

GRAMMATICA DIGITALIS I

The Morphological Code
in the «Werkgroep Informatica» Computer Text
of the Hebrew Bible

TYPUS CONJUGATIONUM
HEBRAICARUM.

S. B. n. t.	Hitpael	Hophal	Hiphil	Pyal	Piel	Niphal	Kal	Gen	Ku	Præteritum Imper.
ille	התפקד	תפקד	הפקיד	פקד	פקד	נפקד	פקד	3	M	S.
tu v.	תפקד	תפקדת	תפקדים	תפקד	תפקדת	תפקדתי	תפקדתי	2	C	S.
ego	התפקדתי	תפקדתי	התפקדתי	תפקדתי	תפקדתי	תפקדתי	תפקדתי	1	C	S.
illa	התפקדה	תפקדה	התפקדה	תפקדה	תפקדה	תפקדה	תפקדה	3	F	S.
tu f.	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	2	C	S.
illi, e	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	2	C	S.
vos v.	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	3	M	P.
vos f.	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	2	F	P.
nos	התתפקדנו	תתפקדנו	התתפקדנו	תתפקדנו	תתפקדנו	תתפקדנו	תתפקדנו	1	C	P.
ego	אתפקד	אפקד	אפקיד	אפקד	אפקד	אפקד	אפקד	1	C	P.
tu v.	תתפקד	תפקד	תפקיד	תפקד	תפקד	תפקד	תפקד	2	C	P.
ille	יתפקד	נפקד	יפקיד	יפקד	יפקד	יפקד	יפקד	2	M	S.
tu f.	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	2	C	S.
illa	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	תתפקדי	3	C	S.
nos	נתפקד	נפקד	נפקיד	נפקד	נפקד	נפקד	נפקד	1	C	P.
vos v.	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	2	M	P.
illi	יתתפקדו	יתתפקדו	יתתפקדו	יתתפקדו	יתתפקדו	יתתפקדו	יתתפקדו	3	F	P.
v. f. illa	תתתפקדנה	תתתפקדנה	תתתפקדנה	תתתפקדנה	תתתפקדנה	תתתפקדנה	תתתפקדנה	2	F	P.
tu v.	תתפקד	תתפקד	תתפקד	תתפקד	תתפקד	תתפקד	תתפקד	3	M	S.
tu f.	תתפקדי	<i>Hapaf</i>	תתפקדי	<i>sive</i>	תתפקדי	תתפקדי	תתפקדי	1	F	S.
vos v.	תתתפקדו	<i>ca</i>	תתתפקדו	<i>rent</i>	תתתפקדו	תתתפקדו	תתתפקדו	1	M	P.
vos f.	תתתפקדנה	<i>impe</i>	תתתפקדנה		תתתפקדנה	תתתפקדנה	תתתפקדנה	2	F	P.
	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו	תתפקדו			

Arian J.C. Verheij

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TABLE OF CONTENTS

Preface	7
1. Introduction	9
2. Theoretical Framework	13
2.1 Lexemes, Morphemes, Words	13
2.2 Morpheme Structure of Words in WIT-BHS	15
2.2.1 Nominals	15
2.2.2 Verbs	16
2.2.3 Prepositions and Interjections	18
2.3 Types of Morphemes in WIT-BHS	18
2.4 Grammatical Description: Parameters and Values	19
2.4.1 Parameters	20
2.4.2 Values in Hebrew	21
2.4.3 Values in Aramaic	23
3. Morphemes in WIT-BHS	26
3.1 Representation of Morphemes	26
3.1.1 Transliteration Alphabet	27
3.1.2 Symbols	28
a. Morpheme Symbols	28
b. Additional Symbols	30
3.2 Survey of Morphemes and Markednesses	32
3.2.1 Subject+Tense Prefixes	33
3.2.2 Verbal Stem Prefixes	34
3.2.3 Subject+Tense Suffixes	35
3.2.4 Nominal Suffixes	37
3.2.5 Locative/State Suffixes	38
3.2.6 Marked Vowel Patterns	39
3.2.7 Pronominal Suffixes	40
3.3 Representation of Morphemes in Greater Detail	42
3.3.1 Surface Text and Word Structure	42
a. Contraction of Morphemes	42
b. Ambiguous Structure of Lexeme	44
Feminines	44
Lexical Plurals	45

3.3.2 State-Marked Vowel Patterns	45
4. Grammatical Description	48
4.1 Inventory of Morphemes	48
4.2 Assignment of Default Values	49
4.3 Assignment of Markedness-Related Values	50
4.4 Assignment of Combinatory Values	51
4.4.1 Verbal Tense	52
4.4.2 Verbal Stem	53
4.4.3 Person	54
4.4.4 Gender	54
4.4.5 State	54
4.5 Switching Off Irrelevant Parameters	55
5. The Lexicon	57
5.1 Sets of Lexemes	57
5.2 Lexical Information	58
Abbreviations and Sigla	62
Appendices	
I Hebrew and Aramaic Passages from WIT-BHS	
I.A Ruth 1	67
I.B Daniel 2,4b-23	70
II Extracts from the Hebrew and Aramaic Lexicons	
II.A The Lexemes in Ruth 1	73
II.B The Lexemes in Daniel 2,4b-23	76
III Examples of Grammatical Description	80
IV The Analytical Lexicon	84
Bibliography	87

PREFACE¹

The *Werkgroep Informatica* (WI) is a research group at the theological faculty of the Vrije Universiteit, Amsterdam, which has been specializing since 1977 in the computer-assisted study of the Hebrew Bible. The WI has developed a computer text of the Hebrew Bible, the so-called *Werkgroep Informatica Text* (WIT-BHS), which can be analyzed by computer programs.² The special quality of this text is that it reflects, through a code of symbols, the morphemic structure of each word in the Hebrew Bible; it is a so-called morphologically coded text.

The present volume is, in the first place, a description of the morphological code itself: a presentation of the symbols that are used in the text, and their meanings. As such, it may serve as a reference manual for those who work with the text. In addition, it describes the theory behind the code, and explains how the code is evaluated by the WI's computer programs. These pages may, therefore, also be read as a practical essay in the computer-assisted processing of basic linguistic information.

Unlike traditional Hebrew and Aramaic grammars, the *Grammatica Digitalis* series we plan to publish has its point of departure in morphology, as dealt with in the present volume. The phonemes and graphemes of the biblical languages are not as such a part of our research program. The traditional pattern of the grammars will be followed, however, in that the next volumes will focus on syntax. Not only will the internal syntax of phrases and clauses be dealt with. We even think that our

-
1. The author wishes to thank Janet W. Dyk and Anneke de Vries for their many valuable contributions to this book.
 2. On the history of the *Werkgroep Informatica*, see Talstra-Postma 1989; Hughes 1987:505-509. The latest version of WIT-BHS has been developed by Peter A. Crom, Ferenc Postma, Constantijn J. Sikkel, Eep Talstra, and the present author, all of whom are referred to as "we" throughout these pages. WIT-BHS is available on request, subject to a license agreement.

formal and data-oriented approach makes it possible to study the relations between clauses and between larger text constituents in such a way that linguistic rules and mechanisms may become apparent on levels where hitherto content-oriented interpretation seemed to be the only possible approach.

In the Introduction to the present volume, we lay down our general idea of what morphological coding is about, and we discuss the status of WIT-BHS in our system of information processing. The second chapter offers a brief linguistic discussion of our view on the Biblical Hebrew and Aramaic morphologies, which is then translated into computer-related terms. Chapter 3 deals with the way in which the morphemes are represented in our text, and offers a survey of all the morphemes that occur in it. Chapter 4 elaborates on the way the computer interprets the information that the morphemes contain. Chapter 5, finally, discusses the lexemes, and the information about them in our lexicons. As Appendices, we give the WIT-BHS version of the first chapter of the book of Ruth; a part of the second chapter of the book of Daniel; selections from the Hebrew and Aramaic lexicons, containing all the lexemes of these chapters; some examples of grammatical description; and a description of the analytical lexicon.

1 INTRODUCTION

The study of the Hebrew Bible as it is done by the *Werkgroep Informatica* focuses on the language of the Massoretic text. Many elements of traditional Old Testament scholarship, such as the history and religion of ancient Israel, are, therefore, not part of our research.¹ The study of syntax, and discourse analysis are our major concerns.² There are some obvious reasons for using a computer in this.³ In the first place, a computer can operate on a large scale, consistently, and fast. More interestingly, a computer's production of knowledge can be controlled from beginning to end. The machine, unlike a human being, is not prejudiced by any unconscious foreknowledge: the origin of every bit of information is traceable. This is particularly useful in the case of the dead languages of the Hebrew Bible. The traceability of the way the computer's knowledge is produced helps to check the validity of one's own intuitive knowledge of Biblical Hebrew and Aramaic.

