)

	Ab	Hb	Ak	Gz
awe, terror, fear	rawʕah, ʔarʕba, hawl, fazaʕ, xašiyah	ʔemah, paxad, yirʔah	adaru, palahu, rašbu, gilittu	ferhat, germa, hakak, dengade

The problem is that this sememe is clearly necessary. The solution came from inspecting previously defined sememes for one that could be expanded in a logical manner. I had already defined *Rʕ I*, “roar, make tremble” and this could obviously be expanded to encompass the meaning of “being afraid, in terror.”

Another possibility is to choose a morpheme that has reflexes that correspond in some but not all nine languages. Unless the languages are as closely related as Hebrew and Aramaic, they most probably point to the common root as the underlying PS morpheme and it should be chosen for basis of the biradical in the lexicon.

If it is not possible to associate the sememe to another without using far-fetched reasoning and there is no evident correspondence between the reflexes in the daughter languages, one should reconsider next whether the sememe is really essential to the lexicon. That is to say, if it is in the lexicon there must be found a way to express it but it may not need to be a separate item in the lexicon. For example, a separate morpheme for the lexeme “blind” might not be needed if the lexicon enables a speaker to say “not seeing.”

Chapter Five. Analysis of the Results

5.1 POSSIBLE SEMANTIC SIGNIFICANCE OF EXTENSIONS

It is evident that the biradical roots entered the daughter languages in different ways: 1) intact, as is the case with some of the oldest words, e.g., *MY* “water;” 2) intact with an intervening semivowel, as in *BT* “house” > *BaYiT* “house;” 3) with one or more added radicals. These radicals are found before, after, and, less often, between the two original radicals. In the following sections I will examine several possibilities.

5.1.1 Prefixed Aleph ʔ

Appendix D presents some Pre-S biradicals and their reflexes in the daughter languages that have initial ʔ (aleph) prefixed to the biradical. The examples given below and the remainder of Appendix D demonstrate that the initial ʔ has no fixed meaning. It is productive solely in that it is a way of forming a triradical from a biradical but not in the sense that it augments or changes the meaning of the biradical in any fixed direction.

(15)

Biradical	Sememe	ʔ Prefix	Gloss
NŠ II	human	enešu ʔaniš	be weak Ak friendly, social Ab
ŠM III	name	ʔašem	be guilty, transgress Hb
ŠP II	bowl, basin	ʔasaf	gather Hb
ŠB II	point to	ʔešbaʔ ʔašbaʔ	finger, unit of measure Hb finger, toe, unit of measure Ab
Dʔ	know	ʔaydaʔa	inform Ab, Gz
DM I	blood	ʔadam, ʔadamah ʔadim adm	humankind, man, red Hb, earth Hb leather of reddish color Gz mankind Ug

5.1.2 Duplication of the second radical to create a third radical

Another means of creating a triradical from a biradical involves duplicating the second radical. In some cases it serves to intensify the meaning of the biradical but that

is not a general rule. One cannot duplicate the second radical and be certain that the result would be the intensive form of the biradical, as shown from these examples taken from Appendix E, which contains many reflexes with this characteristic.

Note that some Semitic languages have grammatical forms that geminate the second of three radicals but that is not what is being discussed here. In the example of *daqqaq* “thin, fragile, unimportant” shown below, the last *q* is the third radical, not the geminated middle *q*.

(16)

Biradical	Sememe	Duplicated second radical	Gloss
DQ	small	daqaqa daqagu daqaq daqqaq dqaq daqq dqq daqiqā	grind to powder Gz crush, make small Ak pulverize Hb thin, fragile, unimportant Ab reduce to powder Ab reduce to powder Am, children Gz small, thin Am reduce to powder Sy, Md grandchildren Gz
DR II	path	dror	a free run, liberty Hb
DL	unreliable	zilullu zalal dalla zll dll	vagrant, tramp Ak be vile, debased Hb be base Ab slacken, be licentious Sy, despised Md, stupid Gz uneasiness Md
ŠN IV	tooth, fang	sanana I: sanana II: šanān šnina? šnn	sharpen Gz bite, fight with teeth Gz whet, sharpen Hb whet, sharpen Am to gnash teeth Ug

5.1.3 Reduplication of the biradical

Reduplication is a popular Semitic means of generating new words, as seen in the following examples: Arabic *bazbez* “waste” from *baza* “subdue, despise,” *jarjara* “gargling, rumbling” from *jawr* “throat;” Hebrew *galgal* “wheel, whirlwind” from *gal* “wave,” Ugaritic *ṣaṣabṣib* “time of famine” from *ṣaṣab* “difficult, harsh,” Mandaic *dndm* < **dmdm* “be stupefied” from *dmm* “come to a stop,” Ge’ez *daqduq* “be

emaciated” from *daq* “small,” Aramaic *lablab* “be courageous” from *lbab* “heart,” Hebrew *laxax* “lick” from *lax* “moist, fresh,” Hebrew *nimnum* “dose” from *num* “sleep,” and Arabic *safsafa* “nonsense” from *saf* “sink, decline.” However, reduplication is found in most languages and does not in itself lend support to the hypothesis of biradicality.

5.1.4 Do the third-radical extensions have semantic significance?

The following eight tables, Tables 3-10, are excerpts from Appendix B. Each table displays the glosses that result from adding a specific third radical (with its most common variants) as an affix to the biradical. It was not possible to include all the languages in every table but every language appears in at least two tables. Not all but the vast majority of occurrences of a particular extension are displayed in the table. The instances in which only one reflex is found for a given biradical are the ones omitted. In addition, not every third radical is analyzed. The variant groups chosen, since they are the ones most commonly found, are: *d*, *ḍ* and *z* in Table 3; *r* and *l* in Table 4; *s*, *ṣ* and *š* in Table 5; *m* and *n* in Table 6; *x*, *h* and *ħ* in Table 7; *q* and *k* in Table 8; *b* in Table 9, *t*, *ṣ*, *ḍ*, and *ẓ* in Table 10, *p* and *f* in Table 11; *g* and *j* in Table 12; and *y* and *w* in Table 13. Note that in these tables the semicolon separates different reflexes within a single language. One reflex, e.g., may have *s* as its third radical and another, *š*.

Lipinski (2001, p. 207) suggests a determinant function for a third radical affixed to a biradical.

Their number [biconsonantal roots] increases significantly if one accepts that only two of the three radicals of the triconsonantal roots are the main bearers of the meaning and the third one had at one stage the task of a determinant or modifier in very much the same way as occurs with vowels in the fully developed triconsonantal system.

Any reasonable person inspecting the results of Tables 3-13 would have to come to the conclusion that there is no fixed semantic meaning to any affix, either within a language or across languages. The following six examples illustrate this.

(17) Interlanguage: Biradical *HS* “lacking” with affix *r*

Ak	Hb	Ab	Ar	Sy	Md	Sb	Gz	Ug
hasaru: break off	xasar: lack, be in need of, decrease; maxsor: need, poverty	hasira: loss, suffer loss; hasara: remove, strip off; hasir: unveiled woman	xasir: lack, wanting, deficient; xassir: lessen, deprive	xesar: decrease, be in want, confiscation	xsr: lack, be defective	hśr: social class of indigents	hasra: be humbled, reduced to poverty, be depleted (land); hasar: misery, disgrace;	

(18) Interlanguage: Biradical *PT* “open” with affixes *ḥ*, *h*, and *x*

Ak	Hb	Ab	Ar	Sy	Md	Sb	Gz	Ug
patahu: puncture, bore through (make an opening)	patah: be spacious, wide, open; mapte-ax: key, opening instrument; petax: doorway, entrance	fataha: open, conquer; fath: judgment, decision; fatt-2a hah: fortune-teller	ptax: open;	ptax: open	pth, pta: open, conquer; ptaha: ritual meal for the dead, opening of daily devotions	ftx: conquer, lawsuit	fatxa: open, disengage, give absolution, administer justice; fetx: lawsuit, precept, verdict; maftex: solution, key	ptx: open

(19) Interlanguage: Biradical *QR II* “near” with affix *b*

Ak	Hb	Ab	Ar	Sy	Md	Sb	Gz	Ug
qerbu: near; qerbiš: in close combat; qurbu-tu: body-guard, relative; qurbu: recently	qarab: come near; qereb: inward part, midst; qrab: war (hostile approach); qereb: entrails, guts	qaraba: come near; qurba: relation	qarab: draw near; qrab: war		qaraba: approach, invasion; qurba: proximity	qrb: be or draw near;	qaraba: come near; megrab: neighborhood, vicinity	yqrb: approach; qrb: private parts, vulva

(20) Intralanguage: Arabic with affix *b*

Biradical	Reflexes
<i>DN</i> rear	danab: tail, appendage, follower; midnab: sinner
<i>GR III</i> scrape	jarabb: scab, itch
<i>HŠ I</i> perceive	hasiba: think; hasaba: count, calculate
<i>RK</i> set out	rakiba: mount an animal, ride; markab: ship, boat, vessel; rakub: riding camels
<i>RX IV</i> wide, broad	ruhḥ: wide, spacious, roomy; rihab: wide area; rhʔab: generosity

(21) Intralanguage: Ge'ez with affix *d, z, or t*

Biradical	Reflexes
<i>BD</i> scatter	badada: make separate, detach
<i>GR III</i> scrape	garaza: cut; garada: remove chaff
<i>KB</i> weighty	kabda: be heavy, be a burden, harden (the heart), be severe (sickness); kabd: liver, stomach, belly; kabra: be honored, glorious, magnificent, precious; kabata: degrade, humiliate
<i>RG I</i> use the feet	ʔargada: perform a ritual dance

(22) Intralanguage: Mandaic with affix *m or n*

Biradical	Reflexes
<i>BL I</i> depleted	buliana: decay, scarcity
<i>HR I</i> taboo	hrm: ban, curse
<i>LB III</i> white	halbania: milky-white waters; hilbuna: the white of an egg; lbina: white, gleaming
<i>RG II</i> furious	rgm: kill by stoning
<i>RŠ</i> head, chief	ršm: ordain a priest, consecrate by signing

Table 3. Effect on meaning of addition of *d*, *d̲* or *z* as a third radical.

Biradical	Md	Ak	Hb	Ab	Gz	Ug
𠂔B work, serve	do, make, work; rite; slave	slave	to work or serve (relig- iously)	bondswoman; slave; serve, worship, obey (God)		slave
𠂔Q constrict	tie, bind		tie, bind	tie, bind; contract	tie, bind	
BD scatter			scatter, dis- perse	scatter, dis- perse; sow, disseminate	separate, detach	disconnect
BL master	country	pay tribute to foreign countries		country		country
BR III storm	cold, hail		hailstone, hail	cold, hail	cold, covered with hail, snow, frost	
GD I cut			furrow, cutting; shear		split, cleave asunder	shear
GR III scrape	scraped		scratch, scrape	peel or strip off bark	shear, cut away; remove chaff	
HM hot, inflamed	hot passion		desire			
KB weighty		grow or be heavy; liver (heavy organ)	heavy, hard, important; honor; liver; abundance, riches	afflict, weigh down; large, thick in the middle; liver	be heavy, a burden; be severe (sick- ness); liver, stomach	heavy; liver; honor
MR I bitterness, sickness			rebel	disease; sick; defiant, recal- citrant		
PR I split off			separate, divide	segregate; unique		
R𠂔 I roar, make tremble		tremble, quake	tremble, be afraid	thunder	tremble, quake, shud- der, shake	
RG I use the feet		skip, dance	skip, dance	race, run, stamp; run leaping	perform a ritual dance	
𠂔M join, bind		span of oxen; bind together	span of oxen; bind, join, couple	staying power; join, bind		yoke

Table 4. Effect on meaning of addition of *r* or *l* as a third radical.

Biradical	Md	Ak	Hb	Ab	Gz	Ug
𠂇B work, serve	impress	house-keeper	produce, yield			
𠂇Q constrict			hamstring, barren; twist	confine, detain	wrap up, confine	
BŚ I flesh, cook	flesh, meat	blood relation	flesh, body	skin	flesh	flesh, meat
BḌ scatter	scatter		separate, make a division	split		
BQ I sprout		sprouted; malt		sprout, grow plants	sprout, grow; bean	groats
BT II sever		mutilate	cut in two	cut off prematurely	cut	
BṬ fail	vain, useless, futile, transitory	miss, cease, fail to do	cease	void, false, invalid	useless, void, failing	
DX creep		crawl, be afraid; serpent	withdraw (humble oneself)		be defeated	
GD I cut	circumcise, banishment		wall off; cut, circumcise		circumcise	hedge, fence
HB love			consort	gladden		
HM hot, inflamed			become agitated	red, bloody, excited		
HS lacking	lack, be defective	break off	lack, be in need of	suffer loss; remove, strip off; unveiled woman	humbled, reduced to poverty; misery, disgrace	
HŞ press, squeeze			courtyard, enclosure	surround, restrain	enclose with fence, besiege	
KB weighty	people of rank	become fat, heavy	be much, many	be great, important; noble, aged; grave offense	honored, glorious, magnificent, precious	
SK tool, knife	knife, pole, peg, nail, pin	bolt, bar				bolt, bar
ŠM II flourish	blossom		bud, blossom; branch, shoot		flourish, be fruitful	
TN baking oven, pit	oven	oven	oven	baking oven, pit		

Table 5. Effect on meaning of addition of *s*, *ś* or *ṣ*¹⁴ as a third radical.

Biradical	Hb	Ab	Sy	Md	Sb	Gz
ṚR II fertility	betrothed	till the land			bear a child	
ṚŚ basis	establish, found	establish, found			base of a statue	
ṚQ constrict	twisted, perverted					ensnare, entangle
HL not fully aware	be weak, prostrate		weak, frail, miserable			
HM hot, inflamed	do violence	zeal; infur- iate; burn the tongue				rage, ven- om, gall, poison
HR I taboo			magician	enchantment, magic; for- bid, prohibit	practice sorcery	
HR III carve, shape	cut into, engrave, plough	scratch, lacerate				carve, engrave
KB weighty	oppress	press, crush, subdue	subdue, conquer, tread under foot			degrade, humiliate
KR I round	be curved; belly	belly	belly, paunch			belly, interior of a ship
NP soul, breath	soul, breath, living being, desire, passion	breathe; soul, spirit, person, blood, desire	soul, breath of life			soul, spi- rit, breath, person; to blow
PR I split off	tear a gar- ment; deter- mine, divide	detach, set apart		separation; exorcism; a keeping-off charm		
QD II holy	separation; holy; sanc- tuary; temple prostitute	be holy; the holy city (Jerusalem)	sanctify	holy	holy	
ṢR II root, origin	root, tribe, family, kin		root, tribe, family	root, kin, family	root out, eradicate	

¹⁴ And *t* in certain cases related to *ṣ*.

Table 6. Effect on meaning of addition of *m* or *n* as third radical.

Biradical	Hb	Ab	Sy	Md	Sb	Gz
𐤓𐤌 II trust	support; right hand (used in oaths)	safety, sec- urity; right; to lead by example	covenant; right	be firm, true; right	security, prot- ection; turn to the right; right hand	
𐤓𐤌 upward	world, eternity; The Most High	world, eter- nity; sublime, outstanding	world		world	world, universe, eternity
𐤓𐤗 hard substance	substance, bone; grand	bone; pride, arrogance; disaster, hard, painful	bone	thigh, flank		bone
𐤓𐤌 I depleted		shabby, decayed, obsolete		decay, scarcity		
𐤓𐤗 putrid		disgusted, nauseated			disgusting things	
𐤓𐤌 I cut		cut, cut off; dwarf	cut down, cut off	cut off, threaten	scissors	
𐤓𐤌 not fully aware	dream	dream, attain puberty by nocturnal emission	dream	dream	dream	dream
𐤓𐤌 I taboo	ban, exter- minate (en- emies of God); sacred mountain	prohibited, sacred; wo- man, lady, wife; mosque interior	interdict, devote to God; ex- communi- cate	ban, curse	sacred, taboo, sanctuary	consecrate to God; ceremony, rite
𐤓𐤌 III white	white; moon; pur- ify, frank- incense	milk; lactate; frankincense, breast		milky-white waters; egg white	frankincense plantation	
𐤓𐤌 III sustenance	bread; food; eat; swallow greedily	meat; cor- pulent; car- nivorous; swallow greedily	bread			chew noisily on hard bread
𐤓𐤌 II furious	kill by ston- ing; slander; murmur rebelliously	cast stones; abuse	cast stones	cast stones		curse, insult
𐤓𐤗 head, chief	primary, first; official; recorded	official; capital, stock		ordain a priest, consecrate by signing		
𐤓𐤌 dark, shadow		be obscure, dark; gloom		black	be darkened; grow blind	

Table 7. Effect on meaning of addition of *x*, *h*, or *h* as third radical.

Biradical	Ak	Ab	Am	Md	Sb	Gz
LK go, send	escape		walk		go along, conform	
LQ take		conceive, impregnate; seed, sperm	take		take, arrest, seize	lend
ML II salt	sailor, shipwright	salt	salt; eat salt (incur obligation)	salt, sailor	salt; make tasty by adding salt	
MŠ I wipe, smear		wipe, smear; anoint	oil	anointing		
NP soul, breath	inflamm	breathe, animate, fill with pride; breeze; blow				
PR III be fruitful	(plant names)	sprout		sprigs, tendrils	sprout, germinate	bud, shoot
PT open	puncture; bore through	open, conquer; fortune-teller		open, conquer; daily prayer opening	open; dis- engage; administer justice	open
RM III throw, use a spear		spear, pierce with a spear	spear, lance		spear	spear

Table 8. Effect on meaning of addition of *q* or *k* as third radical.

Biradical	Ak	Ab	Am	Md	Gz	Ug
BD scatter		tear, render	scatter; breach	disperse, di- vorce; split		
BR II storm	to lighten	shine (the sky with lightning)	lightning	lightning	flash; light- ning; thunder- bolt	lightning
BT II sever	cut off, cut down	amputate			remove, tear off	
DR II path	walk rap- idly; road; successful			roadway; religious or moral law	history	tread upon, trample
KR I round	round loaf of bread; metal disc	turn around			rotation, whirlpool	
MŠ II drag, pull		grasp and hold firmly; drag out	drag		drag; make taut by pulling	
PR I split off	sever	separate; sunder	break off; expiate			
RX III far, long	far; long; road, path	be far	long dura- tion, way, remote;	far; long, tall	be distant, re- coil, withdraw	be far; be long

Table 9. Effect on meaning of addition of *b* as a third radical.

Biradical	Ak	Hb	Sy	Sb	Gz	Ug
𠂇R I wild animal	hare	hare; lie in wait; raven		hare	hare	hare
𠂇Z I go away, take away	leave	leave, forsake; desolation		forsake, abandon		
DN rear		tail, stump	tail		tail, anus	tail, anus
GR III scrape	itch, scrape	itch, scab				
HR II sow, cultivate	plow		plow, till the soil			
HŠ I perceive		think, account for	think, believe, intend		think, believe, estimate; account; astronomer	
LH flame		flame, flashing point of spear	flame		blaze, flame	
QR II near	approach; in close com- bat; body- guard, relatives; recently	approach; inward part; entrails; war (hostile approach); relatives		draw near	come near; neighborhood, vicinity	approach; private parts, vulva
RK set out	ride, set sail; chariot	ride, mount an animal; chariot	ride, mount an animal; chariot	ride a horse; set out on a journey	ride; go by boat	mount (especially a chariot)
RX IV wide, broad	square, open space	grow wide or large; open space		width	be wide, spacious; public square, street	be wide

Table 10. Effect on meaning of addition of *s*, *t*, *d*, or *z* as a third radical.

Biradical	Hb	Am	Sy	Sb	Gz	Ug
ŷB work, serve				extraction, compulsion	force somebody to do something	
ĜM mist	be obscure, concealed		cloud over			
HM hot, inflamed	be ruthless				harm do violence	
HR III carve, shape	incise, break off	engraving tool			carve, engrave, incise	cut, bite
MR I bitterness, sickness	sickly; troublesome	be sick		suffer a sickness		sickness
PL I divide	detach, remove				discriminate	
RG I use the feet					trample, stamp, kick	jump, leap

Table 11. Effect on meaning of addition of *p* or *f* as a third radical.

Biradical	Ak	Hb	Sy	Sb	Gz	Ug
GD I cut		blasphemy, insult			discard, reject	
HR I taboo		reproach due to disgrace		distort, falsify		
RD go down, bring down		chase, pursue	pursue	pursue		
RX II mercy		grow soft, relax	cherish, pity, take care			

Table 12. Effect on meaning of addition of *g* or *j* as a third radical.

Biradical	Ak	Hb	Sy	Sb	Gz	Ug
DR II path	path; lift, make high	a steep place			rise in rank	
MZ mix, blend		mix	mix, blend, mingle			
PL I divide	ditch, cut channel	split; artificial channel	split, distribute an inheritance; discord, schism	channel	dig out, divide, split	split

Table 13. Effect on meaning of addition of y or w as a third radical.

Birad- ical	Ak	Hb	Ab	Md	Gz	Ug
BK II weep		misfortune	weep, cry		weep, mourn; pretend to weep	
BL I depleted		without	old, worn- out		grow old, be obsolete, worn- out	worn-out; to devour
BS I dry		be dried up, withered; dry land; drought	be dried up, withered; dry land	dry up; dry land	dry, arid; continent; one with withered limbs	
DN sacred law	judge	law, judgment; judge	The Judge		judge, sentence; judgment, dam- nation, doom	judge
HD I one		become un- ited; unique; extraordi- nary; together	unique; one; unity		unite	only son, i.e., one without kin
LD child	give birth, beget; offspring	give birth, beget; child; marriageable girl	give birth, beget; son; parent; fertile	bear a child	give birth; son; daughter; midwife	child, bear a child
NQ II suck	suck, suckle	suck, suckle; be influenced; absorb; early infancy		suckle		suck
RD go down, bring down	descend, bring down; slavery	go down; downward flowing river (Jordan)		river in a valley	go down, descend; be insane	descend
RM II throw, use a spear		throw	throw, shoot; game animal		pierce, strike with a spear; make scarred	throw, shoot
RQ III green, yellow		herbs; green, vegetable	leaves, foliage; green	gold	gold, gold coin	gold
ŠK I give to drink		water	drinking vessel; irrigation		give to drink, irrigation	give to drink
ŠM IV sky			exalted, sublime; celestial, divine	heavens	heavens, sky; divine; celestial being	
ŠB I sit	sit, reside	sit, remain, dwell				sit
ŠR Istraight	be or go straight	be straight, upright	be gentle, tractable			upright- ness, lawful- ness

5.2 METHODOLOGICAL ALTERNATIVES

5.2.1 The choice of semantically-related reflexes

How dependent on the results are the choices of which variants were close enough in meaning to be considered as reflexes of a proposed biradical morpheme?

The answer to this question lies in inspecting the process that was used in choosing reflexes. It presents the greatest possibility within this hypothesis for unconscious bias, since it is partially intuitive. Some of my choices have firm backing in that more than one language expanded a biradical to triradicals having similar expanded meaning (but whose instantiation might be different). An example of this is the morpheme *DR II* “path,” Akkadian has *urĥu*: “road, path,” Hebrew has *derek* “road, manner” Arabic has *ṭariq*: “road, trail,” Syriac has *dirka ʔ*: “road, moral law,” Mandaic has *dirga* “step, degree,” Ge’ez has *darga*: “rise in rank,” and Aramaic has *drk* “tread upon, trample.” Not all choices were so simple. Many times a morpheme might have one set of cognates across the languages which have similar meanings but also have in addition variants with different third radicals and/or different meanings. Rarely, but it does happen, a morpheme will have reflexes that are opposite in meaning. A good example is *GR II* “sojourner.” In Hebrew it surfaces as *ger*: “stranger” and in Arabic as *jʔar*: “neighbor.” A sojourner was in fact a foreigner who lived in your neighborhood whose presence was accepted or at least tolerated. In the Old Testament, Ruth, her husband and her mother-in-law were sojourners.

There are reflexes that stretch the association, that perhaps another author would not have chosen. The Arabic *hidda* “stridency, fury, wrath” was considered a semantic reflex of the biradical *HD III* “sharp.” The Arabic *labisa* “wear, get dressed,” *labbisa* “make obscure,” and *talbis* “deceit, fraud” and the Ge’ez *talabasa* “disguise oneself” were all considered natural semantic extensions of the biradical *LB II* “attire.” On the other hand, some potential reflexes that were rejected might have been included by another author. An example of a rejected association to the biradical *TM I* “completed” is

the concept of “being erect” as given by the Arabic *ʔitm ʔar* “be erect” and *tumurur* “signpost.”

The possibility of a relation between the biradicals *LX II* “fight” and *LX III* “sustenance” is interesting. The latter has the gloss of “bread” in some of the languages while in Arabic it is “meat.” The Arabic root for “meat,” *LXM*, has a variant whose glosses are “bloody fight, slaughter, massacre” among others. My intuition is that there is some connection and not just in Arabic but there is no sememe that generalizes both sustenance and fighting. Therefore, they are defined as separate biradicals in the lexicon.

Many choices came from some familiarity with how cognates sometimes differ in meaning across languages. Other choices were supplied by notations and cross-linking in some of the reference books that were used. But it is possible that what is seen as a semantically-related reflex by the author might very well not be accepted by someone else and vice versa.

The following are two examples of biradical morphemes presenting the expanded meanings that I considered to be authentic reflexes of the primary morpheme. I have also included some examples of others that were rejected.

(23)

RŠ head, chief, cause	Ak	Hb	Ab	Am	Gz
Chosen reflexes	rešu: head, chief; reštu: peak, best; rašabu: commanding respect	roʔš: head, chief; riʔšon: primary, first; rišyon: permission; rašum: recorded;	raʔis: head, chief; rasmi: official; rasmal: capital, stock; raʔas: peak, rasaxa: be firmly established	raʔš: head, chief; rašah: have permis- sion; rašaʔ: have power	reʔsa: head, top, chief; rassaya: to establish
Rejected candidates	rašu: possess; ristu: joy, rejoicing	yaraš: inherit; rašaš: beat down; rešep: flame, spark	rasaʔ: be firm; rašaxa: sweat, perspire; rasaba: to sink to the bottom	ršʔ: bad person; ršp: God of pestilence	rasʔa: forget, overlook; rsy: drop anchor; rasna: to glow, ignite

(24)

QB III pierce, hole	Ak	Hb	Ab	Gz
Chosen reflexes	naqbu: spring, depth of water; naqapu: gore, rape, perforate	qab: pail; naqab: pierce; nqeba: female; maqebet: hole, excavation	naqaba: perforate, pierce; naqbu: mountain pass; q?aba: to dig; wagb: hollow, cavity	qabla: be empty, void; naqaba: separate, perforate
Rejected candidates	qablu: battle, warfare	qebah: belly; qabab: curse	qab?a: to vault, arch; qabba: chop	qabša: collapse. give up

I believe that in general it is fairly clear which words are a logical extension of the basic meaning of a sememe.

5.2.2 The choice of two radicals from a triradical cognate

How dependent on the results are the choices of two of the three radicals for the original biradical in a root that has a triradical cognate in multiple languages?

I give some examples here of a choice that I have made of a biradical to represent the sememe “powerful” (represented by *G/J B/P R* in several languages) and one of its possible alternates: First, the option that I have chosen is:

(25)

	Ak	Hb	Ab	Gz
GB III powerful	gaparu: surpass; gapru: strong; gabašu: be massive	gabar: prevail; geher: man; gibor: hero; gbir: a lord	jabara: force to submit; jabr: powerful man, coercion; jabbar: one who is bold, a tyrant; jabaha: show a bold front	gabra: do, work, manufacture; magbar: tool; gabbar: laborer, one who pays taxes

Next I present an alternate choice below in (20). Note that because of the shift in biradical, the words in square brackets shown below would no longer be reflexes. The words in parentheses would be possible new reflexes. I believe it is evident that *GB* is the correct choice.

(26)

	Ak	Hb	Ab	Gz
BR powerful	gaparu: surpass; gapru: strong; [gabašu: be massive] (burru: prove, certify; birtu: tower)	gabar: prevail; geber: man; gbir: a lord;	jabara: force to submit; jabr: pow- erful man, coercion; jabbar: one who is bold, a tyrant; [jabaha: show a bold front] (burj: tower; barg: lightning)	gabra: do, work, manufacture; magbar: tool; (barra: penetrate)

The following is another pair of choices. There are many reflexes that contain the three consonants *QRB*. The first is the one that I believe captures the essence of the sememe “near.”

(27)

	Ak	Hb	Ab	Gz
QR II near, kin	qerebu: approach; qerbu: near; qerbiš: in close combat	qarab: near; qereb: inward part, midst; qarah, qara?: encounter; qiryah: town, city; qrah: war (hostile approach	qaraba: come near; qurba: relation; qarana: link, join together; qirn: an equal; qarinah: spouse, union	qaraba: come near; megrab: neighborhood, vicinity; ʔaqaraya: to provide a hot meal to a guest

The following is the result I would have gotten if I had chosen *RB* to express “near, kin.”

(28)

	Ak	Hb	Ab	Gz
RB come near	qerebu: approach; qerbu: near; qerbiš: in close combat (no new reflexes)	qarab: to approach; qereb: inward part, midst; qrah: war (hostile approach) [qarah, qara?: encounter; qiryah: town, city] (no new reflexes)	qaraba: come near; qurba: relation; [qarana: link, join together; qirn: an equal; qarinah: spouse, union] (no new reflexes)	qaraba: come near; megrab: neighborhood, vicinity [ʔaqaraya: provide a hot meal to a guest] (no new reflexes)

This choice for the biradical does not add any new reflexes but instead discards reflexes that are clearly semantically linked to the sememe. For this reason I consider the biradical *QR II* the correct choice.

5.2.3 Correctly characterizing the biradical reflexes

This section presents two examples of reflex sets, one multigenerating and the other monogenerating, with a detailed explanation of why they are labeled as such. The first set of reflexes has been judged multigenerating.

(29)

	Ak	Hb	Ab	Am	Sy	Md	Sb	Gz	Ug
DR II path	daragu: path, to lift, make high; sidaru: arrange in order	darak: tread, march; madregah: a steep place; derek: road, manner; dror: a free run, liberty; daraš: to beat a path to, seek; sadar: arrange in order; sderah: row of soldiers	daraja: to walk, step by step; daraq: walk rapidly; daraja: rank, degree, grade; darajah: step, stair; darija: rise in rank; darak: successful; dariba: to be accustomed, trained; ṭariq: road, trail; tʔarix: chronicles, history	dargaʔ: step, stair; drak: tread, march	dirkaʔ: road, moral law	dirga: step, degree; dirkaʔ: roadway, moral or religious law; draša: teaching, doctrine; sdr: to set in order		darga: rise in rank; tarax-qot: apostasy; tarik: history	drk: to tread upon, trample

It has the following suffixes: 1. *g* in Akkadian, Hebrew, Mandaic, Ge'ez; *j* in Arabic; *k* in Ugaritic, Ge'ez, Syriac, Mandaic, Arabic; *ḳ* in Hebrew; *x* in Arabic; *q* in Ge'ez, Arabic. These are all possible variants of each other. 2. *r* in Hebrew. 3. *š* in Hebrew, Mandaic. 4. *b* in Arabic. 5. *h* in Hebrew. The prefixes are: 1. *s* in Akkadian, Hebrew, Mandaic. 2. *ṭ* in Arabic. Initial *t* is a Semitic preformative and therefore does not count as a genuine variant. The presence of so many variants marks the biradical *DR II* as multigenerating.

In contrast we have the following monogenerating set of reflexes:

(30)

	Ak	Hb	Ab	Am	Sy	Md	Sb	Gz	Ug
MT likeness	mašalu compare, liken; maṭṭalu mirror image, reflec- tion	mašal: be like, represent, proverb, parable	maṭala: resemble, represent; maṭal: parable; maṭʔal: example, image; mitli: replaceable	mit_la: parable; mtal: be like	metal: com- pare, liken; matla: parable	mtl: liken, compare, mitla: parable; mitlaiia: people of the same class	mtl: con- form, be similar, be a dupli- cate, equi- alent, image; massala: make a statue	masala: resemble, think, suppose; massale: statue, parable, proverb; ʔamsal: image	

We see that *š* in Akkadian, Hebrew; *t* in Arabic, Aramaic, Sabaean; *t* in Syriac, Mandaic; *s* in Ge'ez, Sabaean; and *t* are variants of each other and thus these are genuine reflexes of the biradical *MT*. The consonant *t* is not a typical variant of *t* but the gloss for *maṭṭalu* “mirror image, reflection” in Akkadian demonstrates that it does belong in this specific case. Since every example has only a single extension, the consonant *l*, it is considered a monogenerating biradical.

There are a small number of reflexes in Appendix B that are described as cases of metathesis. This characterization came from two sources: classifying by a Semiticist and my judgment of the obviousness of the metathesis. For example, when the reflexes containing radicals *KTP* denote “shoulder” in six of the nine languages, I characterize *maTKaP* in Ge'ez with the same gloss as a clear case of metathesis.

5.3 ACCOUNTING FOR ANOMALIES

5.3.1 Missing reflexes

How do we account for the fact that there are proposed Pre-S biradical reflexes that appear in some daughter languages and not others?

The Semitic languages, like all languages, have undergone language contact and have adopted foreign words. Ge'ez has many words that have come from Cushitic and whose roots are shared by Amharic and Tigré but no other Semitic languages. For

example, all of the other languages discussed in this paper have variations of *gpn* for “vine, vinyard” while Ge’ez has *tewnaq*. Aramaic is strongly permeated with foreign words, mainly from Hebrew, Akkadian and Persian but also from Greek and Latin. Ugaritic has words from Anatolian, Hittite, and Hurrian. Akkadian has many words that are of Sumerian origin. For example, although it shares the root *mlk* for “ruling, advising” with the other Semitic languages, it employs the Sumerian word *šarrum* for “king” while the others exhibit variations on *malik*. Syriac was influenced by Greek and Hebrew by Aramaic, Greek and Latin. It is not at all surprising that a particular biradical or triradical does not appear in all the nine languages. In addition, languages undergo great changes over the course of millenia.

5.3.2 Semitic cognates without precursors

There are a multitude of words that are cognates in the Semitic languages. Only a subset of them are related to the biradicals postulated in the Pre-S lexicon. What is the origin of the others within the framework of this theory?

The hypothesis is that at an early stage of development the Pre-S lexicon consisted of biradicals, which were later enhanced by the introduction of a third radical providing the opportunity for extending the meaning or breaking the sememe down into its more specific aspects. It is evident from the number of triradical cognates in the Semitic languages that this process had well begun before the dispersal of the various groups. There certainly existed a stage toward the end of the 10,000 to 7000 B.C.E. period in which biradicals and triradicals were found simultaneously in the lexicon. We can see from many examples of reflexes in Appendix B that some biradicals coexisted with their triradical extensions long after the dispersal period (Table 14).

On the other hand there are many examples of monogenerating biradicals without surviving biradicals (see Table 15 below). There is no way to determine whether the previous biradical forms disappeared or if the cognates began as very early triradicals. In any case, it is the existence of multigenerating forms that substantiate the theory.

Table 14. Some examples of biradicals coexisting with their extensions.

Pre-S biradical	Sememe	Lan- guage	Birad- ical	Biradical gloss	Trirad- ical	Triradical Gloss
ʔM	mother	Ak	ummu	father	ummanu	tribe, nation
DQ	small	Hb	daq	small, thin, fine	daqaq	pulverize
DR I	glorious	Ab	dur	pearl	durri	brilliant star
		Hb	dar	pearl	hadar	honor, adorn
DR III	circle	Hb	dur	circle	xadar	surround, enclose
GB I	curved part	Hb	gab	back, anything curved	giben	hump-backed
GR II	sojourner	Sb	gwr	sojourn, become a protégé	gwrhw	partner
		Gz	gar	neighbor	tagawara	live in the vicinity
HD III	sharp	Hb	xad	sharp	xidek	briar
KL	consume	Ab	kal	all	kalaza	gather
		Sy	kl	all	kwll	martyrdom
		Hb	kol	all	kalal	be complete, perfect
LB I	inner essence	Hb	leb	heart, mind	libab	encourage
LK	go, send	Ug	lk	send	hlk	course
MR	bitterness, sickness	Ug	mr	bitter, sorrow, pain	mrr	poison
		Hb	mar	bitter	marah	be contentious
MT	death	Am	met	death	xemta	poison
NM	sleep, ease	Sb	nʔm	be pleasant	nʔmtm	prosperity, happiness
QL I	light, easy, of small value	Hb	qal	light, easy	qalas	mock, scoff
QM I	rise	Ug	qwm	rise	mqm	place
		Am	qam	rise	nqam	arise for oneself, revenge
		Ab	qam	rise	qawam	vigor, stamina
		Hb	qam	rise	yqum	existence
RB	many, much	Ak	rabu	to increase	rbum	prince
		Hb	rob	abundance	rbabah	multitude, ten thousand
		Sy	rb	captain, steward	rbut	grandeur
RM I	high	Md	rum	be high	rauma	heavens
		Hb	rum	haughtiness, height	romam	extolling
RQ II	spit	Am	riq	saliva	tqaq	spit
ŞL	dark, shadow	Ab	şil	shadow	şalmah	to be obscure

Pre-S biradical	Sememe	Lan- guage	Birad -ical	Biradical gloss	Trirad- ical	Triradical Gloss
		Hb	şel	shadow	şalal	be shaded, dark, grow shadowy
ŞR	narrow	Hb	şar	narrow	şarar	bind, be restricted
ŞM III	name	Ab	ism	name, standing, reputation , raise one's head proudly	samada	raise one's head proudly
		Ak	şumu	name, fame, repute	şamatu	mark, brand
		Hb	šem	name	ʔašem	transgress, be guilty
ŞN IV	tooth, fang	Hb	šen	tooth	şanan şninah	whet, sharpen cutting word, taunt
ṬB	felicitous	Md	ṭab	good, well	ṭabaʔ ṭabuta	blessing, whole- some, virtuous; boon, generous gift

Table 15. Some examples of triradical cognates with no surviving biradical.

Sememe	Pre-S biradical	Triradical cognate	A selection of matching glosses
ʔD	ear	ʔDN, ʔZN	ear
ʕB	work, serve	ʕBD	do, perform, work, serve
BK I	first-born, first fruits	BKR	first-born, unprecedented, early
BL II	master	BL, BʔL	lord, master, husband, Baal, have dominion over
BR III	knee	BRK, BRX	knee, kneel, bless
BŠ II	dry	YBŠ	dry, withered, dry land
BT I	place of	BT, BYT	house, tent, place of
KK	star	KK	star
LD	child	WLD, YLD	child, be born, childbirth
LŠ	tongue	LŠN	tongue, taste, language
ML II	salt	MLX, MLH	salt, sailor
MṬ	rain	MṬR	rain
MZ	mix, blend	MZG, MZJ	mix, combine, mingle
PR II	dust, ashes	ʔPR, ʔFR	dust, soil, ashes
QD I	before	QDM	in front of, before, ancient days
QR III	horn	QRN	horn
QŠ	bow, archer	QŠT	bow, archer
RĜ	desire, be hungry for	RĜB, RʕB	hunger, desire, voracious
RX IV	wide, broad	RXB, RHB	wide, open area, generosity
ŠB I	suffer	ʔŠB	suffer, grieve, sad, hard
ŠD II	right, moral	ŠDQ	true, right, just
ŠĜ	young	ŠĜR, SṤR	small, insignificant, child
ŠK II	lie down	ŠKB, SKB	lie down, copulate, bed
ŠL I	safe	ŠLM, SLM	peace, safety, intact
ŠP III	beautiful, pleasing	ŠFR, SFR	beautiful, comely, splendor
ŠX	new beginning	ŠXR, SHR	dawn, daybreak, new moon
ZK	memorial	ZKR, ḌKR	remember, male, testicles
ZM II	time, season	ZMN	time, season, period
ZP	finger nail, claw	ZPR, ŠPR, SPR	finger nail, claw

Chapter Six. Comparison of the Biradical Lexicon with Phoenician, Eurasiatic, Nostratic, and Sanskrit

6.1 MOTIVATION FOR THE COMPARISONS

Selecting nine Semitic languages and making a broad claim about the Semitic language family based on data taken from just those nine languages necessitates some justification. Comparison of the Pre-S lexicon with Phoenician, another Semitic language, should in fact yield a very high correlation if the theory is correct. Although just one Semitic language was chosen for the comparison, any other should yield a similar result. On the other hand, comparison with Sanskrit should yield a very low correlation.

The situation with Eurasiatic and Nostratic is different. These are not languages but word lists based on theories of macrofamilies and common roots. One might agree with the existence of such macrofamilies and the language groups that belong to them without necessarily accepting the postulated list of roots. Greenberg and Bomhard agree on the much of the theory and both locate Eurasiatic as a daughter of Nostratic and sister of Semitic. Therefore the expectation is that there would be some correlation, more for Nostratic than Eurasiatic, but nowhere approaching that of Phoenician.

6.2 PHOENICIAN

6.2.1 The Phoenician language

Phoenician is a group of related Canaanite languages from ancient Lebanon and Palestine. Various dialects were spoken in the cities of Tyre, Sidon, Byblos (Gubl) and the surrounding towns (Krahmalkov, 2002, pp.207-208). The Western dialect, termed Punic, was brought to the North African colonies such as Cyprus, Malta, Carthage, etc. beginning in the thirteenth century B.C.E. This was the language of the Carthaginian Empire and thus was the most important dialect. Stelae and graffiti in Phoenician have been found also in Attica and Egypt. Phoenician inscriptions may be identified by the lack of vowel letters (known as *Mater Lectionis*), the epigraphic characteristics, and the

use of the article *h-* as prefix instead of the Aramaic suffix -*ʔ*, *ʔnk* instead of the Aramaic *ʔn ʔ* for “I,” and *ben* instead of the Aramaic *bar* for “son.”

Phoenician was spoken for at least two thousand years (Harris, 1936, p.7). Although the earliest deciphered inscription is from the 13th century B.C.E., it displayed clear signs of an established literary language and a developed script with characteristics that differed from the other Canaanite inscriptions. In the 2nd century C.E. the language was still spoken in some places and Phoenician coins from 196 C.E. have been found.

