CHAPTER SEVENTEEN

THE USE OF COMPUTERS IN BIBLICAL RESEARCH

Computers provide us with passive tools that are also active and interactive when used as an extension of our own thinking in the study of Scripture. In both areas, individual scholars, projects, and companies have created tools with great potential for searching and researching, but these are greatly under-used for a variety of reasons. There remains a wide gap between the knowledge of the experts creating the tools and that of the scholars for whom the tools are intended. The idea behind these tools is that we scholars continue our investigations as before, but now utilize the additional tools and databases.

Computer programs and databases serve active and passive functions. As passive tools, they serve us just like books, especially text editions, concordances, lexicons, grammars, commentaries, atlases, and encyclopedias. As active tools, programs and databases can be used to improve and expand the areas of our research. We make a distinction between non-flexible computer-assisted research and flexible computer programs and databases. Some very fine computer-assisted research has been presented to the public in a fixed printed form. If perchance a reader wished to retrieve information from the data that the author had not thought of providing, it would be a lost cause, since the reader has no access to the computer data and, in the worst case scenario, the electronic data may no longer be in existence. On the other hand, if a database is available to the public, all questions can be asked at any time.

Twenty years ago, at a computer conference, I stressed that there was a yawning gap between the knowledge of computer experts and that of the public at large,[1] and this is still the case, although much less so. Many scholars and students still do not open an electronic search program with the same ease as a printed concordance, even if the former provides far better results.

In biblical scholarship, computer-assisted studies have focused on the following five areas:

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[1] E. Tov, "A New Generation of Biblical Research," in *Proceedings of the First International Colloquium Bible and Computer, The Text, Louvain-la-Neuve (Belgique) 2–3–4 septembre 1985* (Paris: Champion; Geneva: Sladkine, 1986) 413–43.

1. *Authorship Studies*

Scholars have tried to determine authorship with the aid of statistical analysis of pericopes of 100 words or more, especially outside the realm of biblical scholarship. Statistical analysis was supposed to answer questions such as whether or not two segments of a composition were composed by the author whose name is connected with that composition, and also whether two different compositions were perchance composed by the same author. In our area, pioneering work was performed by Radday et al.[2] The statistics provided by these authors attempted to demonstrate that the only distinction that can be made between the so-called sources of Genesis is that between the Priestly layer P and the combined source JE. This early work by Radday et al. has been criticized much by Krispenz,[3] who herself favors computerized statistical research that is based on different principles.[4] Criticism had been voiced earlier by Forbes who claimed that Radday used the wrong sampling practices for attempting to establish authorship.[5] I note that all these authorship studies are not easily intelligible to those who are not experts in mathematics, and therefore, according to V. Premstaller, cannot be evaluated well.[6]

2. *Stylistics*

In a long series of studies using the database of the Werkgroep Informatica in Amsterdam, Polak investigated the vocabulary of the Hebrew Bible. One study investigates in particular the relation between the num-

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[2] Y. T. Radday and H. Shore, *Genesis, An Authorship Study in Computer-Assisted Statistical Linguistics* (AnBib 103; Rome: Biblical Institute Press; Editrice Pontificio Istituto Biblico, 1985).

[3] J. Krispenz, *Literarkritik und Stilstatistik im Alten Testament: Eine Studie zur literarkritischen Methode, durchgeführt an Texten aus den Büchern Jeremia, Ezechiel und I Könige* (BZAW 307; Berlin: de Gruyter, 2001). See also G. E. Weil et al., "Le livre d'Isaîe et l'analyse critique des sources textuelles," in *Pratique de l'analyse des donneés* (ed. J. P. Benzécri; Paris: Dunod, 1982) 140–60.

[4] Among other things, she criticizes Radday for formulating criteria for linguistic analysis that are meaningful in the analysis of German, but not Hebrew literature. Krispenz also claims (p. 90) that Radday explained away the differences between P on the one hand and J and E on the other by ascribing these differences to different literary genres (*Gattungen*).

[5] A. Dean Forbes, "A Critique of Statistical Approaches to the Isaiah Authorship Problem," in *Association Internationale Bible et Informatique, Actes du Troisième Colloque International* (Paris: Champion; Geneva: Sladkine, 1992) 531–45; idem, "Statistical Research on the Bible," *ABD* (1992) 6.185–206.

