

## CHAPTER THREE

### A COMPUTERIZED DATABASE FOR SEPTUAGINT RESEARCH

#### I. *Nature of the database*

##### 1. *Background*

The CATSS project created a flexible multi-purpose database which contains data needed for the study of the LXX and its relation to MT (for bibliography, see section III). In the perusal of the database (see section IV), certain types of information can be disregarded when necessary, and other information can be added according to specific needs.

The main section of the database is composed of the following elements:

*a.* A *parallel alignment* of all elements of the MT and LXX. The text of MT (BHS) was encoded under the direction of R. Whitaker and H. Van Dyke Parunak and verified by a team at the Westminster Theological Seminary headed by A. Groves. The text of the LXX (the edition of Rahlfs) was created by the *Thesaurus Linguae Graecae* in Irvine, CA. The initial alignment of the LXX and MT was created in 1982–1983 by an automatic program written by J. Abercrombie, and the results were corrected in accord with the project's conception of the equivalence of the MT and LXX by the team in Jerusalem. The alignment of MT and the LXX creates exact equivalents of all elements in both texts in two parallel columns:

1. *Column a* of the Hebrew records the formal equivalents of all elements of the two texts, as if the LXX were a translation from MT. In this recording, several types of symbols are used indicating special phenomena and features which can be listed and analyzed separately.

2. *Column b* of the Hebrew records a selection of presumed equivalents of the LXX retroverted from the Greek, when the Greek seems to reflect a reading different from MT. It also records select differences between the LXX and MT in the area of translational technique. The main purpose of this column is to provide data which are not available through the use of col. a.

β. The *variant readings* to the LXX (not yet integrated in the running text of CATSS). The main Greek text incorporated in the database follows the text of Rahlfs (to be changed to that of the Göttingen editions when available), and to this text the full evidence of the variants is added, either from the Göttingen editions or those of the Cambridge series. For this purpose the contents of the apparatuses of these editions are reformatted to the structure of the database, that is, one Greek word per line. The variants are being encoded by the Philadelphia team, and the system of recording the variants is described by R.A. Kraft in *CATSS 1*.

γ. A *morphological analysis* of all words in the LXX, that is, all grammatical information relevant to the identification of the words, including their dictionary forms (e.g., ἔρχομαι for ἦλθεν). This includes such information as the person, number, tense, mode, and type for verbs, and the case, number, gender and declension for nouns. The initial morphological analysis of the Greek words was produced with the aid of an automatic program for morphological analysis of Greek, written by David Packard and adapted for the LXX. The results of the automatic analysis were verified and analyzed by the Philadelphia team (see W.A. Adler in *CATSS 1* and *Textus 11* [1984] 125-139).

δ. A *Morphological analysis* of all words in *MT*, that is, grammatical information relating to all words in the Hebrew text.

Some forms of the CATSS database combine the morphological analyses with the parallel alignment, while others do not.

## 2. *Limitations of the database*

The database does not provide answers to all questions in the study of the LXX or of its relation to the underlying Hebrew text. It merely contains data scholars would like to have available when analyzing such issues. Some problems can be investigated only with the aid of a computerized database. The flexibility of the database allows for the inclusion of additional data at a later stage.

While most of the information in col. a is as objective as possible, the recording in that column also entails subjective elements. Col. b is fully subjective; yet, scholars will probably want access to this type of material in spite of its subjective nature.

## 3. *Nature and purpose of the Greek-Hebrew alignment*

The philosophy of the alignment is to record as precisely as possible the formal Greek-Hebrew equivalents of the LXX and MT. The relevant information is, as far as possible, contained in a single line of the

alignment with a minimum of cross-references to other lines, so that it is easily accessed.

The basic principle followed in recording the equivalents is that of formal representation (cf. *TCU*, 60–70). The formalistic approach underlying the recording of the equivalents of the LXX and col. a of the Hebrew implies that for the sake of argument the LXX is regarded as a translation of MT. This is a mere convention adhered to by all biblical scholars which promises the most objective basis for further research. Yet, the procedure itself is problematic. Firstly, the LXX was *not* translated from MT. Thus, in a book like Jeremiah it is unnatural to record the details of the LXX as having been derived from MT, since the LXX probably reflects an earlier stage in the development of the book than MT (cf. Tov, “Jeremiah”\*), even though on a technical level the recording can be performed. Secondly, we do not know to what extent the present eclectic editions of the LXX represent the original translation. After all, the editions of Rahlfs and the Göttingen series present mere reconstructions of that original translation. In spite of these difficulties the margin of error for the reconstructions is probably small (note the relatively minor differences between the Rahlfs and Göttingen editions regarding the eclectic text, as opposed to their apparatuses).

The main purpose of the alignment is to identify the Hebrew elements which are equivalent with elements in the LXX, or, put differently, which stand in the place of their counterparts in the LXX. Necessarily, one often records Greek equivalents of Hebrew words which differ from the words the translators had in mind or had in front of them because of textual differences between the parent text of the LXX and MT. These textual differences are referred to in col. b of the database, but they are excluded from col. a that presents, as much as possible, objective data.

According to this system, exegesis is disregarded in the notation. Very free, paraphrastic, and even unusual renderings are recorded as regular equivalents in col. a, since they reflect in some way their counterpart in MT. For a detailed discussion of the problems connected with recording the equivalents, see *CATSS*, vols. 1 and 2.

For an analysis of the determining of the equivalents, see part II.