Our general approach to the syntax of the biblical languages is distributional: we aim at establishing the rules that govern syntax and discourse in these languages, by deducing them from — or formulating them in terms of — the distribution of language elements as they occur in the text corpora of the Hebrew Bible. The term "distribution" refers to the occurrence of language elements, and their positions relative to each other. Thus, we see the syntax of phrases basically in terms of the distribution of (types of) words. Likewise, we deal with the syntax of clauses in terms of the distribution of (types of)

-
1. Computers, especially expert systems, do play an increasingly important role in those fields of study.
 2. See also e.g. Talstra 1986, Talstra 1987, Hardmeier-Talstra 1989, Talstra 1989b.
 3. A computer (hardware) cannot operate without a program (software). The terms of "computer", "machine", and "program" are used interchangeably in these pages.

phrases, and we study the syntax of texts in terms of the distribution of (types of) clauses. The adoption of a distributional approach is no coincidence: a computer is extremely fitted for handling just the type of information which is relevant in this line of thought.

In order to make sound analyses of the distributions of clauses, phrases, and words, the computer needs to know the characteristics of the words in the first place. It makes a great difference whether a word is a conjunction or a verb, a perfect or a participle, singular or plural, feminine or masculine, etc. Such characteristics result from the interplay between the various constituent parts of the word: its *lexeme* and its *morphemes*. The computer, therefore, has to be instructed about these elements, and must be able to imitate (or "emulate", borrowing a technical term from the computer world) their interaction. This morphological knowledge is *input* to our programs, enabling them to produce syntactical *output*.

The morphological input is the subject of these pages. In our system, it consists of the following main parts:

- a) seven sets of Hebrew, and seven sets of Aramaic morphemes, each with its grammatical meaning in terms of tense, verbal stem, person, number, gender, and state (to be discussed in Chapters 2 and 3);
- b) a set of rules on how to process the information contents of the morphemes (Chapter 4);
- c) one set of Hebrew, and one set of Aramaic lexemes, each with its part of speech, and some with their inherent person, number, and gender (Chapter 5);
- d) the words in the text of WIT-BHS, which are segmented into morphemes (examples of which are in the Appendices).

Using this material, the computer makes what we call a *grammatical description* of each word it finds in the text. This description amounts to assigning values to certain parameters, as will be explained later on.

It is important to note, firstly, that all of this input is

human-made: neither were the morphemes defined, nor were the words in the text segmented, by a linguistic program. In the second place, the input is mainly concerned with inflectional morphology. It does not focus on phonology, so that, for instance, the vocalic difference between verbal forms like *יִקְטֹל* and *יִהָרֵר* is not represented in our text. Similarly, derivational morphology, other than that which concerns verbal stem, does not play a role in our text. Lexical morphemes are, therefore, not split up into possible derivational components. The representation of the word *מִשְׁפָּט*, for instance, has no element to separate *mem*, as a preformative, from *šin*, *peh*, and *teth*, as the "root" of this word. Thirdly, the approach to morphology in WIT-BHS is synchronic and system-oriented. The principal aim is to evaluate morphemes in terms of their grammatical function, rather than in terms of their historical development, although our database may prove useful to research in this field as well.

The text of WIT-BHS is not a text or document in the usual sense of the word. With its segmentation into morphemes, it represents, rather, our morphological analyses of the words in the Hebrew Bible, as a tool in corpus-oriented linguistic research.¹ Its status is a provisional, non-definitive one *per se*, because analyses are always liable to change and reconsideration.² Thus, WIT-BHS differs in an essential way from the

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1. The segmentation of words into morphemes, and the identification of the morpheme types makes WIT-BHS different from Wolfgang Richter's computer text as well. This text, which is also being published (for Genesis, see Richter 1991), follows a diachronical system of transcription (Richter 1983) which isolates clitic words, not morphemes as we see them.
 2. Many words, as is well known, can be analyzed morphologically in more than one way. One need only think of, e.g., the homographic QAL PF 3 M S and QAL PTC M S of verbs *mediae waw*. Only one analysis is in WIT-BHS. Tools are being made to ensure that the different possibilities are accessible to the user of WIT-BHS. See the Appendix on the Analytical Lexicon.

Michigan-Claremont-Westminster BHS (MCW-BHS),¹ on which it is based. MCW-BHS transcribes each Hebrew consonant, each vowel sign, and each cantillation accent of the printed edition of the *Biblia Hebraica Stuttgartensia*,² which makes it an electronic replica of *BHS*.³ The text of MCW-BHS can be — and indeed is — often used as a source in scholarly work, in the same way as is the printed edition of *BHS*. This is not the purpose of our text.

Since WIT-BHS is a tool rather than a document, the subject of the present pages is not really its contents. We are not discussing *what* is in it, because what is in it can be changed. Rather, the *how*, the way in which the analyses are recorded, the system of morphological encoding, will be described. The term WIT-BHS, as we use it here, refers primarily to our system of handling morphological information. It does denote our provisional "standard version" as well, which is available to others. It should, however, not be understood as referring to a document with an authoritative status.

-
1. The *Michigan-Claremont-Westminster BHS* was released on diskettes by the Center for Computer Analysis of Texts (CCAT) at the University of Pennsylvania CCAT (R. Kraft), Box 36 College Hall, University of Pennsylvania, Philadelphia, PA 19104-6303, USA. The main initial authors are H. Van Dyke Parunak (University of Michigan), and Richard E. Whitaker (Claremont Graduate Schools). The revision of their text was done under J. Alan Groves (Westminster Theological Seminary, Philadelphia). For detailed information, cf. Hughes 1987:524-529.
 2. The transcription is done with Roman upper case letters, symbols, and numbers in the range of 00..99. The first verse of the book of Ruth in MCW-BHS reads:


```
1:1 WA/Y:HI81Y B.I/YM"Y03 $:PO74+ HA/$.OP:+I80YM
WA/Y:HI71Y RF(F73B B.F/)F92REC WA/Y."63LEK: )I61Y$
MI/B."94YT? LE74XEM Y:HW.DF81H LF/GW.R03
B.I/&:D"74Y MOW)F80B H71W.) W:/)I$:T./O73W
W./$:N"71Y BFNF75Y/W00
```
 3. The text of MCW-BHS deviates from that of *BHS* in some passages where the authors feel that *BHS* misrepresents the Codex Leningradensis. In some of those cases, WIT-BHS follows MCW-BHS, in others, *BHS*. In cases where the *qerē* reading represents a morphological analysis which is different from the *ketib* reading, WIT-BHS follows *qerē*.

2 THEORETICAL FRAMEWORK

The input of WIT-BHS consists of sets of morphemes and lexemes, a text which is segmented into those elements, and a set of rules on how to evaluate them, as we mentioned in the previous chapter. In order to provide the framework that holds these elements together, we will now discuss the way in which we deal with Hebrew and Aramaic morphology. It is not our aim to make a contribution to the morphological study itself of the two languages. The processing of information is what this chapter, and indeed the whole of the present volume, is really about.

2.1 Lexemes, Morphemes, Words

In Biblical Hebrew and Aramaic, any word consists of one *lexeme* and up to five *morphemes*. The lexeme is the bearer of the semantic contents of the word. It also belongs to a paradigmatic category or part of speech, determining what types of morphemes it can have (see below, Chapter 5). The morphemes express inflectional and derivational categories. A morpheme most often takes the form of a consonantal affix,¹ which is combined with a predictable pattern of vowels (or intensification of consonants). However, the vowels can also have a morpho-

1. We do not follow the Bloomfieldian approach, recently adopted by Garr (1992) (cf. Richter 1978:104ff). A morpheme, in this line of thought, is essentially defined in terms of its meaning, and distinguished from its "phonemic representation" (Garr 1992:51). For instance, the morpheme { 1 S PF } is realized as *-tī*, the morpheme { 2 F S IPF } is realized discontinuously, as *tVowel...ī*. We would, rather, see these phonemic representations — *-tī*, *tVowel-*, and *-ī* separately — as morphemes.

logical function of their own, e.g. in marking the difference between absolute and construct state in singular nouns.

