# Lists of Trees and Tree Diagrams: Computational Biology and the History of the List of Trees and Wooden Objects

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## 1. Introduction

The goal of this paper is to experiment with methods from computational biology, in particular phylogenetics, in order to analyze the complex interdependencies between versions of lexical compositions from various places and periods. We will express the distance between two versions of the same list numerically and use these distances to connect all available versions in a dendrogram (tree diagram).

### 1.1 Versions of Lexical Lists in the Old Babylonian and Middle Babylonian Periods

The great majority of Old Babylonian (and Middle Babylonian) lexical texts existed in many versions (Veldhuis 2014, 144). These versions differ from each other in the order of sections, the order of items within a section, the inclusion/exclusion of items, or, occasionally, in the spelling of individual words. This variety exists because there was no sense of a correct or canonical text. Teachers improvised and wrote or dictated a text that they knew by heart, but they showed no interest in preserving a received text verbatim. The changes that were thus introduced may have had all kinds of causes and motivations; they may reflect local usage of terms or the desire to include ever more obscure or outdated terms. For all practical purposes such changes may be considered random, reflecting temporal and geographical distance. We may thus assume that two versions that are relatively close were produced in relative proximity in space and time. Proximity, in this case, does not necessarily refer to a linear distance, but rather a communication distance over space or time.

Comparing versions of lexical texts has a long tradition in Assyriology (e.g. …), linking individual versions, or groups of lexical texts to each other either in order to establish a historical connection between versions of known locations (e.g. Middle Babylonian Emar and Nippur; see Peterson 2006) or to place an unprovenanced exemplar in relation to versions of known origin. We intent to do essentially the same on a larger scale, by involving all known exemplars of the list of trees and wooden objects from the Old Babylonian and Middle Babylonian periods.

### 1.2 Phylogenetics

### 1.3 Previous Research

Much research has focused on similarities and dissimilarities between lexical traditions of various origins. In particular Middle Babylonian tablets from the periphery (Hattusa, Emar, Ugarit, and other places) have been studied extensively (see in particular Scheucher 2012). The current section will highlight some of the proposed connections between versions of lexical lists (primarily the lists of trees and wooden objects) to see what types of similarities have been used to establish or hypothesize historical connections.

#### 1.3.1. The Kelsey Prism and the Isin Lexical Tradition

The four-sided prism KM 89542 (P235262; Kelsey Museum of Anthropology, Ann Arbor; unprovenanced) preserves small parts of sides a and c and a major part of side d. Each side originally had two columns of text. The text of this prism may be compared to the (better preserved) text of IB 1535 + IB 1606 (P459216) and IB 1547 (P459217), two tablets from Old Babylonian Isin that have almost identical versions of the first part of the list of trees and wooden objects, covering trees, furniture, boats, and wagons. The order of sections in the Kelsey prism (as far as preserved) is essentially the same as in the Isin exemplars, and this is mostly identical to the organization of the Nippur text (approximately contemporary with the Isin version). Unlike the Nippur version (Q000039), the Isin lists of trees and wooden objects are split into two (the second half beginning with doors; IB 1512C+ = P459218). This arrangement is occasionally known at Nippur (e.g. CBS 6068 = P229165; with catch-line ŋešig = door) and becomes the standard in Emar/Ugarit. Like the Isin exemplars, the Kelsey prism ends with the section "wagons" (ŋešmar-gid₂-da), presumably to be continued with "doors" in another prism, not currently extant.

The similarity between the Kelsey text and the Isin exemplars becomes clearer when comparing smaller passages, for instance the section "fig/apple":

|  |  |  |  |
| --- | --- | --- | --- |
| Isin (IB 1535+) | Kelsey | Nippur |  |
| ŋešpeš₃ | + | + | fig |
| ŋešpeš₃ ma₂-ri₂ | + |  | Mari fig |
| ŋešhašhur | + | + | apple |
| ŋešhašhur kur-ra | + | + | apricot |
| ŋešhašhur ar-ma-nu-um | + (ar-wa-nu-um) |  | Armanum apple |
| ŋešhašhur dam-ši-lum | + |  | Damšilum apple |
| ŋešhašhur ba-za | + |  | dwarf apple |
| ŋešhašhur eštub | + (še eštub) |  | spring-barley apple |
|  | ŋešhašhur še muš₅ |  | *muš*-barley apple |
| ŋešše-nu | ŋešše-x | ŋešše-dug₃ | chaste-tree |
| ŋešše-dug₃ | + | ŋešše-nu | a tree |
| ŋešše₃-še₃ | + | ŋešše-še | a tree |

With only a few differences (e.g. ar-ma-nu-um vs. ar-ma-nu-um) and the addition of one entry, the Kelsey prism is almost identical to the Isin tablet in this passage, and both are considerably different from the Nippur version. Similarly, the beginning of the section wagons allows for the following comparison:

|  |  |  |  |
| --- | --- | --- | --- |
| Isin (IB 1535+) | Kelsey | Nippur |  |
| ŋešmar-gid₂-da | + | + | wagon |
| ŋešmar-gid₂-da su-bir₄ki | + |  | Subarean wagon |
| ŋešdub₃ bar mar-gid₂-da | + |  | "outer knee" of a wagon[[1]](#footnote-1) |
| ŋeš-dal mar-gid₂-da | + |  | crossbar of a wagon |
| ŋešen₃-dur mar-gid₂-da | + | + | beam of a wagon |

The Nippur version shares the entry ŋešen₃-dur mar-gid₂-da (beam of a wagon), but it appears as the last (17th) entry of the section. The other items listed in this passage in the Kelsey prism and the Isin text are not shared by the Nippur version. For these reasons, the Kelsey prism was included in the "Isin tradition" in the editions of these texts in Veldhuis 1997.