[6] V. Premstaller, reviewing the work of Krispenz: *http://www.bookreviews.org/*.

ber of verbs in the sentence as opposed to the number of nouns.[7] The author shows that this relation changes in the transition from early to late Hebrew in the Bible and also differs between the different literary genres. In another study, Polak investigated the epic formulas used in Scripture.[8]

3. *Linguistics*

A few traditional linguistic studies involving the analysis of specific words, word-groups, grammatical forms, vocalization patterns, and linguistic features of a biblical book or layer in the Bible have been carried out with the aid of computerized data. These studies mainly advance modern linguistic theories, and not the exegesis of these books.[9]

4. *Statistics*

Important studies published in printed editions have been carried out by Andersen and Forbes, especially in their book *The Vocabulary of the Old Testament*. This work of 721 large pages involves word counts of all the words in each biblical book, including the Pentateuchal sources and the individual segments of Isaiah and the Psalms (part III), and a list showing the frequency of occurrences of the *binyanim* of all the verbs (part IV). Part I gives the statistical picture of all the grammatical categories appearing in each of the subdivisions of the Bible, such as the number of common nouns appearing in Genesis or in P, without further details.[10] With all its useful information, this book exemplifies the category of non-flexible data, as we cannot view the data behind the numbers given nor ask additional questions from the data.

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[7] F. H. Polak, "New Means–New Ends: Scholarship and Computer Data," *Association Internationale Bible et Informatique* 4 (Travaux de Linguistique Quantitative 57; Paris: Slatkine, 1995) 282–312.

[8] F. H. Polak, "Epic Formulas in Biblical Narrative: Frequency and Distribution, 2″ in *Les actes du second colloque internationale Bible et Informatique: mèthodes, outils, résultats (Jerusalem, 9–13 Juin 1988)* (ed. R. Poswick et al.; Geneva: Champion-Slatkine, 1989) 435–88.

[9] I confess to not always understanding the mathematical aspects of many linguistic studies, of which the THLI series (*Textwissenschaft-Theologie, Hermeneutik, Linguistik-Literaturanalyse, Informatik*) edited by H. Schweizer is probably typical. See, e.g., W. Bader, *Simson bei Delila—Computer-linguistische Interpretation des Textes Ri 13–16* (TLHI 3; Tübingen: Francke Verlag, 1991); H. Schweizer, *Die Josefsgeschichte—Konstituierung des Textes* (THLI 4; Tübingen: Francke Verlag, 1991).

[10] For example, this book provides statistics regarding the relation between את and עם in a given book. Thus, the Priestly source prefers את over עם, while the other sources in the Torah display the opposite tendency (p. 28).

5. *Textual Criticism*

A study by Weil lists the number of verses in the Leningrad Codex compared with the Masoretic lists.[11] With the aid of the *Accordance* program, I myself studied the frequency of the *petuchot* and *setumot* in the various books in the MT.[12]

The study of orthography is a typical example of an area that benefits much from computer-assisted research. Andersen and Forbes analyzed the spelling of word-groups and individual words, providing, for example, data about the spelling of the patterns *qotel*, *qotlim*, and *qotlot* that were not previously available.[13]

The creation of the CATSS database in Philadelphia and Jerusalem brought about a host of studies based on the morphological analysis of the Hebrew and the Greek and on features in the parallel alignment.[14] This project created a flexible multi-purpose database aimed at the study of the LXX and its relation to the MT. The database contains a long list of stereotyped notes on such matters as *Ketiv/Qere*, renderings of prepositions, the addition/deletion of pronouns, differences in aspect (active/passive) between the Hebrew and Greek texts, the article, addition/deletion of כל, transliterations, doublets, and interchanges of consonants, many of which have been examined in monographic studies.

Thus I was able to investigate the frequency of the interchanges in consonants between the MT and the LXX[15] and the types of renderings of the infinitive absolute.[16] Nieuwoudt examined aspects of the finite verb;[17] Polak studied the relation between the Samuel scrolls from Qumran and the LXX;[18] Kyung-Rae Kim analyzed the relationship between the LXX and the SP;[19] Knobloch studied the phonology of the translitera-

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[11] G. E. Weil, "Les décomptes de versets, mots et lettres du Pentateuque selon le manuscrit B 19a de Léningrad," *Mélanges D. Barthélemy* (OBO 38; Fribourg: Éditions universitaires; Göttingen: Vandenhoeck & Ruprecht, 1981) 651–703.

[12] Tov, *Scribal Practices*, 143–66.

[13] F. I. Andersen and D. Forbes, *Spelling in the Hebrew Bible* (BibOr 41; Rome: Biblical Institute Press; Editrice Pontificio Istituto Biblico, 1986).

[14] For a bibliography, see Tov, *Greek and Hebrew Bible,* 41–3 and R. A. Kraft: *http://ccat.sas.upenn.edu/rs/rak/catss.html*. See also the description by J. Treat in *http://ccat.sas.upenn.edu/~jtreat/rs/rscpuhx.html*.

[15] *Greek and Hebrew Bible*, 301–11.

[16] *Greek and Hebrew Bible*, 247–56.

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

[18] F. H. Polak, "Statistics and Textual Filiation: the Case of 4QSam[a]/LXX (with a Note on the Text of the Pentateuch)," in *Manchester Symposium*, 215–76.