Morphemes, as they occur in WIT-BHS, are either *obligatory* or *optional*. A morpheme which is obligatory must be present in a word. The lexeme (lexical morpheme) is obligatory in each word. An optional morpheme, on the other hand, is either *present* or *absent*. There are two ways for a morpheme to be present: either as a *realized* or as a *zero* morpheme. In its realized form, the morpheme is visible, like the suffix *ū* in the form *qāt^l-ū*. We speak of a zero morpheme in cases where the morpheme is considered to be there, but in an unrealized form, as in *qātal* (actually: *qātal-∅*).¹

Morphemes mostly occur with nominal and verbal lexemes. With nominals they mark number, gender, state, and the locative; with verbals, they mark person, number, and gender (i.e. the agreement between the verb as predicate, and its subject,² or, as some would say, marking the subject itself), as well as tense and verbal stem.³ The nominal morphemes are used with certain forms of the verb as well: infinitive and participle.

There is one specific morpheme which does not mark the above-mentioned features: the *pronominal suffix* marks, among other things, the possessive on nominals, and the object on verbs. Thus, it is different from the other morphemes. Unlike these, it occurs also with prepositions and interjections.⁴

-
1. The vowels of this form are assigned no separate morphological status in WIT-BHS. We see them as predictable vowels, accompanying the zero suffix.
 2. Cf. Garr 1992:60.
 3. Other terms are, e.g., *binyan* and construction; there is no generally accepted word for this category.
 4. In fact, the linguistic capacities of the pronominal suffix are much debated. Some, like Richter 1978:177f, argue that it is an enclitic pronoun. This would make it a word, in our view. We classify it as a morpheme, i.e. as part of a word. The consequences of this will become apparent in several instances in the following discussion.

2.2 Morpheme Structure of Words in WIT-BHS

Basing ourselves on what has been said above, we assume specific morpheme structures in Hebrew and Aramaic words. These structures are essential to the definition of the meanings of the morphemes in WIT-BHS. This in turn determines on the one hand, how the morphological analysis, i.e. the segmentation of words into morphemes should be done, and on the other, how the computer should evaluate the morphemes in order to make a grammatical description. It is important to note once again that these structures are not comprehensive linguistic statements; rather, they are constructs which are necessary to store linguistic information in a machine-readable format which follows the linguistic reality as closely as possible.

2.2.1 Nominals

A nominal word (substantive, adjective, proper name¹) in Hebrew and Aramaic has the following morphemic structure.

Type	Presence	Marking
Lexeme	Obligatory	
Suffix	Obligatory	Gender, Number, State
Suffix	Optional	Locative (Aramaic: State)
Suffix	Optional	Possessive

Diagram 2.2.1.1: Morpheme Structure of Hebrew and Aramaic Nominals

The obligatory suffix inflects for gender, number, and state. It may be either zero or realized. If it is zero, the word's gender

1. On the concept of Part of Speech, see § 5.2.

and state remain unknown, but its number is seen as singular. If the suffix is realized, it represents either masculine or feminine gender; singular, plural, or dual number; absolute, or construct, or still unknown state.¹

The first optional suffix, if present, is realized as *heh locale* in Hebrew, and as *aleph postpositum* marking determined state in Aramaic. It is never zero, i.e.: if this suffix is not present in a realized form, it is supposed to be absent.

The second optional suffix, if present, is realized as pronominal suffix, representing the possessive. The pronominal suffix is also never zero.

2.2.2 Verbs

A Hebrew or Aramaic verb has the following structure:

Type	Presence	Marking
Prefix	Optional	Subject, Tense
Prefix	Optional	Verbal Stem
Lexeme	Obligatory	
Suffix	Obligatory	Subject, Tense
Suffix	Optional	Tense, Gender, Number, State
Suffix	Optional	Object, Subject

Diagram 2.2.2.1: Morpheme Structure of Hebrew and Aramaic Verbs

The optional prefix marking subject and tense is absent in the perfect tense (or suffix-conjugation). We see it as present in WIT-BHS:

1) in the imperfect tense (or prefix-conjugation) where it

1. On these "parameters" and their "values", see § 2.4.

is never zero;¹

2) in the infinitive and imperative tenses, where it is either realized (as a *heh* in Hebrew $niph^{\text{c}}al$, as a *mem* in Aramaic $pe^{\text{c}}al$ infinitive) or zero;

3) in the participle tense of the $hiph^{\text{c}}il$, $pi^{\text{cc}}el$, and $hitpa^{\text{cc}}el$ verbal stems (as a *mem*); in the participle of the qal and $niph^{\text{c}}al$ verbal stem, on the other hand, we see this prefix as absent.

The optional prefix marking verbal stem, if present, is realized as the consonant *heh* (marking $hiph^{\text{c}}il$ and $hoph^{\text{c}}al$), the consonant *nun* ($niph^{\text{c}}al$), or the consonants *heh* and *taw* ($hitpa^{\text{cc}}el$).² If the prefix is absent, the verbal stem may be either qal or $pi^{\text{cc}}el$, depending on the vowel pattern and intensification of the middle consonant of the lexeme.

The obligatory suffix is either realized or zero. If realized, it marks person, number and gender of the subject. If zero, its marking functions depend on whether a subject/tense-marking prefix and/or a nominal suffix are present on the verb, and if so, which ones.

The first optional suffix is the same suffix that is obligatory in nominals. We see it as present in the "nominal-verbal" infinitive and participle tenses, but absent in the other tenses. If present, it is either realized or zero. If realized, it marks state in the infinitive; gender, number, and state in the participle. If the suffix is zero, then state and gender remain unknown, while number is seen as singular.

The second optional suffix is the pronominal suffix that can also occur on nominals. If present, it is always realized, never zero. Generally speaking, it marks the object of the verb if the verb is in the perfect, imperfect, imperative, or participle tense. With the infinitive, it may indicate either subject or object, to be determined on the level of syntax.³

-
1. On the implementation of the statements in the present section, see Chapter 4.
 2. There are some more, very infrequent, realizations of this prefix, cf. § 3.2.2.
 3. The sole exception is the suffix *-nī*, which marks the Object (cf. Joüon-Muraoka (1991) § 65a).

2.2.3 Prepositions and Interjections

The pronominal suffix is the only morpheme that can be present in other words than nominals and verbs. These words are prepositions in both languages, and Hebrew interjections. Their morpheme structure, therefore, is the following:

Type	Presence	Marking
Lexeme	Obligatory	
Suffix	Optional	Object, Subject

Diagram 2.2.3.1: Morpheme Structure of Hebrew and Aramaic Prepositions and Interjections

2.3 Types of Morphemes in WIT-BHS

As may have become clear from the previous section, there is some overlap between the three types of morphemes in nominals and the five types in verbs. In total, there are six consonantal affixes with accompanying predictable vowel patterns. In addition, there is the situation in which the vowel pattern of a word has a morphological significance of its own.¹ Thus, we have defined the following seven types of machine-readable morphemes:

-
1. Stress and shift of stress have no separate morphemic status in our system. We do take stress into account when distinguishing between certain forms, particularly feminine perfect and participle forms, but stress itself is not represented in WIT-BHS.



*Diagram 2.3.1: Types of Morphemes
in WIT-BHS*

The order in which the elements are listed here is the order in which they may occur in a word in WIT-BHS. Throughout these pages, we will use the term *morpheme* in a special sense, namely as referring to one of the above morphological elements as represented in WIT-BHS, and capable of being interpreted by the computer.

2.4 Grammatical Description: Parameters and Values

The computer, reading the symbols to be discussed in the following chapter, will be able to recognize the morphemes into which a given word has been segmented. Thus, it will interpret a form like "!J!QVL[W" in WIT-BHS as a word that has a subject+tense prefix "J", a lexeme "QVL", and a subject+tense suffix "w". The next step is to describe the form as a 3rd masculine plural form of the imperfect. This *grammatical description* involves specific categories and concepts, which are discussed in this section (the process of description itself will be dealt with in Chapter 4). It is important to note in advance, that these concepts are not exclusively associated with morphemes. There are some lexemes that cannot have morphemes, but which do

have certain grammatical properties. These properties are inherent to their lexical meaning, and as such they are part of the lexicon, which we describe in Chapter 5.

2.4.1 Parameters

The grammatical description we want our computer programs to make of a given word amounts to establishing the relevance and the value of certain *parameters* for that word. A word, like any object, can be described with the help of a set of parameters, which can have specific values. The grammatical parameters used in the grammatical description of Hebrew and Aramaic words are shown in Diagram 2.4.1.1.