6.2.2 Analysis of results from comparison of the biradical lexicon with Phoenician

Because the sources for Phoenician are mainly stelae, inscriptions, and coins, the lexicon is missing many ordinary words, which no doubt existed in Phoenician, but that have not come down to us for comparison with the biradical lexicon. The Phoenician in Appendix F is from the lexicons of Harris (1936) and Tomback (1978).

Of the Phoenician words with similar glosses to the postulated biradicals, there is a very high percentage of matches, which is not surprising since Phoenician is a Semitic language. Of 270 items in the biradical lexicon, I have located 147 correspondents in Phoenician and, of those, as many as 137 match the lexicon, which is 93.20%. Table 16 (culled from Appendix F) shows the nonmatching items. However, each is a genuine Semitic word in itself.

Table 16. Nonmatching Phoenician.

Sememe	Biradical	Used to express	Semantically-similar Phoenician
first fruits, first-born	BK I	first fruits, first-born, early	QDMT first fruits
dry	BŠ II	dry, arid, dry land	XRB become dry
round	KR II	round, flat (not round), belly	BṬN belly, womb
womb	KR II	womb, pregnancy	BṬN belly, womb
hair, grain beard	ŠR I	hair, hairy one, goat, barley	ZQN beard
music	ZM	sing, chant, play an instrument	ŠR to sing
weapon	ZN	weapon, penis, tools	PŠM penis

What we don’t see much of in the sample of Phoenician that has survived is the richness of the other languages, which often display multiple extensions of a biradical.

Some examples of biradicals in Appendix D that do exhibit multiple extensions are *GL I* “roll,” *LK* “go, send”, and *XY* “living, healthy. All of the nonmatching words are nevertheless genuine and familiar Semitic roots, alternates of the biradical extensions. Even the root *PʕM*, glossed as both “foot” and “penis,” has a parallel in Hebrew in that *RGL* has the same two meanings. Lipinski (2001, p.563) speculates that “foot” is a euphemism for “penis” in both languages.

It is evident that Phoenician could have been used as a tenth language in this work with no change in the results.

6.3 EURASIATIC AND NOSTRATIC

6.3.1 Eurasiatic and Nostratic word lists

Beginning from the 19th century, linguists such as Franz Bopp, Rudolf von Raumer, Graziadio Ascoli, Vilhem Thomsen, and others have speculated (Bomhard, 1996, pp.1-2) about a possible relation between Indo-European and other language families. Nostratic is the name that was given by Holger Pedersen in 1903 to the group of languages from northern and central Eurasia, the Indian subcontinent and the ancient Near East, which in his view and others constituted a language macrofamily. Over the years various linguists who supported the general theory often disagreed on the inclusion of specific language groupings in this macrofamily. Most mainstream linguists dismissed this theory; nevertheless work on it has continued up to the present day. It is not the intent of this work to discuss the merits or demerits of Nostratic theory (see Campbell, 1998, pp. 115-117 for his discussion and criticism of noncorresponding sound correspondences and semantically non-equivalent forms) but instead to use the word lists produced in the recent past by prominent scholars of Nostratic in comparisons with the biradical lexicon (Greenberg, 2002, pp. 10-189 and Bomhard, 1996, pp. 141-204). Greenberg has produced a Eurasiatic word list while Bomhard’s list is for Nostratic.

The Nostratic macrofamily relationships are still in dispute even among many scholars who accept the theory. I will for the purpose of this paper accept Bomhard’s (1996, p.22) definition of the relationships, to which Greenburg concurs (2000, p. 5). They are presented in the list given below:

(31) NOSTRATIC

Afroasiatic
[Sumerian(?)]
Elamo-Dravidian
Kartvelian
Eurasianic
 Indo-European
 Uralic-Yakaghir
 Altaic
 Chukchi-Kamchatkan
 Gilyat
 Eskimo-Aleut

6.3.2 Analysis of results from comparison of the biradical lexicon with Eurasiatic and Nostratic roots

In this and the following section, the process of matching roots was accomplished by gross inspection of likely phonological variants; there has been no attempt to trace the actual process of sound change. The lists of roots, particularly that of Bomhard's, are not single word glosses but constitute a constellation of meanings. Since the sememes defined in this work have multiple meanings also, this has meant that the candidates for inclusion in the matching list must include all possibilities. An example is given below from Appendix G:

(32)

Sememe	Biradical	Nostratic semantically-similar roots	Possible relation?
carve, cut into, shape	HR III	BAR to scrape, carve, whittle T^hAK^h to form, make, create T'IM to make, build, create K'AR to cut into, engrave ← K^w[h]AY to form, fashion, fit K^wAD to form, fashion, build HAK' cut into WUR^y to scratch, incise ← MAK' to shape, handle, work with the hands	Yes

Note that the most inclusive criteria for matching the roots has been used. If only one of a constellation of meanings has a root which has a possible phonetic relationship

to the biradical sememe, it has been labeled and counted as matching. In contrast, we also have many cases where there is no evident correspondence:

(33)

Sememe	Biradical	Used to express	Eurasiatic semantically-similar roots	Possible relation?
dark, shadow	ŠL	shadow, shade, dark, gloom, night	PI black, night KURA black, dark color POLM dark, pale TUM dark, darkness AMI dark, hidden NOK night, evening	No

When attempting to match the word lists from Greenberg and Bomhard with the biradical lexicon, many sememes were simply not available, as in the following example:

(34)

Sememe	Biradical	Used to express	Nostratic semantically-similar roots	Possible relation?
beautiful, pleasing	ŠP III	beautiful, pleasing, splendor		
bow, archer	QŠ	bow, archer		
bowl, basin	ŠP II	bowl, basin, jar, container		

The sememes for which there was no equivalent semantically-similar root were not included in the statistics. The percent matching is the ratio of the number of sememes that have a phonetically-related counterpart in Nostratic or Eurasiatic to the number of sememes that have a semantically-related counterpart. I have found 156 semantic correspondents in Eurasiatic to the Pre-S biradicals and, of those, 33 match the lexicon (have a phonetically-related counterpart), which yields 21.15%. Similarly, there are 132 semantic correspondents in Nostratic to the Pre-S biradicals and, of those, 39 match the lexicon, which yields 29.54%.

The word list for Nostratic was constructed including Afroasiatic roots, although at times roots from Egyptian, Cushitic or Libyco-Berber were chosen instead of Semitic. As an example, to arrive at the postulated Nostratic root *šaw* “to sleep” the Proto-

Afroasiatic is taken from the Egyptian *ʿwn* and not from the Semitic biradical *NM*. The 29.54% matching value is approximately what would be expected. The 21.15% matching value for Eurasiatic is consonant with the fact that Eurasiatic is considered by Greenberg and Bomhard to be a sister of Afroasiatic (with Semitic as one of the main families of Afroasiatic) and therefore would have a lesser relation with it than with Nostratic. However, it was striking in inspecting the word lists to see that the Eurasiatic list had very little in common with Nostratic. One might expect that the matching values from Eurasiatic would be a subset of those from Nostratic but this is not the case.

6.4 SANSKRIT

6.4.1. The Sanskrit language

The Indo-Aryan language separated from Iranian somewhere around 1400 B.C.E. and its speakers migrated from Mesopotamia and Iran into the Indian subcontinent starting from 1300 B.C.E (Sen, 1958, pp.1-2). The earliest work in this language was the Rigveda, dated somewhere in the tenth or eleventh century B.C.E. The language was at the Early Vedic stage during this period. The period from 1000-700 B.C.E. was considered the Late Vedic stage and the period from 700 to 400 B.C.E. was termed the Early Sanskrit stage. Writings during this period included the Brahmanas and Upanasads. The stage starting at 400 B.C.E. was known as Classical Sanskrit and the scholar Panini wrote a detailed grammatical treatise that permanently fixed the form of Sanskrit grammar, using previous work by linguists but adding to it to produce an extraordinary work (Burrow, 1955, p. 48). The goal of codifying the religious use of Sanskrit as well as its use as a unifying national language by the highest classes of society, i.e., kings, ministers, scholars, for administration and religious purposes ensured its continuation even after other languages began to be used for daily speech (ibid., pp. 60-64). Buddhists and Jains adopted Sanskrit for their literature during the second millennium C.E. The spread of Buddhism brought Sanskrit to Burma (Myanmar), but it was replaced in the 11th century C.E. by another form of Buddhism using Pali and not

Sanskrit. When Hinduism spread to Java, Sumatra, and Bali Sanskrit came along with it. After the Moslem conquest Islam replaced Hinduism but many Sanskrit words have remained in the lexicon of these countries.

6.4.2 Analysis of results from comparison of the biradical lexicon with Sanskrit

The Sanskrit glossary used in Appendix H is taken from Whitney, the 1945 and 1955 reprints respectively of the 1885 and 1889 editions. As in the previous section, the widest latitude for phonetic and semantic matching is used, as shown in:

(35)

Sememe	Biradical	Used to express	Sanskrit semantically-similar roots	Possible relation?
go down, bring down	RD	go down, bring down, subdue, beat, pursue, exercise authority	TAD beat ṚT, ART pursue ← VLAG, VLANG pursue MARG chase	Yes

The ratio of the number of sememes that have a phonetically-related counterpart in Sanskrit (9) to the number of sememes that have a semantically-related counterpart (191) was just 4.73 %. Sanskrit has no relation with Semitic and the 4.73% matching value merely documents chance occurrences.

Chapter Seven. Conclusions

On the whole, the data support my view that a working lexicon for the earliest Semitic-speaking people consisted of biradical roots and the majority of the morphemes found in the lexicon developed triradical reflexes in the daughter languages. The many examples of a biradical spawning multiple variants within the daughter languages add weight to my hypothesis. I give below some examples of the most impressive:

(36)

PL: divide

which has generated in Ge'ez:

falaga: dig out, divide, split; **falasa:** send away, cast out; **falak:** celestial sphere, division;
falama: split, divide; **falaša:** divide in two; **falaṭa:** discriminate; **falaya:** separate, wean

and in Arabic:

falaḡa: split; **fala:** wean; **falq:** fissure; **falam:** notch, indent; **falq:** fissure

and in Hebrew:

niplag: split; **palah:** distinct, marvelous; **palax:** cleave; **palal:** intervene; **peleg:** artificial channel

and in Akkadian:

palašu: break through; **palgu:** ditch, cut channel; **balaṭu:** detach, remove

and in Sabaean:

fl: to cut channels; **flth:** dike separating fields

and in Aramaic:

plag: half; **palxan:** cult

and in Syriac:

plg: split, distribute an inheritance; **plgw:** discord, schism; **plwzʔ:** hatchet

and in Mandaic:

plg: divide, apportion, **plṭ:** separate; **plugta:** gap, crevice

and in Ugaritic:

plg: split

(37) ṢQ: constrict

which has generated in Ge'ez:

Ṣaḡada: tie, bind; **Ṣaḡafa**: hinder, impede; **Ṣaḡḡama**: restrain, detain, confine;

Ṣaḡ^wara: wrap up, confine; **Ṣaḡḡaṣa**: ensnare; entangle

and in Hebrew:

Ṣaḡad: tie, bind; **Ṣaḡal**: bend, twist; **Ṣaḡob**: insidious, deceitful; **Ṣiḡru**: they hamstring;

Ṣiḡeš: twisted, perverted; **Ṣaḡar**: barren, uproot

and in Arabic:

Ṣaḡada: tie, bind; **Ṣaḡim**: constricted; **Ṣaḡd**: contract; **taṢḡid**: entanglement; **maṢḡud**:

tongue-tied; **Ṣaḡala**: confine, detain

and in Sabaean:

Ṣqd: contract, oath; **Ṣqr**: dam wall

(38) RM I: high

which has generated in Hebrew:

Ṣarmon: citadel; **rum**: haughtiness, height; **ramah**: a high place; **ramut**: lofty stature; **ramom**:

be exalted; **trumah**: an offering for sacrifice; **raṢam**: to rise; **Ṣaremah**: heap

and in Arabic:

rayyama: exceed; **raym**: superiority; surplus

and in Aramaic:

romem: exalt; **rum**: be high, haughty

and in Ge'ez:

ramawi: celestial; **rayama**: be high, raised; **rama**: heavenly kingdom

and in Mandaic:

rum: be high; **rauma**: firmament, heavens

and in Sabaean:

rym: raise; **rymm**: exalted

and in Ugaritic:

rwmm: be high; **rm**: erection, height

The data show that 197 of the 272 morphemes, or 72.42%, have two or more variants in the nine languages chosen for this paper. Another 19 morphemes have remained as biradicals. Adding the biradicals that have multigenerating reflexes to the biradicals that had no reflexes but entered the daughter languages in their original form totals 216. Thus, 216 out of 272 morphemes, 79.41%, have a clear biradical origin.

As a contrast, the percent of matches for Phoenician is 93.20%, for Sanskrit it is 04.73%, for Eurasiatic it is 21.15%, and for Nostratic it is 29.54%. Phoenician is a Semitic language and it is not surprising that the biradicals are also related to Phoenician words. Sanskrit has no relation with Semitic and the 04.73% matching value just documents chance occurrences. The percent of biradicals generating triradical reflexes in this work clearly supports the hypothesis, although it cannot by itself account for all the reflexes. Many morphemes exist whose reflexes are triradical cognates that are virtually identical across most of the nine languages. This fact can have several explanations: either that the triradical existed in the language before the dispersal of the population or that it was incorporated through extensive language borrowing after dispersal. Neither of these explanations in itself contradicts the hypothesis. At the end of the pre-dispersal period there existed simultaneously biradicals and triradicals. For some postulated morphemes such as *BK I* “first-born, first fruits”, only the triradical expression is found and it is therefore considered monogenerating. Other morphemes such as *BR I* “choose” entered as biradicals and acquired differing third radicals after the dispersion of population, making it multigenerating. Still other morphemes such as *DQ* “small” entered the languages both as a biradical and a triradical. The existence of a triradical cognate along with variations based solely on the biradical morpheme does not prevent this morpheme from being considered multigenerating.

The fact that 72.42% of the biradicals generate more than one semantically-related triradical coupled with 79.41% when the nongenerating biradicals are added demonstrates that the biradicality hypothesis proposed in this work is both plausible and likely.

Appendix A. The Proposed Pre-Semitic Lexicon.

Sememe	Biradical	Used to express
abundance	DŠ	abundance, grow fat, fertility, thrive
after	XR	after, behind
alien	NK	alien, foreigner, disloyal, hostile
arrow	XŠ I	arrow
attire	LB II	wear, attire
axe, hew	XŠ II	axe, hew
baking oven, pit	TN	baking oven, pit
basis	ʔŚ	basis, genitalia, root
be fruitful	PR III	be fruitful, flower
beautiful, pleasing	ŠP III	beautiful, pleasing, splendor
before	QD I	before, go forward
beloved	DD	beloved, breast
bend	KP	bend, bow down
bird, flight	ʔP	bird, flight
birth, child	LD	give birth, be born, child, beget, childbirth
bite	NŠ	bite, chew, kiss, jaw
bitterness, sickness	MR I	bitterness, sickness, sour, gall, poison
blood	DM I	red, blood, menses, earth (soil)
bow, archer	QŠ	bow, archer
bowl, basin	ŠP II	bowl, basin, jar, container
break, smash	PQ	break, smash, destroy, burst, disaster
brother	ʔX	brother, trusted friend
build	BN II	build, dwelling, within, stone
bury, grave	QB II	bury, grave, vile, curse
capture, ambush	XB	capture, ambush, snare, make a surprise raid, deceive
carry, raise	NŚ	carry, raise, lift
carve, cut into, shape	HR III	carve, cut into, shape

cattle	BQ II	cattle, herd, buffalo
chastise	QŞ	chastise, scold
choose	BR I	choose, preferred
circle	DR III	revolve, circle, encircle
cleanse	NQ I	cleanse, empty out, pure
cold	QR I	cold, freeze
come, accompany	ʔT I	come, accompany, arrive, with
completed	TM I	completed, past, yesterday, over
constrict	ʔQ	constrict, entangle, obstruct
consume	KL I	all, consume, be consumed, every
creep	ḌX	creep, crawling thing, serpent, worm
curved part	GB I	curved part, the back, boundary
cut	GD I	cut down, cut off, circumcise, segregate
dark, shadow	ŞL	shadow, shade, dark, gloom, black
day	YM I	day
death	MT	death
defile	XL	defile, stain, filthy
depleted	BL I	depleted, worn-out, empty, tired, nothing, without
descendant	BN I	descendant, son, daughter, grandchild
desire, be hungry for	RĜ	desire, be hungry for, want
divide	PL I	divide, be distinct, allot, wean
drag, pull	MŠ II	drag, pull, snatch away
drink	ŠT I	drink, to drink
drug, poison	ŠM I	drug, poison, remedy, herbs
dry	BŠ II	dry, arid, dry land
dust, ashes	PR II	dust, ashes, duststorm
dyeing, coloring	ŞB IV	dyeing, coloring, painting
egg	BŞ	egg
enclosure	GN	enclosure, garden, hidden
envy of possessions	QN	envy of possessions

establish	KN	yes, true, exist, suitable, proper, establish, investigate
evil spirit	ŠD	demon, evil spirit, devil, scourge
excite	GŠ I	excite, agitate, set in motion
excrement	ZB	excrement, dross, defecate, diarrhea
extend	DR	extend, scatter, sow, seed, progeny, forearm, measure
extinguish	ṬP	extinguish, go out, clear away
extract	ŠL II	take out, find out, ask, extract
eye, source	ʕN	eye, observe, spring, source, meaning
face	PN	face, front, to face, turn toward
fail	BṬ	fail, cease, void, futile
false, defective	SR	false, defective, deviate, cheat, treacherous, rebellion
far, long	RX III	far, long
father	ʔB	ancestor, father, religious leader
felicitous	ṬB	happy, good, sweet, pleasing
fertility	ʔR II	fertility, conceive, pregnant, plant
fight	LX III	fight, quarrel, duistress, attack, oppression
finger nail, claw	ZP	finger nail, claw
fire	ʔŠ	fire, cooking place
first fruits, first-born	BK I	first fruits, first-born, early
fish	NN	fish
flame	LH	flame, gleam, flash, blaze, kindle
flesh, cook	BŠ I	flesh, meat, cook, burn, sacrifice
flourish	ŠM II	flourish, ripen, swelling, oil
flying insect	DB I	fly, bee, hornet, wasp, to hover, dart, sting
fruit	NB	fruit
furious	RG II	furious
gather	SP	gather, overflow, assembly
gazelle	ŠB III	gazelle
give	HB	gift, to give, share, generous
give to drink	ŠK I	give to drink, irrigate, water
glorious	DR I	glorious, shiny metal or stone, beauty

go away, take away	ʕZ I	go away, take away, flee, shun, abandon
go down, bring down, hunt	RD	go down, bring down, subdue, beat, pursue, hunt
go, send	LK	go, send, messenger
good spirit	ʔL	deity, good spirit
graze, pasture	Rʕ II	graze, pasture
green, yellow	RQ III	green, yellow, gold, vegetables
grind	ṬX	grind, pulverize, sediment
ground meal	QM II	ground meal
grow big	GD II	grow big, become great, leader, conquer
hair, bearded grain	ŠR	hair, hairy one, goat, barley (bearded grain)
hand, authority	YD	hand, authority, strength, five
hard substance	ʕZ	tree, bone, hard substance, wood, flint
hate	SN	hate, avoid, enemy
he, him	ŠW	he, him
head, chief	RŠ	head, chief
hear, understand	ʔD	ear, hear, understand, deaf (= not hear)
heed	ŠM V	heed, obey, pay attention to
here	HN	here, behold
high	RM I	high place, high stature, haughty
hold, seize	XD	hold, seize, grasp, booty
holy	QD II	be holy, make holy, bow down, show respect, bow
horn	QR III	horn, tusk, peak of mountain
hot, inflamed	HM	hot, inflamed, fever, ardor, blush, have ulcers, anger
human	NŠ II	human, frail, man, woman, friendly
I, me	ʔN	I, me
if	ʔM III	if, suppose that
in	B-	in, inside, within, come in, among, between
inner essence	LB I	heart, mind, will, inner essence, courage
join, bind	ŠM	join, bind, unite, yoke, weave, braid

knee	BR III	knee, kneel, bless
know	Dṣ	know, knowledge, claim
lacking	HS	lacking, need, suffer loss, deficient, defective
laugh	ẒX	laugh, play, jeer
learn	MD	learn, teach, accustom
left (side)	ŠM II	left side, left hand, unlucky
lie down	ŠK II	lie down, copulate
light	ʔR III	moonlight, starlight, sunlight, firelight, shine, blind (=no light)
light, easy, of small value	QL I	easy, light, of small value
likeness	MT	likeness, resemble, example, compare, image
lip, edge	ŠP I	lip, edge, rim
living, healthy	XY	living, healthy, vital, animal
love	HB	love, embrace, desire, gladden
low, make low	ŠP	low, make low, below, pour out, spill, valley
make evident, prominent	MR II	make evident, prominent, show, find, speak, command, proclaim
make music	ZM I	sing, chant, hum, play an instrument, tune
many, much	RB	many, much, very, great (status), dense, increase
master	BL II	master, owner, husband
memorial	ZK	memorial, male, remember
mercy	RX II	mercy, compassion, soft, gentle
mist	ĜM	mist, fog, clouds
mix, blend	MZ	mix, blend, combine
mother, people	ʔM I	mother, tribe, truth
mound	TL	mound, hill
mouth	PM	mouth, opening, entrance
mud	ṬY	mud, mire, clay, coat with something
name	ŠM III	name, reputation, guilty (=no name)
narrow	ŠR	narrow, protect, press, guard
near	QR II	near, kin, approach, tribal area, guts, innards
negation	Lʔ	no, not

new	HD II	new, news, gossip
new beginning	ŠX	new beginning, dawn, morning, new moon
night	LL	night
nose	ʔP	nose, breathe, blow, humiliate
not fully aware	HL	dream, dreaming, feverish, hallucinating
old	SB	old, old age, grey (white) hair
one	HD I	one, single, solitary, make one (unite)
open	PT	open, spacious, to open, conquer
path	DR II	path, walk, tread, march, step, move, arrange
perceive	HŠ I	perceive, smell, think, account for, sense
pierce, hole	QB III	pierce, hole, stab, dig, wound, cave, rape, female
pile high	GB II	pile high, mountain, hill
place of	BT I	tent, dwelling place
plains, fields	GR IV	plains, fields
point to	ŠB II	finger, toe, point to
possessing	ML I	ruler, full, to own, to rule over, whole
pottery, vessel	QD III	pottery, vessel
powerful	GB III	powerful, hero, strong, prevail, virility
praise, rejoice	HL	praise, shout in joy, celebrate
prepare	ʔD	prepare, ready
press, squeeze	HŞ	press, squeeze, injure, torture
push, beat	DP	push, expel, thrust, knock down, kick
put	ŠM I	put, there, insert
putrid	BŠ	putrid, ashamed, wretched, disgusted, stink, rotten
quantity	MN II	quantity, allot, weigh, count, offering
rain	MṬ I	rain
rear	DN	rear, tail, anus, pollute
receive, accept	QB I	receive, accept, facing, opposite
repair	RP	heal, repair, recover, medicine, sew up, help
repeat	ŠN II	another, repeat, year, two, second
restrain	KL II	restrain, surround, contain
return	ŠB II	return, answer, put back, turn back

right (moral)	ŞD II	right (moral), just, fair
rise	QM I	rise, stand, stamina, place
roar, make tremble, quake	RŹ	roar, make tremble, thunder, quake, shudder, be afraid
roll	GL I	roll, wave, spin, twist, curl up
root, origin	ŠR II	root, origin, navel, family
round	KR II	round, flat (not round), belly
ruin, error	ŠT II	ruin, error, stray, heresy
sacred law	DN	sacred law, arbiter, moral code
safe	ŠL I	intact, safe, greet, at peace
salt	ML II	salt, sailor
scatter	BD	scatter, stray, wander, strew, disperse
scrape	GR III	scrape, itch, scratch, scrape off, peel
sea	YM II	sea, lake
search	HŠ II	search, seek out, investigate
see	RŹ I	see, vision, prophesize, visionary
set out	RK	set out, ride, sail
sever	BT II	sever, mutilate, amputate, interrupt, chop
sharp	HD III	sharp, acute, briar, thorn, needle, to sharpen
she, her, it	ŠY	she, her
shoulder	KT	shoulder, shoulder blade
silent	DM II	silent, stupefied, resigned
sit, dwell	ŠB I	sit, dwell, settle
skin	GL II	skin, hide, bark, crust, bald
sky	ŠM IV	sky, heavens, sun, divine, azure
sleep, ease	NM	sleep, ease, doze
small	DQ	small, make small, thin, reduce, diminish
sojourner	GR II	sojourner, visitor, stranger
soul	NP	soul, life, spirit, self
sow, cultivate	HR II	sow, cultivate
spit	RQ II	spit, saliva
split off	PR I	split off, detach
spring forth	PL II	spring forth, gush, ejaculate, escape

sprout	BQ I	sprout, plants, buds
star	KK	star, comet
stop, kill	QT	stop, pluck off, snap off, kill, end
storm	BR II	storm, hail, lightening, snow
straight	ŠR I	straight, in order, upright, crippled (not straight)
stream	NH	stream, river, flow
strength	ʕZ II	strength, strengthen, succor, powerful, respected
stretch out, shape	MT II	stretch out, shape, forge
suck	NQ II	suck, suckle, absorb, nurse
suffer	ŠB I	suffer, grief, misery, pain, sorrow, rough, harsh, troubled, afflicted
surround	XP	surround, enclose
sustenance	LX III	sustenance, bread, food
swiftness	QL III	swiftness, hurry
taboo	HR I	taboo, forbidden, terrified
take	LQ	take, marry, seize, collect, glean, grasp
taste	TM II	taste, sense, discernment
they, them	ŠN III	they, them
thin, empty	RQ I	thin, empty, weak, useless
thirst	ZM	thirst, drought, fast
throat	GR I	throat, cry out, groan, scream, neck, swallow
throw, use a spear	RM II	throw, cast, use a spear
time, season	ZM II	time, season, period
tongue	LŠ	tongue, language, slander
tool, knife	SK	tool, knife, club, spoon, stick of wood, be of use
tooth, fang	ŠN IV	tooth, fang
touch	GŠ II	touch, feel, handle, body, embody
tranquility	NX	tranquility, relief, repose, quiet
transgress	XT	err, sin, do bad things
trust	ʔM II	trust, faithful, right hand, support, covenant
turn away	ŠD I	turn away, chase away, side

under	TH	under, humble, stoop
unreliable	DL	unreliable, unstable, careless, dissolute
upward	ʕL	upward, climb, exalted, world, upon, over, above, beyond
urinate	ŠN I	urinate, urine, bladder
use the feet	RG I	foot, leg, run, dance, skip, stamp, trample
voice	QL II	voice, call, recite, sound
vomit, disgorge	QY	vomit, disgorge, spew
waste	BZ	waste, squander, despicable, worthless
water	MY	water, liquid
we, us	XN	we, us
weapon	ZN	weapon, penis, tools
weep	BK II	weep, bewail, mourn
weighty	KB	thick, heavy, weighty, honor, burden, belly, liver
well, pit	BR IV	well, pit, hole, cistern
wet	LX I	wet, moist, humid, damp, lick
what, who, why	MN I	what, who, why (for what)
where, which	ʔY	where, which
white	LB III	white, moon, milk, white of egg, albino
wide, broad	RX IV	wide, broad, open area
wild animal	ʔR I	lion, rhino, mountain goat, boar, fox, hare
wild grasses	ŠB III	wild grasses
wind, scent	RX I	wind, scent, perfume, fragrance, spice
wipe, smear	MŠ I	wipe, smear, rub, anoint
womb	KR II	womb, pregnancy
work, serve	ʕB	work, do, produce, compel, serve, slave, worship
wrap, cover	KS	wrap, cover, conceal, garment
you, thou, ye	ʔT II	you, thou, ye
young	ŠĜ	young, small, insignificant

Appendix B. Reflexes of the Biradicals in the Nine Selected Languages.

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ʔB 15 father	abu: father; abbutu: patronage; abratu: populace, humanity; abbatu: stable, strong; abarrakku: steward, high state official	ʔab: father, ancestor, adviser; ʔabir: strong, brave	ʔab: father, ancestor; ʔabt: take under one's arm; ʔabu: possessor of ---	ʔab: father	ʔaba: father	ʔab: father, ancestor; ʔbr: to impress	ʔb: father, forefather	ʔab: father, ancestor, owner of; beta ʔab: family; ʔabba: religious leader; zayaʔabbi: elder, senior	ab: father, ancestor; ibr: stocky male animal, e.g., bull	C9.3 C8.2 MULTI
ʔD hear, understand	uznu: ear, wisdom, understanding, intelligence	ʔozen: ear; heʔezin: listen, hear	ʔadan: ear; ʔadina: listen, allow, permit, inform; ʔidʔan: declaration; mʔa-dun: authorized	ʔudnaʔ: ear	ʔedna: ear	ʔudna: ear	ʔyn: send a call for, summon; ʔdn: permission	ʔezn: ear	ʔudn: hear, ear; ʔidn: hearing, audience	C4.1 C8.2 MONO
ʔL good spirit	ilu: God; ellu: holy	ʔel: God; ʔalah: invoke God, curse; ʔel: strength, power; ʔul: leader, lord; ʔeloha: god; ʔelilim: idols	ʔallah: God; ʔalah: worship	ʔelah: God	ʔlaha: God	ʔlaha: a god; ʔalhia: false gods; ʔalahuta: idolatry	ʔl: God		ʔil: god, deity; ʔilbt: god of the house, dynasty	C8.2 MONO

¹⁵ This table is alphabetized using the Roman alphabet after starting with ʔ aleph and ʕ ayin.

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐎶𐎶 I mother, people	ummu: mother; 𐎶ammatu: cubit; ummanu: tribe, nation; amtu: female servant; emiqu: carer; umamtu: female animal; emeru: swollen (pregnancy)	𐤀em: mother; 𐤁umah: people, tribe; 𐤁amah: cubit, forearm (mother of the arm)	𐤁umm: mother; 𐤁ummat: tribe, nation; 𐤁amma: follow the example of; 𐤁ummi: motherly	𐤁yma𐤁: mother; 𐤁amah: cubit; 𐤁umah: tribe, nation;	𐤁emma: mother; 𐤁ama𐤁: cubit, forearm 𐤁ama: cubit, forearm; 𐤁amta: bonds-woman; ambura: umbilical cord	𐤁ma𐤁: people, nation, mother; 𐤁ama: cubit, forearm; 𐤁amta: bonds-woman; ambura: umbilical cord	𐤁mt: cubit; 𐤁mm: mother, maid servant	𐤁emm: mother; 𐤁emmexew: grandparents; 𐤁emat: cubit, forearm	𐤁um: mother; 𐤁amt: cubit; 𐤁umm-atu: nation, tribe; 𐤁amt: hand-maid; umt: family, clan	C8.2 MULTI
𐎶𐎶 II trust	imnu: right side, hand; emqu: wise, skilled	𐤁aman: support, bring up, confirm; 𐤁ama𐤁: strong, bold, courageous; yamin: right hand (used in confirming an oath); 𐤁emet: truth; 𐤁amen: verily	𐤁amina: be safe, secure, faithful; yamin: right; 𐤁imama: lead by example; 𐤁amuna: be reliable, trustworthy; 𐤁amn: safety, security; yumna: right hand, lucky	𐤁aman: trust; 𐤁amin: true, everlasting	𐤁amana: covenant; yammina: right; 𐤁min: true, eternal	𐤁amn: be firm, true; iamin: right	𐤁mn: security, protection, deposit, thank-offering; ymn: turn to the right, right hand, south	𐤁im: right direction; 𐤁amna: support, trust, have confidence, admit; 𐤁emnat: act of faith, deposit, confession	ymn: right hand; amn: faithful; am𐤁: strong; imt: truth	C8.2 C8.5 MULTI
𐎶𐎶 III if	ema: if	𐤁im: if	𐤁in: if	𐤁in: if	𐤁en: if	hin: if	hm, hmy: if	𐤁emma: if	hm: if	NON
𐎶𐎵 I, me	anaku: I	𐤁ani: I	𐤁ana: I	𐤁anah: I	𐤁ena: I	𐤁anna: I	𐤁ni: I	𐤁ana: I	𐤁ank: I	C8.2 NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐎶P nose	appu: nose, face	𐤀p: nose, face, anger; paʕah: breathing, blowing; 𐤀payim: nostrils (hence face); pu-ax: blow, breathe; 𐤀anap: snort (hence anger)	𐤀anf: nose; 𐤀anafa: pride; 𐤀anifa: humiliate, i.e., put one's nose out of joint	𐤀anp: face	𐤀p: nostrils, face, presence	𐤀anpia: face, presence	𐤀nf: front, near side	𐤀afaw: odor, scent; 𐤀afawa: breathe, blow, sigh in relief; 𐤀anf: nose, nostrils	𐤀app: nose, beak, muzzle, anger	C8.2 MULTI
𐎶R I wild animal	ariu: buck; arna: goat, mountain; arnabu: hare; arwiyu: gazelle	𐤀aryeh: lion; 𐤀arnebet: hare; 𐤀arab: lie in wait; 𐤀oreb: raven	𐤀urwiyat: ibex, mountain goat; 𐤀arʕam: white antelope; 𐤀arnab: hare	𐤀aryeh: lion; 𐤀arne-baʕ: hare	𐤀arya: lion	𐤀aradaʕ: wild ass; 𐤀aryaʕ: fierce lion; arnab: hare	𐤀ry: mountain goat; 𐤀arnab: hare	𐤀arwe: wild beast; 𐤀arwe medr: snake, serpent, dragon; 𐤀arwaya: become brutal, savage; 𐤀orna: a kind of antelope; 𐤀arna: mountain goat; 𐤀arnab: hare	𐤀nhb: hare	C8.2 MULTI
𐎶R II fertility	aritu: pregnant	harah: conceive; herayon: pregnancy; 𐤀ereṣ: earth; yarek: loins	𐤀arasa: till the land; 𐤀arṣ: earth	𐤀araʕ: earth; 𐤀arak: earth; yirkaʕ, harṣah: loins		𐤀arda: earth; 𐤀arqaʕ: earth, field		haraša: bear a child; 𐤀arara: reap, harvest	hr: conception	C8.2 C8.5 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐤠 III light	urru: light; uru: Ur (seat of moon-god worship)	ʔor: light; ʔur: flame; maʔor: luminary, lamp; zahar: be light, shining	ʔawwara: enkindle; nur: light, illu- minate, a fire; ʔanwʔar: ray of light, gleam; zahara: shine, be radiant; azhar: lumi- nous; nahr: daytime	ʔortaʔ: evening- light, moonlight, starlight; nur: fire; zhar: be light, shining	ʔwrl: blindness	yhr: shine, brighten; ʔur: arouse; ʔiber: be blind (dazzled by light); zhara: brilliance, brightness	ʔrb: sunset, west	nur: light, fire; nawwara: illuminate; ʔora: be blind; ʔirna: sun, ʔer: light	ʔar: light, shine; ʔwrt: blindness	C8.2 C8.5 MULTI
𐤠 fire	išatu: fire; ašipu: sorcerer, magician	ʔeš: fire; ʔašap: con- jurer; ʔašpot: fireplace stones, ash- heap		ʔešaʔ: fire; ʔašap: enchanter	ʔešata: fire; ʔašaf: conjurer	ʔšata: fire; ʔašp: use magical arts		ʔesat: fire; ʔesatawi: creature of fire; ʔasat- armu: moth, i.e., dinner of the fire	išt: fire	C8.2 MULTI
𐤠 basis	išku: testicle; isdu: foundation	ʔešek: tes- ticle; ʔešed: foundation, bottom; ʔašyah: sup- port (buttress); hitʔšaš: show yourself firm	ʔask: labia of the vulva; ʔasasa: establish, found		ʔeška: testicle		ʔss: base of a statue	ʔeskit: genitalia (male or female); ʔasakt: pubic hair	ušk: testicle	C2.2 C8.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐤕 I come, accom- pany	itti: with	𐤕ܐܗ: come; 𐤕ܝܬܢ: entrance	𐤕ܐܬܐ: come	𐤕ܐܬܐܗ, 𐤕ܐܬܐ𐤕: come, ac- company; 𐤕ܐܬܐܪ: place; 𐤕ܝܬܐܝ: there exists	𐤕ܐܬܐܗ: pass	𐤕ܐܬܐ: pass	𐤕ܐܬܐ𐤕: come, arrive; 𐤕ܐܬܐܪ𐤕: place, region	𐤕ܐܬܐܘܐ: come, come home	𐤕ܬܘ: pass	C8.2 MULTI
𐤕 II you, thou, ye	ܐܬܬܐ: you (ms); ܐܬܬܝ: you (fs); ܐܬܬܘܢܐ: you (mp); ܐܬܬܝܢܐ: you (fp)	𐤕ܐܬܐܗ: you (ms); 𐤕ܐܬܐ: you (fs); 𐤕ܐܬܐܡ: you (mp); 𐤕ܐܬܐܢ: you (fp)	𐤕ܐܬܐܬܐ: you (ms); 𐤕ܐܬܐܬܝ: you (fs); 𐤕ܐܬܐܬܘܢ: you (mp); 𐤕ܐܬܐܬܢܢܐ: you (fp)	𐤕ܐܬܐܬܐܗ: you (ms); 𐤕ܐܬܐܬܐ: you (fs); 𐤕ܐܬܐܬܐܢ: you (cp)	𐤕ܐܬܐ: you (cs); 𐤕ܐܬܐܬܐܢ: you (mp); 𐤕ܐܬܐܬܐܢ: you (fp)	𐤕ܐܬܐܬܐ: you (cs); 𐤕ܐܬܐܬܐܢ: you (cp)	𐤕ܐܬܐ: you (ms); 𐤕ܐܬܐ: you (fs); 𐤕ܐܬܐܡܘ: you (mp)	𐤕ܐܬܐܬܐ: you (ms); 𐤕ܐܬܐܬܐ: you (fs); 𐤕ܐܬܐܬܐܡܘ: you (mp); 𐤕ܐܬܐܬܐܢ: you (fp)	𐤕ܐܬܐ: you (cs); plural forms unknown	C8.2 NON
𐤕 X brother	ܐܠܗܐ: brother	𐤕ܐܬܐ: brother	𐤕ܐܬܐ: brother; 𐤕ܐܬܐܘܐ: brotherhood	𐤕ܐܬܐ: brother, colleague	𐤕ܐܬܐܐ: brother	𐤕ܐܬܐܐ𐤕: brother	𐤕ܐܬܐܐ: brother	𐤕ܐܬܐܐ: brother, kinsman; ܬܐܬܐܐܐ: friendship	𐤕ܐܬܐ: brother	C8.2 NON
𐤕 Y where?, which?	ܐܝܝܐܢܐ: where; ܐܝܝܐ: which	𐤕ܐܝܦܐ, 𐤕ܐܝ: 𐤕ܐܝܝܐ: where	𐤕ܐܝܢܐ: where; 𐤕ܐܝܝܐ: which		𐤕ܐܝܐܐ: where			𐤕ܐܝܐܐ: where; 𐤕ܐܝܢܐ: which	𐤕ܐܝ: where	C8.2 MULTI
𐤕 B work, serve	ܐܒܕܐ: slave; ܐܒܐܪܐܩܐ: servant, house- keeper; ܐܒܬܐ: put someone in straits	𐤕ܐܒܐܕ: work or serve (religious); 𐤕ܐܒܐܪ: produce, yield; 𐤕ܐܒܐܕ: slave, servant	𐤕ܐܒܐܕܐ: make lasting or permanent; 𐤕ܐܒܐܕ: slave; 𐤕ܐܒܐܕܐ: worship, serve, obey (God); 𐤕ܐܒܐܕܐ: bondswoman	𐤕ܐܒܐ: do, make; 𐤕ܐܒܐܐ: slave, vassal	𐤕ܐܒܐ: cause, perform; work, deed, ac- tion; 𐤕ܐܒܐܐ: produce (crop)	𐤕ܐܒܐܐ: do, work, make; 𐤕ܐܒܐܐ: work, per- formance, rite; 𐤕ܐܒܐܐ: slave	𐤕ܐܒܐܐ: exaction, compul- sion; 𐤕ܐܒܐܐ: slave, servant, client; 𐤕ܐܒܐ: enslave	𐤕ܐܐܐܐ: force someone to do something, compulsory service; 𐤕ܐܐܐܐ: make, do	𐤕ܐܐܐ: slave; servant	C8.2 C9.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐎧𐎣 prepare	edanu: fixed time, appointment	𐤀𐤐𐤕𐤁: prepare oneself, be ready; he𐤅𐤁: testify; 𐤁𐤍: one who is ready, a witness	𐤀𐤕𐤕𐤁: readiness, instrument, tool; musta𐤀𐤕𐤕𐤁: prepared, predisposed	𐤀𐤐𐤕𐤁: prepare oneself, be ready; ya𐤀𐤐𐤕𐤁: appoint	𐤀𐤕: fix an appointment; keep a feast day; 𐤀𐤕𐤍𐤕: suitable season, time	𐤀𐤕𐤁𐤎: appointment	𐤍𐤀𐤕𐤕𐤁: time, deadline; 𐤍𐤀𐤕𐤕𐤁: pledge, commitment	tadallawa: be ready, prepared; 𐤀𐤕𐤁𐤕𐤁: appoint a time, designate	𐤀𐤕: still, yet; 𐤀𐤕𐤁: set, prepare	C4.3 MULTI
𐎧𐎛 upward	elu: ascend, climb; ullu: exalted (said of the gods)	𐤀𐤕𐤁𐤕: ascend, climb; 𐤀𐤕𐤁𐤕: burnt-offering (that which goes up), stairway; 𐤀𐤕𐤕𐤕: the Most High; 𐤀𐤕𐤁𐤕, 𐤀𐤕𐤁𐤕: exult; 𐤀𐤕: up, upon; 𐤀𐤕𐤕𐤕: world, eternity	𐤀𐤕𐤕𐤕: world, creation; 𐤀𐤕𐤕𐤕: sublime, outstanding; 𐤀𐤕𐤕𐤕: height, loftiness; 𐤀𐤕𐤕𐤕: upper class; 𐤀𐤕𐤕𐤕: be high, rise	𐤀𐤕𐤕𐤕: world, eternity; 𐤀𐤕𐤕𐤕: enter; 𐤀𐤕𐤕𐤕: eternity; 𐤀𐤕𐤕𐤕: go up; 𐤀𐤕𐤕𐤕: above	𐤀𐤕𐤕𐤕: world	𐤀𐤕: on, upon, over; 𐤀𐤕𐤕𐤕, 𐤕𐤕𐤕: upwards; 𐤀𐤕𐤕𐤕: supreme, heavenly, exalted	𐤀𐤕: be exalted (deity), ascend, climb; 𐤀𐤕𐤕: world; 𐤀𐤕𐤕: burnt offering	𐤀𐤕𐤕𐤕𐤕: raise, elevate; 𐤀𐤕𐤕𐤕: world, universe, eternity; 𐤕𐤕𐤕𐤕: be superior, elevated	𐤀𐤕𐤕: eternity, universe; 𐤀𐤕𐤕: the future, tomorrow	C8.2 MULTI
𐎧𐎍 eye, source	inu: eye	𐤀𐤕𐤕: eye; 𐤕𐤕𐤕𐤕: source, spring of water	𐤀𐤕𐤕: eye, source; 𐤀𐤕: according to, on the basis of; 𐤕𐤕𐤕𐤕: meaning, import	𐤀𐤕𐤕: eye	𐤀𐤕𐤕𐤕: eye	ain: eye	𐤀𐤕𐤕: eye, spring of water	𐤀𐤕𐤕: eye, spring, source; 𐤀𐤕𐤕𐤕: contemplate, observe; 𐤀𐤕𐤕𐤕: evil eye	𐤀𐤕: eye, spring, well; 𐤀𐤕𐤕: behold	C8.2 MONO
𐎧𐎍 bird, flight		𐤀𐤕: fly (vb); 𐤀𐤕: flying creatures, birds	𐤀𐤕: circle over a thing (bird); 𐤀𐤕: omen, augury	𐤀𐤕𐤕: bird, birds	𐤀𐤕𐤕: bird, fowl			𐤀𐤕: fly; 𐤀𐤕: bird, fowl	𐤀𐤕: fly; 𐤀𐤕: bird	C8.2 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐤒𐤒 constrict		𐤒𐤓𐤁𐤕 : tie, bind; 𐤒𐤓𐤁𐤕 : bend, twist; 𐤒𐤓𐤁𐤕 : insidious, deceitful; 𐤒𐤓𐤁𐤕 : they hamstring; 𐤒𐤓𐤁𐤕 : twisted, perverted; 𐤒𐤓𐤁𐤕 : barren, uproot	𐤒𐤓𐤁𐤕 : tie, bind; 𐤒𐤓𐤁𐤕 : constricted; 𐤒𐤓𐤁𐤕 : contract; 𐤒𐤓𐤁𐤕 : entanglement; 𐤒𐤓𐤁𐤕 : tongue-tied; 𐤒𐤓𐤁𐤕 : confine, detain	𐤒𐤓𐤁𐤕 : tie, bind		𐤒𐤓𐤁𐤕 : tie, bind	𐤒𐤓𐤁𐤕 : contract, oath; 𐤒𐤓𐤁𐤕 : dam wall	𐤒𐤓𐤁𐤕 : tie, bind; 𐤒𐤓𐤁𐤕 : hinder, impede; 𐤒𐤓𐤁𐤕 : restrain, detain, confine; 𐤒𐤓𐤁𐤕 : wrap up, confine; 𐤒𐤓𐤁𐤕 : ensnare, entangle		C8.2 C3.3 MULTI
𐤒𐤒 I go away, take away	𐤒𐤒𐤁𐤕 : leave	𐤒𐤒𐤒𐤕 : complete removal (of sin and guilt); 𐤒𐤒𐤒𐤕 : leave, forsake; 𐤒𐤒𐤒𐤕 : desolation; 𐤒𐤒𐤒𐤕 : go; 𐤒𐤒𐤒𐤕 : take or seek refuge	𐤒𐤒𐤒𐤕 : be remote, absent; 𐤒𐤒𐤒𐤕 : celibate, unmarried; 𐤒𐤒𐤒𐤕 : turn away from; 𐤒𐤒𐤒𐤕 : shun; 𐤒𐤒𐤒𐤕 : isolate, segregate	𐤒𐤒𐤒𐤕 : go away, depart			𐤒𐤒𐤒𐤕 : forsake, abandon; 𐤒𐤒𐤒𐤕 : remove, postpone			C8.2 MULTI
𐤒𐤒 II strength	𐤒𐤒𐤒𐤕 : be fierce, furious; 𐤒𐤒𐤒𐤕 : strength; 𐤒𐤒𐤒𐤕 : help	𐤒𐤒𐤒𐤕 : be strong; 𐤒𐤒𐤒𐤕 : strength, might; 𐤒𐤒𐤒𐤕 : help, succor	𐤒𐤒𐤒𐤕 : be powerful, respected; 𐤒𐤒𐤒𐤕 : power	𐤒𐤒𐤒𐤕 : be strong	𐤒𐤒𐤒𐤕 : be powerful	𐤒𐤒𐤒𐤕 : strengthen	𐤒𐤒𐤒𐤕 : strengthen, invigorate; 𐤒𐤒𐤒𐤕 : establish, confirm	𐤒𐤒𐤒𐤕 : be strong, vigorous; 𐤒𐤒𐤒𐤕 : power, dominion, excellence, dignity; 𐤒𐤒𐤒𐤕 : order, command; 𐤒𐤒𐤒𐤕 : prevail, be superior	𐤒𐤒𐤒𐤕 : strong, 𐤒𐤒𐤒𐤕 : strength, army	C8.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
𐤆𐤆 hard substance	icu: tree, wood; eṣemtu: bone	עֵץ: tree, wood; עֶשֶׂם: substance, bone; עֲצָה: spine, back-bone; עֹשֶׂם: might, bones	عَظْم: bone; عَظَامَہ: majesty, pride, arrogance; عَظْل: tree trunk, foundation; عَظِیم: disaster; مُعَظَّم: sublime, ossified; مُعَظْم: major part of ...	ܐܐܝ: tree, wood	ܐܐܡ: bone	ܐܐܝ: tree, wood; ܐܐܡ: thigh, flank	ܐܐ: wood, wood-work	ܐܐܡ: bone; ܐܐܐ: tree, wood, stick, shrub, bush	ܐܐܡ: bone; ܐܐ: tree, bush	C10.3 MULTI
B- come in; in, into; entrance	bābu: gate, door; ba'u: walk along; birit: among, between; biritu: space between objects	b: in, within, among; boʔ: enter, come in; bub: be hollow; buka: emptiness; bain: interval, midst; biʔah: entrance;	baʔaʔa: evoke, call forth; munbaʔaʔa: point of origin; baʔaja: slit open; bʔab: gate	bain: between; b: in, within, among;	b: in, within, among;	babaʔ: gate, entrance	b: in; bdʔ: beginning; bhʔ: enter (sexually as well); byn: separated; binia: within	bābu: gate, door; baʔat: entry, beginning	bn: between, among	MULTI
BD scatter		bad: separation, portion; badad: be separate, isolated; lbad: alone, only; badal: separate, make a division; bazar: scatter, disperse; ʔabad: stray, be lost	badaka: tear, rend; batta: scatter, disperse; bazala: split; batt: decision; badara: sow, disseminate; mubaddir: squanderer	bdar, bzak: scatter; bydqa: breach, fissure	bzak: scatter	bzq: disperse, strew; bzz: plunder; bzl scatter; bdaq: split, keep apart, divorce; badar: scatter; bzaʔ: rend, cleave	bdd: distribute	badada: make separate, detach; bada: consecrate	bd: separation, isolation; bddy: disconnected	C9.3 C4.1 C4.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BK I first born, first fruits	bukru: first-born; bakuhu: bud, shoot	bakar: rise early; bkor: first-born; bikurim: first fruits; bkurah: first ripe fig; beker: young camel	bikr: first-born, unprecedented, virgin; bakara: be early, originate; bakir: premature, precocious; bakri: young camel	bukra: first-born	bekar: bring first fruits; bkr? : earliest, primitive	bukra: first-born	bkr: first-born	bak^wr: first-born, first-fruits; bek^wrenna: first-born right	bkr: first-born	C9.3 MONO
BK II weep	baku: weep	bakah: weep, bewail, deplore	bakiy: weep, cry; bakin: mourner; mubkin: sad, deplorable	bka? : weep, bewail	beka? : weep, lamentation	bka? : weep, mourn		bakaya: weep, mourn; tabakaya: pretend to weep	bky: weep	C6.6 MONO
BL I depleted	balu: without, without consent of; abalu: dry up; balu: come to an end	balah: grow old, consume, waste away; bal: nothing; baleh: worn out; balaq: empty out, make waste; balal: confuse; nabal: be senseless, foolish; habal: act emptily, become vain	?bala: amputate; baliya: be old, worn-out; balbala: confused; balin: shabby, decayed, obsolete	blh: wear out; bl? : worn-out clothes, rags	bela: worn-out; balbel: spoil, confuse; bl: grow old	buliana: decay, scarcity; bulbulaia: marks of wear; bura: waste; bla: worn-out; blila: idle, useless; blaita: rag, worn-out fragment	blc: render a contract invalid; bltn, blty: without	balya: grow old, be obsolete, worn out; balla: spoil, confuse	bly-m: worn-out; bly: devour	C7.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BL II master	belu: rule, exercise authority; belu: lord, master; biltu: tribute to foreign countries	baʕal: marry, have dominion over; baʕal: owner, lord,	baʕl: lord, husband, master; balad: town, village, domain; baʕala: own, possess	bʕel: lord; baʕala: owner, husband	bʕl: lord, husband, marry, own	bil 1: Bel, Jupiter; bil 2: lord, master, husband; balda: country	bʕl: lord, husband, owner, citizen; wbl: pay tribute	baʕal: owner, master, head of family; baʕla: acquire wealth, covet wealth; mabʕel: which serves to honor beʕla: marry	bʕl: master, owner, lord; bldn: country	MULTI
BN I descendant	binu ¹⁶ : son; bintu: daughter; binutu: creature, creation; maru: son, descendant, boy; martu: daughter, girl	ben: son, descendant, inhabitant; bat (< bnt): daughter	bint: daughter; ibn: son of, inhabitant of; ibn adam: human being	bat: daughter; bar: son	bar: son; bart: daughter	banunia: begetting children	brw: child, son	bent: pupil (daughter of the eye)	bn: son, bnwt: virility; bnt, bt: daughter	C7.1 MONO
BN II build	abnu: stone; banu: build, creator	ʔeben: stone; banah: build, establish; binyan: building; tabnit: pattern, figure	binʔaʕ: build, set up, structure; binyʔa: physique	baʔ: build; ʔeben: stone		ʔabna: stone; banaʔ: mason, builder	binta: dwelling; biniana: design, building	ʔabn: stone	ʔabn: stone, flint knife, stone weight	C9.3 MULTI