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

tions in the LXX,[20] while the literalness of the LXX translation was subjected to scrutiny by Tov and Wright.[21] Marquis studied differences in sequence,[22] and J. Lust analyzed multiple authorship in Ezekiel.[23] Further , Polak and Marquis devoted a large study to the classification of the minuses of the LXX vis-à-vis the MT.[24]

ELECTRONIC RESOURCES

The list below[25] displays a list of the available electronic resources as known to me in 2006, both as freeware and in commercial software packages (indicated with a star*). Usually the rule is, the more recent the program, the more sophisticated the software. For details pertaining to the description below, the reader is referred to the list.

The Hebrew Bible has been available for some time in machine-readable form, with vowels and accents. The Greek Bible with accents, is also available.

All available sources are designed exclusively for a PC environment except for *Accordance* (Macintosh) and the *Jewish Classics Library* (PC and Macintosh). However, with emulation programs, the PC programs can be used on the Macintosh, and the *Accordance* program can be used on a PC.

The great majority of the software programs of the Hebrew Bible represent the Leningrad Codex or *BHS*. In principle, these two sources

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

[21] E. Tov and B. G. Wright in Tov, *Greek and Hebrew Bible,* 219–37. See also B. G. Wright, "The Quantitative Representation of Elements: Evaluating 'Literalism' in the LXX," in Cox, *VI Congress*, 311–35.

[22] 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.

[23] J. Lust, "The Computer and the Hypothetic Translators of Ezekiel," in *Proceedings* (see n. 1), 265–74.

[24] F. H. Polak and G. Marquis, *A Classified Index of the Minuses of the Septuagint, Part I: Introduction; Part II: The Pentateuch* (CATSS Basic Tools 4.5; Stellenbosch: Print24.com, 2002).

[25] Special thanks are due to R. Brown, R. A. Kraft, and G. Marquis, as well as the late A. Groves, for information provided and criticisms given. The websites by Joel Calvesmaki (*http://www.kalvesmaki.com/LXX/*) and James Adair, as part of a service provided by *TC, A Journal of Biblical Textual Criticism* (*http://rosetta.reltech.org/TC/TC.html*) were also helpful. To the best of my knowledge, no printed bibliography exists with the exception of the following sources, which are not very helpful since the data in this field change very rapidly: John J. Hughes, *Bits, Bytes & Biblical Studies: A Resource Guide for the Use of Computers in Biblical and Classical Studies* (Grand Rapids: Zondervan, 1987); I. Lancashire, *The Humanities Computing Yearbook 1989–90: A Comprehensive Guide to Software and Other Resources* (Oxford: Clarendon Press, 1991) 18–31 (Biblical Studies).

should be identical, since *BHS* is based on codex L, but in practice they are not. The main text which is used, the so-called Michigan-Claremont-Westminster text, has been corrected according to codex L. On the other hand, the Bar-Ilan database, *Tokhnit "HaKeter,"* displays the Aleppo Codex, which differs in only a small number of details from codex L, but for students of grammar these differences may be important. No less than fourteen software packages offer the Hebrew Bible text, all reflecting *BHS* or codex L, with the exception of the Bar-Ilan database.[26]

The text of the MT is thus available in several commercial software packages bearing such names as *Accordance*, *BibleWorks* [6],[27] the *Jewish Classics Library*, *Logos*, *WordSearch*, *Gramcord*, *Bible Windows*, SESB, and *Global Jewish Database.*

The texts from Qumran are researchable in several programs.

Internal differences between the medieval manuscripts of the MT are only researchable electronically for the few books that have been recorded by the HUBP (part of Isaiah as well as Jeremiah and Ezekiel), but otherwise the differences between them are not researchable on the computer. The Masoretic accents are accessible in *Accordance*, Bible-Works, and in the *Tochnit "HaKeter"* of Bar-Ilan. These programs allow for studies on the frequency of specific accents in the individual books and in the Bible as a whole, their internal sequence and interrelation. Similarly, research can be performed in these programs on the vowels alone, for example, on irregular vocalizations, combinations of vowels and consonants, as well as linguistic patterns, such as the pattern *qetel* or *qittalon* with a wildcard for the *waw* of *qittalon*.

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[26] In all programs, slight adjustments were made to the appearance of the text since all used different fonts. A. Groves (2003) notes: "The text was first made available for word-processing using the Hebraica font created and distributed (font and text) by Linguist's Software (Phil Payne in Seattle). Until Hebrew Bible search software became available, this was probably the most widely used version in word processing. There are now many word-processing versions of the text available using fonts produced by the various Bible software companies. Some of the companies have licensed Linguist's Software. The most common of which I am aware are: Hebraica I & II and the New Jerusalem font (Linguist's Software), the BibleWorks font, the BibleWindows font, SuperHebrew (I think the predecessor to Hebraica?) and the Gramcord font. Then there is SIL's font (called SIL Ezra; public domain). I also think that SBL has produced a public domain font. Anyway, these are the fonts I see from my various students. Note that each of these fonts map the Hebrew a little differently, so the vendor has revised our text for use with their fonts. Which means that a text in a particular font is not easily converted to another font." In addition, Accordance uses its own fonts (Yehudit).