#### 4. *Use of the database*

In order to obtain the maximum amount of information from the database, its various components can be merged for indexing and compiling concordances. For these purposes the computer must be able to make the link between words which are found in completely different places in the alphabet, such as הלך and וילך in Hebrew. This information

is found in the aforementioned morphological analyses of the Hebrew and Greek words.

One of the major reasons for creating a database is to enable easy access to the data. These data can be stored in one form, and reformatted in various ways, not only as running (consecutive) texts, but also in other configurations. The data can be accessed in the following ways:

a. *Searches* for individual words, combinations of words, or letter patterns.

β. *Indexing* ('sorting') words in a particular part of the database or in the database as a whole. Such an index can create a simple list of all words in the exact form in which they occur in the text together with all other information present in the same computer record (line). The words can be sorted according to the desired alphabetical order (e.g., Hebrew, Greek). A similar index can be made on the basis of the 'dictionary form' (e.g., ךְּלִי) in addition to the text form (e.g., ךְּלִי).

γ. *Concordances*. A concordance is based on the same principles as an index, but it also supplies the context of the indexed word.

δ. *Special programs*. Other information that is not easily available through any of the three aforementioned formats can be obtained by means of tailor-made programs.

With the aid of the computer, individual segments of the database as well as the entire bank can be accessed in all these different ways. New avenues are opened for the analysis of data in the realms of textual criticism, language, and translation technique, as well as for the study of all the corpora that depend on the LXX (see section III).

The data in the database can be accessed in various ways for word searches and through indexes and concordances. The most sophisticated program available so far is the Accordance program described in section IV. Furthermore, various aspects of the translational technique accessible through the database can now be researched. For some examples, see Tov-Wright, "Literalness"\*; G. Marquis, "Word Order"; Nieuwoudt, *Aspects*, and see further section III. Some details in the notation may be singled out for analysis in word-processing programs. The number in parentheses refers to the relevant paragraph in *CATSS*, vol. 2.

- a. Verses that the LXX has in excess of MT (4.2.1).
- b. Asterized words in the LXX of Job (4.2.1).
- c. The *Ketib-Qere* variations in MT, including information on the relation of the LXX to them (4.3.4, 60).
- d. Prefixed and attached elements of the Hebrew words, with or without their Greek equivalents, such as the prefixed -י, and the

prepositions  $\text{-ל}$ ,  $\text{-ב}$ ,  $\text{-ב}$ , and the pronominal suffixes ( $\text{-ו}$ ,  $\text{-י}$ , etc.) (4.4.6). Cf. Tov–Wright, “Literalness.”\*

e. Differences in the numbering of verses between the MT and LXX, often involving different text arrangements (4.5.5).

f. Representation of one Hebrew word by more than one Greek ‘main’ word (5.3.2.1).

g. Differences in sequence. The frequency of stylistic and grammatical transpositions forms an indication of the literalness of the translation (7.7).

h. Minuses and pluses of the LXX. Different categories of pluses are distinguished (8.4.4) by F.H. Polak and G. Marquis, *A Classified Index of the Minuses of the Septuagint, Vol. I: Pentateuch*, CATSS Basic Tools, 4/1 (in press).

i. Doublets (10.1).

j. ‘Distributive’ renderings, that is, elements referring to more than one word in the translation, such as pronouns, conjunctions and prepositions (10.6).

k. ‘Repetitive’ renderings, that is, words occurring once in Hebrew, and represented more than once in Greek (11.4).

l. Renderings of Hebrew prepositions by Greek compound verbs (16.3.2).

m. Prepositions added in the LXX in accordance with the translational habits of the various books (16.5.3).

n. Renderings of the construction  $\text{קטלתי קטל}$  (17.5.1). See Tov, “Infinitive Absolute.”\*

o. Transliterated Hebrew words (21.6).

p. Differences in verbs: active/passive (54.2.1.1).

q. Differences in prepositions (54.2.2.1).

r. Differences in vocalization (59.5).

s. Interchanges of consonants between MT and the presumed parent text of the LXX, as well as metathesis and differences in word-division (61.3). See Tov, “Interchanges.”\*

## II. *Background of the representation of the equivalents*

### 1. *Formality*

As a rule, Greek-Hebrew equivalents are determined easily as long as one recognizes that formality is the overriding guiding principle behind the notation. Thus all exegesis and possible textual differences between the MT and LXX are disregarded in col. a:

Mich 4:5	כי	ὅτι
	כל	πάντες
	ה/עמים	οἱ λαοὶ
	ילכו	πορεύσονται
	איש	ἕκαστος
	ב/שם אלהיו	τὴν ὁδὸν αὐτοῦ

Even though *שם אלהיו* differs much from *τὴν ὁδὸν αὐτοῦ*, the two phrases are listed as equivalents which cannot be broken down into smaller units.

Mich 1:5	ו/מי	καὶ τίς
	במות	ἡ ἁμαρτία οἴκου
	יהודה	Ιουδα

The present notation demonstrates that it is hard to know whether *ἁμαρτία*, *οἴκου* (בית from *במות*?), both, or neither reflect *במות*. It remains true to say that *במות* and *ἡ ἁμαρτία οἴκου* are formally equivalent.