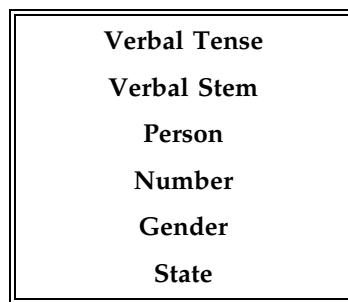


Diagram 2.4.1.1: Grammatical Parameters

Some of these parameters will have a value for a given word, others will not (i.e. their value will be unknown), while still others will be irrelevant. The combination of the values of the parameters that are relevant to a given word makes up the grammatical description of that word. The parameters and their values have been defined in such a way, that they apply to words only. They do not apply to parts of words (e.g. lexemes), nor to combinations of words (e.g. conjunction + verb form). The names of the values that are used here, are to be understood as formal labels, without reference to possible functions. This is particularly important with the values of tense and state.

2.4.2 Values in Hebrew

The parameters of grammatical description, and their values in Biblical Hebrew, are shown in Diagram 2.4.2.1.

vt	vs	ps	nu	gn	st
* pf ¹	* qal	* 3	* s	* ?	* ?
ipf	pql	2	d	m	a
inf	ni	1	p	f	c
imp	pi				
ptc	pu				
	hi				
	ho				
	htp				
	hot				
	et				
	nt				
	ti				

Diagram 2.4.2.1: Parameters and Values in Hebrew

The parameter of tense, and its values, are used here in a formal way, without any intended reference to the problems of time and/or aspect. We feel free, therefore, to treat infinitive, imperative, and participle as tenses. The values of imperfect consecutive, jussive, perfect consecutive, infinitive absolute and infinitive construct are lacking for various reasons. The consecutive perfect and imperfect are lacking, since they are not to be seen as properties of single words. Only in combination with a

1. An asterisk * signifies a default value, see below, § 4.2. For the abbreviations, see below, Abbreviations and Sigla.

preceding conjunction *we-* / *wa-* does an (im-) perfect form become "consecutive". Moreover, the perfect does so only under specific syntactical circumstances. The only difference between normal and consecutive perfect which is visible, the shifting of stress from penultimate to ultimate, occurs in a limited number of cases. It has no morphemic status in our system. The jussive, for its part, can be recognized on the verbal form itself, but again in very few cases. We have therefore chosen not to regard jussive and (im-) perfect consecutive as values for the parameter of tense in the grammatical description now being discussed. As to the infinitives absolute and construct, the difference between the two forms is often not morphologically visible. This is why we do not distinguish between the values of infinitive absolute and infinitive construct tense. There is only the infinitive, which can be in absolute, construct, or an unknown state.

The parameter of verbal stem lacks the values of minor stems such as *po^cel*, *pi^clel*, etc. In WIT-BHS, these are as yet represented as variants of the main reduplicative stem, which is *pi^{cc}el*.

The parameter of person as a morpheme-related parameter is only relevant to finite verbs. Its values with personal pronouns are listed in the lexicon.

The parameter of gender is relevant both to nominals and verbs. With nominals, particularly with singular forms, gender is often not morphologically visible. One could argue that it can be inferred from their plural forms, or from their agreement with verbal forms or adjectives. This, however, is not a very reliable way of assessing a noun's gender. Besides, it has more to do with syntax and semantics than with morphology *stricto sensu*. Morphologically, then, gender is "unknown" in such words, in the sense that it is not known whether the word has a masculine or a feminine gender.¹ The same is true of verbs in

1. In this way, we "distinguish between gender and gender endings" (Joüon-Muraoka (1991) § 89a).

the 1st person, and of 3rd plural perfect forms.¹ Although traditional grammar sometimes seems to postulate a third "common" gender for the 1st person, there is no substantial difference between a (known) common gender and an unknown gender.

The parameter of state, finally, is relevant to nominals, participles, and infinitives.² We think that this parameter, and its values, should be carefully distinguished from the syntactical concept of *nomen regens / rectum* in the so-called "genitive construction". Although strongly related, a noun's morphological state and its syntactical position are quite distinct. The value of this parameter, like that of gender, is often not visible from the form of the word³. In such cases, again, the parameter remains unknown, which means that it is not known whether the word is in the absolute or in the construct state.

2.4.3 Values in Aramaic

With Biblical Aramaic, we use the same parameters as with Hebrew, but some of the values are different, as is shown in Diagram 2.4.3.1.

-
1. With IPF 2 M S and IPF 3 F S forms, we assume that gender, together with person, can be inferred from the context (cf. § 3.2.1).
 2. The term of *state* is not regularly used in connection with the INF, but in our system of information analysis there is no reason why it should not be. One should, however, be careful not to draw the same conclusions from an infinitive's and a noun's state in syntactical analysis.
 3. A shift of stress from *nomen regens* (construct state) to *nomen rectum* (Joüon-Muraoka (1991) § 92a) is not taken into account in our text, if it has no impact on the vowels.

vt	vs	ps	nu	gn	st
* pf	* pe	* 3	* s	* ?	* ?
ipf	pi	2	d	m	a
inf	pa	1	p	f	c
imp	pu				d
ptc	ha				
	ho				
	ht				
	htp				
	it				
	hs				
	sh				
	ap				

Diagram 2.4.3.1: Parameters and Values in Aramaic

Grammatical description with respect to the verbal tenses is less complicated in Aramaic than it is in Hebrew, since there are no consecutive tenses, and the jussive is virtually non-existent. The remarks concerning the parameters of verbal stem, person, number, gender, and state in Biblical Hebrew also apply to Aramaic. In addition, the parameter of state has a value which Hebrew does not have, that of "determined".

Determination as such is a different concept from that of state. It is, in fact, a problematical concept, since it involves various types of linguistic factors. As a rule of thumb, one can say that a nominal is determined if it has a pronominal suffix (a morphological condition), or if in Hebrew it is preceded by a definite article (a syntactical condition, since the article is seen as a separate word in WIT-BHS), or if it is a proper name (a lexical condition). This is why we have chosen not to use determination as a separate parameter in morphological analysis and

description. However, Aramaic grammar has "determined" as one of the three possible states of a nominal,¹ a state which is triggered by the suffix 𐤍-. This article, unlike the Hebrew definite article -ה, is classified in WIT-BHS as a morpheme (state suffix), thus making it necessary and possible to use "determined" as a value of the parameter of state in Aramaic.

1. Cf. Rosenthal (1983) § 41.

3 MORPHEMES IN WIT-BHS

The morphological basics discussed in the previous chapter must now be imparted to the computer. In this chapter, we show how this is done, as far as the morphemes themselves are concerned. The first step concerns the representation of the several types of morphemes in the text (§ 3.1). Secondly, all the morphemes that the computer knows are listed in § 3.2, together with their grammatical meanings. § 3.3, finally, discusses some special problems in the representation of morphemes.

3.1 Representation of Morphemes

The main principle of WIT-BHS, as we said earlier, is the segmentation of each word of the Hebrew Bible into the morphemes that constitute it, by means of special symbols. Written between the letters that represent the consonants of the biblical text, these symbols identify the letters as belonging to one morpheme type or another.

The symbols are used in Hebrew as well as in Aramaic material. Their functions coincide for the two languages, except for the locative/state suffix: in Hebrew, it marks the locative, in Aramaic, it functions as determinator. There is no special symbol to identify the lexeme: all letters of a given word in WIT-BHS that are not identified as part of a morpheme (or as an added, non-morphemic, letter by the ampersand symbol, see below, § 3.1.2.b) are by implication seen as part of the word's lexeme.

In this section, we discuss, first, the transliteration alphabet which is used to represent the Hebrew consonants, and secondly, the symbols that represent the morphological analysis.

3.1.1 Transliteration Alphabet

The transliteration alphabet of WIT-BHS has the following characters:

> : א	Z : ז	M : מ ם	Q : ק
B : ב	X : ח	N : נ ן	R : ר
G : ג	V : ט	S : ס	F : פ
D : ד	J : י	< : צ	C : ש
H : ה	K : כ ך	P : פ ף	T : ת
W : ו	L : ל	Y : ץ	_ : space

Diagram 3.1.1.1: Transliteration Alphabet of WIT-BHS

The alphabet only contains transcriptions for the consonants. The vowels as such are not represented, their possible morphological significance as predictable vowels being taken into account in the identification of consonants as morphemes (cf. above, § 2.3).

The underscore "_" in this alphabet is no transliteration of a Hebrew consonant. It represents the space or the *maqeph* that occurs in proper names that consist of more than one element,¹ as in בֵּית לְחֶם ("Bethlehem"), which is written as BJT_LXM/. Such elements, in our system, together make up one lexical unit. To make sure that the computer reads the two parts as one word, these are linked by the underscore, which at the same time represents the blank in the surface text. The space and *maqeph* that separate words are both represented by a normal space. The underscored space's counterpart is the hyphen, which separates words that are written without a space between them in the Hebrew Bible (see below, § 3.1.2.b). The difference between final and non-final *kaph*, *mem*, *nun*, *peh*, and *sade* is not represented.