¹⁶ Semiticists have identified BN, BR, and MR as known variants of each other.

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BQ I sprout	baqlu: sprouted; buqlu: malt	baqaq: be luxuriant, profuse	baqala: sprout, grow plants; baqqal: greengrocer; bagga: give off in abundance		buqqala: offshoot, bud		bqy: pour forth; bql: plant, cultivated land	baq^wala: sprout, grow; baqbaqa: cultivate the soil; baqela: bean; baqala: sprout (plants)	bql: groats	C5.1 MULTI
BQ II cattle	buqaru: cattle	baqar: cattle, herd, ox	buqur: cattle, bovines; baggara: cow-hand	baqra? cattle, herd, ox	bqr: cattle, herd, ox	baqra: herd, flock; buqara: herdsman	bqr: cattle		bqr: cattle, herd of cattle	MONO
BR I choose	baru: inspect	bar: pure, clean; ?abir: be strong, brave; barah: choose; barar: separate, select out; brit: covenant; bara? create	baraza: stand out, be prominent	brar: separate, choose; barir: distinct, clear		bara? t create; brita? creature; bhr: choose	bhira: chosen, proven, tested; bhar, choose, examine; brr: make upright	barra: choose, select, separate out	brr: pure	MULTI
BR II storm	baraqu: lighten; burruqu: with flashing eyes	barad: hailstone, hail; baraq: lightning, flash	baruda: be cold; barad: hail; baraq: shine (the sky with lightning)	braq: lightning; brad: hail	barda: cold, hail; beraq: lightning	birqa? lightning; barda? cold, hail	barda: cold, hail; brq: lightning; brdm: cold	barada: be cold, covered with hail; barad: snow, hoarfrost, crystal; baraqa: flash; mabraq: lightning, thunderbolt	brq: lightning	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BR III knee	birku: knee	barak: kneel down, bless; berek: knee	baraka: kneel down, bless; rukba: knee (metathesis); sabrak: caused to kneel	berak: kneel down; birka: knee	berax: kneel down; bwrkʔ: genuflection, benediction	brk: kneel down, bless; barukata: a blesser (priest)	brk: bless; brr: pledge, oath	baraka I: kneel down, make genuflection; berk: knee; baraka II: bless, praise, worship; buruk: fortunate	brk: kneel, bless, knee, bend one's knees (give birth)	C8.5 MONO
BR IV well, pit	buru, burtu: well, pit, cistern, hole, fish pond	bʔer: well, pit, spring of water; bor: cistern	bir: well, spring, water pit; buwra: center, site, pit, abyss; bʔara: dig a well	bʔeraʔ: water place, underground water	brʔ, bʔr: well, pit	biraʔ: well, pit, hole, cavity; biriauš: store of living water	bʔr: well, pit	barbir: cistern, well, pit	brky: pool, swamp	MONO
BŠ putrid	baʔišu: smell bad; bišu: bad, malodorous; bušanu: disease with a bad smell; bušu: a stinking plant	boš: be ashamed; mabuš: pu-denda; baʔaš: stink, bad smell	baʔis: be wretched; bašiʔa: be ugly, loathsome; bašima: be disgusted, nauseated	bʔeš: putrify; bʔiš: bad, evil; bʔaš: be unpleasant	bš: be bad, evil	baʔaš: stink, be odious; bʔiš: be bad, evil	bšm: disgusting things; bus: evil-doer; bʔš: do harm, injure	baʔus: bad, vile; basbasa: decay	bʔš: stink, be odious	C2.3 MULTI
BŠ I flesh, cook	bišru: blood relation; basala: cook; bašalu: be cooked, become ripe	bašar: flesh, body; bašal: cook, boil, seethe	bašar: skin; basal: cooked meat	bsar: flesh; bašal: cook	bašel: cook, ripen, melt	bašla: cook; bisraʔ: flesh, meat	bsl: offer a burnt sacrifice; bšr: flesh	basor: flesh; mabsel: pot	bšr: flesh, meat	C2.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BŠ II dry		yabaš: be dried up, withered; yabaša: dry land, i.e., terra firma	yabisa: be dry, withered; yabasa: dry land, i.e., terra firma	yabeš: dry, yabšah: dry land	yibeš: dried up, arid; ybšn? : drought	ybs: dry up; ybsm: dry land	ybs: dry land	yabsa: be dry, arid, be withered (hand); yabs: continent; ḏabus: one with withered limbs		C2.1 MONO
BṢ egg		baišim: eggs	bayša: egg	biyṣat? : egg	byṣt? : egg	bita: egg				C10.3 NON
BT I place of	bitu: house	bayit: house, tabernacle, place of, household, family, receptacle	but: pass the night; bayt: tent, house; bet: place of	bit: pass the night; bayit: house, temple, dwelling	bat: pass the night; bayta: house	but: pass the night; bayta? : house, the earthly world; batala: householder	byt: house, family, community; but: spend the night	beta: spend the night, dwell; bet: house, room, lodging, family, generation, tribe	bt: house, temple, sanctuary	MONO
BT II sever	bataku: cut off, cut down; butturu: mutilate; bataṭu: bring to an end	šabat: put a stop to, rest; batar: cut into two; bataq: cut off, cut down; batah: steep (cut off a	batta: sever; sabata: interrupt; bataka: amputate; batara: cut off prematurely; baḏaḏa: slash open	bitra? : piece				bataka: remove, tear off; batara: cut	btt: cut	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
BṬ fail	baṭalu: miss, fail to do, cease; bitiqtu: damage, loss, deficit	baṭlu: they ceased	baṭala: void, false, invalid	bṭel: cease, be discontinued	bwṭl: infirmity, loss of vigor; bṭl: fail, come to an end; bdwl? empty chatter; bṭly? loss of time through illness	baṭla: vain, useless, futile, transitory		baṭala: useless, void, failing; baṭxa: be deaf and dumb; baṭasa: cut off		C10.3 MULTI
BZ waste	buzzu? treat unjustly; badadu: waste, squander	buz: despise	baza: subdue, despise; bazbez: waste, spread; baṣzaqa: squander, waste; bazaqa: spit out	beza: despise		biz: a demon		bazbaza: offend, despise; badwa: be desolate, a wasteland		C4.3 MULTI
DṢ know	edu: know; mudutu: knowledge	yadaṣ: know; deṣah: knowledge, opinion; madaṣ: knowledge, thought	Ṣaydaṣa: inform; madṣah: reason, motive; Ṣiddiṣa: claim, assumption; duṣiya: be named; daṣ-awa: allegation	ydaṣ: know	idaṣ: know	yda: know; mada: knowledge; intelligence; madihta: discernment, intelligence		Ṣaydeṣa: inform, declare, report	ydṣ: know	C8.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
DD beloved	dadu: favorite, darling	dod: beloved, uncle; yadid: beloved, friend; dad: breast	dada: nurse; daday: pamper, spoil; tady: breast	dad: breast; doda: love	dada: love; yadded: beloved	dada: love	wdt: loving- one, friend	dud: uncle	yadd, dd: love; ydd: beloved; td: breast; mdd: friend	MULTI
DM I blood	damu: blood	dam: blood; ?adam: humankind, man; ?adom: red; ?adamah: earth	dam: blood; damin: gory; damma: dye, tint, smear; damala, damana: fertilize	dma?: blood; admeta?: arable soil	dam, dama?: blood, blood- shed, sap of plants	dma?: blood	dmw: bleed, draw or shed blood; i'damat: soil without stones	dam: blood, sap; ?adim: leather of reddish color	dm: blood; adm: mankind	MULTI
DM II silent		damum: be or grow silent; dmamah: whisper; dumiyah: silence, resig- nation; radam: slumber; damah, dam: be dumb, silent	dama: stand still; katum: reti- cent, taciturn	damdem: lie in a stupor		dmm: come to a stop; dndm < *dmdm: be stupefied		damama: amaze, stup- ify, be dumb- founded; demam: silence; haddama: sleep, slumber	dm: be tranquil; dmm: stand still	MULTI
DN sacred law	dinu: judgment; dayyanu: judge; adannu: firm, strong	din: law, judgment; dayan: judge; ?adon: lord; ?adan: deter- mine, rule, command	din: religion, judgment; dana: be obedient, submissive; ?aday?an: The Judge; madani: to be civilized	din: justice; dayan: judge	dna?: adhere to doctrine; dyn: judge- ment, verdict; dyna?: a judge	dun: judge, have a dispute with; dina?: religion, religious law	dyn: impose a fine	dayyana: judge, sentence; dayn: judgment, damnation; doom	dyn: judge; ?dn: lord, head of house- hold	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
DP push, beat	daʔapu: push; ʔadapu: strike down; duppu: something beaten, i.e., a tablet (document)	dapaq: beat, knock; dpi: blemish, fault; nadap: push, drive away; hadap: thrust, push	dafaʕa: push; dafara: push; dafaqa: pour out, drive (beasts); dafiʕ: repellent; ʔindifaʕ: hot-headness, exuberance	dapaʔ: a board		dapiʔ: a board		daxafa: push aside, expel (metathesis); dafʕa: thrust, kick, cast away; dafara: treat with insolence; dafari: bold, audacious		C9.2 MULTI
DQ small	daqaqu: crush, make small; edaqqu: small	daq: thin, small, fine; daqaq: pulverize; doq: veil, thin curtain; dakah: crush; nidakaʔ: contrite, crushed	qʔaqa: narrow; dagga: be thin, fragile, unimportant; daggag: reduce to powder, crush; dagiʕa: grovel, cringe	dqaq: reduce to powder, crush; daqq: be small, thin	dqq: reduce to powder, crush	dqata: small pieces, dqq: reduce to powder; duq: chop, break small by blows; dqr: crush, wound		daqq: little ones, children; daqqa: grandchildren; daqiq: be thin, small; daqaqqa, damaqa: grind to powder; toqa: be constrained, compressed; daqduq: be emaciated	dq: small	C5.1 MULTI
DR I glorious	adiru: glory, magnificence	dar: pearl, alabaster resembling pearl; neʔdar: majestic, glorious; hadar: ornament, honor; ʔadir: majestic	dur: pearl; durri: brilliant star	hadar: honor, majesty	hdr: adorned, comely	duraʔ: pearl, crystal; hadraʔ: splendor, beauty		dor: pearl, divine fire; ɗarsu: precious stone	ʔdr: majestic	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
DR II path	daragu: path, lift, make high; sidaru: arrange in order	darak: tread, march; madregah: a steep place; derek: road, manner; dror: a free run, liberty; daraš: beat a path to, seek; seder: arrangement, order; sderah: row of soldiers	daraja: walk, step by step; daraq: walk rapidly; daraja: degree, grade, rank; darajah: step, stair; darija: rise in rank; darak: successful; dariba: be accustomed, trained; ṭariq: road, trail; tʔarix: history, chronicles	dargaʔ: step, stair; drak: tread, march	dirkaʔ: road, moral law	dirga: step, degree; dirkaʔ: roadway, moral or religious law; draša: teaching, doctrine; sdr: set in order		darga: rise in rank; taraxqot: apostasy; tarik: history	drk: tread upon, trample	MULTI
DR III circle	zaru: twist, turn, roll	dur: circle, ball; zer: circlet, border; zarzir: girt; ʔazar: gird; haxoderet: that which surrounds them; šazar: twist	daraʔa: turn back, repel; daraʕa: turn on one suddenly; ʕadʕar: revolve; darfil: roller	hadar: turn around	dar: the circle or revolution of the year			zora: go around, turn around; zaur: circle		C4.3 MULTI
DŠ abundance	dišu: make abundant, a herb	dašaʔ: sprout, shoot, grow green; dešeʔ: grass; dašen: abundance, fertility, be or grow fat	dasima: grow fat; dasam: grease, fat	diṭʔah, tadšeʔ: grass, vegetation			dtʔ: fresh shoots (spring-time)			C2.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
DB I flying insect	zumbu, zunbu, zubbu: fly	deborah: bee; zbub: fly; Baʿal zbub: lord of the flies (a Philistine god)	ḏubʿah: fly; ḏabḏaba: move to and fro; zunbir: hornet, wasp; ḏowbah: insect	dibaba: fly; dabartaʿ: bee	didbia: flies; zebbura, zanbura: bee	didbaʿ: fly		zenb: fly; zababa: hover, soar; zanbir: hornet, wasp		C4.1 MULTI
DL unreliable	dalhu: unstable, confused; zilullu: vagrant, tramp	zalal: be frivolous, wanton	ḏahala: be unmindful; ḏalla: be base		zal, zll: slacken, be less, be licentious; dlx: fouled, turbid, blurred; zlg: contemptible, despised	zll: be of light weight, despised; dhl: timid, afraid; dalil: uneasiness	dll: be humbled, abased, ravaged	nezehlul: be careless, immoral, sluggish; manzahlel: lazy, glutton; zaxala: be corrupted (metathesis?); zll: be stupid; ʿizeluf: inconstant, unsteady	dl̥t: weakness, poverty	C4.1 MULTI
DN rear	zimbatu: animal tail, tail end of army	zanab: tail, stump; zanax: reject, spurn	ḏanab: tail, appendage, follower; miḏnab: sinner; ḏanayi: reject, spurn	danbaʿ: tail	dunba, dubbeta: tail	zinibta, dinibta: tail; din-baiia: final, concluding; dunda: penis	ḏnb: clients (followers)	zanab: tail, anus; dannasa: defile, pollute	ḏnb: tail, anus	C4.1 C7.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
DR extend	zeru: seed, (male) progeny; zaramu: over-whelm; dura?u: foreleg, arm	zarah: scatter, winnow; zara? : sow, scatter seed; zaram: pour forth in floods; zirmah: semen; zera? : seed, offspring; pizer: scatter; zro?a: arm; zro?ot: arms, forces	ḏara?a, zara?a: sow, seed, create; bizra? : seed; daraw: disperse, blow away; ḏir?a: forearm; ḏar? : power, ability	dra? , zra? : sow; dra?a: forearm; ?dra?a: arm, might; zera?on: seed	zera? : sow, seed, grain; bedar: strew, scatter; dra?a: forearm	zra: sow; dra: forearm; bazra? : seed, sowing time; maruta: seed, semen, sowing	mdr? : seed time, sowing, plant	zar?a: sow, scatter seed; zar? : seed, sperm, offspring, race, lineage; bezr: seed; mazra?t: arm, shoulder (of an animal), sleeve, strength; zarawa: scatter		C4.1 MULTI
DX creep		zaxal: crawl, be afraid	ḏaxaga: drag on the ground; zaxala: withdraw (humble oneself); zahafa: creep, crawl	zxa: crawl, fear			zxl: with-draw, humble oneself	dexka: creep, crawl, limp; daxla: be defeated		C4.1 C8.3 MULTI
GB I curved part	gabbu: part of human or animal body; asqubbitu: hump of cattle, camel	gab: back, anything curved; giben: hump-backed; gabaxat: bald forehead	ja?ib: breast, bosom, heart, hollow, cavity	gaba? : swell up; gabbah: side; gbi?a: hump-backed	gaban: coagulate; gabbah: side; gabiba: hump-backed; gbb: bend, curve	ganba, gamba: side; gbb: bend, curve; guba: body	gub: bend, curve	gabo: side, flank, rib; gabbaba: be bent	gb: back, spine, body; gbtt: hump, fleshy part of back	C6.1 C9.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
GB II pile high	gabbu: entirety, totality; gab'u: peak, hill	gaboah: be high, exalted; gibʿah: hill; gabhut: haughtiness; gabšušit: height, hill	jabaʔ: gather, collect; jebel: mountain	gabeš: heap up; gbaʔ: collect	gb: side, hump of a camel		gbl: hill country; gabnia: hump, mountain crest	gabasa: gather (straw, wood); gabbaba: gather	gbl: summit, mount; gbʿ: hill, peak, height	C6.1 C9.1 MULTI
GB III powerful	gaparu: surpass; gapru: strong; gabašu: be massive; kabaru: be great, mighty; kabru: huge	gabar: be strong, prevail; geber: man; gbir: a lord	jabara: force to submit; jabr: powerful man; jabbar: one who is bold, a colossus, tyrant; jabaha: show a bold front; kabura: be great (in body, rank, or age); kabyr: noble, great	gburah: power; gbar: man; gibar: strong man	gabber: prevail; gbr: man, strong man, husband; gbrwt: manhood, virile member	gbr: prevail, be strong ; gabraʔ: man; gabaraʔ: hero, giant; gubarutaʔ: virility, manhood; gabil: sculptor	gabar-uta: strength, virility, male organ; gabir: mighty; gabra: man; kbrn: tribal leader	gabra: do, work, manufacture; magbar: tool; gabbar: laborer, one who pays taxes; kbr: be honored, magnificent		C6.1 C9.1 MULTI
GD I cut	gadamu: cut off hair	gadaʕ: lop off; gdud: furrow, cutting; gadar: wall off; gidep: blasphemy, insult; gazit: cutting; gazaz: shear; gazar: tear away, rob; gazar: cut, circumcise; guz: pass away	jadama: cut, cut off; jadam: dwarf; jazala: cut off; jazama: cut; jazza: cut; jadaʕa: amputate	gdad: cut off; gzah: cut, sever; gzaz: shear; gzaʔ: cut off; gzz: circumcision; gdd: cut down	gdy: concede; gedam: cut down; gezam: cut off	gadupa: blasphemy; gdd: cut off; gdm: cut down; gazumaʔ: cut off, threaten; gzz: sentence, circumcise; agzara: banishment	gzz: cut, harvest; gzm: cut to pieces, destroy an enemy; gzʕ: cut down, hew wood	gʷadʔa: strike, crush; gadafa: discard, reject; gadami: scissors; gʷadala: lack, be incomplete; magzaʔ: saw; gazara: circumcise; gazza: split, cleave asunder	gdrt: hedge, fence; gzz: shear	C6.1 C3.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
GD II grow big		gadal: grow, become great; migdal: tower; nagad: be conspicuous; nagid: leader	najada: conquer, overcome	ngad: lead	gdš: heap up	gdl: grow, become great; gadaʔ: fortune, success; gadana: auspicious, divine		gadala: strive; gadl: combat, spiritual fight	gdl: big	C6.1 MULTI
GL I roll	gararu: roll, twist; garu: round; aggulu: sickle, axe	gal: wave, billow; galal: roll; galgal: wheel, whirlwind; gulgolet: skull; mgilah: scroll of writing; gilah: circuit; ʔagil: earring ʔagalla: wheeled wagon	jala: go around, circle; mingal: scythe, sickle	magglāʔ: sickle	glm: encompass, roll up	glala: something rounded; glapa: inset of a ring; gll (grgl): roll, curl up; glm: encompass, roll up	gyl: course, period	gargar: spin, roll; gergel: wheel; kallala: encircle; kolala: roll, make dizzy; saragalla: wheel, cart		C6.1 C7.1 MULTI
GL II skin	giladu: animal hide, skin; gallabu: barber, shave	geled: human skin; galax: be bald, shave; galaʔ: expose, lay bare; galab: barber; gilah: uncover, lay bare	jilad: skin, hide, piece of leather; ǧulfah: foreskin; ǧalihah: bald	gildaʔ: skin	geldaʔ: fur, skin; galduna: foreskin	gilda: testicle, leather		gallada: cover over, cover with hide; gallawa, gallasa: cover with leather		C6.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
GN enclosure	gannatu , gannu : garden; gananu : encircle, shut in; gunu : store- room	gan : enclosure, garden; gan- zak , gnazim : treasury ganan : cover, surround, de- fend; ganah : garden; magen : shield; mginah : cov- ering of the heart, i.e., obstinacy	ʔḡann : lux- uriant (of a garden); janaza : cover up, hide, veil; janna : garden, paradise	gintaʔ : (fenced-in) garden; gnaz : be hidden	gntʔ : a sheltered place, garden; gnz : hidden, occult	ginaia : gardener, dealer in vegetables; ginta : garden; gininia : covered, hidden things	gnt : cover	gannat : garden, the garden of Eden, paradise	gn : garden	C6.1 MULTI
GR I throat	karkara : rumbling noise; ganguritu : throat, tonsils; rigamu : shout (met- athesis); xarurtu : throat	garon : neck, throat; gargeret : neck	jawr : throat; jarjara : gargling, rum- bling; jiraʔn : neck, throat of a camel; jaraʕa : swallow, gulp down; gar : palate; jariḏa : choke, swallow saliva		gaggar- ta : throat; ʕrʕr : gargle, clean teeth, mouth	gargartaʔ : throat; gangarata : throat, ton- sils; gurgma , ganguritu : gullet		nagara : speak; qʷrqʷr : grumble, mumble; kʷerkʷer : commotion, shouting; gʷarʕe : neck, throat, palate		C6.1 C3.3 MULTI
GR II sojourner	geru : become hostile, attack, be at war with	ger : stranger, sojourner; garaš : drive out, cast out; gur : sojourn	jaʔr : neighbor; jarra : drag; hajara : forsake, leave off, emigrate; mahjar : refuge, sanc- tuary; hijrah : The Hegira	graš : : drive out, cast out	giyura : alien		gwr : sojourn, become a protégé, visit; gwrhw : partner, co-owner	gar : neighbor; tagawara : dwell together in a neighborly way, live in the vicinity	gr : pro- tected, guest, foreigner, take refuge	C6.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
GR III scrape	garabu: itch, scab	garad: scratch, scrape; garab: itch, scab; goren: threshing floor; garzen: axe	jarada: peel or strip off bark; jarabb: scab, itch; ġirn: threshing floor; ġarama: scrape meat from a bone	grad: scratch, scrape; garboʔ: itch, scab	grad: scrape off	grida: scraped; grr: scraper; grp: scrape clean		qarada: shear, cut away; garada: remove chaff; g^wern: threshing floor; garaza: cut	grn: threshing floor	C6.1 MULTI
GR IV plains, fields	ugaru: open field	ʔagar: gather food	garax: land without vegetation		ʔqwršʔ: land, field			garha: field, arable land	ugarit: plains; ʔugr: fields	MULTI
GŠ I excite	ragašu: be excited; guštu: a whirling dance	ragaš: be in tumult, excitement; ragaz: be agitated, perturbed	jasara: boldness, recklessness; jašu: be excited, agitated, rage, storm; jaʔaša: be agitated, convulsed	rgaz: tremble, rage; rgaš: be disturbed, in tumult	rgš: be in an uproar; gsr: howl, bellow	rgaza: excited, irritable, raging		(ʔan)gašgaša: agitate, excite, set in motion		C2.5 MULTI
GŠ II touch		gišeš: feel with the hand, stroke	jassa: stroke, touch, palpate, examine by touch; jasad: body; jasuma: make corporeal, embody	gšaš: stroke, touch	gš: handle, touch, gšx: rub, graze the skin; gšp: touch, come into contact with, handle	gišuma: body, embodiment; gšš: feel, make contact with, touch (bottom)		gasasa: touch, feel, handle		C2.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
GM mist	imbaru: fog, mist	ʕamam: dim, obscure	ḡama: cloudy, foggy; ḡamma: veil, conceal; ḡamuḡa : be obscure, con- cealed		ʕayma: mist, fog, cloud; ʕmṭ: cloud over; ʕmmʔ: spurious	gmama: partial eclipse; ʕuma: obscure, darken		gime: fog, cloud, mist, vapor	ʕmm: be covered, dark	C6.5 MULTI
HB give	habatu: loan interest-free	yahab: give; yhab: lot (what is given); habhab: gift	wahaba: give; mauhiba: talent; hibah: gift; habwa: gift	yhab: give	yhb: give, promise, devote oneself	ʔahaba: presenta- tion, giving; yhab: give, bestow, permit; hbata: gifts	whbw: give, give as hos- tages	wahaba: give; habhab: reward, gift; habt: gift, donation		C9.1 MULTI
HL praise, rejoice	alalu: rejoice, shout for joy; xalalu: pipe, emit sound	halal: be boastful, praise; t-hilah: song of praise; hilul: praise, rejoicing	halu: shout in joy or terror; tahaluk: enthusiasm, zeal, ardor; halwasa: vision, hallu- cination; hallala: praise, celebrate	hilulaʔ: marriage song; hallel: praise	hll: praise; hale- luyaʔ: psalms begining with “praise the lord”; hallel: rejoice	hilula: wedding festivity, rejoicing; hll: purify, praise, celebrate, exalt		halleluya: praise God; tahalala: jubilate, utter cries of joy; xalaya: celebrate with songs	hll: shouting	MULTI
HN here	inanna: now	hen, hineh: here, behold; henah: hither	ʔinna: behold; huna: here	haʔ: behold		hin: behold		nahu: behold		NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
HB love	hababu: caress; habu: love	xabab: love, embrace; xob: bosom; ʔahab: love; xabaq: clasp, embrace; xaberet: con- sort	habba: love; habib: friend; habad: approve, think well of; hab- ara: gladden; habila: be or make pregnant	xabeb: love; xubaʔ: bosom; habb: be loved; xabar: friend	xab: burn fiercely; xabab: beloved, dear, cherished		hbb: love; hbl: bond, alliance; hbr: ally with	maxbub: loved; xabib: friend; taxababa: be in love;		C8.1 MULTI
HD I one	wedu: single, soli- tary; edutu: isolation; edumanu: single (with- out any family)	ʔexad: one; yaxad: become united; yaxid: only one	wahada: be alone, unique; hida: isolated, secluded; wahid: one, unique; wahda: unity; ʔahada: unify, unite; ʔahad: some- one, anyone	xad: one; yaxid: unite	xad: one; kdz: yoke, join, couple	ʔaxda: one; ʔalixda, laxadaʔ: unique; xda: one, single; lhud: alone	whd: one, single; kwhd: in unison	ʔaxad: unit, unique; ʔaxadu: one, same, certain one; waxada: unite; xeduʔ: be small in number	ʔxd: one; yxd: only son, person without kin	C8.1 MULTI
HD II new	edešu: be new, renew	xiddeš: renew, repair; xodeš: month, new moon	hadīṭa: be new; hadīt: report, gossip; hadaṭa: youthfulness; hadw: insti- gate, induce; hadaṭ: novelty, innovation; hadīṭa: sur- mise, guess	xadat: new; xaddit: renew	xaddet: make new	xadta: be new	hdṭ: renew, repair; hdṭtn: event (usually a disaster)	xaddasa: restore, repair, renovate; xaddis: new, recent; xaddes: excellent	xdṭ: renew oneself, new, recent, new moon	C8.1 MONO
HD III sharp	uddudu: sharpen	xadad: be sharp, keen; xad: sharp; xadah: be or grow sharp; xedek: briar	hadd: be sharp, sharpen, shrill, a blade; hidda: stridency, fury, wrath	xdad: sharp, keen; xudtaʔ: riddle, pointed remark; xaday: be pierced with joy	hdm: dismem- ber	xada: limit, frontier; kudarat: partial eclipse of the moon; kudka: boundary stone			hdy: lacerate oneself	C8.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
HL not fully aware	halu: grief, sickness	xalam: dream; xala? : be sick, diseased; xalah: be sick, weak; xalaš: be weak, prostrate; xelkah: hapless, unfortunate	halama: dream, attain puberty (by nocturnal emission); mahlul: weakened, exhausted; halik: gloomy, murky; hulm: a vision	xalam: dream; xalaš: be weak, prostrate	xelam: dream; xalaša? : frail, weak, miserable	xilma, hilma: dream	hlm: dream; hlz: be sick, suffer from a disease	xalama: dream; taxalma: see visions; xelpapa: be sick; zaxul: weak; zahlala: grow weak, be sluggish	xlm: dream	C8.1 MULTI
HM hot, inflamed	ememu: be warm, hot, run a temperature; imtu: venom; emmu: fuel, hot cinders	xamam: be or grow warm; xamar: become agitated, inflamed; yaxem: be hot with anger or desire, conceive; xamas: do violence; milxamah: war; xomeš: be ruthless; xamad: desire; xamah: heat, sun; kamar: be or grow hot	hamma: heat; hummah: fever; hammam: bath-house; hamim: close, intimate; humr: red, bloody, excited; hamas: zeal; hamaza: burn the tongue while tasting; hamaša: infuriate; hamw: heat rash; hamiya: passion; humam: lava, embers; tahammus: fanaticism	šaxam: burn to brownness; xemah: wrath; nxam: show warm feelings; xemata: rage, venom; xamam: heat; xamad: desire; kmar: be or grow hot	xm: heated, glowing, fervent, violent; xm? : grow faint with heat; xmt? : anger	šxm: be red-hot, blush; šxn: be inflamed by passion, have ulcers; hamida: hot passion; hamima: feverish, incensed	hmr: ejaculation of semen	xemud: burnt to ashes; xamama: have a fever, be afflicted; xename: passion, disaster; zaxma: be warm, hot; šammaḏa: harm, do violence; xamz: rage, venom, gall, poison; xamaya: curse, revile	xm: heat; xmt: venom; xmxmt: ardor	C8.1 C8.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
HR I taboo	haramu: separate; haradu: tremble	xarad: tremble, be terrified; hexrim: ban, exterminate (enemies of god); xeraf: reproach due to disgrace; xarṭom: magician; diviner; xereš: magic art; xermon: sacred mountain; xarag: quake	haruma: be prohibited, sacred, unlawful; harʔam: mosque interior; harumat: woman, lady, wife; harija: be forbidden, confined; māhrus: safeguarded, protected by God	ʔaxarim: excommunicate; set apart for temple use; xaraš: magician	ʔaxrem: interdict, separate from ordinary use, devote to god; xrm: excommunicated; xarra-ša ʔ: magician	hrm: ban, curse; haršin: enchantment, magic; hrš: forbid, prevent, prohibit	hrm: sacred, taboo; sanctuary; hrf: distort, falsify; thrbn: visions while in temple; hrdn: altar for sacrifices	xarama: prohibit from common use; consecrate to god, consider unlawful; xarasa: practice sorcery; xermat: ceremony, rite, anathema; texremt: abstinence, vow	xtrš: work magic; xarm-anu: sacred place; xarimu: desecrated	C8.1 MULTI
HR II sow, cultivate	erešu: sow, cultivate; harauzzuh-lu: agriculture worker; harbu: plow; errešutu: rent a field for cultivation	xaraš: plow; xorep: harvest time; maxarešet: plowshare	harata: plow, cultivate; hury: granary	xrt: plow, till the land	xarat: dig out, furrow; krb: plow, till the soil	hrt: dig out; krabaʔ: plowed or tilled field	hyr: plain, level, cultivated land; hrt: plowed field	xarasa: plow, cultivate the soil; karmel: plantation; garden-land	xrt: cultivate a field, plow, till the land; alp xrt: work ox	C8.1 MULTI
HR III carve, cut into, shape	harašu: incise, break off; harapu: cut away; haradu: fit together, fabricate	xarat: engrave; xereṭ: engraving tool; xaraš: cut into, engrave	xaraša: scratch, lacerate; haraṭa: turn, lathe, shape with a lathe	xaraš: cut into	xarat: scrape, scratch			haraša: carve, engrave, incise; harawa: pierce, carve, engrave	xrṣ: cut, bite; xrš: artisan, craftsman, builder	C8.1 C10.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
HS lacking	hasaru: break off	xasar: lack, be in need of, decrease; xasal: finish off, consume; maxsor: need, poverty; xašap: strip off, make bare; xašak: withhold	hasira: loss, suffer loss; hasara: remove, strip off; hasama: sever, chop off; hasir: unveiled woman	xasir: lack, wanting, deficient; xassir: lessen, deprive; xasal: come to an end	xesar: decrease, be in want, confiscation; xsd? : disgrace	xsr: lack, be defective	hšr: social class of indigents	hasra: be humbled, reduced to poverty, be depleted (land); hasar: misery, disgrace; hašša: be deficient, be inferior; haswenna: helplessness		C8.1 MULTI
HŠ press, squeeze	halasu: press for payment, squeeze out (metathesis)	laxaš: press, squeeze, oppress; naxuš: press oneself, be urgent; xašer: courtyard, enclosure	lahāša: squeeze, oppress; hašara: surround, restrain; hašuna: be inaccessible, be chaste; hišn: fortress	xšap: urgent		hal?aša? : torture	hšn: fortress; hšr: enclosing wall, enclosed lands	xešn: fortress; xašara: enclose with a fence, besiege		C8.1 C10.3 MULTI
HŠ I perceive	hasasu: remember; ašašu: become disturbed, worried; kašapu: think	xašab: think, account for; xašak: grow dark; xošek: darkness, obscurity; xašeq: feel love, desire; laxaš: charm, whisper; xišabon: creation, invention	hasiba: think; hasaba: count, calculate; hass: sensation, perception; has?asi: allergic; lahāza: perceive, observe	xašab: think, account for	xešab: think, believe, intend; šs: feel emotion; xšš? : feeling pain	hšb: think; huš: intelligence, understanding; hušba: plot, scheme, evil thoughts; hšš: feel; hušbana? : plan, calculation, counting		xasaba: think, believe, estimate; xassab: account; maxassab: astronomer; xassawa: be deceitful	hss: remember	C2.2 C8.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
HS II search	hašahu: desire, need	gišeš: explore, fathom; mašaš: feel, grope		gišeš: explore, fathom; mšaš: feel, grope	xašah: be needed	kšaša: investigation, exploration		xatata: search, inquire, question; hašaša: seek, explore, investigate; basasa: spy, investigate		C8.6 MULTI
KB weighty	kabtu: difficult; kabatu: become honored; kabadu: grow or be heavy; kabtu: fat, painful, serious; kabaru: become fat, heavy; gabidu: liver	kabed: heavy, hard, important; kabod: honor; kabed: liver (the heavy organ); kabar: be much, many; kabaš: oppress, subdue; kbudah: abundance, riches	kabada: afflict, weigh down; kabid: large, thick in the middle; kubud: liver (the heavy organ); kabara: be great, important; kabru: noble, aged; kubur: grave offense; kabasa: press; kabata: crush, subdue; kabkaba: overturn	kabatu: heavy; kabadu: honor; kabda? liver; kbaš: press, oppress	kbš: subdue, conquer, tread under foot; kbz? liver (seat of anger, gall); mk?b? suffering	?akabir: people of rank	k?b: buttress of a dam; kbr: enlarge, behave haughtily, abundance; kbd: gifts of honor	kabda: be heavy, be a burden, harden (the heart), be severe (sickness); kabd: liver, stomach, belly; kabra: be honored, glorious, magnificent, precious; kabata: degrade, humiliate	kbd: heavy; kabidu: liver; tkbd: honor (consider heavy)	C9.3 MULTI
KK star	kakkabu: star	kokab: star	kawkab: star	kokba? star	kwkb? star, planet, comet, Venus; kwkb?g: Jupiter	kukba: star		kokab: star	kbkb: star	C9.3 C6.6 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
KL I consume	akalu: bread; kalalu: complete; ukullu: fodder, food supply; kalu: put an end to	ʔakal: eat, consume, destroy; kalil: entire, whole; kalah: complete annihilation; kalal: be complete, perfect; yakol: be able, have power; kol: all; niklam: be humiliated	kal: all, every, entirety; ʔakala: eat; kulliya: integrity, wholeness; kalaza: gather; kaliba: be seized with madness; kalla: be exhausted	ʔakal: eat, consume; šaklal: complete; ykil: be able, have power	ʔexal: eat; šaklal: complete; kl: all, the whole; kwill: martyrdom	ʔakal I: devour, absorb; ʔakal II: complete, endure; klula: paragon, perfection; kališ: entirely; kll: come to an end, die; klš: complete, absolve	ʔkl: grain crops; eat, devour, absorb; kll: all	ʔakala: be sufficient; ʔekl: food, bread, fodder, produce of the fields; kʷell: all, each; kʷellantawit: the whole person; kʷellawi: universal	kkl: every, all; klkl: everything; nkly: annihilate	C6.6 C3.3 MULTI
KL II restrain	kalu: surround, restrain; kallatu: closed bridal chamber	kalaʔ: shut up, restrain; klub: cage; kalah: bride (one closed in or reserved for her husband), be complete, at an end; kul: contain; keleʔ: imprisonment; miklal: perfection, completion	kalaʕ: protect; takalluf: constraint, unnaturalness; mutakallaf: false, artificial, affected; kʔalaha: stern, austere, somber	klaʕ: surround, restrain	kelaʔ: withhold; prohibit; kltʔ: bride	kla: hold back, withhold;	kll: bring to completion, give in marriage	kalʕa: hinder, forbid, restrain; kalkala: hinder, prohibit; kallala: surround for protection; kalsasa: bind sheaves; kaltafa, kaltexa: bind	kallat: bride	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
KN establish	kanaku: seal; kanu: true, honest, correct; kinu: loyal, correct; kunnu: establish, fix; kanu: justify	ken: yes, so, thus; ʔaken: surely, indeed; konen: establish; taken: estimate, regulate; kanah: give a title to; ken: base, pedestal; tagan: become straight	kʔana: exist, be; kanah: investigate, understand completely; kunh: core, essence; makʔan: place; takawwana (min): consist of; makuna: have influence; kunnʔaša: principles; tam-akkun: power, authority	ken: so, thus; knaʔ: give a title to	kn: be, exist, be by nature; kwn: upright, correct, reform; knʔ: natural disposition	kan: be; kiana: nature, essence	ken: thus; kyn: be; wkn: establish; kyn: be	kona: exist, happen; kʷannana: regulate, govern; kon: sufficiency; kawin: being, nature; takʷannani: punished; makan: place	kn: so, thus; be stable, have; ykn: be, be firm; qny: establish, create; skn: stele, monument; tkn: fix	C6.6 C6.7 MULTI
KP bend	sakapu: topple over, overthrow; kapapu: bend, oppress; kipu: bow down; kappu: wing	kapal: double over; kapap: be bent, bowed; hikpiš: made cower; kanap: wing	kiflu: the double; kafal: buttocks; kafasa: have bent feet	kpap: bend; kpāl: fold over; kpan: writhe in hunger; ktap: bend oneself	qpsʔ: inner bend of a knee joint; kpp: bow, bend, curve	ʔpp, ʔpp: fold over, bend; kanpa: wing; kīpa: arched; kapla: buttocks; kefel: doubling		nakaba: bend, fold; kenf: wing	kpl: double; knp: wing	C7.2 C9.2 MULTI
KRI round	karšu: belly; kakkaru: round loaf of bread, round metal disk	mkurbal: girded, clothed; kareš: belly; kikar: round loaf of bread	kariš: belly; karkar: turn around; kura: ball	krax: surround, wrap round; karšaʔ: belly	krax: surround, wrap round; karša: belly, paunch			karś: belly, interior of a ship; nakʷarkʷar: rotation, whirlpool		C3.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
KR II womb	eru: conceive; karasu: womb, pregnancy, uterus	harah: conceive	kariš: womb, uterus, pregnancy		krs: womb	karsa: womb, uterus, pregnancy		karś: womb	hry: conceive	C5.2 MONO
KS wrap, cover	kasu: cover over; rak-asu: wrap up, kusitu: robe; kusa: algae (sea covering); kusiqu, kusummu: garment	kisah: cover, hide	Al- Kiawah: covering at the Ka'aba; ksw: dress, clothe; kasafa: eclipse; kašaṭa: remove a covering	ksaʔ: cover, hide	ksʔ: cover, veil, conceal, keep secret; kswtʔ: that which is unseen	kasia: hidden, concealed, occult; kisiaia: hypocrite	kśw: clothes, garments		ksy: cover, put on; kst: a type of robe or cloak	MULTI
KT shoulder	katappatu: part of ribs; kittu: a support; kutallu: back, supporter	katep: shoulder, shoulder blade	kitf: shoulder	kitpaʔ: shoulder	ktp: shoulder, shoulder blade	kadpa: shoulder		matkaf: shoulder (metathesis)	ktp: shoulder, shoulder blade	C9.2 MONO
Lʔ negation	la, ul: not	ʔelul: be nothing; ʔelil: false, vanity (hence false god, idol); loʔ: not; ʔal: do not!	la, lam: not	laʔ: not; ʔal: do not!				ʔalbo: not, nothing	l-: not	NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
LB I inner essence	libbu: heart, mind, center	leb: heart, conscience, mind; lebab: mind, will, heart; libab: encourage; in the midst, center	lubb: heart, essence, mind, prime, core; qalb: heart; labib: intelligent, understanding; labaq: cleverness, slyness	libba: heart; lablab: be courageous	lebba: heart; lbk: encourage, inspirit	liba: heart; lub: pulp, core of fruit	lb ʔ: lion; lbb: heart	lebb: heart, mind, understanding; labbaba: understand, be intelligent; labbawa: perceive, be clever	lb: heart	C9.3 MULTI
LB II attire	labašu: wear, get dressed; labatu: a kind of wool; lubaru: garment, outfit; lubbušu: “clothed,” said of unsheared sheep	labaš: wear, get dressed	labisa: wear, get dressed, line, inlay; libsa: costume; gilbab: garment; labbisa: make obscure; talbis: deceit, fraud; mulabasa: surroundings, environment	lbaiš: wear, get dressed	libes: wear, get dressed	lbš: clothe, assume, array; lbuša: garment, covering; malbuša: slough of a snake	lbs: wear a garment	labsa: wear, clothe; talabasa: disguise oneself; labaṭa: overlay with a coating; lebd: horse blanket; labada: plug, cover with a coating	lbš: wear, get dressed; lpš: garment	C9.3 MULTI
LB III white	alibu: milk	laban: white; lbanah: moon; lbonah: frankincense (white); xalab: milk; liban: make white, cleanse, purify; lbenah: brick, tile (white)	laban: milk; luban: frankincense; labanʔat: lactate; labʔan: breast; halib: fresh milk; liban: nursing; xalaba: milk an animal; libna: a cheese; libn: unburnt bricks	xalbaʔ: milk		halba: milk; halbania: milky-white waters; hilibuna: the white of an egg; lbina: white, gleaming	lbn: frankincense plantation	xalaba: milk	xlb: milk, cheese	C9.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
LD birth, child	waladu: give birth, beget; wildu: offspring (human or animals)	yalaḏ: give birth, beget; yeleḏ: child; leḏa: child-birth; yaldā: marriageable girl; moledet: kindred; tol-dot: generations, families	walada: give birth, beget; walad: son; wilad: parent; lida: contemporary in age; wallada: fruitful, fertile	yled: give birth	iled: child	ydl: bear a child (probable metathesis)	wld: bear a child; tlḏn: be born; beget, child; mwld: child-birth, delivery	walada: give birth; wald: son; walatt: daughter; mawaldit: midwife	wld: child; yld: bear a child	C3.1 MONO
LH flame	laḏbu: contagious fever	lahab: flame, flashing point of spear; lahat: flame, blaze up; šalhebet: flame	lahiba: flame; šalheb: inflame; lṣaha: shine, gleam, flash	lahaba, šalhobita: flame	šalheb: flame			lahaba: blaze, flame; lahama: burn, flame		C8.4 MULTI
LK go, send	alaku: go, act, move; halaqu: escape; alaktu: road	halak: come, go, walk; malʔak: angel, messenger	salaka: travel, follow a road	halak: walk; mlak: advice; malʔak: angel, messenger; šlak: send	halak: go, walk, travel; slq: go up		hlk: go along, conform	laʔaka: commission, send; malʔak: angel; mlak: messenger; salaka: walk	lk: send; hlk: course	C6.6 MULTI
LL night	liliatu: night	layil, lailah: night	layl: night	laylaʔ: night	lelya: night		lwl: nights; lyl: night-time; lly: night	lelit: night	ll: night	MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
LQ take	lequ: take, take along, marry; laqahu: take; laqatu: glean, gather	laqax: get, take, take in marriage; leqax: learning (what is received); malqo-ax: booty, jaw (receiving food); laqat: pick up, glean; leqeš: take everything	laqaxa: concieve, impregnate; laqh: seed, sperm, pollen; leqaṭa: collect, glean; laqifa: seize quickly, rob, usurp; laqima: devour, gobble; laqina: infer, grasp	lqx: take			lqx: take, arrest, seize	leqqaxa: lend	lqx: take, collect, grasp, marry	C5.1 MULTI
LŠ tongue	lašu: taste, lick; lišanu: tongue	lašon: tongue, language; lašan: slander	lišʔan: tongue; lasina: to be eloquent	lišan: tongue	leššanu: tongue	lišana: tongue	lsn: tongue, calumny	lessan: tongue, language	lašanu: tongue	C2.2 MONO
LX I wet	saluhu: sprinkle water; leku: lick up	laxak lick; lax: moist, fresh	laxsa: lick up; mezelah: vessel for drawing water	lxak: lick; laxlax: moisten thoroughly	lx: moisture; zelah: pour out (water); laxlax: moisture			laxlexa: be humid, damp; laxasa: parched with thirst, lick; melxas: tongue; lasxa: saliva; zelha: drain all liquid from a vessel; salihot: ointment	lx: moisten, provide drink; lxx: lick	C8.3 MULTI
LX II fight		laxam: fight, do battle; milxama: battle, war; laxaš: oppression, distress	laxy: abuse, revile; laxbaṭa: turmoil, disorder; malxama: bloody fight, slaughter, massacre				lxy: dispute, quarrel, brawl	laxasa: be chased away; malha: eliminate, eradicate; laxama: be strong, severe (disease)	lxm: fight against someone	C8.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
LX III sustenance	lemu , laʔamu : feed; lahamu : brew beer	lexem : bread, food; laham : swallow greedily; laxam : eat	laxm : meat, flesh; laxim : corpulent, carnivorous; laxasa : devour; laxima : swallow greedily; laqima : eat, swallow up	laxmaʔ : bread	laxma : bread	lhm : gather for atacking, threaten		laqama : chew on bread which is hard and makes noise when it is eaten; lhq : a basket for food	lxm : eat, food, bread	C8.3 C6.4 MULTI
MD learn	lamadu : compre- hend, learn; madadu : measure	lamad : learn; limud : taught, accustomed; talmid : scho- lar; malmed : ox-goad; madad : measure	tilmid : student; madrassa : school; mudd : a corn measure	lmad : learn; talmida : scholar; midah : measure, rule	lammed : accus- tomed		mdd : a period of time	lamada : be accustomed to, be trained, learn; talmid : disciple; lemad : custom, usage; maṭṭana : measure out, estimate; maṭan : dimension	lmd : learn	C10.3 MULTI
ML I pos- sessing	malaku : counsel, advise; malku : prince; malu : full	malax : coun- sel, advise; melex : king; molex : (Molech) a sacrificial god; mamlaxa : kingdom; maleʔ : be full, fill; miluʔ : setting, installation	malaka : take possession, own; malik : king; maliʔa : be full; ʔakmal : be complete; milk : wealth, estate, chattels	mlax : rule; malkaʔ : king; mlaʔ : be full, fill	mlax : rule; malka : king; mela : be full	mlk : rule, malka : king; mla : be full; mala : prop- erty, wealth; malia : abundance	mlʔ : fill, complete, period; mlykym : royal, be- longing to the king; mlk : property, domain	mlʔk : become a prince, be appointed chief; malaka : own property, dominate; melkat : dominion; ʔmlak : lord, God; malʔa : be full, over- flow, abound; malala : lengthen	mlk : rule; mlʔ : be full	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ML II salt	malaḥu: sailor, ship- wright; mallu: freight boat; mil'u: saltpeter	melax: salt, season; malax: mariner; mlexah: saltiness, barrenness	miḥ: salt; malʔah: sea- farer	milxaʔ: salt; mlx: eat salt (be under obligation of loyalty); mlxʔ: mariner	melxa: salt	mihla: salt (meta- thesis); malaha: sailor, navigator		malx: salt; mallexa: season with salt, make tasty		MONO
MN I what?, who?, why? (for what?)	minu: what; mannu: who; am-minnu: why	mah: what; my: who; la- mah: why	maʔ: what; man: who; limaʔa: why	mah: what; man: who; la-mah; al-mah: why	maʔ: what; man: who	maʔ: what; man: who; li-maʔ: why	mhn: what, mn: who	mi, ment: what; mannu: who; lama: why	mh: what; my: who; lm: why	NON
MN II quantity	manu: count, hand over; mana: unit of weight	min: a portion; manah: count, assign; maneh: a weight; minxah: trib- ute, offering	manay: assign, apportion; minru: count; manna: grant, award; manaha: bestow, confer	mnaʔ: count				mennan: kind of weight; manqaqa: distribute; mana: gift, present	mnt: portion	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
MR I bitter- ness, sickness	mararu: be bitter; marašu: be sick; marrašu: sickly; maršu: sick, troublesome; martu: gall bladder, bile; muraššu: cantankerous person	marar: be bitter; mar: bitterness; morah: bitterness of spirit; mrarah: gall, poison; marad: rebel; marah: be contentious; maror: bitter herb; nimraš: made sick; mry: rebellion	murr: bitter, severe, painful; tamʔara: fight; marʔara: gall, gall bladder; ʔamrʔaḡ: disease; mʔariḡ: heretic, renegade; marmaṭa: spoil, damage; marid: defiant, recalcitrant; mariyḡ: sick	mrar: be bitter; mrad: rebellion	mrir: be bitter; marta: bile, poison	marir: be bitter, cruel; bimar: sick, infirm; marula: bitterness; disquiet; murat: venom; mrara: poison, venom	mrḡ: suffer a sickness; mrḡyt: sick people	marara: be embittered; merrat: rancor, rebellion; marasa: putrify, spoil	mr: bitter, sorrow, pain; mrr: poison; mrrt: bile; mrš: illness	MULTI
MR¹⁷ II make evident, prominent	amaru: find, see, experience; murru: one who uncovers; murruqu: intelligible; ameranu: eye witness; amru: seen, chosen	ʔamar: utter, say	ʔamara: order, command; ʔimr: matter, affair, issue; ʔimra: a human being	ʔamar: utter, say	ʔemar: see; mrnʔyt: authoritatively, dominantly	ʔamr: see, affairs, aspects; ʔmr: discuss, say, command; mura: authority;	ʔmr: sign, oracle, proclaim, officer, commander	ʔammara: find, make known, demonstrate; ʔemur: famous, recognized; ʔaʔmero: knowledge, intellect	ʔmr: see; mr̄m: height, excellency; mr̄ym: summit of a mountain	MULTI