The system of formal representation is not followed in all instances. Occasionally that system is abandoned, and since the number of exceptions is not very large and their nature can be formulated well, the system itself is not harmed. Formal representation is abandoned when it is misleading. The principle behind the formality is that the Greek and Hebrew words stand on the same place and their listing as equivalents is a good basis for further study, even if the Greek word actually did not translate its Hebrew counterpart. However, the claim that a Greek and a Hebrew word stand on the same place is misleading when the Greek represents an element which is not present in MT and when MT contains another word not represented in the LXX. The very recognition of such a situation is to some extent subjective, and when in doubt the formal approach is nevertheless applied. Thus, when formality becomes misleading, that approach is abandoned, e.g.:

Gen 4:25	ו/ידע	ἔγνω δὲ
	אדם	Αδαμ
	עוד	—
	+ את	Ευαν
	אשתו	τὴν γυναῖκα αὐτοῦ

Formality could require the listing of *Ευαν* as equivalent with *עוד*. However, as long as *עוד* is not considered graphically close to *הוה* (the

presumed equivalent of  $\text{Eυαν}$ ), both  $\text{עוד}$  and  $\text{Eυαν}$  are recorded as having zero-equivalents.

Deut 13:3	גלכה	πορευθῶμεν
	אחרי	—
	+	καὶ λατρεύσωμεν
	אלהים	θεοῖς
	אחרים	ἑτέροις

On a formal level,  $\text{אחרי}$  and  $\text{καὶ λατρεύσωμεν}$  are equivalent. However,  $\text{λατρεύσωμεν}$  has its real equivalent at the end of the sentence, so that the above notation is more realistic.

Ruth 2:21	והאמר	καὶ εἶπεν
	רות	Ρουθ
	המואביה	—
	+	πρὸς
	+	τὴν πενθερὰν αὐτῆς

On a formal level,  $\text{המואביה}$  is equivalent to  $\text{πρὸς τὴν πενθερὰν αὐτῆς}$ . However, these words have completely different meanings and are dissimilar graphically, so that both are denoted as having zero-equivalents.

## 2. Split representation

The basis for the recording is either a single Hebrew word with all its attached elements or two or more Hebrew words represented by one or sometimes more than one Greek main word. As a rule, this system can be followed conveniently, and complications are met when the Hebrew or Greek word is represented by two or more words or parts of words which are not consecutive. For these and other instances a procedure has been devised for recording the information in such a way that all of it is available at the stage of indexing. For this purpose details are recorded twice, once in their actual place (for the sequence of the LXX and MT is never abandoned) and once within special brackets ({} in accordance with their equivalents. All elements within these brackets duplicate data found elsewhere in the text expressed as '...':

Gen 3:23	{שם/ג}... אשר	ἐξ ἧς
	לקח	ἐλήμφθη
	שם/ג	{...}

$\text{ἐξ ἧς}$  reflects both  $\text{אשר}$  and  $\text{שם/ג}$  occurring later in the sentence.

Mich 4:3	{עוד...} ולא	καὶ οὐκέτι μὴ
	ילמדו	μάθωσι

Οὐκέτι reflects both לא and עוד.  
 עוד {...}

This system is also used for possible condensations:

Gen 7:11	ב/שנה	ἐν {...}
	שש מאות	τῶ ἑξακοσιοστῶ
	שנה {ב/שנת...}	ἔτει

שנה and ב/שנה are represented by one word only.

Gen 17:24	בן	{...}
	תשעים ו/חשע	ἐνενηήκοντα ἐννέα
	שנה {ב...}	ἐτῶν

### 3. Inversion

The notation of inversions is problematic since the formal representation of the actual sequence would create unrealistic equivalents. At the same time, there is no reason to deviate from the principles described above, since also in other instances the formal representation creates unrealistic equivalents. Furthermore, in many instances it is unclear whether the LXX reflects the sequence of MT or an inverted one.

In the system of CATSS, unlike HR, whenever the LXX reflects a sequence XY and MT yx, the equivalents are represented exactly as they occur in the text, that is X-y, Y-x. In those cases, a reversal sign (=) is used in the Hebrew column, after the first element and before the second one. In some cases question marks are added after the reversal sign. The real equivalents (presumed equivalents) are provided in col. b. This system is used for the inversion of both adjacent and non-adjacent elements referring to either one or more elements.

Gen 2:4	ארץ ו/שמים	τὸν οὐρανὸν καὶ τὴν γῆν
	recorded as שמים = = ארץ	τὸν οὐρανὸν
	ארץ ו/שמים = =	καὶ τὴν γῆν
Deut 13:3	נלכה	πορευθῶμεν
	= +	καὶ λατρεύσωμεν
	אחרי	—
	אלהים	θεοῖς
	אחרים	ἑτέροις
	אשר	οὓς
	לא	οὐκ
	ידעתם	οἴδατε
	ו/נעבר/ם =	—

Grammatical and stylistic transpositions are treated differently from the aforementioned system, since for them the actual sequence of the LXX is

not followed. In these cases the sequence of the LXX is abandoned since these transpositions are part and parcel of the Greek language. At the same time, when doubts arise with regard to the choice between regular and stylistic transpositions, the former option is chosen, since that system does not require the insertion of changes. Grammatical and stylistic transpositions of the LXX are thus represented in an inverted order; however, with the aid of the aforementioned system of split representation that repeats information, the actual sequence of the LXX is preserved. This system applies especially to the post-position of particles.

Ruth 3:11	כי	{...}
	יודע	οἶδεν
	{כי = ...}	γὰρ
Gen 8:5	{...}	τοῦ δεκάτου
	ה/חדש	{...= τοῦ} μηνός
	ה/עשירי	{...= τοῦ δεκάτου}

#### 4. Pluses and minuses

The LXX, which is the point of departure, contains both pluses (+) and minuses (—) vis-à-vis MT.