1. On the definition of lexemes, cf. below, § 5.1.

3.1.2 Symbols

The text of WIT-BHS contains, in fact, two kinds of symbols: morpheme symbols and additional symbols. Morpheme symbols serve to identify and to separate morphemes; the additional symbols are used to specify possible differences between the consonantal surface text of a morpheme or lexeme, and the form in which the computer knows it.

a. Morpheme Symbols

The morpheme symbols are listed here in the order in which they can occur in a word. Each symbol is illustrated with some examples,¹ consisting of a word in WIT-BHS, and the Hebrew or Aramaic form it represents.

!! Subject+Tense Prefix

Two exclamation marks identify what is between them as a subject+tense prefix. This morpheme may be zero, as in # *b*, where it is represented by writing the symbols, but nothing in between.²

<i>a.</i>	!J!QVL[	יִקְטֹל
<i>b.</i>	!!QVL[	קָטַל

]] Verbal Stem Prefix

Two closing square brackets identify the letter(s) between them as a verbal stem prefix. This morpheme is never zero.

-
1. The complete lists of morphemes and their meanings are in § 3.2.
 2. The absence of a consonant after a morpheme symbol denotes a zero morpheme. Therefore, the zero sign "Ø" is not used in WIT-BHS. It does occur occasionally in the present pages, for the sake of clarity and convenience.

c.]N]QVL[נקטל

Lexeme

The lexeme is not identified by a special symbol.¹

[Subject+Tense Suffix

An opening square bracket identifies what is between itself and the next symbol or the end of the word as a subject+tense suffix. This morpheme may be zero, as in ## *a*, *b*, and *c* above.

d. QVL[H קטלה

/ Nominal Suffix

A slash identifies what is between itself and the next symbol or the end of the word as a nominal suffix. This morpheme may be zero, as in # *e*.

e. MLK/ מלך
f. MLK/JM מלכים

~ Locative/State Suffix

A tilde identifies the letter following it as a locative/state suffix.

g. H-BJT/~H הביתה (Hebrew)
h. MLK/~> מלכא (Aramaic)

: Marked Vowel Pattern

A colon followed by one or more lower case letters signifies that the vowel pattern of the entire word (including *dagesh*) is marked for state, and/or verbal stem, and/or tense. It is used where the vowel pattern of a form contains information on state, stem, and tense, which is not already in the consonantal morphemes.

1. That is why WIT-BHS has double symbols (!!,]]) for the prefixes.

<i>i.</i>	DBR/ :c	דָּבַר
<i>j.</i>	DBR[:d	דִּבֶּר

+ **Pronominal Suffix**

A plus sign identifies the letter(s) following it as a pronominal suffix.

<i>k.</i>	DBR/J+W	דִּבְרָיו
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b. Additional Symbols

Apart from the symbols that identify the morphemes, WIT-BHS has some other symbols. Hebrew and Aramaic words, as is well known, are not always separated from each other, and often they have less, or more, letters than one might expect. The imperfect forms of the niph^cal, for instance, lack the *nun* which is characteristic of this verbal stem, the definite article is often elided, and words may be spelled *plene*, or *defective*.

In such cases, we say there is a difference between the surface text, or the *realized* form of some morpheme, and its *theoretical* form, i.e. the form that belongs to the morphological "knowledge" of the computer. We have chosen in such cases to restore the theoretical form in our text, using some additional symbols which are listed below.

- **Word Separator**

A hyphen separates words that are written without a blank between them in the Hebrew Bible (note, that it does not represent the *maqeph*).

<i>l.</i>	>T H-MLK/	אֶת־הַמֶּלֶךְ
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(**Minus of Letter**

An opening parenthesis signifies that the letter following it is not in the surface text but does belong to the theoretical form of the morpheme, and should therefore be

taken into account in the analysis. Frequent examples of this are the syncope of the definite article and the elision of the *nun* from IPF forms of *niph^cal*.

<i>m.</i>	L- (H-MLK/	לְמַלְךְ
<i>n.</i>	!J!] (N]QVL[	לְקַטֵּל

& Plus of Letter

An ampersand, conversely, signifies that the letter following it is in the surface text but does not belong to the theoretical form of the morpheme, and should therefore *not* be taken into account in the description. A frequent example of this is the *mater lectionis* in *plene* writing.

<i>o.</i>]H]QV&JL[הַקְטִיל
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= Homography

An equal sign, written at the end of a lexeme or a morpheme, distinguishes the transliterations of consonantal homographs from each other. With lexemes, it is only used if they are not already distinct through nominal or verbal suffixes, as with the noun *DBR/* and the verb *DBR[*. A morpheme or lexeme may have more than one "=" symbol. The convention by which this symbol was assigned to a particular morpheme or lexeme was arbitrary.

<i>p.</i>	BQR/	בְּקָר
<i>q.</i>	BQR=/	בְּקָר
<i>r.</i>	CMR[T	שְׁמֵרָה
<i>s.</i>	CMR[T=	שְׁמֵרָה
<i>t.</i>	<RB===== /	עֵרֵב

3.2 Survey of Morphemes and Markednesses

The grammatical description of a given word is made primarily on the basis of its morphemes. Each morpheme is considered to be marked for one or more of the parameters of grammatical description. The term *marked(ness)* denotes the situation where the morpheme represents one and only one value of a parameter. A morpheme can be marked for more than one parameter. For instance, the subject+tense prefix "J" in Hebrew is marked for the parameter of tense: any word starting with this prefix must be in the imperfect tense; it is also marked for person, assigning it the value 3; and for the parameter of gender: masculine; but it is not marked for the parameter of number, since both singular and plural forms can have it. The subject+tense suffix "w", for its part, is not marked for tense, person, and gender, but it is for number: plural. The combination of the markednesses of these morphemes results in a description of the word "!J!QVL[W" as an IPF 3 M P form.

In this section, we list all the morphemes that occur in the Hebrew and Aramaic parts of WIT-BHS. Each diagram contains all the morphemes of one of the types discussed in § 2.3 for one biblical language. A diagram has seven columns. The first column contains the morphemes, while the others represent the six parameters of grammatical description. The markedness of a morpheme for a particular parameter is indicated in the corresponding column. The order of the types of morphemes is the order in which they can occur in a word. The order of the morphemes within each type is that of the Hebrew alphabet.

3.2.1 Subject+Tense Prefixes

Symbol: "!!"

Hebrew

morph	vt	vs	ps	gn	nu	st
∅ ¹						
>	ipf		1		s	
H		ni				
J	ipf		3	m		
M	ptc					
N	ipf		1		p	
T	ipf		2			
T=	ipf		3	f		

Aramaic

morph	vt	vs	ps	gn	nu	st
∅						
>	ipf		1		s	
J	ipf		3			
L	ipf		3			
M						
N	ipf		1		p	
T	ipf		2			
T=	ipf		3	f		

There is no apparent difference between the prefixes "T" and "T=" in both languages. The Hebrew and Aramaic forms of תקטל can either be analyzed as IPF 2 M S ("!T!QVL["]), or as IPF 3 F S ("!T=!QVL["). However, in the overwhelming majority

-
1. In WIT-BHS, a zero morpheme is indicated merely by its symbol, e.g. "!!" for a zero Subject+Tense prefix.

of cases, there is no real doubt as to which of the two is meant (cf. § 2.4.2). We have, therefore, postulated two different but homographic prefixes.

3.2.2 Verbal Stem Prefixes

Symbol: "JJ"

Hebrew

morph	vt	vs	ps	gn	nu	st
>T		et				
H		hi				
HT		htp				
N		ni				
NT		nt				
T		ti				

Aramaic

morph	vt	vs	ps	gn	nu	st
>		ap				
>T		it				
C		sh				
H		ha				
HT		ht				
HCT		hs				

Most verbal stem prefixes in both languages can occur with two distinct sets of predictable vowel patterns: "active" and "passive". The "active" patterns are supposed in these diagrams. That is why the diagrams here contain fewer verbal stems than those in §§ 2.4.2 and 2.4.3 do. For the "passive" pattern, cf. below, §§ 3.2.6, 4.4.2.