¹⁷ Dillman on p. 728 of *Ethiopic Grammar* (London: Williams and Northgate, 1907) is quoted by Leslau (p. 25) as writing: the original meaning of the word *ʔmr* was “to stand out, be conspicuous, be clear, be bright. make clear, show, say.”

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
MŠ I wipe, smear	misu: clean; mašašu: wipe off, clean off; maštu: itching skin condition; muššu?u: rub part of the body	mašax: smear, anoint; mišši: cleansing	masaḥa, masah: wipe, smear; masaxa: anoint	mšax: oil	ms? : rub; msx: smear, anoint; msgn? : one who washes	mašihta: anointing	msx: anointed one	masxa: anoint; mazmaza: smear	mšx: anoint	C2.5 MULTI
MŠ II drag, pull	mašaru: drag across the ground; maša?u: take away by force; maššanu: tongs	mašak: draw, drag; mašah: draw out; mošeket: cord	masaka: grasp and hold firmly, seize; msy: extract; mašaqa: draw out	mešak: drag	baz: pillage	masgiana: one who instigates motion; baz: pillage; mšuniuta: removal		masaka: drag, render taut by pulling; mazaga: carry away; mazaza: pull out, snatch away; baz-baza: pillage		C9.4 C2.5 MULTI
MT likeness	mašalu compare, liken; maṭṭalu: mirror image, reflection	mašal: be like, represent, proverb, parable	maṭala: resemble, represent; maṭal: parable; maṭ?al: example, image; miḡli: replaceable	mit la: parable; mtal: be like	metal: compare, liken; matla: parable	mtl: compare, liken; mitla: parable; mitlailia: people of the same class	mtl: conform, be similar, be a duplicate, image, equivalent; massala: make a statue	masala: resemble, think, suppose; massale: statue, parable, proverb; ?amsal: image		C4.2 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
MT death	matu: die; imtu: poison; mitanu: deceased; mitu: insolvent; muttikku: person suffering from venereal disease	mut: die; šamat: put an end to, exterminate; nišmad: be exterminated; mawet: death	mʔata: die, perish, abate (wind, heat); xumatun: poison; mstamit: death-defying, heroic	mot: death	mat: die	mut: die; mutana: pestilence, cholera, mortality; matudia: resting place	mwt, myt: die, death, mortal sickness	mota: die; mot, death, destruction; ʔimawati: immortal; matha: appear as a spectre	mwt: die, remain immobilized, run aground; mt: man, mortal	MULTI
MṬ I rain		maṭar: rain, shower	maṭara: rain, shower with blows, abuse			miṭra: rain	mṭr: field watered by rain		mṣr: rain	C10.3 MONO
MṬ II stretch out, shape		matax: spread out	maṭala: forge, shape by hammering; maṭṭa: expand by pulling or beating		mth, mta: stretch out	mtx: stretch out				C10.3 MULTI
MY water	mu: water, liquid; mesu: wash; ina mesu: at birth (in the amniotic fluid)	mayim: water, mikal: brook, stream	maʔa: water	miyaʔ, mayin: water	mayya: water		mwy: natural or artificial source of water	may: water, liquid; memaya: become watery, melt; maʕawa; be humid, wet, moist	my, mym: water	C3.1 C3.2 MULTI
MZ mix, blend		mezeg: mixture, mixed wine	mazaja: mix, blend, mingle	mzigʔ: mixed wine	mzg: mix, blend, mingle; mzlwʔ: confusion	mziga: mixed, combined				C6.1 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
NB fruit	inbu: fruit, fruit tree	ʕenab: clusters of grapes; nub: bear fruit; tnubah: produce	ʕinabun: wine grapes	nobaʔ, ʔeb: fruit	ʕnbʔ: berries, grapes		ʔnʕb: vineyards	xanbaba: bear fruit, especially grapes; xenbab: grape cluster		C8.2 C9.3 MULTI
NH stream	naxlu: stream; naru: river	nahar: river; naxal: torrent, wadi; nahal: lead to a watering place, refresh; nahalilim: pastures, watering places	nahr: river; nahara: flow, gush forth, chide; nahala: take a first drink; manhal: spring, pool; nahara: flow copiously	nhar: river; naxla: stream	nahraʕ: river	nahla: brook, ravine, river bed	nhr: irrigation channel, conduits; nxl: primary canal	nahar: river; nahara: flow; menhar: waterfall, spring, afterbirth	nhr: river, nhl: torrent, wadi	C8.1 C8.4 MULTI
NK alien	nakalu: be crafty, cunning; nakaru: be a stranger, hostile; nekelmu: regard mal-evilently; nukurtu: enmity	nekar: that which is foreign, alien; neker: calamity; nakal: be crafty, deceitful	nakala, nakaša: shrink from, recoil; nakafa: disdain, spurn; nakit: perfidious, disloyal		nkl: deceive, plot; nkr: alienate, estrange	nukraia: strange, different, sublime; nakala: deceiver, betrayer; nkr: alienate, estrange	nkr: stranger; nkrm: an unknown person	nakara: be strange, unusual	nkr: foreigner, stranger	MULTI
NM sleep, ease	namu; slumber; munatta < muna-mtu: waking hours	num: be drowsy, slumber; naʕam: melody, gentle voice, be pleasant	nawama: sleep; niʕma: blessings, wealth; naʕam: yes		num: sleep	num: sleep	nʕm: be pleasant; nʕmtm: prosperity, happiness	nwm, noma: sleep, rest, die; menwam: dormitory	nhmmt: drowsiness, fainting fit	MULTI
NN fish	nunu: fish, fish deity	nun: fish	nun: fish	nunʔa: fish	nwnʔ: fish	nuna: fish				NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
NP soul, breath	napištu: life, breath, soul, person; napašu: breathe; napahu: inflame	nepeš: soul, breath, living being, desire, emotion, appetite, passion; napax: breathe, blow; našap: blow (metathesis)	nafasa: breathe; nafs: soul, spirit, person, blood, desire; nafaxa: breathe, inflate, animate, fill with pride; nafha: breeze; nafnaf: air, atmosphere; nafaha: blow		nafeš: soul, breath of life		nfs: self, soul, spirit	nafsa: blow (wind, spirit); nafs: spirit, breath, soul, person; nafsat: person, penis; nafsawi: spiritual	npš: soul, person, lung, breath	C9.2 MULTI
NQ I cleanse		naqah: be empty, clean, leave unpunished, acquit; naqiy ʔ: innocent	naqiya: cleanse, purify; naqiy: pure; nakaša: clear out, dredge (a well)	nqe ʔ: clean, pure	nqd: be pure, cleanse, sincere; nql: clear away, reject	naqia: clean; nqd: cleanse, purify	nqz: excavate; nqd: cleanse, purify; nqy: purify oneself	naqʷara: pierce, pluck out; naqasa: extract an embedded thorn; naqala: uproot, pull out		C5.1 MULTI
NQ II suck	enequ: suck, suckle; tenequ: suckling baby	henikah: nurse, breastfeed; yanaq: suck, be influenced by, absorb; yanqut: early infancy; pineq: coddle, pamper		ynaq: suck	ineq: suckle	ianuq: infant, suckling, nursling			ynq: suck; tnqt: lactation, nursing	C5.1 MONO
NŠ carry, raise	našu: carry, lift; nišitu: elevate to priestly office	naša ʔ: carry, lift; maš ʔet: burden, portion; naši ʔ: one lifted up, i.e., a prince; našah: lend money	naša ʔa: rise, appear; našaza: be elevated; našba: raise, set up	nša ʔ: carry, lift, rise up		nsa: collect	mnš ʔm: raise tribal levies for a campaign	nas ʔa: take, accept, raise, lift; tansa ʔi: resuscitated; tensa ʔe: resurrection	nš ʔ: lift, raise	C2.2 C7.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
NŠ I bite, kiss	našaku: bite; našaqu: kiss; naššugitu: a malevolent kisser (demon)	našaq: kiss; našak: bite	nakata: break by biting (metathesis)		nkat, nkaš: bite (metathesis); nšq: kiss	nšq: kiss; nšk: kiss; nkt: bite; (metathesis) nkutiata: bites, wounds (metathesis)		nasaka: bite; mansak: teeth, jaw; nakasa: bite (metathesis)	nšk: bite; nšq: kiss	C2.3 MULTI
NŠ II human	enešu: be weak; nišu: men	ʔenoš: humanity; ʔanaš: be mortal, weak, sick; nšamah: breath, soul	ʔaniš: friendly, social; ʔansʔam: breath of life, fresh air; niswa: woman; našīta: be lively, animated	nišmah: breath, soul; ʔenaš: humanity	nšʔ: woman, menses (pl.); nšmʔ: living being, soul	ʔanašaʔ, našaʔ: human being; ʔanašata: family, kin-folk; ʔanašutaʔ: humanity	ʔnš: man, fellow (perjorative)	neʔsa: small, young	ʔinš: people; nšʔ: men; ʔinšt: relatives	C2.2 MULTI
NX tranquility	naḥu: rest (person), be pacified (country)	nu-ax: rest; mnuxah: resting place; condition of security obtained by marriage; naxat: quietness, rest	naxa: lie down (on a camel)	nuax: rest; ynax: be in a state of rest	nwx: be at rest, be assuaged; nxm: recovery, revival	nha: calm, at ease; nhimta: relief, consolation; nwh: rest, repose; niha: mild, friendly		noḥ: tranquility; noha: be stretched out, repose; naxḍ: rest; nahey: tranquility, relief	nx: rest	C8.3 MULTI
Pḍ break, smash	napašu: smash, demolish	pašaṣ: break; pašax: cause to burst forth; pašaʔ: bruise, wound; pašam: split open	faḍaxa: break, hew out	pašaʔ: split		pša: break	ḫhmw: conquer, lay waste	fattata: break off a piece; fett: portion, morsel, fraction; faṣxa: break, hew out		C9.2 C10.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
PL I divide	palašu: break through; balātu: detach, remove palgu: ditch, cut channel	niplag: split; palal: inter-vene, inter-pose; palax: cleave; palah: be distinct, marvelous; peleʔ: a wonder; peleg: an artificial channel	falağa: split; fala: wean; falam: notch, indent; falḡ: fissure	plag: half; plugah: group; palxan: cult	plḡ: split, distribute an inheritance; plḡw: discord, schism; plwzʔ: hatchet	plḡ: divide, apportion; plḡ: separate; plugta: gap, crevice	flth: dike separating fields; fl: cut channels; m-flḡ: channel	falaga: dig out, divide, split; falasa: send away, cast out; falak: celestial sphere, division; falama: split, divide; falaša: divide in two; falaṭa: discriminate; falaya: separate, wean	plḡ: split	C9.2 MULTI
PL II spring forth		palat: escape, spring forth	falata: escape from; ʔaflata: rescue		plṭ: escape		fl: flee	falfala: gush out, spring forth; falaqa: gush out, spill out; falxa: bubble up, boil forth		C9.2 MULTI
PM mouth	pu: mouth, utterance, words, opening	peh: mouth	fam: mouth	pum: mouth	pumma: mouth	puma: mouth;	f: mouth, command, authority		p: mouth	C9.2 NON
PN face	bunu: face, appearance; panu: front side; panis, pananu: before, previously; panitu: at an earlier time	ʔopen: manner, circumstance; panah: turn, face; ʔel-pnay: in the presence of; pnimah: inward	fanay: turn away from, disappear	pana: turn toward a direction	pana: turn toward a direction	pna: face, ʔnpy: presence		fenot-a: towards	pn: face; lpn: before	C9.2 C9.4 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
PR I split off	parāsu: separate out, keep away (enemy, demons); pirištu: secret; paraqu: sever	parad: separate, divide; peret: broken-off; paroket: curtain for religious separation; paras: tear (garment); paraš: break through; porer: split, divide; paraš: divide, determine	faraqa: separate, sunder; farra: escape; faraja: split, cleave; farj: gap, vulva; farada: segregate; fard: unique; faraza: detach, set apart; fary: split lengthwise; furḍa: gap, notch	pras: divide; prak: break off, expiate	praq: remove	prš: separation, division; parpašta: dividing wall; parš: exorcism, keeping-off charm;			prq: open, sever	C9.2 C7.1 MULTI
PR II dust, ashes	eperu: dust	ʕafar: dry earth, dust	ʕafar: dust; ʕafarah: cover with dust, soil, begrime		ʕfrʔ: dust	apra: dust, ashes, desert herbiage		ʕafar: dust, soil	ʕpr: dust, earth	C8.2 MONO
PR III be fruitful	para'u: sprout, pardesu: enclosed garden; pirha, pirimah, pirizah: names of plants; piri'tu: shoot, sapling	parah: be fruitful; perax: bud, shoot, sprout; break out in skin eruptions	farʕ: twig, bough, limb; farija: hatch, sprout; farraha: sprout			parahiata: sprigs, tendrils, twigs; pra: bear fruit, blossom, bring forth; pira: fruit (in the gnostic sense)		farha: sprout, geminate; farya: produce fruit	pr: fruit; prx: bud, shoot	C8.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
PT open	petu: open; patahu: puncture, bore through (make an opening)	patah: be spacious, wide, open; mapte-ax: key, opening instrument; peti: open-minded; patax: open; petax: doorway, entrance; miptan: threshold	fataha: open, conquer; fath: judgment, decision; fatt-ʔa hah: fortune-teller; ʔinfitʔah: emergence; fataša: search, scrutinize; fataqa: undo sewing, rip out; fitʔaq: hernia, rupture	ptax: open; ptaʔ: be spacious	ptax: open	pth, pta: open, conquer; ptaha: ritual meal for the dead, opening of daily devotions; ptia: open, wide	ftx: conquer, lawsuit	fatxa: open, disengage, give absolution, administer justice; fetx: lawsuit, precept, verdict; maftex: solution, key	ptx: open	C9.2 MULTI
QB I receive, accept	qablu: middle	qab: a measure of capacity; qabal: take, receive; qabaš: gather, collect; qibuš: assemblage	qabaqa: grasp, seize; qabila: receive, consent; qabul: welcome; qabʔz: hilt, handle; qibal: power, ability	qbal: receive; qabel: facing, opposite		qbl: receive	kbc: harvest; qbl: receive, accept; qblw: lease out land; qbqhw: seizers (military)	qabbala: fetch; taqabbala: accept, receive		C5.1 MULTI
QB II bury, grave	qabaru: bury; qabru: grave, tomb; qabbiru: burial priest; naqbaru: grave	qabar: bury; qeber: grave; qabab, naqab: curse	qabara: bury; qabr: grave; qabuha: foul, vile, shameful	qbar: bury	qbr: bury; qbrʔ: tomb	qabuta: coffin, chest; qabra: tomb, grave	qbr: be buried, qbrn: grave	qabara: bury; qobar: gloom, fog, darkness	qbr: bury, grave; qbʔ: invoke the dead	C5.1 C9.3 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
QB III pierce, hole	naqbu: spring, depth of water; naqapu: gore, rape, perforate	naqab: pierce; nqebah: female; maqebet: hole, excavation; yeqeb: excavated trough for wine-grapes	naqaba: perforate, pierce, bore; naqbu: a mountain pass; qʕaba: dig; naqabu: deflower, rape; waqaba: sunk, depressed; waqb: hollow, cavity	qubtaʔ: room; nqab: bore out, hollow; nqab: pierce; nuqba: female	neqab: perforate; nqb: female	niqba: hole, stone with hole	nqb: cut channels	qabla: be empty, void; naqaba: separate, perforate; neqʕat: hole, abyss	nqb: pierce	C5.1 C9.3 MULTI
QD I before	qudmu: front, former time; aqdamu: ancient times	qadam: be ahead, in front of; qedem: eastward; qadmah: antiquity; qadim: east, east wind	qadama: precede; qidam: ancient days; qudum: make progress; qudwa: model, pattern; muqaddir: fore-ordained	qdam: precede; qadmi: first	qdam: precede	qudam: before; qadmaia: first, primeval	qdm: precede, command	qadama: precede; qadima: in former days; qaddamt: ancestors; maqdem: chief, choicest	qdm: in front of, east	C5.1 MONO
QD II holy	qadada: bow down; qadašu: be pure	qadad: bow down; qadaš: separation, withdrawal, qadoš: holy; miqdaš: sanctuary; qadaš: be consecrated; qdešah: temple prostitute	qadusa: be holy; al quds: the holy city (Jerusalem); ʕaqada: take an oath	qadeš: sanctify	qaddeš: sanctify	qadiša: holy	ʕqd: an oath; qds: holy	qaddasa: qeddus: holy, saint; meqeddas: holy place; qids: faith	qdš: holy, consecrate	C5.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
QD III pottery, vessel	makdu: a wooden bucket	kad: earthen jar, pitcher	qidr: pot; qadaha: ladle out		qdr, qd? : vessel made from animal skin; qdl: cervical; qdr? : pot	qadah: bowl, cup	mqdx: cup, vessel	maqdut: pot	kd: jar, measure of liquid capacity; kdr: a trough	MULTI
QL I light, easy, of small value	qalalu: be light, easy, weak; qallu: few, unimportant; qululu: belittlement, disgrace	qal: light, easy; qalah: be lightly esteemed; qala? : be stunted; qalal: be trifling; qalas: mock, scoff; qlogel: worthless, contemptible	qalla: be light, small, inferior; qallam? : seldom; qalasa: diminish, wane; qalama: neutralize an opponent			qalil: light; qulala: frivolity; qulala: shame dishonor	qll: a small quantity	qalla: light, easy; qalil: of small value; k"ahila: trifle, refuse, dregs; ?aqalala: vilify	ql-t: shame, vileness, humiliation; qallu: inferior	C5.1 MULTI
QL II voice	qulu: voice, noise	qol: sound, voice; qara? : call, proclaim; klimah: insult, reproach	qala: say; qara?a: recite; qalada: joke, tease; kalima: speech, remark	qal: sound, voice; qra? : call	qala: voice, sound; qlys? : good report, praise; qlqs: sound a bell	qala? : voice, cry, noise, clamor		qal: voice, word, speech, noise, command; kalxa: shout, howl; qalada: joke, tease	ql: voice; qr? : call, shout, invite	C5.1 C7.1 MULTI
QL III swiftness	kallu: express messenger	qal: light, swift, fleet; qalil: swift	qal?afa: agility		qlyl: swift, hasty, headlong	qalil: fast, swift		qalil: rapid; qal?fa: hurry	ql: go quickly, run; qll: swift courier	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
QM I rise	qamu: rise, stand up	qum: arise, stand up; maqom: place; qim: adversary, insurgent; qommiyut: uprightness; yqum: existence; naqam: take vengeance	qam: rise, stand up; qawm: people, tribe; qama: stature, qawam: vigor, stamina; magam: site, location; nagama: take vengeance	qam: rise, stand up; nqam: arise for oneself, revenge; qyam: statute	qam: rise, stand up	qam: rise, stand up	qwmw: serve as witness; hqm: erect a building, put in order, qwm: stand, mqmm: place	qoma: rise, stand up, persevere, be valid, be in charge of; qawwam: tall, erect; qom: stature; maqwam: pedestal, rank; taqawemot: opposition	qwm: rise, stand up; mqm: place; qm: adversary	C5.1 MULTI
QM II ground meal	qemu: flour; qamu: crush	qemax: flour, meal	qemxun: wheat flour	qemxaʔ: flour				qamxa: eat grain or other fodder, graze; meqmax: stable, stall, manger; qamxa: produce, fruit	qmx: flour	C5.1 MONO
QN envy of possessions	qanna'u: jealous; qanah: acquire; qinitu: acquisition, property	qanaʔ: be jealous, envious; qanah: get, acquire possessions	qana: acquire, appropriate; qanʔara: possess tremendous riches	qnaʔ: be jealous; qanah: purchase	qeneʔta: grudge	qina: rancor, envy, jealousy; qinianu: property, possessions	qny: possess, acquire	qanʔa: be jealous, zealous, emulate, imitate	qnʔ: be zealous	C5.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
QR I cold	qarahu: freeze	qerax: frost, ice; qarar: be cold; qarah: cold; qar: calm (cool of spirit)	qarr: cold; qarrisa: freeze, be numb		qrr? : cooling, as a drug; qrrut? : severe cold, frost; qršut? : shivering fit; qrt: frozen, chilled	qarir: cold, cool; qariša: congealing, chilling; qaruša: wintry, frigid		q^warir: cold		C5.1 MULTI
QR II near	qerebu: approach; qerbu: near; qerbiš: in close com- bat; qurbutu: bodyguard, relative; qurbu: recently	qarab: come near; qereb: inward part, midst; qarah: encounter; qiryah: town, city; qgrab: war (hostile approach); qereb: entrails, guts; qaraš: compress	qaraba: come near; qurba: relation; qarana: link, join together; qirn: an equal; qarinah: spouse, union; qaraša: pinch	qarab: draw near; qgrab: war	qrk: near, contemp- orary	qaraba: approach, invasion; qurba: proximity	qrb: be or draw near; qry: settled area; qrr: settle- ment	qaraba: come near; megrab: neighborhood, vicinity	yqrb: approach; qry: meet; qrš: pre- cinct of a town; qrb: private parts, vulva; qrt: city	C5.1 MULTI
QR III horn	qarnu: horn; qurnatu: horned goddesses	qeren: horn; qaran: send out rays	qurun: horn, peak of a moun- tain; qarn: forehead	qarna? : horn	qarna: horn	qarna: horn, corner; qurnasa: back of an axe, protrud- ing part of a hill		qarana: grow or have horns; mastaqaran: enemy, adversary	qrn: horn	C5.1 MONO
QŠ chastise		qašap: be wroth, angry	qašša: casti- gate, chastise	qašap: be angry		qašia: hard, satren, cruel		qašša: humiliate; qaššafa: chastise	qš: be harsh, severe; qš: loathe	C10.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
QŠ bow, archer	qaštu: bow	qešet: bow, qašat: archer	qaws: bow, quwʔas: archer	qaštaʔ: bow	qašta: bow; qaššata: archer	qaštaʔ: bow, qaština: archer		qast: bow; qastawa: shoot with an arrow	qšt: bow, weapon, carver of bows	C2.2 MONO
QT stop, kill	taqtitu: end; qašašu: prune off, kašu: strip off; qatalu: kill	qeš: end; qašab, qašah: cut off; qšapah: snap- ping, splinte- ring; qaṭal: kill; qeṭeb: destruction	qaṭaʕa: cut off, separate; qaṭafa: harvest, pluck; qaḍAʕ: ending, settling; qaṭala: kill; qaṭal: enemy; maḡṭal: mortal organ	qtaʔ: cut off; qšat, qšaṣ: cut off; qṭal, qṭal: kill	qas: cut off; qetal: kill	qšš: cut off; giṭla: murder, massacre	qtl: kill	qašaya: break off, snap off; qaṭafa: pluck off flowers, blame, reject; qatala: kill, attack, wage war; gadala: kill, slaughter	qšš: cut off	C5.1 C10.3 MULTI
QY vomit, disgorge	qaʔu: spit	qiʔ: vomit, spew out, disgorge, qayin: Cain; qayah: vomit	qʔaʕa: vomit; qaiḥ: pus, fester			spq: vomit		qyʔ: vomit, spit; šyq: spit between closed teeth		MONO
Rʔ see		raʔah: see; roʔeh: seer, visionary, pro- phetic vision; rʔi: mirror	raʔiy: see, notice, discern; raʔiy: opinion, view; ruʔya: vision, dream; marʔaya: mirror; murʔayin: hypocrite	ra-u: appearance			rʔy: see, expect; rʔ: see, indeed; hrʔy: cause to see	reʔya: see, observe, contemplate; ʔaraʔya: vision, pattern, norm, gaze; maraʔey: spectacles	rʔu: appear- ance	MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RŠ I roar, make tremble, quake	ramamu: roar; radu: tremble, quake; rataṭu: tremble	rašam: thun- der; rašal: quiver; rašad: tremble, be afraid; rašaš: quake, shake	rawša: frighten, startle, be in awe; rašdu: thunder; širtašada: tremble	rša: tremble; rtat: trembling; ršal: quiver, shake	rešem: thunder, resound; (šet)ra- šad: tremble	rim, rum: thunder, resound		rašama: shout, roar, thunder, resound; rešda: trem- ble, quake, shudder, shake		C8.2 MULTI
RŠ II graze, pasture	rešu: pasture, tend	miršeh: mea- dow, pasture; rašah: tend, pasture, graze	rašah: tend, graze	rašaya: shepherd; reišya: pasture, meadow			mršt: pasture land; ršy: graze	rešey: tend; maršet: livestock driven to pasture	ršy: shepherd	MONO
RB many, much	rabu: increase, grow; rabut: high status; rubum: prince; erebu: increase	rabab, rabah: be or become much; rab: chief; rob: abundance; rbabah: multitude, ten thousand; rbibim: copious show- ers, causing fertility	rabb: lord, master; rububiya: divinity, deity; rabaša: hold in esteem; rabiha: profit, win; ribwa: myriad	rab: great, chief; rabaš: be great, grow	rbn: grow great, grow up, multiply; rb: captain, steward; rbwt: grandeur, genero- sity		rbb: be the owner of	rababa: be numerous; rabibawit: sovereignty; rabxa: gain, profit; rabban: leader, elder, senior; rabbawat: myriads	rb: great; rbbt: ten thousand, myriad	C9.3 MULTI
RD go down, bring down, hunt	aradu: valley; waradu: descend, bring down; wardut: slavery; radadu: pursue	radad: subdue, beat down; radap: chase, pursue; yarad: go down; yarden: downward- flowing river	raday: tram- ple; radafa: pursue; šarada: pursue; warada: go down, arrive at; rad: repel, reject	rdap: chase, pursue	rdf: pursue; yarda: river in a valley	radpa: persecution, harrying; rdd: drive back	rdf: pursue; ryd: abate; wrđ: come down; šrd: hunt, chase	radša: pursue; rawid: persecution; warada: go down, descend; tawarada: be insane; redat: manner of descent; murad: down- ward slope	yrd: descend	MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RG I use the feet	raqadu: dance, step; lakadu: skip, dance;	regel: leg, foot; ragal: go about (maliciously, as slander); raqad: skip about, dance; raqaʿ: beat, stamp out; rakal: go about for trade	rijl: foot; rajila: go on foot, march; rakaḏa: race, run, stamp; raqaṣa: dance, prance (horse); rakala: kick; raqada: run leaping; ʿaraḡ: lameness	raglaʾ: foot; rqad: skip about; roklaʾ: trader	regla: foot	ligra: foot (meta-thesis); rgala: fetter the feet	rglhw: foot; rgly: foot soldier	ragaḏa, ragaṣa: trample, stamp, kick; ʾargada: perform a ritual dance	rigla: foot; rqṣ: jump, leap	C6.1 MULTI
RG II furious	ragamu: shout, complain against	ragam: kill by stoning, imprecate; ragan: slander, murmur, slander; margemah: slingshot	ragama: cast stones, abuse; rajaz: tremble with rage or fear; rajasa: make a vehement noise	rgaz: anger; tremble	rgam: kill by stoning	rgm: kill by stoning; argazta: wrath, condemnation; margizana: a bully, one who incites anger		ragama: curse, insult; ragaza: stamp, impale; ragiz: spear	rgm: speak, say	C6.1 MULTI
RĠ desire, be hungry for		raʿeb: be hungry, desire	raḡuba: be voracious; raḡiba: desire vehemently	rʿu: wish, pleasure		rgg: desire, covet		rahba: be hungry for	rḡb: be hungry	C6.2 C6.5 MONO
RK set out	rakabu: ride, set sail, mount sexually; markabtu, narkabtu: chariot; rukubu: vessel; rakkabu: sailor, crew	merkabah: chariot; rakab: mount an animal, ride; rkulah: traffic	rakiba: mount an animal, ride; markab: ship, boat, vessel; rakaḏa: race, gallop, run away; rahala: set out, depart; rakub: riding camels	rkeb: mount an animal, ride	markeba: ship; markabta: chariot; rkb: ride, mount an animal, a throne; rkšʾ: horse	rakša: horse, stallion; riḥṭa: race, running, course; rkb: mount an animal, ride	rkb: ride a horse; rkl: set out, go on a journey	rakiba: ride, go by boat; rakub: female camel	rkb: mount (especially a chariot)	C6.6 C9.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RM I high	arammu: wharf, place of heaping-up of materials	ʔarmon: citadel; rum: be high, haughtiness, height; ramah: a high place; ramut: lofty stature; ram-om: be exalted; trumah: offering for sacrifice; raʔam: rise; ʔaremah: heap	rayyama: exceed; raym: superiority; surplus	romem: exalt; rum: be high, haughty		rum: be high; rauma: firmament, heavens	rym: raise; rymm: exalted	rayama: be high, raised; rama: elevated place; ramawi: celestial; rama: heavenly kingdom	rwm: be high; rm: erection, height	MULTI
RM II throw, use a spear	ramu: throw	ramah: cast, shoot; romax: spear, lance	ramay: throw, shoot; ramaha: pierce with a spear; rumx: spear; ramaya: game animal	rmaʔ: cast, throw; rumxaʔ: spear, lance	rema: throw, cast; rumxaʔ: spear; rmnʔ: cast of a missile	rmaʔ: throw, shoot	rmx: spear	ramaya: pierce, strike with a spear; ʔarmaya: make scarred; ramx: spear; remet: wound, injury	rmy: throw, shoot	MULTI
RP repair	rapa'u: heal	rapaʔ: heal, restore; rapah: relax; marpeʔ: cure, health; rpuʔah: medicine; rapad: aid, support; hitrapeq: support oneself, lean; tapar: sew together (metathesis)	rafaʔa: sew, repair, pacify		repa: cure		rʔfy: be healed, recover; rfd: support, help	rafʔa: heal, mend, sew; merfa: needle	rpʔ: cure	C9.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RQ I thin, empty	šuruqu: empty; riaqu: be empty, useless; riqutu: empty-handed; riqu: unemployed; ruqu: thinness	raq: thin; heriq: make empty; req: empty, vain	saraga: steal, take away; rakka: be weak, feeble; raqq: be thin, weak; raqraqa: render thin, dilute; rugariq: shallow (water); mašarug: gaunt, emaciated	raqe: make thin	sarreq: lay waste, deprive; rqnwt: vanity, emptiness; raq: thin	srq: empty; ruqata: empty words; riqana: empty, void, naked; rqina: sky		saraqa: steal, take away secretly; raqaqa: be thin, be subtle; raqiq: be thin; šarqa: empty	rq: fine, thin	C5.1 MULTI
RQ II spit		yaraq, raqaq: spit; roq: saliva	riq: saliva, sweat; šariga: sweat	yraq, rqaq: spit; raq: saliva	rwq: saliva, spit, ignomy	ruga: spit; ruqa: saliva		waraqa: spit; maraq: saliva		C3.1 MULTI
RQ III green, yellow	arqu: yellow, green; araqu: grow pale	yaroq: green, vegetable; yaraq: herbs	waraq: leaves, foliage; wariq: green	šoriq: grow green	yarqa: herb	yrq: gold	wrqm: gold, green stuff, vegetables	warq: gold, gold coin	yrq: gold	C3.1 MONO
RŠ head, chief	rešu: head, chief; reštu: peak, best; rašabu: commanding respect; rešata: first fruits	roš: head, chief; rišon: primary, first, former; rašum: recorded, established	rašis: head, chief; rasmi: official; rasmal: capital, stock; rašas: peak	raš: head, chief; rašah: have permission; rašaš: have power; ršam: inscribe, record	rš: head, chief, best, summit, first	rišaš: head, summit, chief, extremity; ršm: ordain a priest, consecrate by signing	rsu: servant of deity; šrs: head, chief; rys: serve as chief	rešsa: head, top, chief; rassaya: establish; rosa: male child	riš: head, chief; yrš: perform an action involving the head; rušyt: primordial time	C2.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RX I wind, scent	raqqu: oil-perfumer; riqu: aromatic substance	ru-ax: breath, wind, spirit; rux; blow, breathe; ri-ax: scent, odor	raha: be windy; raxa: smell (transitive); mirwax: fan; rʔihah: fragrance; ruhani: aromatic plant; rxʔa: gentle breeze	ruxaʔ: spirit, breath, wind; rexaʔ: scent	rixa: scent; breathe; roxa: make a breeze by fanning; ruxoʔ: human spirit; ʔarxah: inhale, smell	rixa: scent; ruaxa: ease, relief, recovery; rux: spirit, psyche; rihua: atmospheric conditions	rh: spirit	raxya: emit a good odor; rexe: perfume, flavor; rehwa: be fragrant	rx: aroma, wind, scent, spirit; rehye: be fragrant; rqx: perfume, ointment	C8.3 MULTI
RX II mercy	ruʔamu: love; remu: womb, pity; compassion; remutu: pardon	rexem: womb; rixem: be soft, gentle, have compassion; raxap: grow soft, relax	rahim: womb; rahima: be merciful; raxuma: be soft, gentle; raʔhah: ease, release; raxafa: be soft	rexem: have compassion for, love; raxamaʔ: womb	raxma: womb, testicles, compassion; rxmnʔ: merciful; rxʔ: cherish, pity, take care of	rahma: friend, mercy, devotion; raha: solace, release; rhmta: love, desire	rhḡ: have mercy	maxara: have compassion (probable metathesis); rehrahe: have mercy	rhḡ: girl	C8.3 C8.4 MULTI