The recording of pluses and minuses presents the most difficult problems in the analysis as it is often hard to decide whether the Greek word represents one or two words of the Hebrew or sometimes no word at all. The subjective nature of the decision should be admitted.

E.g.,	Ruth 4:1	פלני	—
		אלמני	κρύφιε

The recording implies that κρύφιε represents only אלמני (see the variants) and not both Hebrew words. In a free translation unit and in different circumstances, a different decision might have been made. In cases of doubt both Hebrew words are listed as equivalents of the Greek word.

Exod 32:34	אל	εἰς
	+	τὸν τόπον
	אשר	ὃν
	דברתי	εἰπά
	ל/ך	σοι

According to one way of viewing the equivalents in this verse, εἰς τὸν τόπον represents אל. In a way, this is a formal presentation of the evidence, since εἰς τὸν τόπον represents the one Hebrew word found in the slot between העם and אשר. However, there is also another way of

viewing the equivalence, and that, too, presents the data formally. Since εἰς represents אל, it is not impossible that τὸν τόπον reflects a variant המקום, and hence it is preferable to list τὸν τόπον as a plus (+). This type of formal presentation is preferred, since only in this way will the plus τὸν τόπον be available at the stage of indexing as a plus element.

In order to improve the practicability of the index, '—' is listed also for the lack of one out of two words written on the same line, especially for אה:

Gen 36:6	— את/ו	καὶ πάντα
	בן/הו	τὰ ὑπάρχοντα

### 5. Further details

The full description of the parallel Greek-Hebrew alignment involves also the following features and words:

doublets (Greek and Hebrew)

Particles and conjunctions

the Greek article

אה

prepositions

εἶναι

numbers

words which have a double task in the translation

עָשׂו

τις

comparatives, superlatives

בן

אשר

geographical names

αὐτός

combinations of pronouns and verbs

combinations of conjunctions and verbs

additions of pronouns to nouns and verbs

special problems in the verb

infinitive absolute

differences in vocalization

interchanges of noun + pronominal suffix / noun + noun

interchanges of noun / construct noun + noun

### III. List of publications relating to the CATSS project

The bibliography is arranged chronologically and pertains to studies describing and presenting the database as well as studies based on it.

R.A. Kraft and E. Tov, "Computer-Assisted Tools for Septuagint Studies," *BIOSCS* 14 (1981) 22-40

J.R. Abercrombie, "Computer Assisted Alignment of the Greek and Hebrew Biblical Texts—Programming Background," *Textus* 11 (1984) 125-139

W. Adler, "Computer Assisted Morphological Analysis of the Septuagint," *Textus* 11 (1984) 1-16

P. Lippi, "The Use of the Computerized Data Base for the Study of Septuagint Revisions," *BIOSCS* 17 (1984) 48-62

Z. Talshir, *First Esdras: Origin and Translation*, unpubl. diss., Hebrew University, Jerusalem, 1984 (Heb. with Eng. summ.)

E. Tov, "The Use of a Computerized Data Base for Septuagint Research—The Greek-Hebrew Parallel Alignment," *BIOSCS* 17 (1984) 36-47

N. Leiter, "Assimilation and Dissimilation Techniques in the LXX of the Book of Balaam," *Textus* 12 (1985) 79-95

Tov-Wright, "Literalness"\*

E. Tov, "Computer Assisted Alignment of the Greek-Hebrew Equivalents of the Masoretic Text and the Septuagint," in: N. Fernández Marcos (ed.), *La Septuaginta en la investigación contemporánea (V Congreso de la IOSCS)* (Textos y Estudios "Cardenal Cisneros" 34; Madrid 1985) 221-242

B. G. Wright, "A Note on the Statistical Analysis of Septuagintal Syntax," *JBL* 104 (1985) 111-114

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W.T. Claassen, "Towards a Morphological Analysis of Biblical Hebrew—A Semi-Automatic Approach," *Actes 1986*, 143-154

J. Lust, "The Computer and the Hypothetic Translators of Ezekiel," *Actes 1986*, 265-274

G. Marquis, "Word Order as a Criterion for the Evaluation of Translation Technique in the LXX and the Evaluation of Word-Order Variants as Exemplified in LXX-Ezekiel," *Textus* 13 (1986) 59-84

Z. Talshir, "Linguistic Development and the Evaluation of Translation Technique in the Septuagint," *ScrHier* 31 (Jerusalem 1986) 301-320

CATSS 2

Tov, "Translation Technique"\*

B.G. Wright, "The Quantitative Representation of Elements: Evaluating 'Literalism' in the LXX", in: Cox, *VI Congress*, 311–335

N. Leiter, "The Translator's Hand in Transpositions? Notes on the LXX of Genesis 31," *Textus* 14 (1988) 105-130

R.A. Kraft, "Computer Assisted Identification and Reconstruction of Fragmentary Manuscripts," *Proceedings of the Second International Colloquium Bible and Computer: Methods, Tools, Results, Jérusalem, 9–13 juin 1988* (Paris/Genève 1989) 319-321

B.A. Nieuwoudt, "Computer Assisted Research of the Greek and Hebrew Bible (II)," in: E. Talstra (ed.), *Computer Assisted Analysis of Biblical Texts* (Amsterdam 1989) 101-118

id., "Beyond CATSS: Utilizing Relational Databases for Text-critical Research," *Literary & Linguistic Computing* 4.4, 254-259

id., "The CATSS Database: Progress in Research Procedures on Main Frame and on Personal Computer," *Second Colloquium*, 401-417