3.2.3 Subject+Tense Suffixes

Symbol: "L"

Hebrew

morph	vt	vs	ps	gn	nu	st
∅						
H	pf		3	f	s	
H=						
W					p	
WN					p	
J			2	f	s	
JN	ipf		2	f	s	
NH				f	p	
NW	pf		1		p	
T	pf		2	m	s	
T=	pf		2	f	s	
TH	pf		2	m	s	
TJ	pf		1		s	
TM	pf		2	m	p	
TN	pf		2	f	p	

The suffix "H=" represents *heh cohortativum/energicum*. There is no visible difference between this suffix and the suffix "H" on PF 3 F S forms. As with the prefixes "T" and "T=", however, there is hardly any doubt in the overwhelming majority of cases as to which of the two is meant. We have, therefore, again postulated two different but homographic morphemes.

Aramaic

morph	vt	vs	ps	gn	nu	st
∅						
H				f	p	
W				m	p	
WN	ipf			m	p	
J	imp		2	f	s	
JN	ipf		2	f	s	
N	ipf		3	f	p	
N>	pf		1		p	
T	pf		3	f	s	
T=	pf		2	m	s	
T==	pf		1		s	
TWN	pf		2	m	p	
TJ	pf		2	f	s	
TN	pf		2	f	p	

Nun paragogicum is part of the suffixes "WN" and "JN" in both languages. This convention does not have theoretical implications as to the nature of this specific letter. The majority of cases in Hebrew occurs with IPF forms, but there are some PF forms as well. We therefore consider the Hebrew suffix "WN" not marked for tense (although the PF forms are "suspect or faulty", according to Joüon-Muraoka (1991) § 42f).

3.2.4 Nominal Suffixes

Symbol: "/"

Hebrew

morph	vt	vs	ps	gn	nu	st
∅						
H				f	s	a
WT				f	p	
WTJ				f	p	c
J				m	p	c
J=					d	c
JM				m	p	a
JM=					d	a
JN				m	p	a
T				f	s	
TJ				f	d	c
TJM				f	d	a

The suffixes "WTJ", "TJM", and "TJ" represent composite morphemes from a historical point of view (cf. Joüon-Muraoka (1991) §§ 91b, 94f), but this is not relevant to our particular purposes. As our system does not support two nominal suffixes on one word, we treat these composites as single morphemes.

The dual suffixes "JM=" and "J=" are considered to be not marked for (masculine) gender, as would seem to be obvious. There are many apparently feminine words that have one of these endings. Rather than postulating gender-disagreement in such words, we leave their gender unknown.

Aramaic

morph	vt	vs	ps	gn	nu	st
∅						
H				f	s	a
W				m	p	c
J				m	p	c
J=					d	c
JN				m	p	a
JN=					d	a
N				f	p	a
T				f	s	c
T=				f	p	c
TJN				f	d	a

3.2.5 Locative/State Suffixes

Symbol: "~"

Hebrew Locative Suffix

morph	vt	vs	ps	gn	nu	st
H						

This suffix (Joüon-Muraoka (1991) § 93 call it a "paragogic vowel", Waltke-O'Connor (1990) § 10.5 use the term of "adverbial suffix") is known as *heh locale*. Although it is a morpheme, it plays no role in grammatical description in terms of the parameters of tense, verbal stem, person, gender, number, and state. Its presence is registered, but its function only becomes apparent in syntactical analysis.

Aramaic State Suffix

morph	vt	vs	ps	gn	nu	st
>						d

The determinator in Aramaic is not written in WIT-BHS as a separate word with a lexeme of its own, like the Hebrew definite article "ה", but as a morpheme. This is in accordance with the lemmatization of *KBL2*. Cf. above, § 2.4.3.

3.2.6 Marked Vowel Patterns

Symbol: ":"

Hebrew

morph	vt	vs	ps	gn	nu	st
a						a
c						c
d						
n						
p						

Aramaic

morph	vt	vs	ps	gn	nu	st
a						a
c						c
d						
p						

The vowel patterns "a" and "c" are not only specified with nouns and participles, but also with Hebrew infinitives, if the

vowel pattern characterizes such a form as being an infinitive absolute or an infinitive construct (cf. above, § 2.4.2).

The patterns "d" (reduplicative), "n" (consecutive), and "p" (passive) are not marked for a specific value of the parameters listed in §§ 2.4.2 and 2.4.3. The pattern "n" is specified only with the conjunction *waw*. It is used if this conjunction is vocalised as *wa-*, and precedes an IPF verb form. The combination of the two words can then be identified at clause level as a consecutive form. On the evaluation of "d" and "p", see § 4.4.

3.2.7 Pronominal Suffixes

Symbol: "+"

Hebrew

morph	vt	vs	ps	gn	nu	st
H			3	f	s	
HW			3	m	s	
HM			3	m	p	
HMH			3	m	p	
HN			3	f	p	
HNH			3	f	p	
W			3	m	s	
J			1		s	
K			2	m	s	
K=			2	f	s	
KM			2	m	p	
KN			2	f	p	
M			3	m	p	
MW			3	m	p	
N			3	f	p	
NW			1		p	
NJ			1		s	

Aramaic

morph	vt	vs	ps	gn	nu	st
H			3	m	s	
H=			3	f	s	
HWN			3	m	p	
HJ			3	m	s	
HM			3	m	p	
HN			3	f	p	
J			1		s	
K			2	m	s	
KWN			2	m	p	
KJ			2	f	s	
KM			2	m	p	
KN			2	f	p	
N>			1		p	
NJ			1		s	

The pronominal suffix plays only a limited role in grammatical description of words in both languages. Its markedness for person, gender, and number does not affect the values for those parameters of the word to which it is attached, since it represents, generally, a verb's object, and a noun's possessor (cf. above, Chapter 2). However, its presence affects the parameter of state if this parameter is relevant (cf. §§ 4.3, 4.4.5).

3.3 Representation of Morphemes in Greater Detail

The previous sections presented our code of symbols "from within", describing its logic and its constituent parts. In the present section, we take a look at it from the perspective of the text to be encoded. We discuss the representation of words that have an imperfect correspondence between surface text and morpheme structure, and the use of the symbols for state-marked vowel pattern.

3.3.1 Surface Text and Word Structure

For many words in the text of the Hebrew Bible, the representation of their morphemes in WIT-BHS follows immediately from our code of symbols. There is a one-to-one correspondence in those words between surface text and morpheme structure. All letters of the morphemes are in the surface text, and each letter of the surface text clearly belongs to one specific morpheme. This is the case, for instance, in masculine plurals like מְלָכִים (MLK/JM). Quite often, however, there is no such correspondence, either because some letters are not realized in the surface text, or because the morpheme structure is ambiguous.

a. Contraction of Morphemes

A one-to-one correspondence between surface text and morpheme structure is lacking in cases where not all letters that belong to the theoretical forms of the morphemes (cf. § 3.1.2.b) are realized in the surface text. The elision can be the result of contraction of morphemes, or of defective spelling. In WIT-BHS, *all* letters are written, including those that are not realized. Each

unrealized letter is preceded by a parenthesis "(".¹ As a result, WIT-BHS has the theoretical form of each morpheme.

It may happen that the theoretical form of a word contains two identical letters next to each other, while only one of them is in the surface text. The question then is, which of the two is to be written as realized, and which one as elided. By convention, we write the letter that is nearest to the centre of the lexeme as elided, and the other one as realized. We have defined a convention for this type of situation, so as not to prejudice future study of such forms. It has no theoretical implications.

This situation occurs, for instance, in masculine plural forms of gentilics and other adjectives ending in *-ī*, like מִצְרַיִם ("Egyptians"). Here, both the final letter of the lexeme and the first letter of the nominal suffix are *yod*, but only one *yod* is in the surface text. As the *yod* of the lexeme is nearest to the centre of the lexeme, it is written in WIT-BHS as an elided letter:

MYR (J/JM)

Also, there are masculine plural forms with the pronominal suffix of the 1st person, e.g. דְּבָרַי ("my words"), where the *yod* represents both nominal and pronominal suffix. The nominal suffix is nearest to the centre of the lexeme, and therefore it is written as an elided letter:

DBR / (J+J)

As to verbs, it sometimes happens that a form is in a verbal stem whose consonantal prefix is identical to the first letter of the lexeme, as in the niph'al form נִסְתַּחַתֶּם ("you have been torn away"). The first letter of the lexeme is nearest to the centre. It is therefore written as an elided letter in our represen-

1. Metathesis, which often occurs with sibilants and dentals, is represented in WIT-BHS as a combination of elision and addition of a letter. The form נִסְתַּחַתֶּם (1 Sam 26,19), for instance, is written as !!]H(T]S&TPX[/.

tation of the form:

]N] (NSX[TM

b. Ambiguous Structure of Lexeme

The one-to-one correspondence between the surface text and the morpheme structure in a word can also be disturbed in the sense that the structure of a lexeme is ambiguous. Some letters, in such words, can be said to belong to more than one morpheme. This concerns certain feminine nouns and lexical plurals.