RX III far, long	requ: far; arku: long; urhu: road, path	raxaq: be far; ʔarok: long; ʔarax: wander, journey; ʔorxah: caravan	raxiq: be far; rahaba: set out, emigrate; rahhal: wandering, roaming	raxeq: remote; ʔarkah: long duration; ʔarak: way, path; ʔore-ax: traveller	rexag: be far off, remote	rhq: be far; ʔrika: long, tall; ʔaraq: flee from ; ruhqia: distant places	rxqm: far from: ʔrk: long, ʔrq: flee from	rexqa: be distant, withdraw, recoil	rhq: be far; ʔrk: be long; rxq: go away	C6.4 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
RX IV wide, broad	rebitu: square, open space in city	raxab: be or grow wide or large; rxob: broad open place; rawax: be wide, spacious	ruhḥ: wide, spacious, roomy; rihab: wide area; rhʔab: gener- osity; raxa: palm of the hand	rexab: be wide			rwḫ: widen, enlarge; rxmnn: plateau; rxḫ: width	rexba: be wide, spacious; marxab: public square, marketplace, street	rxḫ: be wide	C6.4 MONO
ŠB I suffer	šibtu: epi- leptic seiz- ure; šubak- ilu: person with mental or physical defect	šʔab: hurt, pain, grieve	inšaʔuba: be hard, difficult; šabra: severe cold; mušabara: long-suffering	šʔab: sad, be grieved	šbg: suffer, endure	šʔba: grieve		šʔa šaba: difficult, harsh; šʔa šabšib: time of famine		C9.3 MULTI
ŠB II point to	šupru: nail	šʔbaʔ: finger, unit of measure; šabaʔ: reach, hold; šiporen: nail, stylus point; šapah: look out, spy	šabaʔa: point with the finger; šʔbaʔ: finger, toe, unit of measure; musabbixa: index finger; špr: nail	šʔbaʔ- aʔ: finger; špar: nail	šebʔa: finger; šprʔ: nail	ššb: finger	ššbʔ, šbata: finger	šʔbaʔet: finger, toe, unit of measure	šʔba- ʔat: fingers; šp: look at, glance	C9.3 MULTI
ŠB III gazelle	šabitu: gazelle	šbi: gazelle	šby: gazelle	šabyah: gazelle	šbtʔ: gazelle	šibuia: deer	šby: gazelles		zby: gazelle	C10.3 MONO
ŠB IV dyeing, coloring	šabu: dyer; šubitu: dyed wool; šapu: dyed soaked,	šʔbaʔ: dye, dyed stuff; šabal: dip	šabaga: immerse, dye	šbaʔ: dye, dip; šbal: dip	šbg: dye, dip; šbaʔ: pigment	šiba: dyed material; šibutaʔ: dyeing; šibiana: color		šabha: dip		MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠD I turn away	šadu: roam, prowl; šiditu: (travel) provisions; ša'idu: restless	šad: side; šadah: lie in wait	šadda: turn away, alienate, persecute; šadafa: shun, avoid; šadaf: psoriasis; šudfa: haphazard; šidam: breakdown	šd: side		šadia: lonely, desolate place		sadada: banish, chase away, reject, excommunicate	šd: roamer, with no fixed abode	C10.3 MULTI
ŠD II right, moral		šadaq: be just, be in the right; šdaqah: justice, alms, righteousness	šadaqa: be upright, pay debts, fulfill obligations, speak the truth, license, sanction, certify; šadaqah: alms, charity; ʔašdiqah: marriage contract; mišdaq: criterion; šadiq: friend	šidqah: be just, charity	zadeq: it is right	šadiq: true, pure, perfect, just	šdq: right, moral; šdqm: truth, reality; mšdqm: document attesting a grant or loan; mšdʔn: agent, official	šadqa: be just, speak the truth; šedqat: alms; šedq: deliverance, salvation, truth	šdq: right, upright-ness	C10.3 MONO
ŠĜ young	šehru: young, small; šehheru: very small (pl. retainers, servants); šuharu: child, adolescent	šaʕar: be or grow insignificant; šaʕir: little, insignificant, young; zʕair: little, tiny	šaġur: small, young; šaġura: be insignificant, despicable, servile; zaʕira: be scanty of hair	zʕir: be or grow small	šgr: be insignificant, despicable		šġrm: small, unimportant			C10.3 C6.5 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠM I drug, poison	šammu: poison, šamamu: cause pain; šumruṣu: very painful	sam: spice used in incense	summ: poison; šamma: smell, sniff	samaṣ: drug, spice	sm, smṣ: drug, medicine, remedy, poison	samah: drug, poisoning; simana: leaves and healing herbs			šmrr: poison, poisoning	MULTI
ŠM II left (side)	šumelu: left	šmṣol: left; hišimṣil: take the left (turn away from the true way), use the left hand	šimṣal: left; šamṣal: north, north wind; šṣam: unlucky	šmṣal: left	semma-la: left	šaml: north wind	šṣmt: unlucky, north; šṣm: go left, deviate		šmal: left	C2.2 MONO
ŠP lip, edge	šaptu: lip, edge, rim	šapah: lip, edge, speech; sap: threshold; šapam: mustache	šafah: lip, edge, rim; šafaṣ: border, verge; šaftara: pout; safaṣn: border		safanaṣ: lip, edge; sfrṣ: coast, border	šapia: edge; siptaṣ: lip			špt: lip	C2.3 C9.2 MULTI
ŠR hair, bearded grain	šartu: hairy skin, animal pelt; šuru: eyebrow	šṣarah: hair; šaṣar: bristle with horror; šaṣir: hairy goat, hairy satyr, demon; šaṣorah: barley (bearded grain)	šaṣar: hair, bristles, fur, pelt; ṣašaṣar: hairy, long-haired; šaṣir: barley (bearded grain); saraja: braid hair; saraha: comb hair	šṣar: hair	saṣra: hair, down, wool	sara: hair, barley (bearded grain)	šṣrm: barley (bearded grain)	seṣart: hair; ṣag^wr: hair, fleece, fur; saṣr: grass	šṣrt: wool or hair; šṣr: barley or hair	C2.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
SB old	sibu: old age, elder, testimony, witness; šaibu: become old	sab: old man, ancestor, grandfather; šeb: grey hairs, old age	šaibun: gray hair; sabah: dotage, impaired mind esp. of old age	šaibataʔ: gray hair; šabayaʔ: old man	seʔb: gray hair; sʔb: grow old; sbtuʔ: anile; sbʔ: old person, grandfather	sab, sib: gray hair; sibuta: old age; siba: old man		šeba: turn gray, be moldy	šbt: whiteness of hair; šb: old man	C2.1 MULTI
SK tool, knife	sikaltu: tool; sikka-nu: rudder, steering paddle; sikkatu: peg of wood, blade of plough; sikkuru: bar, bolt	šakin: knife; šukah: barb, spear; sakan: be of use or benefit	sakkin: knife; sukaʔn: rudder	sakinaʔ: knife	sknʔ: knife, dagger; sktʔ: pin, peg, pole, stake, nail, wedge	siktaʔ: knife; sukra: bolt; sukana: steering paddle; sukk: stab, nail; sikta: pole, peg, nail, pin		sakata: pierce, sakawa: cut, stab; sakeza: arrow	sukuru, suguru: bolt, bar	MULTI
SN hate	zenu: hate; zeru: dislike, avoid, hate	šaneʔ: hate; šoneʔ: enemy; šinʔah: hatred of foes, sexual revulsion	šaniy: hate; šanara: blame, revile, censure; šanʔah: repulsive, disgraceful	šnʔa: hate; šanʔah: hater		snʔa: be hateful, ugly, detestable; snq: torment, torture; znzl: belittle, despise; sʔnʔ: enemy	snʔm: enemy			C2.1 C7.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
SP gather	sapahu: extend, scatter	sap, sepel: dish, basin; ʔasap: gather; ʔasip: harvest; mispoʔ: fodder; spar: enumeration, census; šapak: suffice	safa: satiate			spasa: gratitude, thanks- giving; spq: be abun- dant, suf- fice; spʔ: accumulate	safax: overflow	safafa: spread out, abound; safxā: extend, enlarge		C9.1 C9.2 MULTI
SR false, defective	sararu: be false, cheat; sartu: treachery	sarabim: rebels; sarax: overrun, ex- ceed; sarar: be stubborn, rebellious; sar: sullen; saris: eunuch; sarah: apostasy, with- drawal; sur, šur: turn aside	saraf: exceed all bounds, be immoderate; saris: be impotent			srey: stink, be putrid; saris: be castrated				MULTI
ŠB I sit, dwell	wašabu: sit, reside; šušubu: garrison soldiers; šubtu: seat, dwelling	yašab: sit, remain, dwell; mošab: dwelling-place, assembly; tošab: sojourner; šebeṭ: tribe	šabaṭa: cling, cleave to; šabaṭa: cling, hold on; sibṭ: tribe (of the Israelites)	yteb: sit, remain, dwell, settle; šbeṭ: tribe	šbet: tribe		wṭb: sit, settler, dwell; ṭbt: seat, shrine of a god		ʔatib: sit, reside; yṭb: sit	C2.3 C9.3 MONO
ŠB II return		šub: turn back, return, put back; tʾšubah: return, answer	šaʔba: return; tʔab: repent	tub: return		tub: turn back from, repent	twb: return, respond; wtwbn: restore; ṭṭwb: some- thing done re- peatedly		ṭwy: return; ṭb: turn around, return;	C2.3 C9.3 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠB III wild grasses	ešebu: be green	ʕešeb: grass	ʕaššb: grass	ʕašab: grass, vegetation	šbṭbṭ? : knot-grass		ʕšb: grass for fodder	sabla: grow, ripen, become grain		MONO
ŠD evil spirit	šedu: a protective spirit	šed: demon; šadad: devastate, ruin; šadap: scorch, blight; šoṭ: scourge, whip; šaʔat: des-pise; šaṭan: devil, the Adversary; šod: violence, ruin	šatama: abuse, revile; šyṭʔan: the devil; šadida: calamity, misery; šadaxa: smash, shatter; šadaha: confuse, perplex	šaṭanaʔ, saṭanaʔ: devil, the Adversary		šdd: over-power; šdh: prey upon; šdum: a ruler of the under-world; šdn: be pos-sessed by a demon	sdm: affliction	sayṭan: devil, adversary; šadanot: monster, satyr, angel of death		C4.3 MULTI
ŠK I give to drink	šakaru: be drunk; šakaru: beer; šaqu: give to drink; šikitu: irrigation; mašqu: place for watering cattle	šakar: be or become drunk; šekar: beer; šiker: give in to someone else's power (make drunken); šaqaḥ: cause to drink water; hišqaḥ: give to drink	sakira: be drunk; saga: give to drink; ʔistisqaʔ: dropsy, irrigation; siqaya: drinking vessel; sakiba: a drink offering, libation; suqya: irrigation	šekar: be drunk	šekar: be drunk		škr: be defeated; sqy: irrigated field; sqyt: canal	sakra: be drunk, intoxicated; šaqaḥ: irri-gate, water; saqayat: irrigation	škr: be drunk; šqy: give to drink	C2.2 C6.7 MULTI
ŠK II lie down	sakapu: lie down	šakab: lie down; škobet: copulation; miškab: couch, bed		škeb: lie down; miškab: bed, grave	škm: alight, perch	škb: lie down		sakaba: lie down, be asleep, lie with a woman; maskab: genitalia	škb: lie down; mškb: place of rest, bed	C2.2 C6.6 C2.3 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠL I safe	šalamu: complete; šulmanu: greeting present, bribe; šulmu: completeness, well-being; šulmu: completeness, well-being	šalem: be complete, sound, keep peace; šalom: completeness, welfare, peace; šilem: recompense; šalmon: reward, bribe; šalah: be quiet, at ease	salima: be intact, be safe; sallama: greet, salute; salisa: be docile, compliant	šlam: well-being, prosperity; šlem: be complete; šleh: carefree	šelama: peace	šlama: peace, greeting, safety, welfare; šlamana: salvation	šlm: be finished, perfect, accomplish; slm: make peace, soundness, health	salama: greet; sallama: make the sign of the cross; sulame: concord, harmony, peace	šlm: be intact, healthy, at peace; šlmm: peace-offerings	C2.2 MONO
ŠL II extract	šalu: ask; šalapu, sala hu: pluck out, extract; silitu: afterbirth; salallu: plunder; šaliptu: withdrawal	šaʔal: ask; šel: from, of; šalah: extract; šalap: pluck out, unsheath; šilyah: afterbirth; šalal: draw out	šalapa: pluck out, extract; suʔal: ask; salaba: wrest, snatch; salata: extract; salaxa: strip off	šaʔal: ask		šlp: pluck out, extract		salaba: remove, deprive		MULTI
ŠM I put	samu: determine; samašu: hide	šam: there, thither; šim, šum: insert, put, hide	tamma, ṭamma: there, thither; šama: insert, introduce	tamah: there, thither; sam: insert, put, hide	sam: insert, put, hide	sum, sim: put in, place	šym: set up, prepare, establish	sema: put, place, set in order, ordain, designate; simat: ordination, appointment, rank, office, dignity	ṭm, ṭmny: there	C2.2 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠM II flourish	šamaku: grow, flourish, šamuhtu: lush vegetation; šamnu: oil; šammu: plants, grass for fodder šamaššam-mu: flax, linseed, sesame	zmorah: branch, twig, shoot; šum: garlic; šamen: grow fat; šaman: fat, fertile; šemen: fat, oil; smadar: blossom of grape	zamrah: flower; samin: fat; tamara: bear fruit; šawm: garlic; simsim: sesame; samaʔd: fertilizer	tumaʔ: garlic; šmen: fat; smdr: blossom of grape	smdr: put forth blossom; šm: onions, garlic; šmn: ripen, grow fat, swell as a tumor;	simaʔ-draʔ: blossom of grape		samra: flourish; be fruitful; sum: garlic; semur: fertile	šmn: fat, oil	C2.5 MULTI
ŠM III name	šumu: name, fame, repute; šamatu: mark, brand; šiamu: fix, decree	šem: name, reputation; ʔašem (< ʔal šem): transgress, be guilty	ism: name, standing, reputation; samada: raise one's head proudly; samiy: name, call, designate; sima: brand an animal	šem, šmaʔ: name	šum, šma: name	šum: name, reputation	smy: name; smt: mark, brand	ʔesma: namely, since; samaya: call, name, invoke, appeal to, become famous	šm: name	C2.2 MULTI
ŠM IV sky	šamu: heavens; šamšu: sun, sun god, sun disc, gold	šamayim: heavens, sky; šemeš: sun	samaʔ: heavens; samʔan-juni: azure; samawi: celestial; šams: sun	šmayaʔ: heavens; šimsaʔ: sun	šmšʔ: sun	šumia: heavens; šamiš: sun, sun god	smy: heaven; šams: sun	samay: heavens, sky; samayawi: divine, celestial being	šm-m: heavens	C2.2 MULTI
ŠM V heed	šemu: hear, obey	šamaʕ: hear, obey; šamar: guard, watch; šemaʕ: report	samiʕa: hear, pay attention to	šmaʕ: hear, obey; šmg: harken, obey; šmš: serve	šemaʕ: hear	šemaʕ: hear, listen, harken; šmita: hearing; šmš: serve	smʕ: hear, submit, obey, witness	samʕa: hear, obey, testify; semuʕ: notable, notorious; semmaʕe: fame, glory	šmʕ: hear, listen, pay attention	C2.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠN I urinate	šanu: urine; šatanu: urinate	šatan: urinate	tina: urine; mašʔanah: bladder	tn: urine	tanʔa: urine			sent: urine	tnt: urine	C2.3 MONO
ŠN II repeat	šina: two; šanu: another; šanu: change	šnayim: two; šanah: change, repeat; mišneh: copy, double; šinʔan: repetition	ʔitnani: two; thani: second; sanah: year; thanay: fold, double	tren: two; tinyanaʔ: second; šnaʔ: change; šnaʔ, štaʔ: year; tnaʔ: re-peat, teach	tna: repeat	trin: two; šna: change	sn: year; tny: double, second	saney: the next day; zenawa: report, repeat	tn: two; šnt: year; tny: repeat	C2.2 MULTI
ŠN III they	šunu: they (m); šina: they (f)	hem: they (m); hen: they (f)	hum: they (m); hunna: they (f)	himo, himon, ʔinun: they (m); ʔinyn: they (f)	hennon: they (m); hennin: they (f)	hinun: they (m)	hmw: they (m); hn: they (f)	ʔemmuntu: they (m); ʔemmantu: they (f)	hm: they (m); hn: they (f)	C2.4 MONO
ŠN IV tooth, fang	šinnu: tooth, point of a hoe; šinqatu: hand-tooth (finger); šinšu: taunt	šen: tooth, ivory; šanan: whet, sharpen; šinah: cutting word, taunt	sanna: sharpen; sinn: tooth; šnr: revile, slander; šunba-da: whetstone; šunḡaba: thorn, spike	šininaʔ: whet, sharpen; šinaʔ: tooth	šen: tooth	šina: tooth, peak, spike	tnhw: incisor teeth	senn: tooth; sanana: sharpen, bite, fight with teeth; tasnan: discord; lawsuit	šn: tooth, ivory; šnn: gnash teeth	C2.2 C2.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠP I low, make low	šaplu: low; šap-lanu: below; šapaku: pour out; šapliš: downward; šupalu: low-lying area; sapanu: flatten	šapel: be low, abased; špelah: coastal lowlands; šiplut: sinking, negligence; mišpax: outpouring of blood; šapkah: male organ (as fluid-duct); šapak: pour out	safla: low; saf: sink, slip, decline; safsafa: nonsense, silly talk; safaha: stupidity, insolence; safaha: pour out water, shed blood; safaka: pour, shed blood	špal: be low; špak: pour out; mašpil: humiliating	šapla: low, lowland; šfaʔ: pour forth; šfl: humiliate; sfk: pour from one vessel to another; sfkʔ: funnel	supat: the lowest part of earth, i.e., hell; šapala: lowland, valley; šapla: low, mean, despicable; špa: gush, pour; špikia: outpouring of blood	sfl: humility, lowland; sfh: treat with scorn, despise;	safaxe: libation, sacrifice	špk: pour	C2.2 C9.2 MULTI
ŠP II bowl, basin	šappu: bowl; saplu: dish for oil; sip-ħu: (metal) container; šappatu, sappatu: pottery vessel	sap: basin, goblet; sepel: bowl, cup	sift: bowl, jar; šafšaq: carafe, jug	siplaʔ: bowl, basin	sfl: wash basin; sfkʔ: jar with twisted molding	šapta: cooking pot			sp: bowl	C2.3 C9.2 MULTI
ŠP III beautiful, pleasing		šapar: beautiful, comely; šiprah: clearness, fairness of sky	safar: unveil, shine, glow	špar: be pleasing	šfr: be beautiful, bright, pleasing; špr: early dawn	šapiga: splendor, brightness; šapira: beautiful, pleasing				C2.3 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠR I straight	išaru: be or go straight	yašar: be straight, right, smooth; mešor: uprightness, level place; ʔašar: go straight, advance; ʔošer: happiness	šaraʕa: point directly; šariʕa: law; yasara: be gentle, tractable			šurah: rule of conduct; šrara: reality, truth, steadfastness	ysr: cause to go straight, plain, level land; šrg: water-course	šarʕa: establish order	yšr: uprightness, lawfulness	C2.5 MULTI
ŠR II root, origin	šuršu: root, tribe, family, kin; šurru: start, inauguration	šoreš: root, tribe, family, kin	sirr: origin, source; surah: navel, center; šuruš: root; šarašir: soul, a person's nature; šaroʕa: start	šoršaʔ: root	šrš: root, establish; šerša: tribe, family; šrbʔ: tribe, nation	širša: root, family, kin	šrs: root out, eradicate; šrsm: beginning, foundation	šerw: sinew, root, origin, tribe; šarara: lay a foundation	šrš: root, tribe, scion	C2.2 MULTI
ŠT I drink	šatu: drink	šatah: drink; mišteḥ: feast, drinking bout		štaʔ: drink; mišteʔ: banquet	ʔšti: drink	šta: drink	šty: drink, sty: a drink offering, libation	satya: drink; setay: beverage	šty: drink	C2.2 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ŠT II ruin, error	šet̃tu: evil deed, crime; šatu: rebel; šutturu: ruin	šatah: turn aside (of unfaithful wife); šaxat: go to ruin; šaṭam: bear animosity against	saṣita: disorder; šatta: deviate, be led astray; suxt: forbidden, illegal possessions	štaʔ, štaʔ: stray	stʔ: turn aside; str: destroy, ruin; stwrʔ: slanderer	šut: bring shame on; šifuta: scorn, contempt, shameful deed; šifia: infidelity, heresy; šut: bring shame on; šifia: infidelity, heresy; štʔ: go astray	štʔ: revolt, uprising	saxta: err, do wrong		C2.2 C10.3 MULTI
ŠW he, him	šu: he	hu: he	huwa: he	hu: he	hu: he	hu: he	h(w) ʔ: he	weʔetu: she	hw: he	C2.4 MONO
ŠX new begin- ning	šeru: dawn, morning star; šertu: morning	šaxar: dawn, look early for; šaharonim: moon or crescent ornaments	sahar: dawn, early morning; (ta)saxxara: have a light meal before daybreak	šaxaraʔ: dawn	sahra: moon	sira: moon	sahr: beginning of the month	šahr: moon, first day of the month	šxr: dawn, daybreak, morning, tomorrow	C2.5 MONO
ŠY she, her, it	ši: she	hi: she	hiya: she	hi: she	hi: she		hiʔ: she	yeʔetu: she	hi: she	C2.4 MONO
TH under		taxat: under	taht: the lower part; tahta: under	txot: under	texut: under	tit, atutia: under	tḥt: under, by the authority of	taxata: be humble, stoop; tatexta: be inferior, submissive; taxtīt: hell	txt: under	C8.3 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
TL mound	tulu: breast, nipple; tilu, tillu: hill, mound; tiliša, tilaniš: into ruin mounds	tel: mound, hill; telem: ridge, furrow; talul: exalted, lofty	talṣa: hill, elevation; tall: mound; talam: ridge	tlamaʔ: ridge, furrow	tella: mound, hill	tililia: small hills, mounds		tallaṣ: breast; telm: ridge, furrow	tlm: ridge, furrow	MULTI
TM I completed	timalu: yesterday; šalšumu: the day before yesterday	tamam: be complete, finished; tmol, ʔetmol: yesterday; tumah: integrity; tam: complete, perfect; šil-šom: day before yesterday	tamam: be complete, finished; tatmim: perfection, accomplishment; tamm: self-contained (needing no completion)	ʔitmaley, tmaley: yesterday	ʔitmal: yesterday	ʔetmaliʔ: yesterday	tmm: in perpetuity	temalem: yesterday, eve; tamam: complete		C2.3 MULTI
TM II taste	temu: sense, discernment	ṭaṣam: taste, sense, discernment	taṣima: taste	ṭṣem: order, decree, influence (of wine)	teṣam: taste	tam: taste	tṣm: cause to taste	teṣama: taste, be sweet, experience death		MONO
TN baking oven, pit	tinuru: oven; tangussu: copper or bronze cooking vessel	tanur: oven	tannur: pit, baking oven	tnnʔ: vapor, smoke; tanuraʔ: oven, firepot	tanuraʔ: oven; tnnʔ: cosmic vapor, smoke	tanuraʔ: oven; tana: cosmic vapor, smoke; tangara: copper cauldron; atuna: oven		tann: vapor, smoke; tantaga: burn vigorously, scorch		MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ṬB felicitous	ṭiabu: be pleasing, sweet, good; ṭubu: happiness, satisfaction	ṭob: pleasing, good, benefit, welfare, heṭib: make glad, do well	ṭayib: be good; heal, cure, sweeten; ṭabiʔah: nature, character; ṭabba: treat medically; ṭabat: reliable, trustworthy; ṭabṭaba: stroke, caress; ṭayyib: bright, intelligent	yṭab: be good, well, glad, pleasing	tʔb: be good, well; tʔbʔ: news; tbʔ: valuable, precious, favorable	ṭab: good, well; ṭabaʔ: blessing, wholesome, virtuous; ṭabuta: boon, generous gift		ṭabba: be wise, prudent; ṭabaya: nature, essence; ṭabʕa: be brave, determined, manly	ṭb: good, sweet, generous	C10.3 C9.3 MULTI
ṬP extinguish	ṭapuru: remove, clear away		ṭafiya: be extinguished	ṭepa: be extinguished	ṭaf: flicker as a dying light			ṭafʔa: be extinguished, perish, vanish; ṭafeʕ: abandoned house		C9.2 MULTI
ṬX grind	ṭenu: grind flour, grain	ṭaxan: grind, crush	ṭahana: grind, mill, pulverize; ṭuhl: sediment, dregs	ṭxan: grind	ṭxnʔ: grind; ṭxn: pound, grind, masticate	ṭhn: grind	ṭxn: flour	ṭaxana: grind flour; ṭaxl: sediment; ṭaxf: cereal used in baking bread	ṭxn: grind	C10.3 C8.3 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ṬY mud	ṭiṭu, ṭidu: mud, mire, clay, mortar, plaster, underworld food	ṭiṭ: mud, mire, potter's clay, brick clay, symbol of contempt; ṭaxax: be besmeared; ṭu-ax: overlay, coat, besmear	ṭin: daub or coat with clay, soil, mud, slime	ṭin: earthenware, (wet) clay; ṭu-ax: overlay, coat, besmear	ṭin: mud, mire, clay, dirt			ṭiṭ: besmear, plaster with mud; ṭib: plaster, coat, plug up	ṭwx: plaster; ṭiṭ: mud, clay	C10.3 MULTI
XB capture, ambush	habalu: tie, snare, harm; nahbalu: trap	xabal: act craftily against; xebel: birth pangs, destruction; xabaš: bind up	xabala: set a trap; xibl: shrewd, cunning; habasa: confine, restrict	xabulah: harm, damage; xabušyaṭ: imprisonment	xabbel: act craftily against		hbl: lie, deceive; xabala: set a trap; xabaṭa: conceal; xabaṭ: make a surprise raid; xbtṭ: attack of disease	xabala: tie, fetter; xabl: rope, snare, booty; hbt: means of connecting or joining together		C8.3 C9.3 MULTI
XD hold, seize	ahazu: hold, seize, marry, learn	ʔaxaz: seize, grasp; xazak: strong, powerful; xazaka: seizing; ʔaxuza: landed property	ʔaxaḏa: hold, seize; hadaqa: surround, encompass; hadda: mark off, stake off land	ʔaxad: hold, seize; ʔaxuztaṭ: landed property	ʔxad: hold, seize	ʔahd: hold, seize	hwz: seize; hṣf: booty; ʔhad: occupied land	ʔahaza: grasp, occupy, dominate; ʔehiz: dominion, power; ʔehizat: virtues (power of heaven)	ʔxd: hold, seize; xšk: seize, grasp	C8.3 C4.1 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
XL defile		xelkah: unfortunate; xalal: pollute, defile, profane; xol: profaneness; xalalah: woman sexually dishonored	xalla: violate; xalaba: pounce upon; muxill: shameful; xaliṣ: wanton, morally depraved; hall: profane; taxliṭ: insanity; maxluṣ: crazy		hl: deride, mock	hall: profane, degrade	xalaṣ: defile	hawlaya, xawlaya: mock, ridicule		C8.3 MULTI
XN we	ninu: we	ʔanaxnu: we	nahnu: we	ʔanax-nah: we	xnan: we	ʔanin: we		nexna: we		MONO
XP surround	haparu: surround	xapah: cover; xapap: enclose, cover, surround; xop: (surrounding) coast; yaxep: barefoot (uncovered); xupah: canopy	haffa: surround; hafʔaf: side or border of something; ʔafiya: go barefoot (uncovered)	xapaṣ: cover	xpṣ: cover, hide, veil, obscure		hfr: enclosed field; hff: encirclement		hpn: cover, wrap up, garment	C8.3 C9.2 MULTI
XR after	aharu: tarry; ahrutu: posterity; maharu: come to meet; hurdu: posthumous child	ʔaxar: remain behind, delay; maxar: tomorrow; ʔaxar: afterwards; ʔaxer: another; ʔaxaron: the last, end part	ʔaxxara: delay; ʔal-ʔixra: the next world; ʔaxir: last, ultimate, extreme; ʔaxaru: another	ʔaxarey: after; ʔaxar: be behind	ʔxr: be late, delay, tarry	ʔahuria: behind	hʔxrw: keep back, delay; ʔxr: the future	ʔahara: kept back, delayed; ʔaharit: extremity, end; dahara: be late, be last; daharit: posterity	ʔxr: end, after-ward; ʔuxryt: the future; ʔuxry: the next world	C8.3 MULTI
XṢ I arrow	uṣu, uṣṣu: arrow	xes: arrow; mxasṣim: archers	xazwa: arrow	xṭṣ: arrow			xzy-n: archer	xasṣ: arrow, dart	xz: arrow	NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
XŠ II axe, hew	haššinu: axe; ešedu: reap, cut the harvest; ešu: split, cut into	xašab: hew, cleave; xašaš: reap, cut the harvest; xašah: divide	xaša: castrate; xadaḏa: cut off, break off; hašaša: cut in two	xšd: reap, cut the harvest	xšn: small axe	hašubia: cuts, wounds	xšm; split wood, xšb: cut, hew wood or stone	maxše: axe; maxasa: extirpate		MULTI
XṬ trans- gress	taḥṭipu: oppression; xaṭu: sin; xaṭtu: criminal	xaṭaʔ: sin, miss a goal, go wrong, xatap: catch, seize; maxteret: breaking in, burglary	xaṭiʔa: sin, commit an error	xaṭaʔ: sin	xēṭa: sin	hatia: sinning, offending; hatipa: rapacious, despoiling	xtʔ: sin, err, commit a crime	haṭ ʔa: lack, be destitute, fail; cause to sin: haṭaʔ: lack, scarcity, want	xṭʔ: sin	C8.3 MULTI
XY living, healthy		xayah: live, xay: alive; xayah: animal, community; xayim: life; mixyah: suste- nance	hayya: live, experience; hayy: animated, active; hayawi: vital, essential to life; hayawan: animal	xayaʔ: alive, living being; hayah: keep alive; xaiba: animals	xiya: live	hia: live; hiua, hiuta: animal; hiia: Life, deity of Mandaic religion	hyw: live, cure, survive; hyn: life, health	xaywa: live, revive, be cured, heal; mexeyawi: life-giving, saving, savior; xiwat: good health, salvation, lifetime	xyy: live; xwy: be alive, resusci- tate; xym, xyt: life	C8.3 MULTI
YD hand, authority	idu: side, arm, goal, strength; ederu: hug, embrace	yad: hand, authority; yadah: cast, throw	yad: hand; wattada: make firm, stabilize; waday: throw; yadawi: manual	ydaʔ: hand; yadah: laud	yad: hand		yd: hand, power, presence of	ʔed: hand; wadda: join together, esta- blish firmly	yd: hand; ydk: penis	C3.1 C3.2 MULTI
YM I day	umu: day; immaniš: in daytime; umakkal: length of one day; umiša: daily	yom: day, time (in the general sense); yomam: daytime, daily	yawm: day (24 hours), era, age; muyawama: day labor	yom: day; yema- maʔ: daytime	yawma: day	ium: day	ywm: day, battle	yom: today, nowadays	ym: day	NON

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
YM II sea	yamu: sea, lake, river	yam: sea	yamm: open sea	yam: sea	yama? : sea, lake; yam-ma? : seaman; yamat? : pool, swamp	iama: sea, lake, river, lagoon			ymm: sea	NON
ZB excrement	ziblu: refuse	zabax: slaughter for sacrifice	zibl: manure; zabun: stupid, foolish; zabaga: tear out, pluck	zibla: manure	zibla: manure			zabala: defecate, have diarrhea, spread manure; zebl: dung; ʿazaba: dung of bovines; zaban: back part, tail	zbl: manure	C9.3 MULTI
ZK memorial	zakar: declare, speak, proclaim; zkaru: male; zikartu: testicle	zakar: remember; zikaron: memorial; mazkir: recorder; zakar: male	ḏakara: remember, mention; ḏikar: male; ḏakar: male, penis; dukra: reputation	dkar: remember; dikra? : male	dekar: remember; dwkrn: keepsake, memory	dukran: remembrance; midkar: mention, call to mind; zkr, dkr: recite an incantation; dikra? : male animal	dkr: mention, make known, announce	zakkara: remind; zakara: remember, mention	dkr: male animal	C4.1 MONO

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ZM I make music	zamaru: sing	zimer: make music in praise of God; zimrah, mizmor: melody	zamara: play upon a reed; mazamur: psalm; zamjara: roar, make a loud noise, curse loudly; zamzama: rumble, murmur	zmar: sing, praise in song	zmtʔ: chant, song; zmmʔ: a ringing sound; zmr: play on a stringed instru- ment	zmar: sing, praise; zamura: flutist; zwm: hum; zmm: hum, resound	zʕm: invoke a deity	zammara: sing, praise or glorify in song; mazammer: musician; mazmer: verse		MULTI
ZM II time, season	simanu: (right) occasion, season	zman: time, appointed time	zaman: time, duration; zamani: pass- ing, transitory	zman: time, season	zabna: period, season	zaman: time; zibna: time; zamanta: summoning for a fixed time		zaman: time, period, season		MONO
ZN weapon, penis		ʔazen: a kind of instrument or weapon; zanah: for- nicate, be a harlot	zana: fornicate; zanim: low, despised, bastard	znaʔ: fornicate; ʔazan: be armed	znaʔ: fornicate	znaʔ: forni- cate, be adulterous, unchaste; zyn: arm oneself; zaina: weapon, equipment		zanaya: fornicate; zenet: sperm; maʔezen: angle, corner	zn: supplies offical; dnt: lechery, fornica- tion	MULTI
ʕM thirst	ʕumu: thirst	ʕameʔ: be thirsty; ʕimaʔon: thirsty ground; ʕamaq: dry up, shrivel; ʕimuq: dried grapes; ʕom: fast	ʕamaʔ: be thirsty; ʕawm: fast	ʕum: fast	ʕamaʔ: be parched	ʕum: fast	ʕmʔm: drought; ʕmʔ: thirst	ʕamʔa: be thirsty; meʕmaʔ: arid place; ʕambaya: be faint, wither; ʕom: fast	ʕm: be thirsty	C10.2 MULTI

Biradical	Akkadian	Biblical Hebrew	Arabic	Aramaic	Syriac	Mandaic	Sabaeen	Ge'ez	Ugaritic	App. C citation
ṢP finger-nail, claw	ṣupru: fingernail, claw	ṣiporen: fingernail, claw	ṣifr: fingernail, claw	ṣep̄ra: fingernail, claw	ṣpr? finger-nail, claw	ṭupra: talon, fingernail		ṣefr: fingernail, claw		C10.2 C10.3 C9.2 MONO
ṢX laugh	ṣihtu: laughter; tuppu ṣihtu: fraudulent tablet	ṣahala: neigh, cry shrilly; ṣaxaq: laugh, make sport; ṣaxaq: laugh, jest; ṣxoq: laughter, derision	ṣahaka: laugh, jeer; muṣhik: buffoon; ṣahl: trivial, superficial; ṣahala: neigh, cry shrilly; ḍahiga: laugh	dxak: laugh		shq, ghk: laugh		ṣaxaqa: laugh, mock; ṣaxṣa: scorn, despise, insult	ṣxq: laugh	C10.2 C10.3 C8.3 MULTI

Appendix C. Phonetic Variants across the Nine Selected Languages.