E. Tov, "Computer Assisted Research of the Greek and Hebrew Bible," in: E. Talstra (ed.), *Computer Assisted Analysis of Biblical Texts* (Amsterdam 1989) 87–99

E. Tov, "Achievements and Trends in Computer-Assisted Biblical Studies," *Second Colloquium*, 33–60

B.G. Wright, *No Small Difference—Sirach's Relationship to its Hebrew Parent Text* (SCS 26; Atlanta, GA 1989)

T. Bergren, *Fifth Ezra: The Text, Origin and Early History* (SCS 25; Atlanta 1989)

B.A. Taylor, "Evaluating Minority Variants within Families of Greek Manuscripts," *BIOSCS* 23 (1990) 31-38

Tov, "Infinitive Absolute"

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G. Marquis, "The CATSS-Base: Computer Assisted Tools for Septuagint Study for All—Transcript of a Demonstration," in: Cox, *VII Congress*, 165-203

E. Tov, "The CATSS Project—A Progress Report," in: Cox, *VII Congress*, 157–163

J. Lust, E. Eynikel, and K. Hauspie, *A Greek-English Lexicon of the Septuagint, I-II* (Stuttgart 1992, 1996)

B.A. Nieuwoudt, *Aspects of the Translation Technique of the Septuagint: The Finite Verb in the Septuagint of Deuteronomy*, unpubl. diss. University of Stellenbosch, Stellenbosch 1992

F.H. Polak, "Statistics and Textual Filiation: the Case of 4QSam<sup>a</sup>/ LXX (with a Note on the Text of the Pentateuch)," in *Manchester Symposium*, 215-276

Tov, "Interchanges"\*

J.J.S. Weitenberg, *Parallel Aligned Text and Bilingual Concordance of the Armenian and Greek Versions of the Book of Jonah* (Dutch Studies in Armenian Language and Literature 1; Amsterdam 1992)

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B.A. Taylor, *The Lucianic Manuscripts of 1 Reigns, Volume 1, Majority Text, Volume 2, Analysis* (HSM 50,51; Atlanta 1992, 1993)

Kyung-Rae Kim, *Studies in the Relationship between the Samaritan Pentateuch and the Septuagint*, unpubl. diss., Hebrew University, Jerusalem 1994

T. McLay, *Translation Technique and Textual Studies in the Old Greek and Theodotion Versions of Daniel*, unpubl. diss., University of Durham, 1994

B.A. Taylor, *The Analytical Lexicon to the Septuagint—A Complete Parsing Guide* (Grand Rapids, MI 1994)

F.W. Knobloch, *Hebrew Sounds in Greek Script: Transcriptions and Related Phenomena in the Septuagint, with Special Focus on Genesis*, unpubl. diss., University of Pennsylvania (Philadelphia 1995)

F.H. Polak, "A Classified Index of the Minuses of the Septuagint," in: Greenspoon–Munnich, *VIII Congress*, 335-347

J.C. Treat, *Lost Keys and Interpretation in Old Greek Song of Songs and Its Earliest Manuscript Witnesses*, unpubl. diss., University of Pennsylvania, 1996

#### IV. Use of the database with the Accordance program

##### 1. Background

The CATSS database, as well as the MT and LXX 'text panes,' can be accessed with the aid of the Macintosh *Accordance* program,<sup>1</sup> as of 1998 without col. b of the Hebrew, and without the linkage with the CATSS files of morphological analysis of the Greek and Hebrew words. Nevertheless, the internal morphological analysis of *Accordance* allows the user access to many of the data which otherwise would have been obtained by a linkage between the main file of parallel data and the morphological analyses of the CATSS database. Complete listings of individual Greek and Hebrew words can now be provided with the aid of the internal *Accordance* predetermined lemmas (morphologically and lexically tagged) and can be displayed with or without the context of the verse. In this way all the individual words of the Hebrew and Greek

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<sup>1</sup> Thanks are expressed to Roy Brown, the programmer of *Accordance*, and to F. Polak for improving the description.

Bible can be concorded with their equivalents in the other language. Furthermore, the grammatical analysis and the search possibilities of *Accordance* allow bilingual grammatical searches.

At the word level alone, the new type of concording retrieves much more information than HR, as that tool does not include all the Hebrew and Greek words. Thus, the user now has access to all the equivalents of such Greek particles as δέ and ἀλλά and of all the Greek pronouns, and in these cases the Hebrew parallel data are available as well. The *Accordance* program further avoids the various pitfalls of HR's recording system (cf. *TCU*, 90–99), and it can execute searches of parts of Hebrew or Greek words, such as Hebrew prefixes and suffixes and Greek preverbs.<sup>2</sup> Beyond HR, *Accordance* enables searches of combinations of words and of grammatical categories (see below). In the MT and LXX 'text panes' of *Accordance* (but not in the MT/LXX file) searches can be executed on any text unit in the LXX or the Hebrew Bible (all of the LXX, one or more biblical books, or any combination of verses). Searches can also be conducted on the comments in CATSS in the Greek and Hebrew text relating to translation technique, the relation to the Qumran scrolls, and underlying Hebrew variants.