Feminines

The gender of a noun in the singular is, as a rule, not visible in WIT-BHS. The zero nominal suffix, which such a noun is supposed to have, is not marked for gender, leaving the value of this parameter unknown (cf. § 2.4.2, and below, § 4.2). The representations in WIT-BHS of words like מֶלֶךְ ("king"), דְּבָרַי ("word"), and נֶפֶשׁ ("soul") reflect this: MLK/, DBR/, and NPC/. But there are nouns, such as תּוֹרָה ("instruction"), certain *nomina segolata*, such as תְּפִאֲרוֹת ("beauty"), and nouns like מְלִכּוּת ("kingship"), whose gender is visible: these are feminine nouns, as is generally accepted, because of the final letters *-āh*, *è.èt*, and *-ūt*, respectively.

Now these final letters, which can be seen as derivational morphemes, are part of the lexemes as they are recorded in *KBL2* (the lexical basis of WIT-BHS, cf. below, § 5.1). It is a theoretical question, whether gender in such words is a lexical/derivational or an inflectional property, or perhaps even both. In any case, the feminine gender of these words is visible, and this is taken into account in their morphological representation in the text. The final *heh* or *taw* is not only written as part of the lexeme, but as a nominal suffix as well. It is therefore written twice in WIT-BHS, first as an elided letter, and then as realized in the surface text, as in

TWR (H/H
 TP>R (T/T
 MLKW (T/T

Lexical Plurals

A situation similar to that of the feminine nouns occurs with lexical plurals or *pluralia tantum*. This is because *KBL2* lemmatizes these words in their plural form, e.g. מִסְכָּנוֹת ("storage-places") or נְעִירִים ("youth"). The final letters *-ōt* or *-īm* of the lexeme of such words must, we think, also be seen as morphemes. Here again, in order to account for the double role of these letters, we write them twice:

MSKN (W (T/WT
 N<WR (J (M/JM¹

As a result of the conventions just discussed, our representations of lexical plurals with a pronominal suffix of the first person, e.g. נְעִירַי ("my youth"), have three representations for the one letter *yod* of the surface form. It is written as part of the lexeme, as a nominal suffix, and as a pronominal suffix:

N<WR (J (M / (J+J

3.3.2 State-Marked Vowel Patterns

The parameter of state in nominals (including infinitive and participle) is assigned its value in most cases through nominal suffixes which are marked for state, or through the presence of a pronominal suffix (see below, § 4.4.5). But sometimes a word's state is visible only through its vocalization. It is generally

1. The word אֱלֹהִים is written as >LH(J(M/JM. In spite of its frequent use as a noun in the singular ("god"), and even as a proper name ("God"), it is really a plural form.

accepted, for instance, that the form דְּבַר is in the absolute state, while דְּבֵר is in the construct state. In such cases, we use Marked Vowel Pattern morphemes to distinguish between the forms. $\text{DBR}/:a$ represents דְּבַר , and $\text{DBR}/:c$ represents דְּבֵר .

The question now arises as to which vowel patterns are to be seen as marked for state. Our basic approach to this problem is distributional. For some words, we follow what could be called a paradigmatic line. The distributional approach is based on the assumption that a nominal form — without pronominal suffix and without state-marked nominal suffix — can have up to three different vowel patterns. It always has a standard pattern, which is in the lexicon; in addition, it may have a shorter or lighter pattern, a longer or heavier (*pausa*) pattern, or both. Only few words are attested in three patterns; one mostly finds only one or two.

As to the markedness of these patterns, the shorter one is always considered marked for construct state, and the longer one for absolute state. The markedness of the standard pattern depends on whether the short pattern is attested in the Hebrew Bible: if it is, the standard pattern is considered to be marked for absolute state, otherwise it is seen as unmarked. The examples in Diagram 3.3.2.1 illustrate this principle.

Short	Standard	Long
	אִישׁ — $>JC/$	
	דֶּלֶת — $DLT/$	דֶּלֶת — $DLT/:a$
דְּבֵר — $\text{DBR}/:c$	דְּבַר — $\text{DBR}/:a$	
יָיִן — $\text{JJN}/:c$	יָיִן — $\text{JJN}/:a$	יָיִן — $\text{JJN}/:a$

Diagram 3.3.2.1: Markedness of Vowel Pattern for State

The singular of the noun אִישׁ ("man") occurs in the Hebrew Bible in only this form. It is not possible to tell its state from its vowel: the vowel is not marked for state. The singular of דֶּלֶת ("door") is only attested in its standard form and in the longer

form הִלְתָּ ¹ This is the situation in the second row: only the longer form is marked for (absolute) state. The singular form of the noun הִלְתָּ has attestations in the Hebrew Bible of its standard form and of the shorter form. This is the situation of the third row of the diagram: both forms are marked. The three forms of וְיִי are in the fourth row: the shorter form is marked for construct state, both other ones for absolute.²

The paradigmatic approach concerns specific categories of words rather than individual words. A word which belongs to one of these categories is seen as marked for state, regardless of its attestation in other forms:

- a) Feminine nouns ending in *-at*, whose lexeme ends in *-ah*, as well as feminine adjectives and participles in *-at*, are considered to be marked for construct state.
- b) Nominals (including masculine participles of *lamed-heh* verbs) ending in *-ēh*, and nominals ending in *-èh* are considered to be short (construct state) and standard (absolute), respectively.
- c) In participles of passive qal, participles of niph^cal of *‘ayin-yod/waw*, feminine plurals, and apparently pausal segolate forms, the patterns *ā-ū*, *ā-ō*, *ā-ōt*, and *ā-èt*, respectively, are considered to be marked for absolute state.

1. The forms of this word that do have a short vowel pattern, like הִלְתָּ , also have a pronominal suffix. As this suffix is sufficient to determine the state of the word (cf. § 4.4.5), the vowel pattern is not taken into account in the representation of this form.
2. We have checked all relevant forms in the Hebrew Bible to see whether they conform to these rules. In cases of doubt we have refrained from writing the Marked Vowel Pattern morphemes.

4 GRAMMATICAL DESCRIPTION

In the previous chapters, we have discussed the Hebrew and Aramaic morphemes in WIT-BHS, and their grammatical meanings. The computer, upon reading a word from the text, recognizes the morphemes that constitute it, and knows the markedness of each morpheme. The following step involves processing this information, in order to come up with a grammatical description of the word. The term "grammatical description", as we use it here, refers exclusively to a combination of values of the grammatical parameters discussed in § 2.4.1. The present chapter is devoted to the process of making such a description. It may be useful to stress once more that the text represents our morphological analysis of the Hebrew Bible. The computer, in making a grammatical description, merely echoes the analysis. That is why we speak of processing, rather than producing, information.

The grammatical description of Hebrew and Aramaic words as executed by our computer is a process which logically consists of five main stages. In practice, some of these stages take place simultaneously. The machine will first make an inventory of the morphemes that the word has. Depending on the morphemes it finds, it will then assign default values to the grammatical parameters. As a third step, it will assign markedness-related values to the parameters, possibly overruling the default values. To complete the description, it will evaluate possible combinations of morphemes. The final step is to "switch off" parameters that turn out to be irrelevant.

4.1 Inventory of Morphemes

The computer, upon reading a word, makes an inventory of the morphemes in that word. It will find, for instance, that the form

"!J!QVL[W" has a subject+tense prefix "J" and a subject+tense suffix "w". If there are no morphemes at all, or if there is only a pronominal suffix, this first step of the description is in effect also the last one. The possible values for the parameters must then be read later on from the Lexicon (see below, Chapter 5). This is the case with prepositions and interjections (cf. above, § 2.2.3), particles, pronouns, adverbs, etc. The rest of the process only goes into effect if the word has a nominal suffix, a subject+tense suffix, or both, which are the obligatory morphemes in nominals and verbs.

4.2 Assignment of Default Values

Having made the inventory, the computer assigns initial values, or *default* values¹ to some of the parameters, depending on the morphemes that were found. The machine first checks whether there is a nominal suffix. If there is one, the following parameters are assigned a value:

gn = ?²
 nu = s
 st = ?

The machine then checks whether there is a subject+tense suffix. If there is one, the following parameters are assigned a value:

vt = pf
 vs = qal (Aramaic: pe)
 ps = 3
 gn = ?
 nu = s

-
1. Default values have an asterisk * in the diagrams of § 2.4.2.
 2. On the "unknown" values, cf. above, § 2.4.2.