C1 Introduction

The rationale for the section organization below is to form a cross-reference to the biradical extensions and therefore they are grouped by related variants. The characterization of each section is of the majority of consonants in it. Some sections will reference variants that are related to others in the section but do not fall into the named category.

Table 2 provides a translation from the reconstructed Proto-Semitic consonants to their equivalents in the nine daughter languages. That is, if the reconstructed consonant is not part of the consonant family of a language, which consonant then takes its place. Of course, this strict correspondence does not account for all variations. Many other phonological changes have taken place, such as replacement of one emphatic with another, lenition of gutturals, etc. The material in this appendix is based on the work of Moscati et al. (1964) and Lipinski (1997).

C2 Sibilants *s z š ʒ*

PS has the following reconstructed consonants:

- *s, a voiceless alveolar fricative
- *š, a voiceless postalveolar fricative
- *ś, a voiceless lateral dental fricative
- *z, a voiced alveolar fricative

In Arabic the following progression is attested from proto-Semitic to the present: *ś > š and *s, *š > *ś > s. In Ge'ez, *ś > š but the original form *š > s. In Hebrew, Mandaic, and Aramaic, *ś > s (ś in Hebrew and Aramaic is expressed by the original symbol ש for this consonant but the pronunciation changed to match that of the sibilant s). *ś > š in Akkadian, Ugaritic, and Syriac. *š > š in Hebrew, Aramaic, Sabaeen, Akkadian, Ugaritic, Syriac, and Mandaic.

C2.1 The consonant š in Akkadian, Ugaritic, Syriac, Arabic often corresponds to s in Hebrew and Aramaic, ś in Sabaeen and Ge'ez.

C2.2 The consonant s in Arabic and Ge'ez often corresponds to š in Hebrew, Aramaic, Sabaeen, Akkadian, Ugaritic, Syriac, and Mandaic.

C2.3 The PS consonant ś in can occasionally appear as *t* or *t* in Aramaic, Mandaic, Sabaeen, and Ugaritic, and as *s* in Akkadian and Arabic.

C2.4 *š* goes to *h* in personal pronouns.

C2.5 Interchangeability among the sibilants is widespread.

C3 Semivowels *y w*

PS has the following reconstructed consonants:

- **y*, a voiced palatal approximant
- **w*, a voiced labio-velar approximant

The semivowel *y*, when not original, derives from *w*, appears as a glide, or results from a palatalization of *i*. In Arabic it often replaces the glottal stop *ʔ* between vowels, especially after *i*, as in *ḥatiʔa* > *ḥatiya* “sin.” It also serves as an on-glide in initial position, as in *ʔusr* > *yusr* “captivity.”

The labial semivowel *w* appears in all the Semitic languages. When not the outcome of a consonantal shift, it can appear as a glide between vowels and an on-glide before initial vowels, as in the Arabic *wakkil* < *ʔakkil* “he fed.” In North Semitic here are many occurrences of *w* > *y* in initial position, as in *yld* “to give birth” as opposed to *wld* in the other languages. In Akkadian, initial *w* was lost: **wasib* > *asib*; initial *y* was also lost and *ya* became *i*: **yašarum* > *išarum*.

C3.1 The semivowels *w* and *y* are often interchanged.

C3.2 Initial *w* or *y* in the other languages correspond to initial vowels in Akkadian.

C3.3 In Ge’ez all velars have a labio-velar phoneme, as in *targ^wama* “to translate” and *k^well* “all”.

C4 Nonemphatic dentals and interdentalals *d d̥ t t̥ z š*

PS has the following reconstructed consonants:

- **d*, a voiced dental stop
- **d̥*, a voiced interdental fricative
- **t*, a voiceless dental stop
- **t̥*, a voiceless interdental fricative
- **z*, a voiced alveolar fricative
- **š*, a voiceless postalveolar fricative

Proto-Semitic has two dental stops, voiceless *t* and voiced *d*. In older Arabic both the voiced and unvoiced version of the latter existed but had no phonemic value. Hebrew and Aramaic, the dental stops *d* and *t* were articulated as the fricatives *d̥* and *t̥* after

vowels. The spirantized *t* that is rendered *s* in the Ashkenazi pronunciation of Hebrew is attested in Babylonian texts from the 8th century B.C. There is some evidence of an alternation *t* / *k* based on the forms of the personal pronouns in different Semitic languages. Proto-Semitic has two interdental fricatives, voiceless *t̪* and voiced *d̪*, as well as an emphatic fricative *ṣ*. Ge'ez among other Ethiopic languages lost the interdentals *t̪*, *d̪* and *ṣ*, which became *s*, *z*, and *ṣ*. In Akkadian, common Semitic *d̪* and *z* have merged to *z* and *ṣ*, *ś* and *t̪* have merged to *ś*.

C4.1 The consonant *d̪* that is found in Mandaic, Arabic and Sabaean corresponds to *z* in Hebrew, Ge'ez, and Akkadian, and appears as either *d* or *d̪* in Aramaic and Ugaritic. The consonant *d* exists in all the nine languages.

C4.2 The consonant *t̪* that is found in Arabic, Ugaritic, Aramaic, and Sabaean corresponds to *t* in Syriac, *s* in Ge'ez, and *ś* in Hebrew and Akkadian. The PS *t̪* appears in all the nine languages.

C4.3 *t* and *d* alternations are found, as are *z* and *d* alternations.

C5. Emphatic *q* and its reflexes *q* *k* *g*

PS has the following reconstructed consonants:

- **q̤*, a voiceless emphatic uvular stop
- **q*, a voiceless uvular stop
- **k*, a voiceless velar stop

PS has two velar plosives, voiceless *k* and voiced *g*, as well as the emphatic velar plosive *q̤*. The PS consonant *q̤* still exists in Arabic but has been lost in all the other languages. It has been replaced most often by nonemphatic *q*, less often by *k* and occasionally by *g*, as in Ge'ez.

C5.1 *q̤* often corresponds to *k* in the other languages and sometimes *g* in Ge'ez.

C5.2 *k* often is softened to *h*.

C6 Velars *g* *k* *x* *ğ* (*j*)

PS has the following reconstructed consonants:

- **ğ*, a voiced velar fricative
- **g*, a voiced velar stop
- **k*, a voiceless velar stop
- **x*, a voiceless pharyngeal fricative

In Hebrew and Aramaic, the velar stops *g* and *k* were articulated as the fricatives *ḡ* and *x* after vowels in syllable-final position. After a time *ḡ* disappeared as a separate consonant while *x* remained. The consonant *k* is found in all the languages.

C6.1 The PS consonant *g* appears in all the languages except Arabic where it is *j*. However, PS *g* can also correspond to *k* or *q*.

C6.2 The consonants *ḡ* and *g* often correspond.

C6.3 The consonant *x* in Hebrew and Aramaic often corresponds to *k* in other languages.

C6.4 The consonant *x* is found in all the languages except Akkadian, where it appears as the glottal stop *ʔ*. However, it can also take the form of *q*, *h*, or *ħ*.

C6.5 The reflex of *ḡ* is sometimes *ʔ*, *g*, or *ħ*.

C6.6 In Hebrew and Aramaic, the stop *k* was articulated as the fricative *k̤* after vowels in syllable-final position, as in *katav*, *lik̤tov* “he wrote, to write.”

C6.7 Occasionally the PS *k* will appear in other languages as *q* or *g*.

C7 Liquids and nasals *l r n*

PS has the following reconstructed consonants:

- **l*, a voiced lateral approximant
- **r*, a voiced rolled dental approximant
- **n*, a voiced dental nasal

PS has two dental liquids *l* and *r*. All the daughter languages have both *l* and *r*. Interchanges between *l* and *r* are attested in and between several Semitic languages. Arabic *saraha* “to dispatch” corresponds to Hebrew and Aramaic *šalax*. Arabic *silsila* and Hebrew *šalšelet* “metal chain” correspond to Babylonian *šeršerratu*. Sabaean *rzm* “land tax” is related to Arabic *izm*. Interchanges between *n* and *r* also occur, as in the Neo-Assyrian *qaṇṭuppi* > *qarṭuppi* “stylus.”

C7.1 The consonants *l* and *r* are sometimes alternated, as are *n* and *r* and also *l* and *n*.

C7.2 A vowelless *n* is sometimes assimilated to the next consonant. Arabic *xanzir* “pig” corresponds to Hebrew *xazir* and Hebrew **yinten* “he gives” > *yitten*.

C8 Laryngeals, glottals and pharyngeals \hbar h x ʕ ʁ

PS has the following reconstructed consonants:

- ʔ , a glottal stop
- ħ , a voiceless velar fricative
- ʕ , a voiced pharyngeal fricative
- h , a glottal fricative
- x , a voiceless pharyngeal fricative

Akkadian early on lost the following proto-Semitic guttural sounds: glottal stop ʔ , the voiced velar fricative ğ , the glottal fricative h , and the voiced pharyngeal fricative ʕ except in some early records, where they are found in word-initial position.

In Ge'ez, the laryngeals have been lost or reduced, as in $\hbar > h$. The presence of a word-initial glottal stop is ignored but emphatics are glottalized, i.e., $\text{ṣa} > s\text{ʔa}$.

The five “guttural” consonants in Akkadian: ʔ , h , x , ʕ , and ğ , gradually merged and then were lost: $\text{*ʔamarum} > \text{amarum}$; $\text{*halakum} > \text{alakum}$; $\text{*xaraθum} > \text{erešum}$; $\text{*ʕazabum} > \text{ezebum}$; $\text{ğaθayum} > \text{ešum}$. As is evident, the last three colored the a vowels to e . Mandaic shows similar losses to Akkadian: ʔ and ʕ merged and often disappeared; similarly, $x > h$ and often disappeared.

C8.1 The voiceless velar fricative \hbar found in Akkadian, Arabic, Sabaeen, Ge'ez and Ugaritic corresponds to x in Hebrew, Aramaic, Syriac and Mandaic and, rarely, also in Ge'ez.

C8.2 The voiced pharyngeal fricative ʕ may be found in all the languages except Akkadian, where it is sometimes ʔ but often is lost. Often ʔ itself disappears in Akkadian.

C8.3 The voiceless pharyngeal fricative x is sometimes softened to an \hbar or h , especially in word-final position.

C8.4 In Akkadian the voiceless velar fricative \hbar sometimes goes to w/y or disappears and PS h sometimes appears as ʔ .

C8.5 The PS consonant ʔ sometimes appears as y or h .

C8.6 The PS consonant x sometimes appears as k , \underline{k} , or g .

C9 Bilabial stops and related fricatives *p b m* (b *f*)

PS has the following reconstructed consonants:

- *p, a voiceless bilabial stop
- *b, a voiced bilabial stop
- *m, a voiced bilabial nasal

Ge'ez has a set of labialized consonants: *b^w*, *g^w*, *k^w*, *ħ^w*, and *q^w*. The voiceless labial stop *p* is realized as an *f* in Arabic, South Arabian and Ge'ez. Possibly, *p* was first spirantized to [φ] and then to *f*. However, there is also a voiceless labial stop *p* in Ge'ez, which is usually used for loanwords. A *b* not in word-initial position can be spirantized into b and then become *w* and reduce to the vowel *o* or *u*. Examples are Ge'ez *dabsa* and *dawasa* “to be weak,” which coexist. In Arabic a loan word with a *p* is pronounced as [b] or [f].

Lipinski postulates that *p/b* were one phoneme in PS and when they were differentiated their reflexes in different languages were not identical, viz. *pʕl* “to make, do” in Hebrew while Ugaritic has *bʕl*. The phoneme *m* may interchange with *b*, as in the alternation *ymmt* and *ybm̄t* “daughter-in-law” in Ugaritic. There are also examples of a *b* or *p* insertion after *m*, as in the Mandaic *mbr* < *mr* “sheep.”

Moscatti et al. suggest that the pattern of *p* > *f*, *b* > b could have had an intermediate step of bilabial fricatives φ, β. This pattern also holds when the previous word ends in a vowel (sandhi). In Ge'ez, the consonants *b*, *m*, *k*, and *q* can be spirantized but the variants are not phonemic.

C9.1 In Hebrew and Aramaic, the stop *p* is articulated as the fricative *f* after vowels in syllable-final position, as in *piseg*, *lifsig* “he ascended, to ascend.”

C9.2 The voiceless labial stop *p* found in Akkadian, Hebrew, Aramaic, Syriac, Mandaic, and Ugaritic is realized as an *f* in Arabic, Sabaean, and Ge'ez. However, there is also a *p* in Ge'ez, which is usually used for loanwords, while Arabic articulates the *p* in loanwords as *b* or *f*.

C9.3 In Hebrew and Aramaic, the stop *b* was articulated as the fricative b after vowels in syllable-final position, as in *biker*, *libaker* “he visited, to visit.”

C9.4 The consonant *m* may alternate with *b* and *p* alternate with *b*.

C9.5 In Ge'ez a *b* not in word-initial position can be spirantized into b and then become *w* and reduce to the vowel *o* or *u*.

C10 Dental emphatics ḏ ṭ ẓ ṣ (t d s)

PS has the following reconstructed consonants:

- *ḏ , a voiced emphatic interdental fricative
- *ṣ , a voiceless emphatic dental fricative
- *ẓ , a voiceless emphatic interdental fricative
- *ṭ , a voiceless emphatic dental stop

C10.1 The emphatic ḏ found in Arabic, Sabaean and Ge'ez corresponds to ṣ in Hebrew, Syriac, Mandaic, Ugaritic, Akkadian, and Aramaic.

C10.2 The emphatic ẓ found in Arabic, Sabaean and Ugaritic corresponds to d in Ge'ez, ṣ in Akkadian, and ṭ in Hebrew, Syriac, Mandaic, and Aramaic.

C10.3 Interchangeability of emphatics with each other and with consonants such as s , t , and d is widespread.

C10.4 The PS consonant z often is ẓ in Arabic, Sabaean, and sometimes in Akkadian. It also appears as t , s , ṣ , ṭ and \acute{s} .

Appendix D. Effect on Meaning of Prefixing *ʔ* to Some Pre-Semitic Biradicals.

Biradical	Sememe	ʔ Prefix	Gloss
BD	scatter	ʔabad	stray, wander Hb
BN II	build	abnu ʔeben ʔabna ʔabn	stone Ak stone Hb, stone Am stone Md stone Gz, stone flint knife, stone wt.
BR	chosen	ʔabar	be strong, brave Hb
Dʕ	know	ʔaydaʕa	inform Ab, Gz
DM I	blood	ʔadam, ʔadamah ʔadim adm	humankind, man, red Hb, earth Hb leather of reddish color Gz mankind Ug
DN	sacred law	ʔadonay ʔdn ʔadan ʔadayʔan adannu	name of God, lord Hb lord, head of the household Ug determine, rule, command Hb The Judge Ab firm, strong Ak
DR I	glorious	ʔadar	become glorious Hb magnificent Ak
DR	extend	ʔdraʕa	arm, might Aram
GB I	curved part	ʔagab	by the way, incidentally Hb
GL I	roll	ʕagala ʕagil	wheeled wagon Hb earring Hb
GR I	throat	ʕagar	cry out Hb
HB	give	ʔahaba	presentation, giving Md
HB	love	ʔahab	love Hb
HD I	one	ʔexad, ʔixud ʔahada ʔahad ʔaxda ʔalixda ʔahadu ʔxd	one, unity Hb unify, unite Ab someone, anyone Ab, unit, unique Gz one Md unique Md one, same, certain one Gz one Ug
HM	hot, inflamed	ʔammaḏa	harm, do violence Gz

Biradical	Sememe	ʔ Prefix	Gloss
HR I	taboo	ʔaxarim ʔaxrem	excommunicate, set apart for temple use Am interdict, separate from ordinary use, devote to god Sy
KB	weighty	ʔakabir	people of rank Md
KL I	consume	ʔaxal ʔakala akalu ʔakal ʔkl ʔekl	consume Hb, Ab, Ak, etc. be sufficient Gz bread Ak (I) devour, absorb; (II) complete, endure Md grain crops; eat, devour, absorb Sb food, bread, fodder, produce of the fields Gz
KN	establish	ʔaken	surely, indeed Hb
LK	go, send	alaku	go Ak
NB	fruit	inbu ʔenab ʔeb ʔnʔb	fruit, fruit tree Ak wine grape(s) Hb fruit Am vineyards Sb
NS II	human	enešu ʔaniš ʔenoš ʔanaš ʔnš ʔinš ʔinšt ʔanašaʔ ʔanašata ʔanašutaʔ:	be weak Ak friendly, social Ab humanity Hb be mortal, weak, sick Hb man, fellow (perjorative) Sb people Ug relatives Ug human being Md family, kinfolk Md humanity Md
PN	face	ʔnpy ʔopen	presence Md manner, circumstance Hb
QL I	light, easy, of small value	ʔaqalala	vilify (< be small) Gz
RD	go down, bring down, hunt	ʔarad aradu	flee Hb valley Ak
RG I	use the feet	ʔarağ	lameness Ab
RM I	high	ʔarmon	citadel Hb
RX I	wind, scent	ʔarxah	inhale, smell Sy

Biradical	Sememe	ʔ Prefix	Gloss
RX III	far, long	ʔorxah: ʔarok ʔarkah arku urhu ʔarak ʔrika ʔaraq ʔrk	caravan Hb long Hb long duration Am long Ak road, path Ak way, path Am long, tall Md flee from Md be long Ug
SP	gather	ʔasaf ʔasefa	gather Hb assembly Hb
ŞB I	suffer	ʔaşab	suffer pain, grieve Hb, Gz, Am
ŞB II	point to	ʔeşbaʔ ʔaşbaʔ ʔşb ʔşbʔ ʔaşbaʔet ʔuşbaʔat	finger, unit of measure Hb finger, toe, unit of measure Ab finger Md finger Sb finger, toe, unit of measure Gz fingers Ug
ŞL	dark, shadow	ʔaşel	hold back, reserve Hb
ŞR	narrow	ʔaşar ʔşr	store Hb, Am squeeze, press out Sb squeeze, wring out, press out Md
ŞM III	name	ʔaşem	be guilty, transgress Hb
ŞN IV	tooth, fang	ʔaşen	be firm Hb
ŞP II	bowl, basin	ʔasaf	gather Hb
ŞR I	straight	ʔaşar	go straight, advance Hb
XD	hold, seize	ʔaxaza	grasp, occupy, dominate Gz
ZN	weapon	ʔazen	tools, implements Hb

Appendix E. Effect on Meaning of Duplicating the Second Radical of Some Pre-Semitic Biradicals.

Birad-ical	Sememe	Duplicated radical	Gloss
ʕZ II	strength	ʕezaz ʕazza	dominion, power, excellence, dignity Gz be powerful, respected Ab
BD	scatter	badad batta bdd badada bddy bzz	be separate, solitary Hb scatter, disperse Ab distribute Sb make separate, detach Gz disconnected Ug plunder Sy
BL	depleted	bl blila balla	mingle, confuse Hb idle, useless Md spoil, confuse Gz
BQ	sprout	baqaq baqqa buggala	be luxuriant, profuse Hb give off in abundance Ab offshoot, bud Sy
BR I	choose	brr bara barra brr	separate, select out Hb separate, choose Am choose, select, separate out Gz pure Ug
BR III	knee	brr	pledge, oath Sb
BT II	sever	batatu batat batta butturu	bring to an end Ak cut off, sever Hb sever Ab mutilate Ak
BZ	waste	badadu	waste, squander Ak
DM I	blood	damma	dye, tint, smear Ab
DM II	silent	damam dmm damama dmamah dmm	be silent Hb come to a stop Md amaze, stupify Gz whisper Hb stand still Ug
DN	sacred law	addanu	firm, strong Ak
DP	push, beat	duppu	a beaten tablet, i.e., document
DQ	small	daqaqa daqaqu daqaq daqqaq dqag daqg dqq daqg daqiga	grind to powder Gz crush, make small Ak pulverize Hb thin, fragile, unimportant Ab reduce to powder Ab reduce to powder Aram small, thin Aram reduce to powder Sy, Md children Gz grandchildren Gz

Birad- ical	Sememe	Duplicated radical	Gloss
DR II	path	darar dror	stream, flow abundantly Hb a free run, liberty Hb
DL	unreliable	zilullu zalal dalla zll dll	vagrant, tramp Ak be frivolous, wanton Hb be base Ab slacken, be licentious Sy, despised Md, stupid Gz uneasiness Md
GB I	curved part	gabbu gebab gabbah gabiba gbb gabbaba	part of a human or animal body Ak be curved Hb side Am, Sy hunchbacked Sy bend, curve Sy, Md be bent Gz
GB II	pile high	gabbu	entirety, totality Ak
GB III	powerful	jabbar gabber gabbar	one who is bold, a tyrant Ak prevail Sy laborer, one who pays taxes Gz
GD I	cut	gadad gdud jazza gdad gzaz gdd gzz gazza	lop off Hb furrow, cutting Hb cut Ab cut off Am shear Am cut off Md cut, harvest Sb split, diminish Gz
GL I	roll	golal glala gararu kallala kolala	roll Hb something rounded Md roll, twist Ak encircle Gz roll, make dizzy Gz
GL II	skin	gallabu galladah gallawa gallasa	barber, shave Ak cover over with hide Gz cover with leather Gz cover with leather Gz
Gš II	touch	gašaš jassa gšaš gšš gasasa	feel with the hand, stroke Hb stroke, touch, palpate Ab feel with the hand, stroke Am feel, make contact with, touch Md touch, feel, handle Gz
ĠM	mist	ġamma gmama ġmm	veil, conceal Ab partial eclipse Md be covered, dark Ug
HB	love	hababu habib xabeḥ habba habb xabab hbb	caress Ak friend Gz, Ab love, embrace Hb, love Am love Ab be loved Am dear, beloved, cherished Sy love Sb

Birad- ical	Sememe	Duplicated radical	Gloss
HD II	new	haddasa haddis haddes xaddit xaddet	restore, repair, renovate Gz new, recent Gz excellent Gz renew Am make new Sy
HD III	sharp	hadd hidda uddudu xdad	be sharp, sharpen, shrill, a blade Ab stridency, fury, wrath Ab sharpen Ak sharp, keen Am
HM	hot, inflamed	hamma hummah hammam hamim ememu xamam hamima xamama xemame	heat Ab fever Ab bathhouse Ab close, intimate Ab be warm, hot Ak heat Am feverish, incensed Md have a fever, be afflicted Gz passion, disaster Gz
HŠ I	perceive	hasasu ašašu hass xšš? hšš xassawa	remember Ak become disturbed, worried Ak sensation, perception Ab, remember Ug feeling pain Sy feel Md be deceitful Gz
HŠ II	search	gišeš kšaša xatata kašaša basasa	explore, fathom Hb, Am investigation, exploration Md search, inquire, question Gz seek, explore, investigate Gz spy, investigate Gz
KL I	consume	kalal kalalu ukullu kulliya kalla kwl kl k^well k^wellawi	complete, perfect Hb complete Ak fodder, food supply Ak integrity, wholeness Ab be exhausted Ab martyrdom Sy all Sb all, each Gz universal
KL II	restrain	kallatu kallala kallat	closed bridal chamber Ak surround for protection Gz bride Ug
KN	establish	k^wannana kunnu konen	regulate, govern Gz establish, fix Ak establish Hb
KP	bend	kappu kapap Kpap	wing Ak be bent, bowed Hb bend Aram
KT	shoulder	kittu	a support Ak

Birad- ical	Sememe	Duplicated radical	Gloss
LB I	inner essence	libbu lebab libab lubb labib libba lebba lebb labbaba labbawa	heart, mind, center Ak mind, will, heart Hb encourage Hb heart, essence, mind, prime, core Ab intelligent, understanding Ab heart Am heart Sy heart, mind, understanding Gz understand, be intelligent Gz perceive, be clever Gz
MD	learn	madadu limmud madad mudd mdd mattana	measure Ak accustomed Hb measure Hb a corn measure Ab a period of time Sb measure out, estimate Gz
ML II	salt	malax	sailor Am
MN II	quantity	mennan manna	kind of weight Gz grant, award Ab
MR II	bitterness, sickness	mararu mrarah maror murr mrar mrir mrr marara merrat	be bitter Ak gall, poison Hb bitter herb Hb bitter, severe, painful Ab be bitter Am be bitter Sy be bitter Md, poison Ug be embittered Gz rancor, rebellion Gz
MŠ I	wipe, smear	mašašu muššuʔu	wipe off, clean off Ak rub part of the body Ak
MŠ II	drag, pull	maššanu mazaza	tongs Ak pull out, snatch away Gz
MṬ II	stretch out, shape	matṭa	expand by pulling or beating Ab
NQ	pierce	naqaq	fissure, cleft of rock Hb
PL I	divide	palal fl flth	intervene Hb cut channels (II) Sb dike separating fields Sb
PL II	spring forth	fl	flee Sb
PR I	split off	parar	break in pieces Hb
QD II	holy	qadada qadad	bow down Ak bow down Hb
QL I	light, easy, of small value	qalal qalalu qalil qallu qalil qll	be trifling Hb be light Ak of small value Gz inferior Ug light Md small quantity Sb
QL III	swiftness	kallu qalil qll	express messenger Ak swift Hb, fast Md, swift Gz swift, hasty, headlong Sy

Birad- ical	Sememe	Duplicated radical	Gloss
QR I	cold	qarar qarr qrr? qrrut? qarir q^warir	be cold Hb cold Ab cooling, as a drug Sy severe cold, frost Sy cold, cool Md cold Gz
RB	many, much	rbabah rabb rababa rabibawit rabbān rabbawat	multitude, ten thousand Hb lord, master Ab be numerous Gz sovereignty Gz leader, elder, senior Gz myriads Gz
RD	go down, bring down	radadu radad rdd	pursue Ak subdue, beat back Hb drive back Md
RM I	high	romem arammu rymm ramom	exalt Am wharf, place of heaping-up of materials Ak exalted Sb be exalted Hb
RQ I	thin, empty	raqaq raqaqa raqiq raqq raqqeq	be thin Hb be thin, be subtle Gz be thin Gz be thin, weak Ab make thin Am
ŠM I	drug, poison	šammu šamamu smm summ	poison Ak cause pain Ak spice, drug Hb poison
SK	tool, knife	sikkanu sikkatu sikkuru sakkin	rudder, steering paddle Ak peg of wood, blade of plough Ak bar, bolt Ak knife Ab
SR	false, defective	sarar sararu	be stubborn, rebellious Hb be false, cheat Ak
ŠD I	turn away	šadad šadda sadada	turn away, alienate Hb turn away, alienate, persecute Ab banish, chase away, reject, excommunicate Gz
ŠL	dark, shadow	šalal šalala šellal šullulu šalila telala telala zll	be shaded, dark, grow shadowy Hb overshadow, darken, conceal Gz umbrella Gz provide shade Ak shady Ab shadow, shade Am shadow, shade Sy roof over Sb
ŠR	narrow	šarar	bind, be restricted Hb

Birad- ical	Sememe	Duplicated radical	Gloss
ŠB II	turn back, return	šobeb	apostate Hb
ŠD	evil spirit	šdd šadad šadida	overpower Md devastate, ruin Heb calamity, misery Ab
ŠN I	tooth, fang	sanana I: sanana II: šanana šnina? šnn	sharpen Gz bite, fight with teeth Gz whet, sharpen HB whet, sharpen Am to gnash teeth Ug
ŠP II	bowl, basin	šappu šappatu, sappatu	bowl Ak pottery vessel
ŠT II	ruin, error	šeṭtu šutturu šatta	evil deed, crime Ak ruin Ak deviate, be led astray Ab
ŠM III	name	ʔašem ʔesma	transgress, be guilty Hb namely, since Gz
TL	mound	talal talul	heap, hill Hb exalted, lofty Hb
TM I	completed	tamam tmm tamm	be complete, finished Hb, Ab, Gz in perpetuity Sb self-contained (needing no completion) Ab
ṬB	felicitous	ṭabba	treat medically Ab be wise, prudent Gz
XL	defile	xalalah xalal xalla hll hall	woman sexually dishonored Hb profane, defile Hb violate Ab deride, mock Sy profane, degrade Md
XP	surround	xapap haffa hff	enclose, surround Hb surround Ab encirclement Sb
YM I	day	yomam yemama immaniš	daytime Hb daytime Am in daytime Ak

Appendix F. Comparison of the Pre-Semitic Biradicals with Semantically-Similar Phoenician Roots.

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
abound	SP	gather, overflow, assembly	ŠPX clan ʔSP gather YSP add	Yes
abundance	DŠ	abundance, grow fat, fertility, thrive		
after	XR	after, behind		
alien	NK	alien, foreigner, disloyal, hostile		
arrow	XṢ I	arrow	XṢ arrow	Yes
attire	LB II	wear, attire		
axe, hew	XṢ II	axe, hew	XṢB hewer	Yes
baking oven, pit	TN	baking oven, pit		
basis	ʔŠ	basis, genitalia, root		
be fruitful	PR III	be fruitful, flower	PR fruit	Yes
beautiful, pleasing	ŠP III	beautiful, pleasing, splendor		
before	QD I	before, go forward	QDM aforetime	Yes
beloved	DD	beloved, breast	YDD beloved	Yes
bend	KP	bend, bow down	KPP to present a gift	Yes
bird, flight	ʔP	bird, flight	ʔPT flier	Yes
birth, child	LD	give birth, be born, child, beget, childbirth	YLD youth, to beget children	Yes
bite	NŠ	bite, chew, kiss, jaw		
bitterness, sickness	MR I	bitterness, sickness, sour, gall, poison		
blood	DM I	red, blood, menses, earth (soil)	DM blood	Yes
bow, archer	QŠ	bow, archer		
bowl, basin	ŠP II	bowl, basin, jar, container	SP basin	Yes
break, smash	Pḏ	break, smash, destroy, burst, disaster	PD to bring ruin	Yes
brother	ʔX	brother, trusted friend	ʔX brother	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
build	BN II	build, dwelling, within, stone	ʔBN stone BNY to build MBNT building	Yes
bury, grave	QB II	bury, grave, vile, curse	QBR to be buried (in a religious context) QBR grave QBB curse	Yes
capture, ambush	XB	capture, ambush, snare, make a surprise raid, deceive		
carry, raise	NŠ	carry, raise, lift	NŠ carry, raise, lift	Yes
carve, cut into, shape	HR III	carve, cut into, shape	XRŠ artisan XRṣ engraving, carving XRT engrave	Yes
cattle	BQ II	cattle, herd, buffalo	BQR cattle, herd	Yes
chastise	QṢ	chastise, scold		
choose	BR I	choose, preferred	BRʔ create	Yes
circle	DR III	revolve, circle, encircle		
cleanse	NQ I	cleanse, empty out, pure	ZKʔ clear, pure	
cold	QR I	cold, freeze		
come, accompany	ʔT I	come, accompany, arrive, with	ʔT with	Yes
completed	TM I	completed, past, yesterday, over	TM true, complete, total, resolved	Yes
constrict	ʔQ	constrict, entangle, obstruct		
consume	KL I	all, consume, be consumed, every	KL all, every KLY to complete, accomplish ʔKL eat KLL all	Yes
creep	ḌX	creep, crawling thing, serpent, worm		
curved part	GB I	curved part, the back, boundary	GB territory, boundary GBL limit	Yes
cut	GD I	cut down, cut off, circumcise, segregate	GZ shear GZT hewn stone	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
dark, shadow	ŠL	shadow, shade, dark, gloom, night	XŠK darkness	
day	YM I	day	YM day	Yes
death	MT	death	MT to die, be dead	Yes
defile	XL	defile, stain, filthy		
depleted	BL I	depleted, worn-out, empty, tired, nothing, without	BL not, without ?BL not BLT only, except	Yes
descendant	BN I	descendant, son, daughter, grandchild	BR son	Yes
desire, be hungry for	RĜ	desire, be hungry for, want		
divide	PL I	divide, be distinct, allot, wean	PLG divide, district	Yes
drag, pull	MŠ II	drag, pull, snatch away	GRR drag away	
drink	ŠT I	drink, to drink		
drug, poison	ŠM I	drug, poison, remedy, herbs		
dry	BŠ II	dry, arid, dry land	XRB become dry	No
dust, ashes	PR II	dust, ashes, duststorm		
dyeing, coloring	ŠB IV	dyeing, coloring, painting		
egg	BŞ	egg		
enclosure	GN	enclosure, garden, hidden	GN garden GNN protect	Yes
envy of possessions	QN	envy of possessions		
establish	KN	establish, yes, true, exist, suitable, proper, investigate	KWN to exist, establish KN thus, therefore KN base KNY to designate, name MKN fixed or established place	Yes
evil spirit	ŠD	demon, evil spirit, devil, scourge		
excite	GŠ I	excite, agitate, set in motion		
excrement	ZB	excrement, dross, defecate, diarrhea		
extend	DR	extend, scatter, sow, seed, progeny, forearm, measure	DR family, perpetuity ZRĜ seed, offspring	Yes
extinguish	ṬP	extinguish, go out, clear away		
extract	ŠL II	take out, find out, ask, extract		

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
eye, source	𐤒𐤍	eye, observe, spring, source, meaning	𐤒𐤍 spring 𐤒𐤍 sight	Yes
face	𐤒𐤍	face, front, to face, turn toward	𐤒𐤍 in the presence of 𐤒𐤍 face, side 𐤒𐤍 turn, face 𐤒𐤍 meet, reach	Yes
fail	𐤁𐤕	fail, cease, void, futile		
false, defective	𐤑𐤕	false, defective, deviate, treacherous, rebellion	𐤑𐤕 to turn aside, remove	
far, long	𐤕𐤕 III	far, long	𐤕𐤕 length	Yes
father	𐤕𐤁	ancestor, father, religious leader	𐤕𐤁 father	Yes
felicitous	𐤕𐤁	happy, good, sweet, pleasing	𐤕𐤁 be good	Yes
fertility	𐤕𐤕 II	fertility, conceive, pregnant, plant	𐤕𐤕 fruit, branches 𐤕𐤕 earth, soil	Yes
fight	𐤕𐤕 II	fight, quarrel, distress, attack, oppression	𐤕𐤕 fight	Yes
finger nail, claw	𐤕𐤒	finger nail, claw		
fire	𐤕𐤑	fire, cooking place	𐤕𐤑 fire	Yes
first fruits, first-born	𐤁𐤕 I	first fruits, first-born, early	𐤁𐤕 first fruits	No
fish	𐤍𐤍	fish		
flame	𐤕𐤕	flame, gleam, flash, blaze, kindle	𐤕𐤕 flame	Yes
flesh, cook	𐤁𐤑 I	flesh, meat, cook, burn, sacrifice	𐤁𐤑 flesh, type of sacrifice 𐤕𐤕 flesh	Yes
flourish	𐤑𐤍 II	flourish, ripen, swelling, oil	𐤑𐤍 oil 𐤕𐤕 fruit	Yes
flying insect	𐤁𐤁 I	fly, bee, hornet, wasp, to hover, dart, sting		
fruit	𐤍𐤁	fruit		
furious	𐤕𐤕 II	furious	𐤕𐤕 to be agitated, disturbed	Yes
gazelle	𐤑𐤁 III	gazelle		

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
give	HB	gift, to give, share, generous		
give to drink	ŠK I	give to drink, irrigate, water		
glorious	DR I	glorious, shiny metal or stone, beauty	ʔDR majestic	Yes
go away, take away	ʔZ I	go away, take away, flee, shun, abandon		
go down, bring down	RD	go down, bring down, subdue, beat, pursue, exercise authority	YRD to go down	Yes
go, send	LK	go, send, messenger	HLK to go, walk ŠLX to send LʔK messenger	Yes
good spirit	ʔL	deity, good spirit	ʔL god, deity ʔLM god, godhead ʔLN god	Yes
graze, pasture	Rʕ II	graze, pasture	Rʕ shepherd	Yes
green, yellow	RQ III	green, yellow, gold, vegetables		
grind	ṬX	grind, pulverize, sediment		
ground meal	QM II	ground meal		
grow big	GD II	grow big, become great, leader, conquer	MGDL tower	Yes
hair, bearded grain	ŠR	hair, hairy one, goat, barley (bearded grain)	ZQN beard	No
hand, authority	YD	hand, authority, strength, five	YD hand	Yes
hard substance	ʔZ	tree, bone, hard substance, wood, flint	ʔŠ wood ʔŠM bone	Yes
hate	SN	hate, avoid, enemy	ŠNʕT hatred	Yes
he, him	ŠW	he, him	HWʔ he	

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
head, chief	RŠ	head, chief	RʔŠ leader, head, promontory RʔŠT beginning, chief RŠʔT to rule	Yes
hear, understand	ʔD	ear, hear, understand, deaf (not hear)		
heed	ŠM V	heed, obey, pay attention to	ŠMʕ to hear ŠMR to guard	Yes
here	HN	here, behold	HN behold, here is	Yes
high	RM I	high place, high stature, haughty	MRM raised RM lofty	Yes
hold, seize	XD	hold, seize, grasp, booty		
holy	QD II	be holy, make holy, bow down, show respect, bow	KDŠ sanctuary QDŠ to consecrate QDŠT holy	Yes
horn	QR III	horn, tusk, peak of mountain	QRN horn	Yes
hot, inflamed	HM	hot, inflamed, fever, ardor, blush, have ulcers, anger		
human	NŠ II	human, frail, man, woman, friendly		
I, me	ʔN	I, me	ʔNK I	Yes
if	ʔM III	if, suppose that	ʔM if	Yes
in	B-	in, inside, within, come in, among	B- in, from, among	Yes
inner essence	LB I	heart, mind, will, inner essence, courage	LB heart	Yes
join, bind	ŠM	join, bind, unite, yoke, weave, braid	ŠMD bind SMDT pair, span (of oxen)	Yes
knee	BR III	knee, kneel, bless	BRK bless	Yes
know	Dʕ	know, knowledge, claim	DʕT knowledge	Yes
lacking	HS	lacking, need, suffer loss, deficient, defective	MXSR need, lack	Yes
laugh	ZX	laugh, play, jeer		
learn	MD	learn, teach, accustom		