[27] See a detailed review of this package in: *http://www.bibfor.de/archiv/02-2.schmidl.htm*.

The Masorah Magna and Parva are now available in the Bar-Ilan database.

The Samaritan Pentateuch is available within *Accordance* in the edition of A. Tal,[28] with morphological analysis.

In addition to Hebrew Scripture, ten software packages also contain the LXX as encoded by the *Thesaurus Linguae Graecae* (*TLG*) from the edition of A. Rahlfs (1935),[29] without any variant readings. The variants of the LXX have been encoded by CCAT in Philadelphia, though not yet for all books. Other tools available are the text editions by Swete, Brooke, McLean, and Thackeray (1906–1940),[30] and Field (1875),[31] the grammar of Conybeare and Stock (1905),[32] Swete, *Introduction* and modern translations, some of them as scanned images.

The edition of the Vulgate is presently available in nine software sources.[33]

The Targumim as well as the Peshitta are available in several sources, foremost on the website of the Comprehensive Aramaic Lexicon (CAL), together with lexicographical facilities and search capacities.[34]

The key to the effective use of any software program of Scripture texts is the availability in the background of a lemmatization and of a morphological analysis (grammatical tagging) of all the Hebrew, Greek, Aramaic, and Syriac text words. This lemmatization allows for a search of all the text words as well as for producing concordances.[35] While word searches are available in several programs, *Accordance* is probably the only one that enables the creation of complete concordances. Such concordances can be produced for any text range so defined: any combination of biblical books or parts thereof, combinations of verses, pericopes, or selections, such as the deuteronomistic verses, Wisdom literature, or late biblical prose or poetry. The defining of such ranges is subjective, and can be changed at any given moment. The search facilities of the various programs differ; some are more sophisticated than others. The most sophisticated programs, *Accordance* and *BibleWorks*, also allow for

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[28] Tal, *Samaritan Pentateuch.*

[29] Stuttgart: Deutsche Bibelgesellschaft.

[30] Cambridge: Cambridge University Press.

[31] Oxford: Oxford University Press.

[32] Boston: Ginn and Company.

[33] For the history of the encoding of the Vulgate text and for further sites, see the data provided by R. A. Kraft in *http://www.le.ac.uk/elh/grj1/linksa.html.*

[34] Based mainly on *Mikra'ot Gedolot "HaKeter"* (Bar-Ilan University Press, 1992–2000) as well as on various editions.

[35] See *http://www.balboa-software.com/semcomp/scbible2.htm* for H. Hahne's descriptions of these aspects in "Using a Computer in Biblical and Theological Studies, Lesson 6: Computer-Assisted Bible Study, Part 2."

the search of morphological features, such as the frequency of the individual *binyanim* of the verb and unusual nominal forms, and also the search for combinations of lexical and grammatical information. The morphological and lexical information in the background of *Accordance* also allows for grammatical and orthographical studies on the Qumran texts.

Although these morphological analyses usually follow one central source, such as the lexicon of Köhler-Baumgarten in the case of Hebrew Scripture, they are subjective, and a word that one scholar considers a noun, may be considered by another to be a verb. One scholar may ascribe a given form to the *niph'al*, while another one considers it to be a *hitpa'el*. One source discerns one main meaning of *dever*, while another differentiates between two homographs. *Accordance* probably places too many groups of words under the heading of "particle." This subjectivity comes to light when one reviews the differences between the existing morphological analyses.

The morphological analyses that are at the base of the software packages should be considered separate entities since they derived from independent sources. Seven different morphological analyses of Hebrew Scriptures are based on codex L / *BHS*. These include the *Westminster Hebrew Old Testament Morphology* of Groves-Wheeler, available in at least five software packages, the *Werkgroep Informatica* (including syntax and clause hierarchy) from Amsterdam, the Bar-Ilan analysis, the analysis of the Academy of the Hebrew Language, as well as additional commercial and private morphological analyses. For the LXX, I know of just one such analysis, that of CATSS-Taylor-Wheeler, which is available in seven different software packages. For the Targumim, there is the analysis of CAL, while for the Vulgate there is no such analysis, so searching in that translation is rather restricted. In addition, four different morphological analyses exist for the non-biblical Qumran texts.

The availability of different lemmatizations enlarges the search facilities, since different lemmatizations and grammatical decisions yield different results. Accordingly, differences relating to exactly the same search executed in different software packages may derive from (1) differences in the base text, among them errors; (2) differences in tagging words[36] and determining of lemmas; (3) differences due to the capabilities and assumptions of the software. In an example given by H. Hahne (n. 35), the different programs provide differing numbers for the occurrences of the pair of Greek particles μέν and δέ.

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[36] Hahne (n. 35) compared a few software packages for the New Testament. Thus, some programs classify καί as an adverb, while others classify it as a conjunction.