#### 1.3.2 BRM IV 29+ and the Tradition from Ur

For similar reasons, the unprovenanced list of wooden objects BRM IV 29 + BRM IV 30 (P250364) has been listed with the lexical tradition from Ur (Veldhuis 1997: §5.6.2). Remarkably, the main text from Ur, UET 6, 0677 + (P346714) has hardly any entries in common with BRM IV 29+. The texts are similar in their sequence of *sections*, even if these sections contain a different set of entries. Both texts follow the section wagons and carts (ŋešgigir, ŋešmar-gid₂-da, and ŋeššid-du₁₀) immediately with the section plow – a sequence not otherwise known. Similarly, in both texts the sections ŋeš-rin₂ (scales) immediately precedes the section ŋešal (hoe), an arrangement that is otherwise only known from TCVC 752 (P273712). The 20 preserved lines of this last text practically duplicate the corresponding section in the main text from Ur (UET 6, 677+ = P346714) and may well derive from that same city.

Historically, the association of BRM IV 29+ with the city of Ur is problematic, because the text is dated to Samsuiluna 28 – a period in which Ur no longer was controlled by the Babylonian king and cuneiform texts from this city are not extant. We may see BRM IV 29+ as a later descendant of the Ur tradition, perhaps by scribes who had moved north. This may explain why the general organization is still the same, but the actual entries are often different.

#### 1.3.3 Middle Babylonian Examples

Other texts that have been discussed in the literature as potentially related are a brief exercise from Nuzi and a large tablet from Emar (Civil 1987). The spelling of the entries in the Nuzi school text is usually different from those in the Emar text, but the sequence of various words for weapons is as good as identical. On similar grounds, Peterson 2006 argued that there may have been direct scholarly connections between Nippur and Emar in the Middle Babylonian period. Such connections – between Nippur, Nuzi, Emar, and other places – can be understood in the historical context of the Middle Babylonian period when a network of diplomatic and scholarly contacts connected the entire ancient Near East (see Beckman 1983; ## add article by Nils Heeßel on Babylonian physician; Van Soldt on Assyrian in Emar and Wiggermann 2008).

#### 1.3.4 Shared Entries and Shared Spellings

Finally, we may see connections between lexical texts that offer the same unusual words or spellings. The lexical text from Isin, quoted above, offers the rare spelling ŋešše₃-še₃, for regular ŋešše-še (a type of tree). The spelling may appear in the Kelsey prism (see above – the entry is very broken) but it clearly appears in the lexical fragment FLP 1168 (P459784). This fragment offers only three legible lines (followed by the name of the scribe) but these three lines are identical with the corresponding passage in the Isin text, including the rare spelling of this tree.

An interesting pair of lexical items is ŋeška-ta-pu-um; ŋešne-gi-pu-um, which are attested in four Old Babylonian lists, but disappear in later tradition. Bot words are loans from Akkadian and may designate ornamental weapons; the first is well-known from Mari (Arkhipov 2012: 113-114); the other from Ur III texts from Puzriš-Dagan and Ur (Paoletti 2012: 154). The lexical texts that include these items are a large lexical tablet from Šaduppum (IM 051144 = P247864) and three unprovenanced exemplars (CUSAS 12 3.1.01 = P273880; *Education in the Earliest Schools* 19 = P388265; and MSL SS 1 96 = P347814). Although these four texts are not particularly close otherwise, one might argue that the appearance of these pairs of items, not known elsewhere in the lexical tradition, can hardly be ignored.

#### 1.3.5 Lessons Learned

This brief overview of lexical texts that may be related in time or space because of shared features is hardly exhaustive. We have seen that a number of different criteria have been used in establishing such connections, including:

* similarity in sequence of sections
* similarity within a section
* similarity in the attestation of rare words or rare spellings

Any similarity measure between texts has to take into account that Old Babylonian and Middle Babylonian lexical texts range in length from 2 to more than 700 lines. This difference in length is due to breakage, but also to the fact that the extant material is a mix of exercise tablets (ranging in length between 2 and 100 lines) and large tablets or prisms which originally included the entire text of a lexical composition or a major part of it.

see <https://arxiv.org/pdf/1403.4024.pdf>

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1. For this entry, see ## Heimpel CUSAS 5 59. The word is translated as "thigh" in the Ugumu cylinder CUSAS 12, 4.3 ix 8' (P251921). ### add further notes on this word. [↑](#footnote-ref-1)