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
left (side)	ŠM II	left side, left hand, unlucky		
lie down	ŠK II	lie down, copulate	MŠKB resting place MŠKB the lower classes ŠKB to lie down, be laid to rest	Yes
light	ʔR III	moonlight, starlight, sunlight, firelight, shine, blind (=no light)	ʔR God of light	Yes
light, easy, of small value	QL I	easy, light, of small value		
likeness	MT	likeness, resemble, example, compare, image		
lip, edge	ŠP	lip, edge, rim		
living, healthy	XY	living, healthy, vital, animal	XWY to live, preserve, keep alive XYM life, lifetime XYT living thing, usually a wild animal	Yes
love	HB	love, embrace, desire, gladden	MXB to love	Yes
low, make low	ŠP I	low, make low, below, pour out, spill, valley	ʔMK valley	
make evident, prominent	MR II	make evident, prominent, show, find, speak, command, proclaim	ʔMR say, see	Yes
many, much	RB	many, much, great (status), dense, increase, very	RB chief, lord, multitude, many RBT lady (in divine titles only)	Yes
master	BL II	master, owner, husband	BʔL citizen, husband, owner, Ba'al	Yes
memorial	ZK	memorial, male, remember	ZKR mention, memorial ZKRN commemoration offering SKR to remember	Yes
mercy	RX II	mercy, compassion, soft, gentle		
mist	ĠM	mist, fog, clouds		
mix, blend	MZ	mix, blend, combine	MSK mixing vessel	Yes
mother, people	ʔM I	mother, tribe, truth	ʔM mother ʔMT maid servant ʔMM people, nation ʔMT people, community	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
mound	TL	mound, hill	TYL mound	Yes
mouth	PM	mouth, opening, entrance	P mouth, words	Yes
mud	ṬY	mud, mire, clay, to coat with something	MṬX coat, smear, plaster	Yes
music	ZM I	sing, chant, hum, play an instrument, tune	ŠR to sing	No
name	ŠM III	name, reputation, guilty (=no name)	ŠM name	Yes
narrow	ŠR	narrow, protect, press, guard	NSR to watch, guard	Yes
near	QR II	near, kin, approach, tribal area, guts, innards	QRT city	Yes
negation	L ʔ	no, not		
new	HD II	new, news, gossip	XDS new, new moon	Yes
new beginning	ŠX	new beginning, dawn, morning, new moon	ŠXR dawn XDS new, new moon	Yes
night	LL	night	LL night	Yes
nose	ʔP	nose, breathe, blow, humiliate		
not fully aware	HL	dream, dreaming, feverish, hallucinating	XLM to dream	Yes
old	SB	old, old age, grey (white) hair		
one	HD I	one, single, solitary, make one (unite)		
open	PT	open, spacious, to open, conquer	PŠ open the mouth, offer PTX to open	Yes
path	DR II	path, walk, tread, march, step, move, arrange	DR to tread DRK road	Yes
perceive	HŠ I	perceive, smell, think, account for, sense	XŠB think, plan	Yes
pierce, hole	QB III	pierce, hole, stab, wound, dig, cave, rape, female		
pile high	GB II	pile high, mountain, hill		
place of	BT I	tent, dwelling place	BT house, room in palace, tomb	Yes
plains, fields	GR IV	plains, fields		
point to	ŠB II	finger, toe, point to		

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
possessing	ML I	ruler, full, to own, to rule over, whole	MLK king of a country, city or an ethnic group, kingdom, to rule	Yes
pottery, vessel	QD III	pottery, vessel		
powerful	GB III	powerful, hero, strong, prevail, virility	GBR young, vigorous man GBRT strength, might	Yes
praise, rejoice	HL	praise, shout in joy, celebrate		
prepare	ʕD	prepare, ready		
press, squeeze	HṢ	press, squeeze, injure, torture		
push, beat	DP	push, expel, thrust, knock down, kick		
put	ŠM I	put, there, insert	ŠM there, to put, to set	Yes
putrid	BŠ	putrid, ashamed, wretched, disgusted, stink, rotten		
quantity	MN II	quantity, allot, weigh, count, offering	MNY to count	Yes
rain	MṬ I	rain		
rear	DN	rear, tail, anus, pollute		
receive, accept	QB I	receive, accept, facing, opposite		
repair	RP	heal, repair, recover, medicine, sew up, help	ʕZR to help RFʔ heal, healer, physician	Yes
repeat	ŠN II	another, repeat, year, two, second	ŠNʕ teacher (from repeat) ŠNY second ŠNM two ŠN change ŠT year	Yes
restrain	KL II	restrain, surround, contain		
return	ŠB II	return, answer, put back, turn back		
right (moral)	ṢD II	right (moral), just, fair	ṢDQ pious, just, legitimate, righteousness	Yes
rise	QM I	rise, stand, stamina, place	MQM a cultic functionary (causes to rise) MQM place, sacred place	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
roar, make tremble, quake	Rʕ I	roar, make tremble, quake, thunder, shudder, be afraid	XRD trembling, terror	No
roll	GL I	roll, wave, spin, twist, curl up	GLGL to roll upon, burden MGLT scroll ʕGLT cart	Yes
root, origin	ŠR II	root, origin, navel, family	ʔŠR basis ŠRŠ root, stock	Yes
round	KR II	round, flat (not round), belly	BṬN belly, womb	No
ruin, error	ŠT II	ruin, error, stray, heresy		
sacred law	DN	sacred law, arbiter, moral code		
safe	ŠL I	intact, safe, greet, at peace	ŠLM peace, well-being, refuge, completion, soundness ŠLM to fulfill a vow	Yes
salt	ML II	salt, sailor	MLX salt, mariner, salt water MMLX salt worker	Yes
scatter	BD	scatter, stray, wander, strew, disperse	BDD to be separate, lonely	Yes
scrape	GR III	scrape, itch, scratch, scrape off, peel	MGRD scraper, grater, file MGRDM flesh scrapers	Yes
sea	YM II	sea, lake	YM sea	Yes
search	HŠ II	search, seek out, investigate		
see	Rʔ	see, vision, prophesize, visionary	RʔY to see, eyesight	Yes
set out	RK	set out, ride, sail	MRKBT chariot RKB ride	Yes
sever	BT II	sever, mutilate, amputate, interrupt		
sharp	HD III	sharp, acute, briar, thorn, to sharpen, needle		
she, her, it	ŠY	she, her	HIʔ she	
shoulder	KT	shoulder, shoulder blade		
silent	DM II	silent, stupefied, resigned		
sit, dwell	ŠB I	sit, dwell, settle		
skin	GL II	skin, hide, bark, crust, bald		
sky	ŠM IV	sky, heavens, sun, divine, azure	ŠMM heaven ŠMŠ sun, sun as a god	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
sleep, ease	NM	sleep, ease, doze	NṢM pleasing, lovely, goodness NṢMT favorable YṢN to sleep	Yes
small	DQ	small, make small, thin, reduce, diminish	DQ thin, fine	Yes
sojourner	GR II	sojourner, visitor, stranger	GR client	Yes
soul	NP	soul, life, spirit, self	NPŠ person, desire	Yes
sow, cultivate	HR II	sow, cultivate	XRŠ plowing	Yes
spit	RQ II	spit, saliva		
split off	PR I	split off, detach	PRŠ break through	Yes
spring forth	PL II	spring forth, gush, ejaculate, escape	PLṬ escape	Yes
sprout	BQ I	sprout, plants, buds		
star	KK	star, comet	KKB star	Yes
stop, kill	QT	stop, pluck off, snap off, kill, end	QṬY cut off QṬR part of a sacrificial animal	Yes
storm	BR II	storm, hail, lightening, snow		
straight	ŠR I	straight, in order, upright, crippled (not straight), happiness	ŠŠR happiness YŠR just, upright	Yes
stream	NH	stream, river, flow		
strength	ṢZ II	strength, strengthen, succor, powerful, respected	ṢZ strength, mighty	Yes
stretch out, shape	MṬ II	stretch out, shape, forge		
suck	NQ II	suck, suckle, absorb, nurse		
suffer	ŠB I	suffer, grief, misery, pain, sorrow, rough, harsh, troubled, afflicted		
surround	XP	surround, enclose		
sustenance	LX III	sustenance, bread, food	LXM bread, food	Yes
swiftness	QL III	swiftness, hurry		
taboo	HR I	taboo, forbidden, terrified	XRM devote, consecrate	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
take	LQ	take, marry, seize, collect, glean, grasp	LQX to take	Yes
taste	TM II	taste, sense, discernment		
they, them	ŠN III	they, them	HM, HMT they, them	
thin, empty	RQ I	thin, empty, weak, useless		
thirst	ZM	thirst, drought, fast		
throat	GR I	throat, cry out, groan, scream, neck, swallow		
throw, use a spear	RM II	throw, cast, use a spear		
time, season	ZM II	time, season, period		
tongue	LS	tongue, language, slander	LSN tongue	Yes
tool, knife	SK	tool, knife, club, spoon, stick of wood, blade, flake		
tooth, fang	ŠN IV	tooth, fang		
touch	GŠ II	touch, feel, handle, body, embody		
tranquility	NX	tranquility, relief, repose, quiet	MNX rest NXM ease, comfort	Yes
transgress	XṬ	err, sin, do bad things		
trust	ʔM II	trust, faithful, right hand, support, covenant	ʔMN trust TMX support	Yes
turn away	ŠD I	turn away, chase away, side	ŠD side, besides	Yes
under	TH	under, humble, stoop	TXT under NXT descend	Yes
unreliable	DL	unreliable, unstable, careless, dissolute	DL deficient	Yes
upward	ʔL	upward, climb, exalted, world, upon, over, above, beyond	ʔL stair, on ʔLY to rise, offer sacrifice ʔLT lid of a sarcophagus	Yes
urinate	ŠN I	urinate, urine, bladder		
use the feet	RG I	foot, leg, run, dance, skip, stamp, trample	RQD dance, skip PʔM foot	Yes

Sememe	Biradical	Used to express	Phoenician semantically-similar roots	Possible relation?
voice	QL II	voice, call, recite, sound	KOL voice	Yes
vomit, disgorge	QY	vomit, disgorge, spew		
waste	BZ	waste, squander, despicable, worthless		
water	MY	water, liquid		
we, us	XN	we, us	ʔNXN we	
weapon	ZN	weapon, penis, tools	PʕM penis	No
weep	BK II	weep, bewail, mourn	BKY weep	Yes
weighty	KB	thick, heavy, weighty, honor, burden, belly, liver	KBD honor, weight	Yes
well, pit	BR IV	well, pit, hole, cistern	BWR well	Yes
wet	LX I	wet, moist, humid, damp, lick		
what, who, for what	MN I	what, who, for what	MA what MI who	Yes
where, which	ʔY	where, which		
white	LB III	white, moon, milk, white of egg, albino	XLB milk LBN white	Yes
wide, broad	RX IV	wide, broad, open area	RXB be wide	Yes
wild animal	ʔR I	lion, rhino, mountain goat, boar, fox, hare		
wild grasses	ʕB III	wild grasses		
wind, scent	RX I	wind, scent, perfume, fragrance, spice	RX spirit, wind BʕM spice, balsam	Yes
wipe, smear	Mʕ I	wipe, smear, rub, anoint		
womb	KR II	womb, pregnancy	BṭN belly, womb	No
work, serve	ʕB	work, do, produce, compel, serve, slave, worship	ʕBD to work, serve god ʕBD temple slave	Yes
wrap, cover	KS	wrap, cover, conceal, garment	KSY cover KST a covering	Yes
you, thou, ye	ʔT II	you, thou, ye		
young	ʕĜ	young, small, insignificant	ʕʕR least, little, insignificant	Yes

Appendix G. Comparison of the Pre-Semitic Biradicals with Semantically-Similar Eurasiatic and Nostratic Roots.

Sememe	Biradical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
abundance	DŠ	abundance, grow fat, fertility, thrive			G^wAN to swell, abound MAʔ to increase, be many, abundant WAR to raise, elevate, grow, increase MIK' to exceed, surpass, to grow, increase N^wIM to stretch, extend, increase RIY to prosper, flourish, thrive	
after	XR	after, behind	TAK ~ TEK back, behind, rear, after SE back			
alien	NK	alien, foreigner, disloyal, hostile				
arrow	XŠ I	arrow	AYE arrow LONK arrow			
attire	LB II	wear, attire	IP dress, wear ISU clothe		HAW to put on, wear, get dressed	
axe, hew	XŠ II	axe, hew				
baking oven, pit	TN	baking oven, pit				
basis	ʔŠ	basis, genitalia, root				

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
be fruitful	PR III	be fruitful, flower			BUL to ripen, blossom, mature P^hIR to bear fruit, bring forth ←	Yes
beautiful, pleasing	ŠP III	beautiful, pleasing, splendor	ARA beautiful, clean, wash			
before	QD I	before, go forward	HANT before			
beloved	DD	beloved, breast	MELK milk, breast		ǾUB bosom, breast	
bend	KP	bend, bow down	BUK bend, bow, nod EKA turn, ring, to bend		DAR bend, twist, turn GUB to bend, twist ←	Yes
bird, flight	ǾP	bird, flight	CAYU bird			
birth, child	LD	give birth, be born, child, beget, childbirth			S^ʷAW give birth, be born K^ʷAN to create, beget, give birth MAN^y to lust after, desire passionately, to copulate, to beget MAN^y man, male, progenitor, begetter	
bite	NŠ	bite, chew, kiss, jaw	KUN kiss KEM chew, bite, gnaw KEP chew, eat		K^ʷAB to seize with the teeth, bite K^ʷAP^[hl] jaw, jawbone	
bitterness, sickness	MR I	bitterness, sickness, sour, gall, poison	NINKA bitter SEU sour, gall		ǾIM to be sour, bitter, pungent HAM sharp, sour, acid	
blood	DM I	red, blood, menses, earth (soil)	MAG earth, land, ground MAN ~ MAR sand, stony earth, marsh YA land, earth, place PER ~ PAL red, blood		DIQ^h earth, soil, clay K^[hl]UR blood ǾAR earth, ground	
bow, archer	QŠ	bow, archer				

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
bowl, basin	ŠP II	bowl, basin, jar, container	SULI bag, vessel, container KOCA basket, drinking vessel			
break, smash	PD	break, smash, destroy, burst, disaster			BUR to strike, hit, beat, smash, destroy T'AW to hit, strike T'UK to knock, beat, strike, pound T^yh UM to strike, hit, beat T^yAD to pound, beat, strike ʒAG to strike, beat, drive away Kh ATh to beat, strike, fight MUR to crush, break, destroy	
brother	ʔX	brother, trusted friend	AKA older brother ← TOM friend, companion ILA friend, kinsman	Yes	ʔAR companion, kinsman, friend	
build	BN II	build, dwelling, within, stone	KIU stone, rock, cliff TUL stone		P^hAL stone P^hIR house T'IM to make, build, create Kh IW stone K^wAD to form, fashion, build	
bury, grave	QB II	bury, grave, vile, curse				
capture, ambush	XB	capture, ambush, snare, make a surprise raid, deceive				
carry, raise	NS	carry, raise, lift	OL lift, raise WEK carry, bring OP carry on back KOT raise, lift		BER to carry, bring, bear K'AL to lift, raise, make high WAG^y to carry, convey HAŋ to ascend, lift, raise WAR to raise, elevate, grow, increase	

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
carve, cut into, shape	HR III	carve, cut into, shape	SEN work, make, carve		BAR to scrape, carve, whittle T^hAK^h to form, make, create T'IM to make, build, create K'AR to cut into, engrave ← K^{w[h]}AY to form, fashion, fit K^wAD to form, fashion, build HAK' cut into WUR^y to scratch, incise ← MAK' to shape, handle, work with the hands	Yes
cattle	BQ II	cattle, herd, buffalo				
chastise	QŞ	chastise, scold	SIKE scold, reprove, caper			
choose	BR I	choose, preferred			HAN to show favor, be gracious, affectionate	
circle	DR III	revolve, circle, encircle	PIR around, circle ← TUR turn, twist, spin ← KUL turn, roll, circle EKA turn, ring, to bend SARI wind around, be curved KAM wind around, braid, plait	Yes	T'UM to twist, turn, wind C^[h]UK^[h] to bend, turn, wind, twist GAW-AL to twist, turn, bend K^[h]AY to twist, turn, wind K^[h]AD to twist, wind, wrap K'AR to twist, turn, wind ← GUB to bend, twist HAN to bend, curve, twist WALy to turn, roll, revolve MUR to twist, turn, bend	Yes
cleanse	NQ I	cleanse, empty out, pure			ʔAL to purify, cleanse LAW-AH to wash clean	
cold	QR I	cold, freeze	LAM cold, snow KUL ~ KEL freeze, cold, ice ← YENKA ice, cold, snow KITA ice, frost KON snow, freeze, winter	Yes	K'UF^y to become cold, freeze K^wUR to be severe, bitterly cold ←	Yes

Sememe	Bira-dical	Used to express	Eurasianic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
come, accompany	ʔT I	come, accompany, arrive, with	TUR accompany ←	Yes	T ^{ylh} AR to reach, come to, arrive at T'UL to reach, attain, come to SAG to reach, attain, get, obtain HIN-AK ^{lh} to reach, attain, arrive at	
completed	TM I	completed, past, yesterday, over	MUTA all, complete, be ended		T ^h UM to fulfill, complete ← K ^{wlh} UL to complete, finish	Yes
constrict	ʔQ	constrict, entangle, obstruct				
consume	KL I	all, consume, be consumed, every	TUMA all MUTA all TAMP eat, food, swallow INU eat, food YE eat, be hungry PALA swallow, bite, eat KEM chew, bite, gnaw KEP chew, eat		P ^h AH eat K'AM to chew, bite, eat ʔAT to chew, bite, consume ʔAK ^{lh} to eat	
creep	ḐX	creep, crawling thing, serpent, worm	KURM worm PAM snake, worm, lizard		K ^{wlh} UR worm, grub, maggot, insect	
curved part	GB I	curved part, the back, boundary	SE back, PERE back, edge TERU edge, blade KACI edge, protrusion		K ^{lh} UN-K to be bent, curved HAN to bend, curve, twist	
cut	GD I	cut down, cut off, circumcise, segregate	KAP cut off PERI tear, break off, crumbs, loosen		GUL to cutoff, pluck, break off C'AR to cut off, cut into K ^{lh} AS to cut K ^{lh} AR to cut K ^{wlh} UR to cut HAT' to cut into, hollow, scrape	

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
dark, shadow	ŞL	shadow, shade, dark, gloom, night	PI black, night KURA black, dark color POLM dark, pale TUM dark, darkness AMI dark, hidden NOK night, evening		BAL dark, obscure, blind DUM to darken DUM-K ^w cover over, obscure T ^h AM to cover over, hide, become dark T ^y UL to overshadow, cover over, make dark K ^[hl] AR black, dark ǴIR to become dark set (sun) HAM black	
day	YM I	day	AKA day (24-h), AGAN daytime			
death	MT	death	KOLA die, pain, anguish		DAW be exhausted, die ǴAW to pass away, remove G ^w AN to strike, slay, kill, wound, injure	
defile	XL	defile, stain, filthy			DUR dirt, stain, blemish MAR to soil, stain, make dirty	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
depleted	BL I	depleted, worn out, tired, empty, nothing, without	BUL, BOL worn out, old, tired ← KAM be extinguished, tired, exhausted KARA old, be tired, worn out ALI tired, weak, uncertain, foolish, mistaken PAR tired, exhausted, dizzy PAN weak, be tired	Yes	DAW be exhausted, die T^hAR^y to be weak, frail, delicate ʒAʔ to waste away, to become exhausted, weary GAʔ to be empty, lacking, void K'IR^y to decay, wear out, wither, become old HAL to wear down, worn out, weakened WAS^y to grind, pound, wear down, worn out, exhausted NUS^y to wear down, diminish, weaken	
descendant	BN I	descendant, son, daughter, grandchild	PO child, PAN child, MER young man or woman ←	Yes¹⁸	N^yIP^[h] offspring	
desire, be hungry for	RĜ	desire, be hungry for, want	KERI desire, want, yearn PER(K) wish, hope, desire AVE hunt, kill, look for YE eat, be hungry WEL wish, want, need		HIW to lack, be in want, need HAW to long for, desire MAN^y to lust after, desire passionately, to copulate, to beget LAW to yearn for, feel a burning desire	

¹⁸ *bn* is equivalent to *br* and *mr* (*maru*).

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
divide	PL I	divide, allot, be distinct, wean			BAD split, cleave, divide P^hAC to break open, break apart T'AH split, cleave, divide SAR to split, rip apart K''UN to crack, split, divide HAR-AK' to tear, rend, break apart HAL to divide, allot, apportion MAN to divide, apportion RUW to cut, tear, break apart	
drag, pull	MŠ II	drag, pull, snatch away	PIK pull, tear out, pluck		T^hAR to draw, drag, pull WAL to pull out	
drink	ŠT I	drink, to drink			T^hAR to drink SAW to drink, swallow	
drug, poison	ŠM I	drug, poison, remedy, herbs				
dry	BŠ II	dry, arid, dry land	PA dry up, fade SARU be dried out CAK dry up, be shallow, sediment ČIRA roast, dry up, overburn, cook, burn		T^hAR to be dry, arid S^yAW to be dry, arid, withered ƆAB to be or become dry	
dust, ashes	PR II	dust, ashes, duststorm	KIM, PANA ashes			
dyeing, coloring	ŠB IV	dyeing, coloring, painting	SOM ~ SIM dye			
egg	BŞ	egg	MUN egg, testicle		MUN egg, testicle	
enclosure	GN	enclosure, garden, hidden				
envy of pos-sessions	QN	envy of possessions				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
establish	KN	establish, yes, true, exist, suitable, proper, investigate			DAY consider, examine DAW put in place, establish, set up T^[hl]IK established, firm, solid SAH examine, consider, try to understand T'AK^[hl] to be suitable, proper, appropriate WUY-IK^[hl] to put in order; straight, true, correct	
evil spirit	ŠD	demon, evil spirit, devil, scourge				
excite	GŠ I	excite, agitate, set in motion			WAK' to rouse, stir up, excite MAT^[hl] to arouse, set in motion, impel, be fertile	
excrement	ZB	excrement, dross, defecate, diarrhea	ON excrement PAL excrement, stink KER dirt, manure TER urine, dung, dirt SARI tail, buttocks, defecate			

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
extend	DR	extend, scatter, sow, seed, progeny, forearm, measure	AL seed TAM measure of arm stretched out TUYA arm, wing, shoulder KAR hang, stretch MA-N ~ MA-K ~ MA-R hand, give, measure, paw AL seed, grow, crops		T^hAL^y to extend, stretch, spread T^hAN^y to extend, stretch, spread T^hAR to extend, expand, scatter ← T'AL to stretch, extend C'IL to extend, stretch out, exceed, to prosper MIH to measure, mark off WIR to stretch, extend, expand MAT' to expand, lengthen, measure out MIK' to exceed, surpass, to grow, increase N^yIM to stretch, extend, increase RAK to stretch, extend, draw out	Yes
extinguish	TP	extinguish, go out, clear away	SUN extinguish, fade, die KU strike, kill KUPSA go out, put out KAM be extinguished, tired, exhausted			
extract	SL II	take out, find out, ask, extract			P^hIR to ask, request	
eye, source	ǂN	eye, observe, spring, source, meaning	NI, NU eye ←	Yes	BAW to become aware of, notice RAQ' to observe, supervise, control	
face	PN	face, front, to face, turn toward			HAŋ-T^[h] front, the foremost part MUN to protrude, stand out, be foremost, in front of	

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
fail	BṬ	fail, cease, void, futile			DAW be exhausted, die T^hAR^y to be weak, frail, delicate ʒAʔ to waste away, to become exhausted, weary	
false, defective	SR	false, defective, deviate, treacherous, rebellion			K^[hl]AL^y to steal, hide, deceive	
far, long	RX III	far, long	TUI far KIN ~ KIL long, far DEL long, wide, flat		K^{w[hl]}UL far, distant	
father	ʔB	ancestor, father, religious leader	ECE father, ancestor APA father, grandfather, uncle ←	Yes	ʔAT^[hl] father ʔAB father, ancestor ←	Yes
felicitous	ṬB	happy, good, sweet, pleasing	ASU good, excellent, advantage AYA good, happy, fitting PARE large, good, best		BAR to be kind, do good MAL good, pleasant	
fertility	ʔR II	fertility, conceive, pregnant, plant				
fight	LX II	fight, quarrel, distress, attack, oppression	MAK fight, outdo, beat, torture			
finger nail, claw	ʒP	finger nail, claw	TOPA claw ←	Yes		
fire	ʔŠ	fire, cooking place	KUM fire, spark, be burning TUL fire, cook, burn PAR fire, cook, burn T'A fire, hot, spark AMA hot, burn, ember		P^hAʔ-W flame, spark, fire T^hAP^h to burn, be hot	
first fruits, first-born	BK I	first fruits, first-born, early				
fish	NN	fish	KAL whale, big fish ANI fish		DIG fish K^{w[hl]}AL fish, large fish	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
flame	LH	flame, gleam, flash, blaze, kindle	NULU flame, light, torch BELK bright, shine, light PAR shine, appear, be visible PIK shine, glitter		BAL ^y to shine, be bright, glitter BAR to shine, be bright, sparkle, glitter, whiten, illuminate BAH to shine P^h Aŋ-W flame, spark, fire DAG to glitter, shine, day D^yAK^{w[hl]} to blaze, be bright GIL to shine, glisten ŋAL to make a fire, ignite, kindle HAR-AK^y to glisten ʔIL to shine, flash, glitter WAL ^y to blaze, shine, be bright WAL to set fire to, burn, warm up	
flesh, cook	BS I	flesh, meat, cook, burn, sacrifice	KAM meat MIM flesh, meat AS burn, cook TAKU fire, tinder PE burn, shine KUM fire, spark, burning TUL fire, cook, burn PAR fire, cook, burn AMA hot, burn, ember		GAB to cook, roast, boil, burn K'AL to burn, warm, cook, roast ʔAP^[hl] to burn, be hot, cook, boil, bake WOR to burn	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
flourish	ŠM II	flourish, ripen, swelling, oil			BUL to ripen, blossom, mature P^hIR to bear fruit, bring forth P^hA? to swell, fatten T^hAW to swell T^{yh}IQ^w to swell, swelling, growth GAR^y to swell, increase, grow Q^wAL to swell, expand HUY-AT' to swell, be fat WAR to raise, elevate, grow, increase	
flying insect	DB I	fly, bee, hornet, wasp, to hover, dart, sting	PER ~ PAL bee/fly ČURI fly, louse, nit MUS fly, gnat, mosquito NEM gnat, midge, flea NYALE lick, tongue, louse, stinging insect PAR to fly, wing, feather		K^{lh}UN^y bee, honey	
fruit	NB	fruit				
furious	RG II	furious			BUR to rage, whirl	
gather	SP	gather, overflow, assembly	LEK collect		ʔAS to gather, collect HAP^{lh} to gather or collect (with hands) MI? to reap, harvest LUK' to gather, collect	
gazelle	ŠB III	gazelle				
give	HB	gift, to give, share, generous	TO give, put, sell AKE give, trade, pay, buy MA-N ~ MA-K ~ MA-R hand, give, measure, paw		G^yAB to give, bestow ← MIG to give	Yes
give to drink	ŠK I	give to drink, irrigate, water				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
glorious	DR I	glorious, shiny metal or stone, beauty				
go away, take away	ʕZ I	go away, take away, flee, shun, abandon	PIL ~ BIR leave, abandon, drive out KOD leave, abandon, remain behind LEK ~ LAK leave, run away, escape		P^hAR to fly, flee T^hAW to leave, let go, chase away S^yIL^y to take away, seize C^hAL to empty, leave, abandon GAR to take away, carry off BAW-AK^y to flee ʕIG^y to get out or away from WUT to seize, collect, take away	
go down, bring down, hunt	RD	go down, bring down, subdue, beat, hunt, pursue			BUR to strike, hit, beat, smash, destroy P^hUL to fall, fall down GUS drive away, chase away HUL to destroy, lay waste	
go, send	LK	go, send, messenger	I ~ YA go, walk, reach AL go, walk, wander MEN walk, go, trot, travel LEK ~ LAK leave, run away, escape ←	Yes	BUW to go, come	
good spirit	ʔL	deity, good spirit				
graze, pasture	Rʕ II	graze, pasture				
green, yellow	RQ III	green, yellow, gold, vegetables				
grind	ṬX	grind, pulverize, sediment	MELI grind, crush, break into pieces		T^hAR^y to rub, wear down, grind K^wUR to crush, grind GAR to crush, grate, grind MUL to rub, crush, grind	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
ground meal	QM II	ground meal				
grow big	GD II	grow big, become great, leader, conquer			BAR, BOL, BUN to swell up, expand, puff up, grow large P^hUW to puff, blow, exhale, inflate P^hAS^y to breathe out, blow K^[h]AW to swell, expand, grow big, inflate HAL^y to grow, be strong MAH to exceed, surpass, become great MIK^y to exceed, surpass, to grow, increase N^yIM to stretch, extend, increase	
hair, bearded grain	ŠR	hair, hairy one, goat, barley (bearded grain)	MEL head, hair			
hand, authority	YD	hand, authority, strength, five	KATI hand, branch UTE hand, arm, thigh ← MA-N ~ MA-K ~ MA-R hand, give, measure, paw	Yes	K^[h]AP^[h] to take, hand	
hard substance	ʕZ	tree, bone, hard substance, wood, flint	PON bone UT wood, board ← TIK hard, firm, tough KAT hard, strong KEM hard, bone, flint MUK tree, forest TUNKE tree trunk, stump	Yes	MAR tree, wood	
hate	SN	hate, avoid, enemy				
he, him	ŠW	he, him				
head, chief	RS	head, chief	PEK, KABEL, KER head MEL head, hair		T^hAL head, top, end	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
hear, understand	ʔD	ear, hear, understand, deaf (not hear)			K^[hl]UL to hear	
heed	ŠM V	heed, obey, pay attention to			G UW to heed, pay attention to	
here	HN	here, behold				
high	RM I	high place, high stature, haughty	OL lift, raise KA-M above, top, upper part		GUB highest point, summit HAR to be superior, higher in status or rank	
hold, seize	XD	hold, seize, grasp, booty	KAP, KEM seize ←	Yes	P^hID seize, hold, capture D^ʔAR to hold firmly GAT^ʔ to grasp LAB to take hold of, grasp	
holy	QD II	be holy, make holy, bow down, show respect, bow			T^ʔAW to rever, honor, worship	
horn	QR III	horn, tusk, peak of mountain	NOG horn, antler, nail		BUR-G^y to be prominent, mountain, hill top Q^ʷUR point, tip, peak, summit ←	Yes
hot, inflamed	HM	hot, inflamed, fever, ardor, blush, have ulcers, anger	KOR anger AMA hot, burn, ember ←	Yes	T^ʔAB to become warm, heated K^[hl]AY to be or make warm, heated G^ʷAR to burn, be hot HAL^y to burn, be hot HAG to burn, be aflame, be on fire WOR to burn	
human	NS II	human, frail, man, woman, friendly	KUM ~ KUN person, man, people, country SOROM person MON person, man, woman EME woman, mother, female KUN woman, wife, queen		ʔAW-AR male, man, male animal MAN^y man, male, progenitor NAT^ʔ woman, female relative	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
I, me	𐀀N	I, me	ANA self ←	Yes	𐀀A I, me WA first person stem	
if	𐀀M III	if, suppose that				
in	B-	in, inside, within, come in, among, between	ENA inside KEL come, go, walk TUL find, enter, come ashore SUNKA enter		BI in, within, among ← K'wARB the inside, middle part, interior K'wALB the inside, middle part, interior 𐀀IN into, in, toward WAT'y belly, bowels, womb, the inside of anything MAT ^[h] in the middle of, among	Yes
inner essence	LB I	heart, mind, will, inner essence, courage	AYU brain			
join, bind	𐀀M	join, bind, unite, yoke, weave, braid	EP bind TOL hang, fasten RASANA rope, cord, strap		BAN ^y join together DAB make fast, join together T'yAR to be stuck, joined, bound together S'IR to tie, bind, cord, sinew C'AB to press, stick, tie, bind, join firmly together GAD to force together, join, unite K'UM to pack or press together HAW to weave, braid, plait YA? to tie, bind, gird NAT'y to turn, twist together RAK ^[h] to twist, turn, bind	
knee	BR III	knee, kneel, bless				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
know	DƆ	know, knowledge, claim	TAN know, learn, read, count, teach ALA know, listen, observe SER ~ SOR know, feel, be awake		WAR to watch out for, observe, look at RAQ' to observe, supervise, control	
lacking	HS	lacking, need, suffer loss, deficient, defective			K'AL to need HIW to lack, be in want, need	
laugh	ZX	laugh, play, jeer	KELA laugh			
learn	MD	learn, teach, accustom				
left (side)	ŠM II	left side, left hand, unlucky				
lie down	ŠK II	lie down, copulate			MAN' to lust after, desire passionately, to copulate, to beget	
light	ʔR III	moonlight, starlight, sunlight, firelight, shine, blind (=no light)			BAR to shine, be bright, sparkle, glitter, whiten, illuminate DIL' to shine, be bright DUL to burn, be bright T'AY to shine, glitter, glow HAW to shine ʔIL to shine, flash, glitter HAL to light up, shine, radiate LAW to shine	
light, easy, of small value	QL I	easy, light, of small value	LEK light			
likeness	MT	likeness, resemble, example, compare, image	SEM same, like		SAM to resemble, be like	
lip, edge	ŠP	lip, edge, rim				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
living, healthy	XY	living, healthy, vital, animal	AŋA animal AYU live, age, lifespan ←	Yes	ǵAN-AH to breathe, live HAY-AW to live, life, lifetime ←	Yes
love	HB	love, embrace, desire, gladden				
low, make low	ŠP I	low, make low, below, pour out, spill, valley	KU pour, roll down, fall PES pour, drip, sprinkle TEKW pour, flow, run, ooze, melt, dissolve		GUL valley, ravine, gully LAMD low, lowland, low-lying ground	
make evident, prominent	MR II	make evident, prominent, show, find, speak, command, proclaim	KEL speak, shout, tongue AW speak, call, name IP speak, mouth, tell PA speak, thing		BAH to say, speak T’UQ’ to say, speak, tell K^[hl]AL to point out, disclose, make known C’AR to be visible, clear, evident HAK direct, guide, command YAN to say, speak WAR to say, tell, make known ← MUN to protrude, stand out, be foremost, in front of ǵIN-IM to say, speak, name	Yes
many, much	RB	many, much, very, great (status), dense, increase	MEL many, much, strong, big, full, thick MANKA many, abundant ČOK many, thick ENA large, much, many, very		P^hAL to fill, many, much T’AN-AS to be closely packed MAǵ to increase, be many, abundant	
master	BL II	master, owner, husband				
memorial	ZK	memorial, male, remember				
mercy	RX II	mercy, compassion, soft, gentle			HAR release, set free N^hIM flexible, soft, pliant	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
mist	ǾM	mist, fog, clouds	KURI fog, cloud NEP mist, fog, cloud KUM cloud, hide, cover ←	Yes		
mix, blend	MZ	mix, blend, combine	MES mix, blend ←	Yes	BUL to mix, mix up, confuse	
mother, people	ʔM I	mother, tribe, truth	EME woman, mother, female ←	Yes	ʔAM(M) mother ← ʔAY(Y) mother, female relative ʔAN ^y mother, aunt ←	Yes
mound	TL	mound, hill	MOR hill SA(N)KA hill, heap, pile		GUR to jut out, project	
mouth	PM	mouth, opening, entrance	POL mouth, cheek ANGA mouth/opening AKUR open, mouth, hole		HAŋ to open, gape, yawn, mouth	
mud	ṬY	mud, mire, clay, coat with something	SIBA mud TOI clay ←	Yes		
music	ZM I	sing, chant, hum, play an instrument, tune	KIG sing, cry		BAR to make a sound, utter a noise T ^y AR to make a noise, hum, buzz ʒIM to blow, play a wind instrument ← K ^[h] Aŋ to sing, to sound	Yes
name	ŠM III	name, reputation, guilty (=no name)	AW speak, call, name NIM ~ NOM name AT name		ʔIN-IM to say, speak, name	
narrow	ŞR	narrow, protect, press, guard	CUPA narrow TER few, narrow, weak PAK guard, protect, watch		P ^h IN ^y watch over, protect K ^[h] AL to guard, protect	

Sememe	Biradical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
near	QR II	near, kin, approach, tribal area, guts, innards	KUR intestine ← TUL ~ SUL gut, KAL sibling-in-law ← EKE elder sister, female relative PALG village, settlement, dwelling	Yes	GUR gut ← ʔAN^y approach, draw near to ʔAR companion, kinsman, friend WAT^y belly, bowels, womb, the inside of anything NAT^y woman, female relative	Yes
negation	Lʔ	no, not			ʔAL element of negation ←	Yes
new	HD II	new, news, gossip	SAY new, young UD new, rare ←	Yes		
new beginning	ŠX	new beginning, dawn, morning, new moon			N^y Aʕ to appear, arise, come into being	
night	LL	night				
nose	ʔP	nose, breathe, blow, humiliate	KANKA nose, snout, beak PUS blow, bubble, make smoke ← ANA breathe	Yes	P^hUW to puff, blow, exhale, inflate ← NAS^y to breathe, blow SAW to sigh, pant, gasp, breathe deeply ʕAN-AH to breathe, live NAP^h to breathe, blow ←	Yes
not fully aware	HL	dream, dreaming, feverish, hallucinating	TOL dream		BUL to mix, mix up, confuse	
old	SB	old, old age, grey (white) hair,	PEL old, ancient KARA old, be tired, wornout		S^yIN^y to grow old, deteriorate WAT^h to grow old, wither; year, age, old	
one	HD I	one, single, solitary, make one (unite)	TIK finger, toe, point out, one, only PIR first, one, begin OI one, only		GAD to force together, join, unite ←	Yes

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
open	PT	open, spacious, to open, conquer	AKUR open PA(N)TE open ← PUTO hole, vulva, anus ←	Yes	P^hAT^h to be open, wide, spacious ←	Yes
path	DR II	path, walk, tread, march, step, move, arrange	TELU road, path MEN walk, go, trot, travel		ǂAT^[h] to move, proceed, advance in years HAR-AK^[h] to move, set in motion ǂAY to come, to go RAK^[h] to put in order, arrange	
perceive	HŠ I	perceive, smell, think, account for, sense	MET think, sense, know, believe, observe MEN think, say, learn, understand SAP touch, taste, feel		T^yAN think SAN to perceive, sense GUN to perceive, notice K^yAN^y to observe, perceive ǂUT^y to smell	
pierce, hole	QB III	pierce, hole, stab, wound, dig, cave, rape, female	ALA deep, hollow KOT hole, pit, room API hole, door, space PUTO hole, vulva, anus TEL pierce, stab, skewer KAP pierce, shave ← TEK pierce, prick, strike, knock, beat	Yes	BUR pierce, bore DAL cut, gash, pierce, notch, wound D^yAW to prick, pierce, penetrate K^[h]AY to scoop out, dig, spoon, ladle Q^yAL^y genitals HAT^y to cut into, hollow, scrape HAŋ to open, gape, yawn NAG to strike, split, pierce	
pile high	GB II	pile high, mountain, hill	PAL mountain, SA(N)KA hill, heap, pile		BUR-G^y to be prominent, mountain, hill top K^[h]UM to pile up, accumulate MAL hill, mountain	
place of	BT I	tent, dwelling place				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
plains, fields	GR IV	plains, fields	PAT field, uncultivated land SAI space, uninhabited land		HAK field	
point to	ŞB II	finger, toe, point to	TIK finger, toe, point out, one, only			
possessing	ML I	ruler, full, to own, to rule over, whole			T^hIR to be full, satisfied MAL to be or become full ←	Yes
pottery, vessel	QD III	pottery, vessel			K^wl^hAR vessel, pot	
powerful	GB III	powerful, hero, strong, prevail, virility	KAT hard, strong BEK strong, firm, solid, stable NEK strong, muscle, grind, crush		PhAR to surpass, outstrip K^hAR hard, strong, firm HAL^y to grow, be strong NIR manly, virile	
praise, rejoice	HL	praise, shout in joy, celebrate			NAW to praise, exult, shout	
prepare	ʔD	prepare, ready			HAR to prepare, make ready	
press, squeeze	HŞ	press, squeeze, injure, torture			D^hAB to beat, harm, injure G^wAN to strike, slay, kill, wound, injure Q^hAL to strike, spilt, wound, injure HAN-AG to press or squeeze together, strangle, narrow, constricted HAK^y to inflict pain, wrong, oppress N^yAM to press, squeeze	
push, beat	DP	push, expel, thrust, knock down, kick	UT hit, push, beat		T^hAK to touch, push, strike T^hAL^y to push, thrust	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
put	ŠM I	put, there, insert	TEK put, place PATA cover, lid, conceal TALU close, hide, secret		DIY throw, cast, put in place DAW put in place, establish, set up T ^h UR to push in, stuff, press in T'UW to put, place, give K ^[hl] AY to put, place, set ʔAS ^y to put, place, set, sit, be seated LAG to put, place, lay, set	
putrid	BŠ	putrid, ashamed, wretched, disgusted, stink, rotten	KULI smell, stink, foul ČIRI stink, be rotten		K ^w IY to fester, be putrid, foul	
quantity	MN II	quantity, allot, weigh, count, offering			BAY to apportion, allot MAN to divide, apportion ←	Yes
rain	MṬ I	rain	AMA rain, cloud ALI rain, hail, ice APE water, rain, wade WET water, rain		HAW to sprinkle, spray, rain	
rear	DN	rear, tail, anus, pollute	SARI tail, buttocks, defecate		K ^[hl] Uṇ the fatty part of the body, rump	
receive, accept	QB I	receive, accept, facing, opposite	UK receive, take, grasp NEK acquire			
repair	RP	heal, repair, recover, medicine, sew up, help				
repeat	ŠN II	another, repeat, year, two, second	ANA year TU two, second KI two, twins, we AL other of two, one of a pair, behind ENA other, second, foreign QOL other, replace PON season, year			