The bilingual CATSS database, in *Accordance*, allows examination of Greek-Hebrew equivalences, select features in translation technique, and searches of Hebrew or Greek grammatical features.

The list below records the available sources (commercial products [indicated with a star*] and freeware) relevant to textual criticism as of 2006.[37]

I. Source Texts of the Hebrew Bible

MT, Codex Leningrad B19^A / *Biblica Hebraica Stuttgartensia*

> 1. Accordance [7.1]* (OakTree Software)
>   *http://www.oaksoft.com/*
>
> 2. BibleWorks for Windows [7.0]*
>   *http://www.bibleworks.com/*
>
> 3. Jewish Classics Library* (Davka Company)
>   *http://www.davka.com/*
>
> 4. SESB*
>   *http://www.logos.com/products/details/1981*
>
> 5. Logos* (Logos Research Company)
>   *http://www.logos.com/*
>
> 6. WordSearch [7]*
>   *http://www.wordsearchbible.com/*
>
> 7. Gramcord for Windows* (Gramcord Institute)
>   *http://www.gramcord.org/*
>
> 8. Bible Windows [7.0]*
>   *http://www.silvermnt.com/bwinfo.htm*
>
> 9. Global Jewish Database* (Responsa Project, CD-ROM 12, Bar-Ilan University) (with cross-references to Rabbinic Literature)
>   *http://www.biu.ac.il/JH/Responsa/index.html*
>
> 10. Translator's Workplace [4.0] (private software package of the Summer Institute for Linguistics [SIL])
>   *http://www.sil.org/*

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[37] In this area, data change constantly, and the use of a web search engine such as google.com may provide additional information on new projects and products. Use of the search facility in google.com under "images" provides further links under such headings as "Septuagint," "Dead Sea Scrolls," and "Hebrew manuscripts." For a helpful new site, see *http://www.hum.huji.ac.il/Dinur/links/texts heb.htm*.

11. Bible Companion (restricted use)
   http://www.biblecompanion.com/

12. DBS International Corporation* (probably *BHS*)
   http://www.dbs123.com/

13. *Mechon Mamre*
   http://www.mechon-mamre.org/i/t/t0.htm

14. Snunit
   http://kodesh.snunit.k12.il

15. Westminster Hebrew Institute in: *The Dead Sea Scrolls Electronic Library*, Brigham Young University, Revised Edition, 2006; part of the Dead Sea Scrolls Electronic Reference Library of E. J. Brill Publishers (ed. E. Tov; Leiden: E. J. Brill, 2006)*

MT, Codex Leningrad B19A: scanned images

1. West Semitic Research Project (private)
   http://www.usc.edu/dept/LAS/wsrp/

MT, Aleppo Codex

1. *Tokhnit "HaKeter"–Ma'agar HaTanakh*, Bar-Ilan University, Ramat Gan; part of the *Miqraot Gedolot "HaKeter"* Project* (in books in which the Codex is missing, its text has been reconstructed according to sources close to the Aleppo Codex)

2. *http://aleppocodex.org/flashopen.html* (scanned pages)

MT, Masoretic Accents

1. Accordance [7.1]* (OakTree Software) (BHS-W4)
   http://www.oaksoft.com/

2. *Tokhnit "HaKeter"–Ma'agar HaTanakh**, Bar-Ilan University, Ramat Gan

MT, Aleppo Codex, Masorah Magna and Parva

Tokhnit "HaKeter"–Ma'agar HaTanakh*, Bar-Ilan University, Ramat Gan; part of the *Miqraot Gedolot "HaKeter"* Project*, version 2 (2005)

Biblical Texts from the Judean Desert

1. Dead Sea Scrolls Publication Project (Jerusalem; Notre Dame) (private, all texts published after 1990)

2. Database of J. Cook, Stellenbosch (private, incomplete)

3. Qumran database of S. Pfann (private, incomplete)

4. *Biblia Qumranica* (in preparation; private, incomplete)

5. Large Isaiah scroll, scanned images (F. P. Miller)
   http://www.ao.net/~fmoeller/qumdir.htm
   http://www.imj.org.il

6. Accordance [7.1]*
   http://www.oaksoft.com/ (OakTree Software)

Samaritan Pentateuch

1. Edition of Tal, *Samaritan Pentateuch*
   Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

2. Edition using Samaritan fonts on the basis of "Rylands Sam. MS 1 with Chester Beatty and Cambridge 1846" (private: A. Crown)

3. Edition of A. F. von Gall*, Der Hebräische Pentateuch der Samaritaner* (Giessen: Töpelmann, 1914–1918), scanned images: TC Ebind Index
   http://rosetta.reltech.org/Ebind/docs/TC/

Ben Sira, Hebrew, medieval manuscripts

1. *Ma'agarim**, CD-ROM of the Academy of the Hebrew Language
   http://hebrew-academy.huji.ac.il/