*Accordance* furthermore provides the user with brief standard equivalents (not always reliable) in English of all the words in the Hebrew and Greek texts. This information is provided in the text files by placing the pointer on the text word. The lexical box at the bottom of the screen provides the Hebrew or Greek text word together with the lemma word and its brief morphological analysis (thus by clicking on וַיֵּאמֶר in MT, the lexical box provides the different English equivalents of אָמַר as well as their morphological analysis). More extensive lexical information can be culled from entries in LSJ and the LXX lexicon of Lust-Eynikel-Hauspie<sup>3</sup> for the Greek words and in BDB for the Hebrew words. This information is provided by first selecting the word in MT, and by subsequently selecting a lexical source (BDB, LSJ, or the LXX lexicon) in the Amplify Palette, usually on the right side. As a rule, the program makes the correct connection between the text word in the running text of MT and the entries in BDB. Thus if הוֹצֵא in הוֹצֵא is selected, the relevant entry of יָצָא in BDB is displayed. This search can also be applied to the MT/LXX text, but as the Hebrew in that text is not connected with

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<sup>2</sup> Words prefixed by -ב are searched for in the MT/LXX tool with the use of a 'wild card' according to the sequence of the Hebrew as: ? <within 2 words> ב.

<sup>3</sup> J. Lust, E. Eynikel, and K. Hauspie, *A Greek-English Lexicon of the Septuagint*, I-II (Stuttgart 1992, 1996).

an underlying morphological analysis, often the wrong entry from BDB is displayed.

In *Accordance*, lexical searches can be executed on the Greek (LXX1) or Hebrew (HMT) text panes separately or on the MT/LXX tool (= CATSS). The principles guiding these searches in the text files are:

- a. Words can be selected from the text and placed in the search box.
- b. Words can be defined in the search box.
- c. Words can be called up from the list of predetermined words, in the Options box in the main menu, under Enter Lexical Forms (e.g. הרג) or Inflected Forms (e.g., הרגתי).
- d. Complex searches can be performed in the Construct window.

The principles for these searches are more or less identical when searching in MT, LXX, or the combined MT/LXX tool, but in the latter text (treated by *Accordance* as a tool, rather than a text) the options are more limited as it is not linked with the list of predetermined lemmas.

The following files may be opened:

- a. the MT/LXX tool (the parallel alignment of CATSS without col. b) by selecting the appropriate item from the New Window Palette, usually on the upper right side. Alternatively this text can also be opened by clicking on the 'Open...' item in the Edit menu.

- b. MT (HMT), reflecting codex L.

- c. the LXX (LXX1), reflecting the edition of Rahlfs.

- d. any combination of these text panes, or a combination with one of the English translations, SP, or the Vulgate. Within *Accordance* all these texts are linked, so that they can be scrolled down together, always showing the same verse in Hebrew/Greek, Hebrew/English, MT/SP, etc. as the first item on the screen. Also dissimilar texts can be linked with the 'Tie To' command. Any second text can be added to the first one by selecting the appropriate file in the menu File, New Text Pane (e.g., HMT + SP or HMT + MT/LXX) or by selecting them separately. Subsequently the 'Tie To' command in the Windows menu should be invoked in order to link these dissimilar files.

The texts are presented as complete verses, and not as individual words as in the CATSS database. The combination of the MT (HMT) and LXX (LXX1) text panes is very significant in the perusal of *Accordance*, as the separate Hebrew and Greek files allow for more search possibilities than the MT/LXX tool.

Beyond the general equivalents of verses in the MT and LXX text panes, *Accordance* also provides equivalents at the level of individual words (lines in the CATSS database), by using the MT/LXX tool. The sophistication of *Accordance* allows the user many possibilities short of a

full morphological analysis, so that the lack of the CATSS morphological analysis of Greek and Hebrew is felt less. Furthermore, by using the 'Tie To' command, the HMT and MT/LXX text panes can be combined, so that the morphological analysis of the HMT text pane can be used in order to show the complete MT/LXX contexts in the parallel window. The same possibility also exists in the reverse direction: single equivalents can be called up in the MT/LXX tool, while the full context can be viewed in the parallel window in the text pane of either the HMT or LXX.

## 2. Principles of search in the lemmatized Hebrew and Greek texts

### i. Word searches

The principles of searching words or forms in the two types of text files differ, because the text panes of MT (HMT in *Accordance*) and LXX (LXX1) use predetermined lemmas (morphologically and lexically tagged), while the MT/LXX tool is not lemmatized, and hence its search options are limited.

Searches in the HMT and LXX1 text panes are executed by opening these texts and by filling in the word in the search box as described above (the Search mode itself is activated by first clicking on Mode). In this search Hebrew vocalization and Greek accents are disregarded, so that the results refer to the Hebrew consonants or Greek letters only. A simple search thus often produces more items than asked for. This limitation pertains to nouns, adjectives, and particles, and to a lesser degree to verbs. However, by combining data from different sets of information within *Accordance*, specific searches can nevertheless usually be performed, with the exception of the search for some homographs (Hebrew words belonging to the same grammatical category, such as דָּבַר and דִּבְרָה). Thus a search<sup>4</sup> for the three consonants דבר can be accompanied by the definition Noun in the Tags menu (in this case referring to both דָּבַר and דִּבְרָה, but in most other cases referring only to a single noun)<sup>5</sup> or Verb. In the case of Greek homographs, εἰν can be defined as either Preposition (producing a list of occurrences of εἰν) or Adjective (producing a list of occurrences of εἰν). This amplified description is obtained by combining the regular search with the possibilities provided by the Tags menu. In this way tailor-made searches can be conducted for specific verbs or nouns. Thus present

<sup>4</sup> The search alphabet is based on the transcription alphabet of the CATSS database. Thus in Hebrew א = A, ב = B, ג = G, etc., and in Greek, α = A, β = B, γ = G, etc.