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
restrain	KL II	restrain, surround, contain				
return	ŠB II	return, answer, put back, turn back	SE back		ʕAN to return, turn, turn back, turn around HAP^[h] to turn, turn away, turn back	
right (moral)	ŠD II	right (moral), just, fair			K^[h]AN to do properly, set straight, make right	
rise	QM I	rise, stand, stamina, place	OR arise, stand OL lift, raise, arise AKI go up, rise KAL ~ KEL rise, soar		K^{y[h]}IL^y to rise, ascend	
roar, make tremble, quake	Rʕ I	roar, make tremble, thunder, quake, shudder, be afraid	P^hIR, P^hER to tremble ALIKA fear, be afraid of PEL fear, panic, terror		P^hIL to tremble, be frightened P^hIR to tremble, shake T^hIR to tremble, shake K'AL to tremble, shake NAH to tremble, shake, fear, be afraid	
roll	GL I	roll, wave, spin, twist, curl up	TUR turn, twist, spin KUL turn, roll, circle ← KOY wave	Yes	BAR twist, turn P^hIR to turn, twist DAR bend, twist, turn GUR to roll, wrap, wind K^[h]AR to twist, turn, wind ← WALy to turn, roll, revolve LAW to bend, twist, turn	Yes
root, origin	ŠR II	root, origin, navel, family				
round	KR II	round, flat (not round), belly				
ruin, error	ŠT II	ruin, error, stray, heresy				
sacred law	DN	sacred law, arbiter, moral code				

Sememe	Biradical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
safe	ŠL I	intact, safe, greet, at peace			SʸUL to be safe, well, ←sound	Yes
salt	ML II	salt, sailor	MARU sail	Yes		
scatter	BD	scatter, stray, wander, strew, disperse			PʰAR to spread, scatter	
scrape	GR III	scrape, itch, scratch, scrape off, peel			BAR to scrape, carve, whittle TʰAR to scratch, scrape GIR to scratch, scrape ← KʷʰAR to scratch, scrape, dig ←	Yes
sea	YM II	sea, lake	TO lake, pond, MINA lake, port, headwater KI sea, river		YAM water, sea ← MAR any body of water, lake, sea	Yes
search	HS II	search, seek out, investigate	SIK see, look, spy, search		RAʔ-AY to see, perceive	
see	Rʔ	see, vision, prophesize, visionary	TAK see, look, be aware NEKE see, visible SIK see, look, spy, search		RAʔ-AY to see, perceive ←	Yes
set out	RK	set out, ride, sail	MARU sail		HAPʰ to go, move along, march, sail NAʔ to come, go, travel, journey, sail	set out
sever	BT II	sever, mutilate, amputate, interrupt, chop			PʰAR break off, separate, sever DUNʸ cut off, cleave, sever TʰAR to tear, cut, sever CʰAR to cut off, cut into ʔAR to sever, separate, part asunder ʔUR-UB to set apart, put asunder	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
sharp	HD III	sharp, needle, acute, briar, thorn, to sharpen	PENE sharpen, needle PEK sharpen, point, thorns, to hew, file, saw		HAK ^[h] to whet, sharpen, scrape ← ʔAD ^y to be pointed, sharp	Yes
she, her, it	ŠY	she, her				
shoulder	KT	shoulder, shoulder blade	TUYA arm, wing, shoulder			
silent	DM II	silent, stupefied, resigned				
sit, dwell	ŠB I	sit, dwell, settle			P^hAL settlement, settled place K^wAR to stay, remain, wait ʔAS ^y to put, place, set, sit, be seated MAN to stay, remain, dwell, be firm, steadfast	
skin	GL II	skin, hide, bark, crust, bald	KAL skin, membrane, bark ← KAPA skin, bark, covering	Yes	P^hAL skin, hide K^yAL^y bald, head ← K^wUY outer covering, skin, hide, bark, crust	Yes
sky	ŠM IV	sky, heavens, sun, divine, azure	NAR sun, morning KAL ~ KEL sky SULA clear sky, noon,			
sleep, ease	NM	sleep, ease, doze	NU sleep, lie, pillow ← SINI sleep, night	Yes	SAW to sleep, rest ʔAW to sleep	
small	DQ	small, make small, thin, reduce, diminish			T^hAH to reduce, diminish, lessen T^yAK ^[h] to cut into small pieces, chop ← K^wIL to decrease, become little, small, few K^w[h]UR to cut short, reduce, lessen	Yes
sojourner	GR II	sojourner, visitor, stranger				
soul	NP	soul, life, spirit, self				

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
sow, cultivate	HR II	sow, cultivate				
spit	RQ II	spit, saliva	TUP spit			
split off	PR I	split off, detach	CEK ~ SEK cut, split SALA disappear, be separated		BAD split, cleave, divide BAK split off, cleave, break open P^hAR separate, tear, rend ← T^yAR to cut, split K^yIY to split, crack, burst open HAL to be separated or apart from ǂUR-UB to set apart, put asunder RUW to cut, tear, break apart	Yes
spring forth	PL II	spring forth, gush, ejaculate, escape			P^hAS^y squirt out, ejaculate D^yAW to run, flow, gush forth S^yUR to surge, gush, spring ǂAR to gush forth, spurt NAB to burst forth, gush forth	
sprout	BQ I	sprout, plants, buds	AL seed, grow, crops			
star	KK	star, comet	TER sun, moon, star UNGER star, light			
stop, kill	QT	stop, pluck off, snap off, kill, end	TAM lose, cease		T^yAB to strike, slay, kill K^wUD to stike, wound, slay ←	Yes
storm	BR II	storm, hail, lightening, snow	NEGU snow, frosty weather KON snow, freeze, winter		K^yUF^y to become cold, freeze K^wUR to be severe, bitterly cold	
straight	SR I	straight, in order, upright, crippled (not straight)				

Sememe	Biradical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
stream	NH	stream, river, flow	URUS river, pool, to flow, water NAY river, lake, brook ←	Yes	DAN to run, flow T'yUR to run, flow	
strength	ʔZ II	strength, strengthen, succor, powerful, respected			ʔAB to be strong, mighty WAL to be or become strong WUY strength, power, to make an effort, act with energy	
stretch out, shape	MT I	stretch out, shape, forge	SEN work, make, carve KAU hammer, strike, forge			
suck	NQ II	suck, suckle, absorb, nurse	IMA suck, drink MELK milk, breast		K'AL to suckle, nourish, rear K'wAN to suckle, nurse, suck MUN-AT'y to suckle, breast, udder MAL to draw out, pull out, suck	
suffer	ʃB I	suffer, grief, misery, pain, sorrow, rough, harsh, troubled, afflicted	BAL pain, wound, harm KES hurt, suffer TEL hurt, to torture, pain BAL pain, harm, wound WA wound, ulcer, abcess		P^hAL^y to burn, to smart, to be painful Q^[h]AL to strike, spilt, wound, injure K^[h]AR rough, coarse HAG^y to be disheartened, afflicted, troubled MIR to cause pain, to suffer pain	
surround	XP	surround, enclose			G'yIR to enclose, gird	
sustenance	LX III	sustenance, bread, food				
swiftness	QL III	swiftness, hurry			P^hAT to move quickly ʔAT^[h] at once, early, quickly ʔUR to move rapidly, hastily, set in motion	
taboo	HR I	taboo, forbidden, terrified				

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
take	LQ	take, marry, seize, grasp, collect, glean	LEK collect ← KAP seize, take, grasp KEM seize, press, squeeze ALI take, receive, keep AI take, give AMU take, give, pull out PER take, carry, gather TAL take, steal	Yes	DAY bring, take T'AR^y to grasp, embrace T'AK^h to take, seize, obtain S^yIL^y to take away, seize HAC' to seize, grasp, take hold of K^[h]AM to seize, grasp, clutch, collect K^[h]UM to pile up, accumulate K'AR to gather, collect, pluck ǾAB to grasp, seize, hold tightly SAG to reach, attain, get, obtain WAD to take, carry, bring MAL to draw out, pull out, suck	
taste	TM II	taste, sense, discernment	AMA taste, mouth, sweet, smell SAP touch, taste, feel		GAS^y to touch, feel, handle	
they, them	ŠN III	they, them				
thin, empty	RQ I	thin, empty, weak, useless	PAN weak, light, thin			
thirst	ZM	thirst, drought, fast				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
throat	GR I	throat, cry out, groan, scream, neck, swallow	KIG sing, cry KUR throat, swallow ←	Yes	SAW to drink, swallow GUR to roar, growl, gurgle ← GAR to cry out, yell ← K'AR to call out, summon, cry out, shout ← Q^{hl}AR' neck, throat ← Q'AL neck, throat Q'^wUR neck, throat, to swallow ← WAʔ to call, cry out, sound WAL to cry out, call out, shout LUK' to lick lap up, gulp down, swallow	Yes
throw, use a spear	RM II	throw, cast, use a spear			DIY throw, cast, put in place GUD throw, toss Q'^wAL throw, hurl	
time, season	ZM II	time, season, period	PON season, year		ʔAM time, moment NAW time, now	
tongue	LŠ	tongue, language, slander	NYALE lick, tongue KEL speak, shout, tongue, language		T'UQ' to say, speak, tell YAN to say, speak WAR to say, tell, make known ʔIN-IM to say, speak, name	
tool, knife	SK	tool, knife, club, spoon, stick of wood, blade, flake	KAU hammer, strike, forge SAW pole, rod, stick			
tooth, fang	ŠN IV	tooth, fang	NI tooth, gums			
touch	GŠ II	touch, feel, handle, body, embody				
tranquility	NX	tranquility, relief, repose, quiet			T'AM to quiet, calm, pacify RAM to stop, rest, relax	
transgress	XṬ	err, sin, do bad things	AKA, WALU bad		T'^yAW bad, evil	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
trust	ʔM II	trust, faithful, right hand, support, covenant				
turn away	ʃD I	turn away, chase away, side				
under	TH	under, humble, stoop	ACA under, downward KATA down ALA under, below, deep, hollow, down, sole of foot			
unreliable	DL	unreliable, unstable, careless, dissolute				
upward	ʔL	upward, climb, upon, over, above, beyond, exalted, world	OL lift, raise, arise ← AKI go up, rise	Yes	ʔAL to be high, exalted, ascend, upon, over, above, beyond ← ʔAR-AG to climb on, mount WAR to raise, elevate, grow, increase	Yes
urinate	ʃN I	urinate, urine, bladder	OTU urine, spray			
use the feet	RG I	foot, leg, run, dance, skip, stamp, trample	PAS run, hurry TELE run, jump, walk POK run, run away PAD ~ PAT foot, leg, paw KIT foot, heel TAP hit, stamp, trample KAMA run, flee KER run, hurry, jump, hop		P ^h AT foot, move quickly SAL to spring, leap, bound LAK ^[h] foot, leg	

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
voice	QL II	voice, call, recite, sound	AW speak, call, name KIG sing, cry		T'UQ' to say, speak, tell K^[h]AL to call, make a noise ← K'AR to call out, summon, cry out, shout ← K^wAL to call out, cry out, shout ← K^wUT^{y[h]} to say, speak, call Q^wUR sound, noise, to make a sound ← WAŋ to call, cry out, sound WAL to cry out, call out, shout MUR to murmur, make a noise	Yes
vomit, disgorge	QY	vomit, disgorge, spew			WUM to eject, spit out, emit	
waste	BZ	waste, squander, despicable, worthless				
water	MY	water, liquid	AKWA water, river, drink WET water, rain MOR water, sea URUS river, pool, to flow, water SUS wash, scoop, water APE water, rain, wade		D^yAW to run, flow, gush forth T^yUR to run, flow YAM water, sea WAT' to moisten, wet, water MAW water, liquid, fluid ← MUS^y-IK' to immerse or dip in water	Yes
we, us	XN	we, us	KI two, twins, we			
weapon	ZN	weapon, penis, tools			Q'AL^y genitals	
weep	BK II	weep, bewail, mourn	TER weep, despise, curse		K'AM to weep, moan, lament	
weighty	KB	thick, heavy, weighty, honor, burden, belly, liver	YUK liver NI burden MAN belly, SALI large, important, respected		K^wUR^y to be heavy, solid, bulky MAG to be of great influence, importance, exalted, esteemed	
well, pit	BR IV	well, pit, hole, cistern				

Sememe	Bira-dical	Used to express	Eurasiatic semantically-similar roots	Possible relation?	Nostratic semantically-similar roots	Possible relation?
wet	LX I	wet, moist, humid, damp, lick	NYALE lick, tongue LAK lick, lap up, wash, pour, wet ← NAM lick, taste, swallow, drink SUS wash, scoop, water MEU wet, wash, sea TUK ~ TEK wet, pour, damp, ooze	Yes	T'UF' to sprinkle, wet, moisten SAW-AL to wet, moisten, flow HAW to sprinkle, spray, rain WAT' to moisten, wet, water WAL to flow, wet, moisten; well up, flood MAT' to be or become wet, moist NAT' to moisten, wet LAH to pour, moisten, wet ← LAK ^[h] to lick, lap up ←	Yes
what, who, for what	MN I	what, who, for what			ʔAY who, what, which MI what	
where, which	ʔY	where, which				
white	LB III	white, moon, milk, white of egg, albino				
wide, broad	RX IV	wide, broad, open area	PALAn palm of hand, broad		P^hAT^h open, wide, spacious P^hAL flat, level, broad, palm (flat of the hand) RAW-AH to be spacious, wide ←	Yes
wild animal	ʔR I	lion, rhino, mountain goat, boar, fox, hare	GURA wild animal	Yes	GUW-IR wild animal ← ʔAR basis for domestic animals	Yes
wild grasses	ŠB III	wild grasses	PAK grass, onion, weed			
wind, scent	RX I	wind, scent, perfume, fragrance, spice				
wipe, smear	MŠ I	wipe, smear, rub, anoint	SILU rub, wipe, smooth, wash		MAR to smear, anoint, rub (with grease, fat, ointment)	
womb	KR II	womb, pregnancy			WAT' ^y belly, bowels, womb, the inside of anything	

Sememe	Bira- dical	Used to express	Eurasiatic semantically- similar roots	Possi- ble re- lation?	Nostratic semantically-similar roots	Possi- ble re- lation?
work, serve	ʕB	work, do, produce, compel, serve, slave, worship	SEN work, make, carve SI make, do KI do, accomplish, AG do, build		T'AW to rever, honor, worship K^{hl}AM to work, make, do K'wAD to form, fashion, build	
wrap, cover	KS	wrap, cover, conceal, garment	AREK cover, protect WUR cover, blanket PATA cover, lid, conceal TALU close, hide, secret KOM cover oneself, wrap up, swaddle TEP cover, obstruct		BUR to cover, enclose, wrap up P^hAL to cover, conceal, to hide P^{hl}AL skin, hide T'AQ to cover, protect Q^{hl}AM to cover, conceal HAG to cover over, hide, conceal	
you, thou, ye	ʔT II	you, thou, ye			T^hI you	
young	ʃĜ	young, small, insignificant	MER youth, SAY new, young ← KUT ~ KIT small, young, puppy MIK be small	Yes	ʕAG young of an animal MAR young man, young animal MAG young, young person, child	

Appendix H. Comparison of the Pre-Semitic Biradicals with Semantically-Similar Sanskrit Roots.

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
abound	SP	gather, overflow, assembly	SAMGAMA assembly CAYANA collection	
abundance	DŚ	abundance, grow fat, fertility, thrive	PINV , SPHA fatten EDH , PUṢ thrive RAI wealth	
after	XR	after, behind	PAḌCINA behind, west	
alien	NK	alien, foreigner, disloyal, hostile	DRUH , HID , HEL be hostile	
arrow	XṢ I	arrow		
attire	LB II	wear, attire	VAS clothe	
axe, hew	XṢ II	axe, hew		
baking oven, pit	TN	baking oven, pit		
basis	ṚŚ	basis, genitalia, root		
be fruitful	PR III	be fruitful, flower		
beautiful, pleasing	ŚP III	beautiful, pleasing, splendor	YAÇAS beauty	
before	QD I	before, go forward	PRAN̄C forward PURVA prior, east PURA before	
beloved	DD	beloved, breast	URAS breast	
bend	KP	bend, bow down	AC , AṆC , BHUJ bend NAM bend, bow	
bird, flight	ḡP	bird, flight	ḍI , DI fly PAT fly, fall VI bird	
birth, child	LD	give birth, be born, child, beget, childbirth	JAN , JA give birth, be born	
bite	NŚ	bite, chew, kiss, jaw	DAṆÇ , DAÇ bite NINS , CUMB kiss KHAD , CARV chew JAMBH , JABH chew up, crush	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
bitterness, sickness	MR I	bitterness, sickness, sour, gall, poison		
blood	DM I	red, blood, menses, earth (soil)	BHU earth ASRJ , ASAN blood	
bow, archer	QŠ	bow, archer		
bowl, basin	ŠP II	bowl, basin, jar, container	GR̥BHI container	
break, smash	Pḍ	break, smash, burst, destroy, disaster	BHAÑJ , MUṭ , RU , RUJ , LUP break KRAKṢ crash KAD , KṢI destroy DAL , NABH , PHAL , SPHUT burst	
brother	ṚX	brother, trusted friend	ŚAKHI friend SVASR̥ sister	
build	BN II	build, dwelling, within, stone		
bury, grave	QB II	bury, grave, vile, curse	ÇAP curse ← NIND , NID , BHARTS revile	Yes
capture, ambush	XB	capture, ambush, snare, make a surprise raid, deceive	RED̥ deceive	
carry, raise	NŚ	carry, raise, lift	VAH carry TUL lift, weigh	
carve, cut into, shape	HR III	carve, cut into, shape	ÇAS , KṚT , LU cut KU design	
cattle	BQ II	cattle, herd, buffalo		
chastise	QṢ	chastise, scold	GARH chide	
choose	BR I	choose, preferred	VR̥ choose	
circle	DR III	revolve, circle, encircle		
cleanse	NQ I	cleanse, empty out, pure	PU cleanse KṢAL , NIJ wash	
cold	QR I	cold, freeze		
come, accompany	ṚT I	come, accompany, arrive, with	SAC accompany SAHA along, with SACA together, with	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
completed	TM I	completed, past, yesterday, over		
constrict	ƧQ	constrict, entangle, obstruct	YUP, RUDH obstruct	
consume	KL I	all, consume, be consumed, every	BHRI consume GRAS devour ← PSA, BHARV, BHAS devour AD, AÇ, GHAS eat JAKŞ, BHAKŞ eat JAGH eat, devour GRDH be greedy ← SARVA, VIÇVA, KEVALA all, every AÇEŞEṆA, SAMANTAT completely KHADA devouring	Yes
creep	ḌX	creep, crawling thing, serpent, worm	RIṆKH, RIṆG, SRP creep SARPA serpent	
curved part	GB I	curved part, the back, boundary		
cut	GD I	cut down, cut off, circumcise, segregate	CHID cut off ← VRAÇC, CHA cut up	Yes
dark, shadow	ŞL	shadow, shade, dark, gloom, night		
day	YM I	day	DYO sky, day	
death	MT	death	MṚ die MṚCH perish	
defile	XL	defile, stain, filthy		
depleted	BL I	depleted, worn-out, empty, nothing, without, tired	KLAM, GLA, TAND be weary ÇRAMA weariness	
descendant	BN I	descendant, son, daughter, grandchild	JA progeny TYAJAS descendant	
desire, be hungry for	RĠ	desire, be hungry for, want	KŞUDH be hungry VAṆCH, KANKŞ, LAŞ desire LUBH be lustful ARI eager, greedy SPṚHA, VAŞṬI eager	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
divide	PL I	divide, be distinct, allot, wean	KṢAD divide KUṬṬ divide, crush DA, BHAJ divide, share	
drag, pull	MŚ II	drag, pull, snatch away	KṚṢ drag, plough	
drink	ŚT I	drink, to drink	PA, PITI drink	
drug, poison	ŚM I	drug, poison, remedy, herbs		
dry	BŚ II	dry, arid, dry land	ÇUṢ dry	
dust, ashes	PR II	dust, ashes, duststorm	KIRANA dust	
dyeing, coloring	ṢB IV	dyeing, coloring, painting	RAJ, RAÑJ to color	
egg	BṢ	egg		
enclosure	GN	enclosure, garden, hidden	GUH, HNU hide VRJANA enclosure, town	
envy of possessions	QN	envy of possessions	IRṢY be jealous	
establish	KN	establish, yes, true, exist, suitable, proper, investigate	UH consider DIÇ direction STHANE suitably	
evil spirit	ŚD	demon, evil spirit, devil, scourge	PAPA evil RAKṢAS demon	
excite	GŚ I	excite, agitate, set in motion	HRṢ be excited IR set in motion AYA movement GATI motion BHURNI excited	
excrement	ZB	excrement, dross, defecate, diarrhea	CAKṚT ordure	
extend	DR	extend, scatter, sow, seed, progeny, forearm, measure	VYAC, VIC extend MA measure AṅGA limb, body DOS forearm RETAS seed	
extinguish	ṬP	extinguish, go out, clear away	DA clear	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
extract	ŚL II	take out, find out, ask, extract	PRACH, YAC ask	
eye, source	ṚN	eye, observe, spring, source, meaning	CAY, CI note, observe AKṢA eye CAKṢAS eye CAKṢUS brightness, seeing, eye	
face	PN	face, front, to face, turn toward	MUKHA face PRAÑC forward AGRE in front SAMKAÇA appearance	
fail	BṬ	fail, cease, void, futile		
false, defective	SR	false, defective, deviate, treacherous, rebellion	ÇṚDH be defiant VALH challenge	
far, long	RX III	far, long	PARA distant, other	
father	ṚB	ancestor, father, religious leader	PITṚ father	
felicitous	ṬB	happy, good, sweet, pleasing	UC, TRP be pleased KAN, KA be pleased, enjoy RAN, LAM take pleasure BHAGAVANT fortunate, blessed JOṢA, BHOJANA enjoyment PRAYAS pleasure AVAS favor	
fertility	ṚR II	fertility, conceive, pregnant, plants		
fight	LX II	fight, quarrel, distress, attack, oppression	PRṬ, YUDH fight SPṚDH, SPURDH fight, contend DYU attack DVIṢ enemy SAH overcome	
fangernail, claw	ṚP	fangernail, claw		
fire	ṚṢ	fire, cooking place	AGNI fire	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
first fruits, first-born	BK I	first fruits, first-born, early	ADAU first	
fish	NN	fish		
flame	LH	flame, gleam, flash, blaze, kindle	ÇUC gleam	
flesh, cook	BŚ I	flesh, cook, burn, meat, sacrifice	PAC cook UŞ, KUD, KUL, KŞA, DAH, DU, PLUŞ burn HU sacrifice MAS meat, flesh VYOŞA, TAPANA burning	
flourish	ŞM II	flourish, ripen, swelling, oil		flourish
flying insect	DB I	fly, bee, hornet, wasp, to hover, dart, sting		
fruit	NB	fruit		
furious	RG II	furious	DRUH, HIḌ, HEL be hostile	
gazelle	ŞB III	gazelle		
give	HB	gift, to give, share, generous	DA, DAD, RA, RAS give DAY share DA, BHAJ divide, share DATR giver DANA giving RATI gift BHOJA, MAGHAVAN generous	
give to drink	ŞK I	give to drink, irrigate, water		
glorious	DR I	glorious, shiny metal or stone, beauty	YAÇAS glorious VAPUS wonderful TEJAS splendor	
go away, take away	ŹZ I	go away, take away, flee, shun, abandon	RAH desert HANI abandonment	
go down, bring down	RD	go down, bring down, subdue, beat, pursue, exercise authority	TAD beat ṚT, ART pursue ← VLAG, VLANG pursue MARG chase	Yes

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
go, send	LK	go, send, messenger	I, Ī, AY, GAM, GACH, GA, JIRI, PAD, YA go Ṛ, ṚCH go, send	
good spirit	᳚L	deity, good spirit	DEVA god DEVI goddess	
graze, pasture	R᳚ II	graze, pasture		
green, yellow	RQ III	green, yellow, gold, vegetables		
grind	᳚X	grind, pulverize, sediment		
ground meal	QM II	ground meal		
grow big	GD II	grow big, become great, leader, conquer	BRH make big or strong JI conquer NI lead MAHA great	
hair, bearded grain	ŚR	hair, hairy one, goat, barley (bearded grain)	KEÇA hair	
hand, authority	YD	hand, authority, strength, five	PANI hand	
hard substance	᳚Z	tree, bone, hard substance, wood, flint	ASTHI bone	
hate	SN	hate, avoid, enemy	DVI᳚ hate ÇATRU enemy DRUH harmer, hater, enemy DVI᳚ enemy	
he, him	ŚW	he, him		
head, chief	RŚ	head, chief	ÇIRAS head ←	Yes
hear, understand	᳚D	ear, hear, understand, deaf (not hear)	ÇRU᳚ hear KAR᳚A ear	
heed	ŚM V	heed, obey, pay attention to	DR, SURK᳚ heed	
here	HN	here, behold	IHA here	
high	RM I	high place, high stature, haughty	UCCAIS on high	
hold, seize	XD	hold, seize, grasp, booty	DHR hold GRABH, GRAH seize	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
holy	QD II	be holy, make holy, bow down, show respect, bow	NAM bend, bow ÇUDH, ÇUNDH purify ← PUJ reverence VEDHAS pious	Yes
horn	QR III	horn, tusk, peak of mountain	KAKUD summit	
hot, inflamed	HM	hot, inflamed, fever, ardor, blush, have ulcers, anger	KUP, KRUDH, BHAM, HR̥ be angry JVAR be hot YAS, YEṢ be heated RUṢ be vexed TAPUS heat, hot, warmth ÇOCI, JURNI heat KRODHA wrath	
human	NṢ II	human, frail, man, woman, friendly	PUMS man VADHU, STRI woman SUHARD friendly, kind-hearted	
I, me	ṚN	I, me	AHAM 1st person singular	
if	ṚM III	if, suppose that	YAD if, when, that	
in	B-	in, inside, within, come in, among, between	ANTARA among, between	
inner essence	LB I	heart, mind, will, inner essence, courage	HR̥D heart MANAS, CETAS mind	
join, bind	ṢM	join, bind, unite, yoke, weave, braid	PAÇ, DA, DI, BANDH, SA, SI bind NAS, YAD, YU unite LAG attach GRANTHI knot	
knee	BR III	knee, kneel, bless	AÇIS blessing	
know	DṢ	know, knowledge, claim	JNA, VID know BUDH know, wake VEDA knowledge	
lacking	HS	lacking, need, suffer loss, deficient, defective	ṚTE, VINA without	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
laugh	ꣳX	laugh, play, jeer	KRIḌA play	
learn	MD	learn, teach, usage		
left (side)	ŚM II	left side, left hand, unlucky		
lie down	ŚK II	lie down, copulate		
light	ꣳR III	moonlight, starlight, sunlight, firelight, shine, blind (=no light)	ÇCAND, CAND, RJ, CAKAS, DIP, DYUT, BHA, BHAS, BHRAJ, RUC, VAS, UṢ, UCH shine JYOTIS, DYOTIS, ARCIS, ROCIS light	
light, easy, of small value	QL I	easy, light, of small value		
likeness	MT	likeness, resemble, example, compare, image		
lip, edge	ŚP	lip, edge, rim		
living, healthy	XY	living, healthy, vital, animal		
love	HB	love, embrace, desire, gladden	KANKṢ, LAṢ, VAÑCH desire KAM love PREṆI loving	
low, make low	ŚP I	low, make low, below, pour out, spill, valley	NICAIS, ADHAS below	
make evident, prominent	MR II	make evident, prominent, show, find, speak, command, proclaim	VID find JALP murmur, speak BHAN, BHANṢ, BHAṢ, VAC speak CETANA visible UKTI speech	
many, much	RB	many, much, great (status), dense, increase, very	VAKṢ, UKṢ increase MAHA great VṚDH increasing BṚHANT great	
master	BL II	master, owner, husband	ĪÇ be master PATI lord, master RAJAN king	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
memorial	ZK	memorial, male, remember	SMṚ remember KṚ commemorate	
mercy	RX II	mercy, compassion, soft, gentle	DAYA pity	
mist	GM	mist, fog, clouds	MEGHA cloud	
mix, blend	MZ	mix, blend, combine	MIKṢ, MIḢ, DVAL, PṚC mix MIL combine	
mother, people	ṂM I	mother, tribe, truth	MATR mother ← VIḢ the people	Yes
mound	TL	mound, hill		
mouth	PM	mouth, opening, entrance	ASYA mouth DVAR door	
mud	ṬY	mud, mire, clay, to coat with something		
music	ZM I	sing, chant, hum, play an instrument, tune	GA, GR, RIBH sing GUṆJ, KUJ, KṢVID, KṢVID hum GIR song JURNI singing	
name	ŠM III	name, reputation, guilty (=no name)	RAṆCH, LAṆCH, LAḶS mark NAMAN name ḢRAVAS fame	
narrow	ŠR	narrow, protect, press, guard	AṆH be narrow or distressing GUP, PA protect PID, VAH press RAKṢANA protection	
near	QR II	near, kin, approach, tribal area, guts, innards	DHAUK approach UDARA belly SVASṚ sister ASAT, AKE, ANTI near JṆATI relative	
negation	L?	no, not	NA simple negation MA prohibition	

Sememe	Birad-ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
new	HD II	new, news, gossip	NAVA new	
new beginning	ŠX	new beginning, dawn, morning, new moon	USṚ , UṢAS dawn ADAU first	
night	LL	night	NIÇ night DOṢAS night	
nose	ṚP	nose, breathe, blow, humiliate	AN breathe DHAM , DHMA blow VA blow NAS nose	
not fully aware	HL	dream, dreaming, feverish, hallucinating	NAÇ be lost MUH be crazed	
old	SB	old, old age, grey (white) hair	VR̥DDHA old SANA old JARAS old age	
one	HD I	one, single, solitary, make one (unite)	YAD , YU unite ← SAJUS together EKA one SAKAM together	Yes
open	PT	open, spacious, to open, conquer	KAS open JI conquer	
path	DR II	path, walk, tread, march, step, move, arrange	AN̐G , ĪṢ , EṢ , CAR , NU move SYAND , SYAD move on CYU move, stir PATHI road	
perceive	HŠ I	perceive, smell, think, account for, sense	BHAL perceive CIT perceive, know, appear CINT , TARK , DHI , DIDHI , DHYA , MAN think GHRA smell DHI , MATI thought	
pierce, hole	QB III	pierce, hole, stab, wound, dig, cave, rape, female	ÇNATH , NIKṢ , VYADH , VIDH pierce DR̥ pierce, split KHAN , KHA , RAD dig	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
pile high	GB II	pile high, mountain, hill	RAÇI heap	
place of	BT I	tent, dwelling place		
plains, fields	GR IV	plains, fields		
point to	ŞB II	finger, toe, point to	DIÇ point	
possessing	ML I	ruler, full, to own, to rule over, whole	PAT rule RAJ be kingly	
pottery, vessel	QD III	pottery, vessel		
powerful	GB III	powerful, hero, strong, prevail, virility	ÇAD, SAH prevail TU be strong RADH, SADH, SIDH succeed TAVAS mighty VRŞŇI virile	
praise, rejoice	HL	praise, shout in joy, celebrate	ARC, RÇ shine, praise KURD leap, exult BHRAM lively ÇAŇS, ID, NU, STU praise STUBH praising	
prepare	ŹD	prepare, ready		
press, squeeze	HŞ	press, squeeze, torture, injure	BADH oppress JYA, JI overpower, injure PIĐ, VAH press DHVŖ, DHUR, DHURU, DHURV, AM, HIŇS, MŖC injure DRUH harmer, hater, enemy ARUS wound, sore DVIŞ enemy	

Sememe	Birad-ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
push, beat	DP	push, expel, thrust, knock down, kick	ṚS, NUD, MIV, MU push TUD push, thrust TAD beat	
put	ŠM I	put, there, insert	DHA, DADH put	
putrid	BŠ	putrid, ashamed, wretched, disgusted, stink, rotten	LAJJ, HRI be ashamed KUTH, PUY stink VRID be abashed PUTI putrid	
quantity	MN II	quantity, allot, weigh, count, offering	TUL lift, weigh	
rain	MṬ I	rain	VṚṢ rain	
rear	DN	rear, tail, anus, pollute		
receive, accept	QB I	receive, accept, facing, opposite		
repair	RP	heal, repair, recover, medicine, sew up, help	BHIṢAJ heal SIV, SYU sew BHIṢAJ physician ANUKARA assistance	
repeat	ŠN II	another, repeat, year, two, second	CARC repeat PUNAR again DVA two	
restrain	KL II	restrain, surround, contain	DAM control RAJ direct	
return	ŠB II	return, answer, put back, turn back		
right (moral)	ŠD II	right (moral), just, fair		
rise	QM I	rise, stand, stamina, place	STHA stand	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
roar, make tremble, quake	RṢ I	roar, make tremble, thunder, quake, shudder, be afraid	VRŃH, BRŃH, GARJ, TAN, RAMBH, RAS roar KAMP, KṢMA, REJ, VIJ, VIP, VEP tremble KṢUBH, CAK quake BHUR, SPAND quiver TAŃ, TAS, DHU, MATH, MANTH shake BHIYAS fear	
roll	GL I	roll, wave, spin, twist, curl up	LUṬH roll KṚT spin VRJ twist	
root, origin	ŚR II	root, origin, navel, family	MULA root	
round	KR II	round, flat (not round), belly		
ruin, error	ŚT II	ruin, error, stray, heresy		
sacred law	DN	sacred law, arbiter, moral code		
safe	ŚL I	intact, safe, greet, at peace	GUR greet	
salt	ML II	salt, sailor		
scatter	BD	scatter, stray, wander, strew, disperse	KṚ, KIR, CHUR scatter DHVAŃS, DHVAS scatter PHAR scatter RUṢ, VAP, STR strew AṬ, AT, BHRAM wander	
scrape	GR III	scrape, itch, scratch, scrape off, peel	KAṢ, RIKH, LIKH scratch	
sea	YM II	sea, lake		
search	HṢ II	search, seek out, investigate		

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
see	R?	see, vision, prophesize, visionary	PAÇ, SPAÇ, DRÇ, IKŞ, KHYA, CAKŞ see LOC see, consider CAKŞUS brightness, seeing, eye DRŞTI sight	
set out	RK	set out, ride, sail	NAU ship	
sever	BT II	sever, mutilate, amputate, interrupt, chop	AKŞ mutilate	
sharp	HD III	sharp, acute, briar, thorn, to sharpen, needle	ÇA, CI sharpen	
she, her, it	ŞY	she, her		
shoulder	KT	shoulder, shoulder blade		
silent	DM II	silent, stupefied, resigned		
sit, dwell	ŞB I	sit, dwell, settle	AS, SAD sit VAS dwell	
skin	GL II	skin, hide, bark, crust, bald	TVAC skin	
sky	ŞM IV	sky, heavens, sun, divine, azure	DYO sky, day	
sleep, ease	NM	sleep, ease, doze	DRA, SAS, SVAP sleep KHALL be relaxed	
small	DQ	small, make small, thin, reduce, diminish	ṚHANT small ALPA small	
sojourner	GR II	sojourner, visitor, stranger		
soul	NP	soul, life, spirit, self	ATMAN soul, self BHAVANT being SVA self	
sow, cultivate	HR II	sow, cultivate		
spit	RQ II	spit, saliva		
split off	PR I	split off, detach		
spring forth	PL II	spring forth, gush, ejaculate, escape	SARGA emission VIMOCANA release	
sprout	BQ I	sprout, plants, buds		
star	KK	star, comet		
stop, kill	QT	stop, pluck off, snap off, kill, end	HAN slay	

Sememe	Birad-ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
storm	BR II	storm, hail, lightening, snow		
straight	ŚR I	straight, in order, upright, crippled (not straight), happiness	SUD put in order	
stream	NH	stream, river, flow	KṢAR, DHAV, NED, PRU, RI, SṚ, SRU, UTI, RITI flow NADI, AROTAS stream SARA brook	
strength	ṢZ II	strength, strengthen, succor, powerful, respected	VIḍ make strong BRḥ make big or strong BALA strength	
stretch out, shape	MṬ II	stretch out, shape, forge	TAN, TA, TAY, YAT stretch	
suck	NQ II	suck, suckle, absorb, nurse	DHA suck CULUMP suck in CUṢ draw, suck	
suffer	ṢB I	suffer, grief, misery, pain, sorrow, rough, harsh, troubled, afflicted	KṚPAṆA misery ROPI pain	
surround	XP	surround, enclose	VR̥JANA enclosure, town	
sustenance	LX III	sustenance, bread, food		
swiftness	QL III	swiftness, hurry	RAṆH, TVAR hasten TARAS quick JU hasty, rapid TURN̐ hasty	
taboo	HR I	taboo, forbidden, terrified	DIKṢ be consecrated	
take	LQ	take, marry, seize, collect, glean, grasp	LABH, HṚ take GRABH, GRAH seize UṆCH glean	
taste	TM II	taste, sense, discernment		
they, them	ŚN III	they, them		
thin, empty	RQ I	thin, empty, weak, useless	VRAD, VRAND weaken	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
thirst	ṢM	thirst, drought, fast		
throat	GR I	throat, cry out, groan, neck, swallow	GR̥, GIR, GIL swallow ← KRUÇ, KRAND, KLAND cry out ← VAC̥, NARD bellow KROṢṬU jackal (lit.: howler) ← KROÇANA yelling ←	Yes
throw, use a spear	RM II	throw, cast, use a spear	KṢIP hurl	
time, season	ZM II	time, season, period		
tongue	LṢ	tongue, language, slander		
tool, knife	SK	tool, knife, club, spoon, stick of wood, blade, flake		
tooth, fang	ṢN IV	tooth, fang	DANT tooth	
touch	GṢ II	touch, feel, handle, body, embody	SPRÇ touch, MṘÇ touch, feel AṅGA limb, body TANU body	
tranquility	NX	tranquility, relief, repose, quiet	ÇAM quieting, repose	
transgress	XṬ	err, sin, do bad things	HVAL err, go wrong SKHAL err, stumble PAPA evil	
trust	ṢM II	trust, faithful, right hand, support, covenant	DAKṢINA right, south	
turn away	ṢD I	turn away, chase away, side	MARG chase	
under	TH	under, humble, stoop		
unreliable	DL	unreliable, unstable, careless, dissolute	MṘDH neglect MUH be crazed MṘDHAS contempt	
upward	ṢL	upward, climb, exalted, world, upon, over, above, beyond	RUH ascend UCCAIS on high UPARI above	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
urinate	ŚN I	urinate, urine, bladder		
use the feet	RG I	foot, leg, run, dance, skip, stamp, trample	DRAM, DRA, DRU, DHAN, DHANV, DHAV run CAŃC, NṛT dance NAṭ dance, play KRAM stride PAD foot ARVANT running	
voice	QL II	voice, call, recite, sound	HU, HVA call KVAṆ, GU, GHUṢ, JHAṆ, ḌAM, NAD, DHVAN, MAṆ, SVAN, SVAR sound VAC voice KROÇANA yelling	
vomit, disgorge	QY	vomit, disgorge, spew	VAM vomit ṢṬHIV spew CHṚD spew, eject	
waste	BZ	waste, squander, despicable, worthless	DAS waste	
water	MY	water, liquid	AP, VAR, UDAN water	
we, us	XN	we, us	VAYAM 1st person plural	
weapon	ZN	weapon, penis, tools		
weep	BK II	weep, bewail, mourn	RUD weep	
weighty	KB	thick, heavy, weighty, honor, burden, belly, liver	UDARA belly YAKṚT liver	
well, pit	BR IV	well, pit, hole, cistern		
wet	LX I	wet, moist, humid, damp, lick	RIH, LIH lick ← UD, UND, KNU wet	Yes
what, who, for what	MN I	what, who, for what	KA, KI, KU interrogative pronoun KASMAT why?	
where, which	ṚY	where, which	KUHA, KUA, KVA where?	

Sememe	Birad- ical	Used to express	Sanskrit semantically-similar roots	Possible relation?
white	LB III	white, moon, milk, white of egg, albino		
wide, broad	RX IV	wide, broad, open area	URU broad	
wild animal	ṚI I	lion, rhino, mountain goat, boar, fox, hare	MRḠAYAS wild animal	
wild grasses	ṢB III	wild grasses		
wind, scent	RX I	wind, scent, perfume, fragrance, spice	MARUT wind, wind god	
wipe, smear	MS I	wipe, smear, rub, anoint	MRḠJ wipe MRḌ, MRAD rub, crush GHRṢ, GHATṬ rub MRAṆJ anoint	
womb	KR II	womb, pregnancy		
work, serve	ṚB	work, do, produce, compel, serve, slave, worship	SAP serve VIDH worship KAL drive, produce ÇAM, ÇIM labor APAS work, active	
wrap, cover	KS	wrap, cover, conceal, garment	VIṢṬ, VEṢṬ wrap CHAD, TVAC, VR, STHAG cover GUṆṬH cover up	
you, thou, ye	ṚT II	you, thou, ye	TVAM 2 nd person singular YUYAM 2 nd person plural	
young	ṢḠ	young, small, insignificant	KANYA girl ṚHANT small YUVAN young ALPA small	

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Vita

Bernice Varjick Hecker was born in New York City, New York on Nov. 13, 1935, the daughter of Bessie Varjick and Stephen Joseph Varjick. After completing her work at Hunter College High School, New York City, in 1952, she entered Hunter College. After a year, she participated in a work-study year in Israel. Upon returning from Israel she worked at various jobs until she could return to college. In May 1959 she received the degree of Bachelor of Science from City College of New York with a major in Physics. She spent another two years in Israel with her archaeologist husband Howard Hecker. Upon returning, she was hired in 1962 by Plenum Press to edit and proofread translations of Russian Physics, Mathematics, and Astronomy journals. She gave birth on March 24, 1964 to a son, Orrin R. Hecker. She continued working free-lance for Plenum Press while attending City College of New York. In May 1974 she received the degree of Master of Arts in Mathematics. During 1974-75 she taught mathematics in the Open Admissions program at City College. In 1978 she was hired as a computer programmer by Manufacturer's Hanover Trust and worked there until moving to Texas in 1983 with her second husband, Lawrence R. Moran. In Texas she was employed as a programmer by the Continuum Company. In 1988 she was hired by the Comptroller of Public Accounts, State of Texas, as a programmer/systems analyst and worked there until retiring in 1998. In September 2000 she entered The Graduate School at The University of Texas at Austin in the Linguistics Department. She received a Master of Arts degree in Linguistics in May 2004.

Permanent address: 5214 Duval St., Austin, TX, 78751

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