2. P. C. Beentjes, Utrecht (private)

3. Accordance [7.1]*
   http://www.oaksoft.com/ (OakTree Software, in preparation)

II. Source Texts of Ancient Versions

LXX, Codex S: scanned images

Edition of C. von Tischendorf, *Bibliorum Codex Sinaiticus Petropolitanus* (Leipzig: Giesecke et Devrient, 1862): TC Ebind Index: *http://rosetta.reltech.org/Ebind/docs/TC/*

LXX, Codex W: scanned images

Edition of H. A. Sanders, *Facsimile of the Washington Manuscript of Deuteronomy and Joshua in the Freer Collection* (Ann Arbor: University of Michigan, 1910), and idem, *Facsimile of the Washington Manuscript of the Minor Prophets in the Freer Collection and the Berlin Fragment of Genesis* (Ann Arbor: University of Michigan, 1927): TC Ebind Index:
http://rosetta.reltech.org/Ebind/docs/TC/

Greek Scripture, Papyri

1. Duke Papyrus Archive
http://odyssey.lib.duke.edu/papyrus/

2. APIS
http://www.columbia.edu/cu/lweb/projects/digital/apis/

3. P.Oxy
http://www.papyrology.ox.ac.uk/

4. Database of R. A. Kraft (links to the major early witnesses of the LXX, usually with images)
http://ccat.sas.upenn.edu/rs/rak/jewishpap.html

5. The Perseus Digital Library (in all these: search for "Septuagint," "LXX," "Bible," etc.)
http://www.perseus.tufts.edu/

LXX, edition of A. Rahlfs (Stuttgart, 1935) (encoded by TLG)

1. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

2. BibleWorks for Windows [7.0]*
http://www.bibleworks.com/

3. SESB*
http://www.logos.com/products/details/1981/

4. Logos* (Logos Research Company)
http://www.logos.com/

5. Gramcord for Windows* (Gramcord Institute)
http://www.gramcord.org/

6. Bible Windows [7.0]*
http://www.silvermnt.com/bwinfo.htm

7. CCAT
http://ccat.sas.upenn.edu/

8. Bible Companion (restricted use)
http://www.biblecompanion.com/

9. University of British Columbia
http://www.cnrs.ubc.ca/index.php?id=3560

10. Websites, see:
http://www.kalvesmaki.com/LXX/

LXX, edition of H. B. Swete: scanned images

Christian Classics Ethereal Library
http://www.ccel.org/s/swete/index.html

LXX, edition of Brooke-McLean, scanned images

TC Ebind Index
http://rosetta.reltech.org/Ebind/docs/TC/

LXX, variants, Göttingen and Cambridge editions (incomplete)

CCAT
http://ccat.sas.upenn.edu/

LXX, Hexapla, edition of F. Field (Oxford, 1875): scanned images

TC Ebind Index
http://rosetta.reltech.org/Ebind/docs/TC/

LXX, Swete, *Introduction*: scanned images

1. CCEL
http://ccel.org/s/swete/greekot/

2. TC Ebind Index
http://rosetta.reltech.org/Ebind/docs/TC/

LXX, grammar: F. C. Conybeare and St. G. Stock (Boston: Ginn, 1905)

1. CCEL (scanned images)
http://ccel.org/c/conybeare/greekgrammar/

2. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

LXX, grammar: Thackeray, *Grammar*

Accordance [7.1]* (OakTree Software, in preparation)
http://www.oaksoft.com/

LXX, translations into English

    a. Brenton's translation, without the Deutero-canonical books

        1. Boston Christian Bible Study Resources
          http://www.bcbsr.com/topics/olb.html

        2. BibleWorks for Windows [7.0]
          http://www.bibleworks.com/

        3. Accordance [7.1]* (OakTree Software)
          http://www.oaksoft.com/

    b. NETS

        http://ccat.sas.upenn.edu/nets/

LXX, translation into French

        http://epelorient.free.fr/

LXX, translation into German

        Septuaginta Deutsch
        http://www.septuaginta-deutsch.de/

LXX, translations into modern languages: work in progress

        http://www.kalvesmaki.com/LXX/

Vetus Latina

        Vetus Latina Institut, Beuron*
        http://www.brepolis.net/login/overview.cfm#

Vulgate: Edition of R. Weber (Stuttgart, 1969, 1983)

        1. SESB*
          http://www.logos.com/products/details/1981

        2. BibleWorks for Windows [7.0]*
          http://www.bibleworks.com/

        3. Logos* (Logos Research Company)
          http://www.logos.com/

        4. Bible Windows [7.0]*
          http://www.silvermnt.com/bwinfo.htm

        5. Accordance [7.1]* (OakTree Software)
          http://www.oaksoft.com/

        6. Bible Gateway.com
          http://www.catholic.net/RCC/Catechism/bible.html

        7. The Internet Sacred Text Archive
          http://www.sacred-texts.com/

        8. Unbound Bible
          http://unbound.biola.edu/

9. *www.biblegateway.com*

Targumim

CAL (Comprehensive Aramaic Lexicon)
http://cal1.cn.huc.edu/

Targum Onkelos

1. Global Jewish Database (12)*
http://www.accordancebible.com/ *strange*

2. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

3. CCAT/PHI CD-ROM (1987) (text encoded by M. Grossfeld, Wisconsin)

4. http://books.google.com/books?vid=ISBN9004140387&printsec=toc#PPP1,M1 (edition of Sperber)