<sup>5</sup> In this search, *Accordance* provides the results for the following items under דבר, which cannot be distinguished: word, plague, pasture, Debir, Debar.

tense forms of λέγω can be searched for as λέγω@[VERB present]. The optimum for this search is obtained by opening both the HMT and LXX1 text panes (with the aid of the New Text Pane menu). This procedure enables the scrolling down together of the two text panes. The combination of these two text panes is needed, as the MT/LXX tool cannot be used directly with the grammatical tags.

An example of a complex search of data which cannot be accessed with the extant printed research tools is the search for any combination of two or more words such as על פי (על פה).<sup>6</sup>

The following issues should be considered as well:

1. Searches for the Greek base forms, such as κύριος for the noun or ἔρχομαι for the verb automatically list all inflected forms as well, thus including κυρίου, etc. for κύριος and such forms as ἐλεύση and ἦλθοσαν for ἔρχομαι.

2. Searches can be conducted on any combination of Hebrew and Greek characters, including 'wild cards,' as explained in the *Accordance* manual. Wild cards for *single* characters are indicated by '?'. Thus in the LXX text pane a search for οτ? will produce listings for both ὅτι and ὅτε. Likewise, a wild card in the middle of word refers to any single letter. Thus ר?ב will list any Hebrew word starting with a *beth* and ending with a *resh*, with a single letter in the middle. The slash separating between morphemes in the database itself (e.g., π/ῶ) is disregarded in this search.<sup>7</sup>

3. The wild card \* refers to any number of letters. The search of \*ερχομ\* (with a star at both ends) provides all the inflected forms of that verb, including preverbs (ἐξέρχομαι, προσέρχομαι, etc.), and including inflected forms which have no consonants in common with ερχομ-, such as ἀπελεύση and διήλωμεν.

4. In the Construct panel the same results can be obtained without the use of stars: When the Greek text is displayed, one should select in the File menu New Construct, Greek. LEX is placed in the bottom left window, together with ερχομαι from the list of lexical forms. The search is then started after the two windows are first linked with LINK in the Options menu under Enter Commands. In the same way all infinitives of this verb can be listed by listing 'infinitive' in the space under the Greek verb, or all non-infinitive forms by selecting the NON box for the

<sup>6</sup> This search yields the following results for the LXX: διὰ ῥήματος (3 x), διὰ προστάγματος (8 x), διὰ φωνῆς (10 x), ἐκ (1 x), ἐπί (6 x), ἐπὶ στόματος (4 x), ἐπὶ στόμα (1 x), ἐπὶ τῷ στόματι (2 x), καθάπερ (1 x), κατά (3 x), κατὰ τὰ εἰρημένα (1 x), κατὰ στόμα (1 x), μετὰ (1 x).

<sup>7</sup> This implies, for example, that for this type of search בריה/ consists of four letters only when the search refers to בר?ר or בר?ר.

infinitives. In a similar way all occurrences of  $\text{לָהֵךְ}$  can be concorded in the Hebrew construct window, starting with the bottom right window. Or, all forms of the type  $\text{בִּנְסַע}$  are concorded in the New Construct window as a combination of the LEX form  $\text{ב}$  and VERB, inf. constr., combined by the command WITHIN 1-1 words.

5. Combined searches can be extended to more than one item (commands: AND, NOT, FOLLOWED BY, PRECEDED BY, OR). Thus, use of the AND command (Options: Commands) allows the user to find all verses in which  $\lambda\acute{\epsilon}\gamma\omega$  and  $\kappa\acute{\upsilon}\rho\iota\omicron\varsigma$  occur together, or all verses in which forms of  $\lambda\acute{\epsilon}\gamma\omega$  are immediately FOLLOWED BY  $\kappa\acute{\upsilon}\rho\iota\omicron\varsigma$ . The same pertains to more complex searches such as  $\omicron\tilde{\upsilon}\tau\omega\varsigma$  <WITHIN 2 Words>  $\lambda\acute{\epsilon}\gamma\omega$  <WITHIN 2 Words>  $\kappa\acute{\upsilon}\rho\iota\omicron\varsigma$ .

6. *Secondary* searches on the results of initial searches can be executed with the aid of the CONTENTS command in the OPTIONS menu. In the last mentioned example in paragraph 4, many equivalents of the combination of  $\text{ב}$  and the inf. constr. are provided, which can be tabulated further. If from this list the equivalent  $\omicron\tilde{\upsilon}\tau\iota$  is singled out, the following procedure needs to be followed after the initial results have been concorded: another search menu needs to be opened (FILE, NEW, SEARCH WINDOW). In this search window, write ' $\omicron\tilde{\upsilon}\tau\iota$  <AND> [CONTENTS SEARCH],' both to be selected from the OPTIONS, COMMANDS.

#### ii. *Grammatical searches*

*Accordance* includes an analysis of all the Greek and Hebrew words defining each of these words grammatically (e.g., for  $\text{יְהוָה}$ : noun, plural, masculine, construct). The program allows for a search of all the words belonging to a specific grammatical category. Thus the user can ask for all nouns, or more in detail, all plural nouns, or in still greater detail, all plural masculine nouns, or all plural masculine construct nouns (such as  $\text{יְהוָה}$ ), etc. These searches can be executed with or without the equivalents in the other language. After the Hebrew or Greek text is chosen, the search can be performed on any of the grammatical categories listed in the Tags menu. At a second stage the parallel Hebrew or Greek text can be linked to the results of this search, so that all the bilingual contexts are presented.

The Hebrew tagging allows, i.a., for a specialized search of forms with a directional *he*, paragogic *he* (both under 'suffix' in the Tags menu), infinitive absolute forms of the Hebrew verb, construct nouns, dual forms of nouns, relative and interrogative pronouns, suffixes, conjugations of the Hebrew verb, etc. Tagging of the Greek allows for

similar searches, such as a specific tense or aspect of the Greek verb. Thus, the frequency of the aorist optative can be researched in this way.

Special searches can be executed by combining specific Greek or Hebrew words with grammatical categories. In the Construct window these searches can be combined with various commands such as NOT (under the word searched, not next to it), WITHIN, INTER, AGREE (all in the central box). In this way one can list, for example, προσεύχομαι FOLLOWED BY 'Noun' in order to examine the *rectio* of that verb. The subjunctive forms of the verb not preceded by οὐ or μή can be listed in this way (Accordance User's Guide, 9.8).<sup>8</sup> The construction ἐν + infinitive (actually = ἐν + τῶ + inf.) can also be concorded in this way, with or without elements intervening between ἐν and τῶ (Accordance User's Guide, 9.9). The latter search is executed by writing ἐν in the left box, followed by 'VERB, infinitive' in the adjacent box and below WITHIN (1-2 words) in the central box. In another instance, examples of θεός without an article within five words before the noun are listed (Accordance User's Guide, 9.14).<sup>9</sup> By the same token all entries of אָמַר or דָּבַר which are NOT verbs can be concorded.

### 3. Principles of search for the unlemmatized MT/LXX tool

Words in the unlemmatized MT/LXX tool (= CATSS) cannot be accessed with the same sophistication as the separate LXX and MT text panes. However, some simple searches can be executed by searching for strings of letters in either language.

These searches are executed in the MT/LXX tool by locating equivalents either in the context of a complete verse or as individual lines of the CATSS database. For this purpose, in the MT/LXX tool, the box Entry is opened and either 'Hebrew' or 'Greek' is selected in this box. Subsequently a Hebrew or Greek word or combination of letters in the text is selected and copied in the search box. Alternatively any combination of letters can be written in the search box. Subsequently, the results are displayed in lists of individual equivalents in the MT/LXX tool or of lists of such equivalents within their context of the complete verse. For the first line on each screen the text reference is provided in the reference box. The results of the search for עַל includes such forms as עַל/י, עַל/יך, but not בַּעַל or נַעַל, so that the results form a reasonable basis for research, although inferior to the results obtained in the separate LXX

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<sup>8</sup> Central box WITHIN, left bottom box οὐ, μή, crossed out by NOT, and adjacent box: VERB, subjunctive.

<sup>9</sup> Central box WITHIN, left bottom box 'art.' crossed out by NOT, and adjacent box θεός.

or MT text panes. On the other hand, the results include the parallel elements in the other language.

In the Hebrew text in the MT/LXX tool, the different morphemes are separated by a slash. These slashes are treated as word separators, so that a search for **יברא** /ו should be phrased as

**יברא** <WITHIN 2 WORDS> ו.

In the MT/LXX tool, the results are listed for the database as a whole, and cannot be subdivided into individual books of the Bible.

#### i. *Special searches and notations*

Special searches include an analysis of all paragraph divisions in the MT text (פ or ס) which can be searched in the HMT text pane.

In the CATSS database, special notations refer to select categories in translation technique and other data. Searches of these notations can be made on all the special notations in the Hebrew and Greek columns of the CATSS database, relating to the translation character of the LXX and its relation to the Qumran scrolls, as well as textual variations. These searches can be executed in the MT/LXX tool, in the 'Entry' box under Comments. A search for '?' lists all these comments according to the sequence of the text. Specific details which can be searched for include:

c = {c}	conjectures in the Greek text
d = {d}	doublets
d = {..d}	distributive use in the translation
p = {p}, {..p}	difference between MT and LXX in particle/ preposition
r = {..r}	element repeated in the translation
s = {s}	superlative
t = {t}	transcriptions
nd, ad ,nad, v, etc.	subdivisions in the renderings of inf. constr. denoted as {!}nd, etc.
sp = <sp>	agreement between the LXX and SP against MT
q = <q4b>	agreements with Qumran scrolls, in this case relating to 4QNum <sup>b</sup>
.yw, etc.	interchange between <i>yod</i> (MT) and <i>waw</i> (LXX),
.m	metathesis
.y-	the LXX omits a <i>yod</i>
.j	the LXX joins two words

At this stage the following important components of the CATSS base elements cannot be searched for: . { --- --+ !. The next release of *Accordance* will address these issues.

ii. *Special display*

The Amplify Palette in the top right corner of the text panes allows for special presentations of the search results:

1. The 'Plot' option provides a graphic chart displaying the results of the search data according to book and chapter. For example, this presentation enables the user to see graphically in which chapters in Genesis the *hiph'il* forms of the verb are found, and in which chapters and books in the Torah עָדָה occurs. The 'Table' option provides the actual numbers of occurrences in each of the biblical books.

2. The 'Analysis' box, to be used in conjunction with the 'Analysis display' in the Options menu, lists the individual searches alphabetically, a feature which is of help in grammatical analyses.

3. Under 'Parsing' the morphological information for each of the words is provided.

4. The box 'Old Testament' provides parallels from the books of the Hebrew Bible, if extant.

5. The box 'Speech' activates the speech representation of any element on the screen, in English, Greek, or Hebrew, including the recitation of the complete Bible text, or the parallel alignment of CATSS.