Targum Pseudo-Jonathan

1. CCAT/PHI CD-ROM (1987) (text encoded by E. G. Clarke, Toronto)

2. Accordance [6.4]* (OakTree Software)
http://www.oaksoft.com/

Targum Jonathan

1. DBS International Corporation*
http://www.dbs123.com/

2. Accordance [7.1]* (in preparation; OakTree Software)
http://www.oaksoft.com/

3. http://books.google.com/books?vid=ISBN9004140387&printsec=toc#PPP1,M1 (edition of Sperber)

Targum to Job

CCAT/PHI CD-ROM (1987) (text encoded in Oxford)

Targum Neophyti

1. CCAT/PHI CD-ROM (1987) (text encoded by M. Sokoloff)

2. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

Targumim, Pseudo-Jonathan and Onkelos, translations

    Translation of J. W. Etheridge (1862)
       http://www.tulane.edu/~ntcs/pj/psjon.htm

Targumim to the *megillot* and Psalms

       http://www.tulane.edu/~ntcs/tgtext.htm

Targumim from Qumran

    CAL (private)
       http://cal1.cn.huc.edu/

Peshitta

    1. CAL (most books)
       http://cal1.cn.huc.edu/

    2. Peshitta Institute, Leiden (private)
       http://www.leidenuniv.nl/gg/

      For progress reports see also *Hugoye*:
       http://syrcom.cua.edu/Hugoye/

    3. Project of W. Strothmann, Göttingen University, discontinued (complete Peshitta, including morphological analyses and concordances).
       http://www.gwdg.de/~mzumpe/strothm.htm

Peshitta, codex A: scanned images

    Edition of A. M. Ceriani**,** *Translatio Syro Pescitto Veteris Testamenti ex codice Ambrosiano* (Milan, 1876–1881):
      TC Ebind Index
      http://rosetta.reltech.org/Ebind/docs/TC/

MT (*BHS*) and LXX (ed. Rahlfs) compared in parallel alignment

    1. Accordance [7.1]* (OakTree Software)
       http://www.oaksoft.com/

    2. CCAT (ASCII format)
       http://ccat.sas.upenn.edu/

    3. CATSS, Ben-Sira (in preparation; private: B. G. Wright and G. Marquis)

    4. CATSS, programs for the use of: J. Lust (private) [merging of the text file and the morphological analysis]

    5. CATSS, analysis of minuses of the LXX (private: F. Polak and G. Marquis)

    6. Logos* (Logos Research Company)
       http://www.logos.com/
       Bible works

III. Modern Translations of Hebrew Scripture

1. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

2. BibleWorks for Windows [7.0]*
   http://www.bibleworks.com/

3. Jewish Classics Library* (Davka Company)
   http://www.davka.com/

4. Logos* (Logos Research Company)
   http://www.logos.com/

5. Gramcord for Windows* (Gramcord Institute)
   http://www.gramcord.org/

6. Bible Windows [7.0]*
   http://www.silvermnt.com/bwinfo.htm

7. Nelson's eBible*
   http://www.discountchristian.com/ebible_plat.html

8. Unbound Bible (allows searches in many translations in several languages)
   http://unbound.biola.edu/

9. Blue Letter Bible (allows for comparative searches in the KJV and dictionaries)
   http://blueletterbible.org/links.html

10. SESB*
    http://www.logos.com/products/details/1981

11. Modern translations are presented in countless websites.

IV. Critical Apparatuses

BHS

1. SESB*
   http://www.logos.com/products

2. Accordance [7.1]*
   http://www.oaksoft.com/ (OakTree Software)

HUBP

HUBP (private): Isaiah 45 ff., Jeremiah, Ezekiel

Göttingen Septuagint

Septuaginta Unternehmen (private): Joshua, Daniel

Biblia Hebraica Quinta (in preparation)

Novum Testamentum Graece (Nestle-Aland)

1. SESB*
   http://www.logos.com/products/

2. Accordance [7.1]*
   http://www.oaksoft.com/ (OakTree Software)

V. Morphological Analyses

Hebrew Scripture

1. Groves-Wheeler Westminster Hebrew Old Testament Morphology
   a. BibleWorks for Windows [7.0]*
      http://www.bibleworks.com/

   b. Accordance [7.1]* (OakTree Software)
      http://www.oaksoft.com/

   c. Gramcord for Windows* (Gramcord Institute)
      http://www.gramcord.org/

   d. Logos* (Logos Research Company)
      http://www.logos.com/

   e. CCAT (ASCII format)
      http://ccat.sas.upenn.edu/

2. Werkgroep Informatica (including syntax and clause hierarchy)
   http://www.th.vu.nl/~wiweb/

   Available in SESB*
   http://www.logos.com/products/

3. *Tokhnit "HaKeter"–Ma'agar HaTanakh*, Bar-Ilan University, Ramat Gan;
   part of the *Miqraot Gedolot "HaKeter"* Project*

4. Global Jewish Database*
   http://www.biu.ac.il/JH/Responsa/index.html

5. *Ma'agarim*, CD-ROM of the Academy of the Hebrew Language
   http://hebrew-academy.huji.ac.il/

6. Database of F. Andersen and D. Forbes (private)

7. Database of CIB/Maredsous (*Mikrah)* (private: R. F. Poswick, Maredsous)

Greek Scripture: CATSS, Morphologically Analyzed LXX text (*http://ccat.sas.upenn.edu/*
Accessible, with corrections by D. Wheeler (version 2.2), in

1. SESB*
   http://www.logos.com/products/details/1981

2. BibleWorks for Windows [7.0]*
   http://www.bibleworks.com/

3. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

4. Logos* (Logos Research Company)
http://www.logos.com/

5. Gramcord for Windows* (Gramcord Institute)
http://www.gramcord.org/

6. Bible Windows [7.0]*
http://www.silvermnt.com/bwinfo.htm

7. CCAT (ASCII format)
http://ccat.sas.upenn.edu/

Targumim and Peshitta

1. CAL (allows on-line lexical and concordance searches)
http://cal1.cn.huc.edu/

All Hebrew texts from the Bible until the 11th century

1. *Ma'agarim*, CD-ROM of the Academy of the Hebrew Language (based on fresh readings of manuscripts as well as critical editions).

VI. Tools

Biblical Hebrew Reference Grammar

1. Logos* (Logos Research Company)
http://www.logos.com/

BDB

1. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

2. Gramcord for Windows* (Gramcord Institute)
http://www.gramcord.org/

3. BibleWorks for Windows [7.0]*
http://www.bibleworks.com/

4. Logos* (Logos Research Company)
http://www.logos.com/

5. Translator's Workplace
http://www.sil.org/

6. SESB*
http://www.logos.com/products/details/1981

L. Koehler, W. Baumgartner and J. J. Stamm, *Hebrew and Aramaic Lexicon of the Old Testament*, trans. and ed. under the supervision of M. E. J. Richardson

1. CD-ROM [Brill, Leiden]

2. Accordance [7.1]* (OakTree Software)
http://www.oaksoft.com/

3. Logos* (Logos Research Company)
   http://www.logos.com/

4. BibleWorks for Windows [7.0]*
   http://www.bibleworks.com/

LSJ together with LSJ, *Supplement* and P. G. W. Glare, *Revised Supplement* (Oxford: Clarendon Press, 1996)

1. The Perseus Digital Library (includes links to other lexicons, and provides links to all the texts)
   http://www.perseus.tufts.edu/

2. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

3. BibleWorks for Windows [7.0]*
   http://www.bibleworks.com/

4. Logos* (Logos Research Company)
   http://www.logos.com/

5. SESB*
   http://www.logos.com/products/details/1981

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

1. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

2. SESB*
   http://www.logos.com/products/details/1981

3. Gramcord for Windows* (Gramcord Institute)
   http://www.gramcord.org/

G. Kittel (ed.), *Theological Dictionary of the New Testament* (trans. G. W. Bromiley; Grand Rapids: Eerdmans, 1968–1976), abridged edition

1. Logos* (Logos Research Company)
   http://www.logos.com/

2. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

3. SESB*
   http://www.logos.com/products/

Anchor Bible Dictionary (ed. D. N. Freedman; New York and London: Doubleday, 1992)

1. * CD-ROM

2. Accordance [7.1]* (OakTree Software)
   http://www.oaksoft.com/

3. Logos* (Logos Research Company)

http://www.logos.com/

Bible Atlas

> 1. Accordance [7.1]* (OakTree Software)
> *http://www.oaksoft.com/*

> 2. Logos* (Logos Research Company)
> *http://www.logos.com/*

PhotoGuide (linked with text files)

> 1. Accordance [7.1]* (OakTree Software)
> *http://www.oaksoft.com/*

W. Bauer, W. F. Arndt, F. W. Gingrich, W. D. Danker, *A Greek-English Lexicon of the New Testament and Early Christian Literature* (2d ed., Chicago and London, 1979; 3d ed., 2000)

> 1. Accordance [7.1]* (OakTree Software)
> *http://www.oaksoft.com/*

> 2. BibleWorks for Windows [7.0]*
> *http://www.bibleworks.com/*

> 3. Logos* (Logos Research Company)
> *http://www.logos.com/*

> 4. Translator's Workplace [4.0]
> *http://www.sil.org/*

> 5. SESB*
> *http://www.logos.com/products/details/1981*