This step is included in the description to prevent relevant parameters from being left without an assigned value. The latter could occur if not all morphemes are present in the word or if there are only morphemes which are not marked for any parameter. The result would be an analysis in which a verb, for instance, had no tense, or a nominal no number. With default values, the analysis will always be complete.

The setting of a default value for a parameter implies, conversely, that the parameter is relevant in principle. That is why a nominal suffix brings with it defaults for gender, number, and state, but not for the other parameters. A word with only a nominal suffix (that is, a substantive, or an adjective) has neither tense, nor verbal stem, nor person. Likewise, a word with a subject+tense suffix but without a nominal suffix (that is, an imperfect, or a perfect, or an imperative verbal form) has no state. As it turns out, however, not all parameters that are assigned default values through the subject+tense suffix are indeed relevant. An infinitive, for instance, has no person. The computer deals with this problem in the final stage of the description (cf. § 4.5).

4.3 Assignment of Markedness-Related Values

The next thing for the computer to do is to check the markednesses of each of the morphemes as listed in § 3.2. Basically, if a morpheme in a given word is marked for a value of a certain parameter, the parameter will be assigned that value, the default value being overruled. The Hebrew subject+tense prefix in our example of !J!QVL[W, for instance, is marked for the imperfect tense. The default tense value of perfect will be replaced by imperfect. Since the markedness for 3rd person of the prefix coincides with the default value for that parameter, this value remains unchanged. The value for gender, which is unknown by default, becomes masculine due to the gender-markedness of the prefix. As the subject+tense suffix is marked for plural, the

default value of singular number will be replaced by plural. The result, then, is that the word is an IPF 3 M P form of the (default) QAL verbal stem.

The morphemes are evaluated in the order in which they occur in the word. Therefore, if two morphemes are marked for the same parameter, but in different ways, the value of the last morpheme will be decisive. This situation does not occur very often, but one example of it is the parameter of state in Aramaic. A word in Aramaic can have a nominal suffix which is marked for construct state, e.g. the suffix "ֿ", together with the state suffix ">", which is marked for determined state. The final state suffix prevails over the nominal suffix, so that the parameter of state in this word will be assigned the value of "determined".

The pronominal suffix is excluded from this procedure, because it marks, among other things, the possessor in nominals, and the object in verbs, as indicated in § 2.1. The inflectional properties of these words, therefore, remain unaffected by the pronominal suffix. A noun in the singular, for instance, remains singular even if it has a plural pronominal suffix, and a verb in the second person remains so, even if it has, e.g., a first person pronominal suffix. The presence of the pronominal suffix, rather than its markedness, is taken into account in the next stage of the grammatical description.

4.4 Assignment of Combinatory Values

In the fourth stage of the description, parameters are assigned values based on the combined presence or absence of morphemes which are not themselves marked for these parameters.

4.4.1 Verbal Tense

It may happen that a form with a subject+tense suffix (a verbal form) has no morphemes that are marked for tense. The subject+tense suffix, for instance, may be zero, or unmarked "w", while there is no prefix. In order not to describe all such words as (default) perfect tense forms, the machine applies a set of rules concerning the combination of unmarked morphemes. These rules reflect the conventions of encoding which are followed in WIT-BHS.

Hebrew

{!! or !H!}	& sts	& no nms	→ vt = imp ¹
{!! or !H!}	& [	& nms	→ vt = inf
{!M! or no stp ²}}	& [	& nms	→ vt = ptc

Aramaic

{!M! or no stp}	& [	& nms	→ vt = ptc
!M!	& no vsp & [	& nms & no :d & no :p	→ vt = inf

-
1. The general syntax of these rules is that of an "IF THEN" statement, the structure "A → B" meaning: if combination of morphemes A occurs then value assignment B is made. Morpheme symbols indicate (the required presence of) specific morphemes, including zero morphemes. The symbol "X" refers to a non-zero morpheme. Abbreviations refer to morpheme types. The word "or" plus curly brackets "{}", and the symbol "&" refer to logical exclusive "OR", and "AND", respectively. The word "no" indicates the required absence of what follows. The present line, then, means: if the word under consideration has either a zero subject+tense prefix or a "H" subject+tense prefix, and it has also a subject+tense suffix, and it does not have a nominal suffix, then its verbal tense is assigned the value of "imperative". For the abbreviations, cf. below, Abbreviations and Sigla.
 2. The *mem* prefix, as a morpheme marked for PTC tense, is actually redundant in our system. It never occurs in WIT-BHS without the combined presence of a zero Subject+Tense Suffix and a Nominal Suffix, but these two are used without the *mem* prefix, in qal and niph'al participles.

!!	& sts	& no nms	→ vt = imp
!!	& [	& nms	→ vt = inf

4.4.2 Verbal Stem

In the value-assignment for verbal stem, an important role is played by the markedness of the vowel pattern of the word. The two patterns which are symbolized as "d" and "p" (reduplicative and passive, respectively), are not marked for any particular verbal stem. But their occurrence in combination with the presence or absence of verbal stem prefixes and with each other is evaluated in terms of verbal stem in the following way.

Hebrew

no vsp	& :d	& no :p	→ vs = pi
no vsp	& no :d	& :p	→ vs = pql
no vsp	& :d	& :p	→ vs = pu
]H]		& :p	→ vs = ho
]HT] ¹		& :p	→ vs = hot

Aramaic²

no vsp	& :d	& no :p	→ vs = pa
no vsp	& no :d	& :p	→ vs = pi
no vsp	& :d	& :p	→ vs = pu
]H]		& :p	→ vs = ho
]HT]		& :d	→ vs = htp

-
1. The Hebrew prefix "]HT]", unlike its Aramaic equivalent, is seen as marked for a reduplicative verbal stem (hitpa^{cel}).
 2. The situation in Aramaic according to the traditional view, is more complex than that in Hebrew. Some scholars claim that pu^{cal} and hoph^{cal}, mentioned in the above rules, are not the only passive counterparts of pa^{cel} and haph^{cel}. In the participle tense, the passives are sometimes called passive pa^{cel} and passive haph^{cel}. This implies what we would call a separate parameter of "voice", with values "active" and "passive", to be relevant for participles. Such a parameter has not been implemented in WIT-BHS.

4.4.3 Person

The combinations of morphemes that cause a verb to be described as an imperative (cf. above, § 4.4.1) also affect the parameter of person, in the sense that it will get the value 2 in both languages:

Hebrew
 {!! or !H!} & sts & no nms → ps = 2

Aramaic
 !! & sts & no nms → ps = 2

4.4.4 Gender

The value for gender is unknown by default. However, the masculine gender of some verbal forms with morphemes that are not marked for gender is assessed in the following ways for PF 3 S, IMP/IPF 3 S/P, and PTC, respectively:

Hebrew
 no stp & [& no nms → gn = m
 {!! or !T!} & {[or [W} & no nms → gn = m
 {!M! or no stp} & [& / → gn = m

Aramaic
 no stp & [& no nms → gn = m
 {!! or !J!} & [& no nms → gn = m
 {!M! or no stp} & [& / → gn = m

4.4.5 State

The parameter of state is also sometimes assigned a value on the basis of the combined presence or absence of morphemes that are themselves not marked for it. The state of Hebrew and Aramaic nominals (including participles) is made absolute by

the presence of a pronominal suffix, while a Hebrew infinitive is seen as an infinitive construct if it has a non-zero nominal suffix, or a pronominal suffix.¹

Hebrew and Aramaic Nominals

no stp & nms & prs → st = a

Hebrew Infinitive

{!! or !H!} & [& /X → st = c
 {!! or !H!} & [& nms & prs → st = c

Regarding the nominals, it may be useful to stress once more that the parameter of state, like all parameters, applies to the word as a whole, rather than to any of its constituent parts. The relationship within one word between a nominal lexeme and a pronominal suffix much resembles the so-called "genitive construction", with the lexeme acting more or less as *nomen regens*, and the pronominal suffix as *nomen rectum*. Indeed, the nominal suffix or the vowels of the lexeme often reflect this. The pronominal suffix in WIT-BHS, however, is part of the word to which it is attached (cf. above, § 2.1), and this word as a whole cannot be said to be in construct state. Therefore, the parameter is assigned the value of absolute (even if the word's preceding nominal suffix is marked for construct state).

4.5 Switching Off Irrelevant Parameters

Having completed these four steps, the only thing left for the computer to do is to determine which parameters are irrelevant to the grammatical description of the word. As already mentioned at the beginning of this section, the assignment of a default value to a parameter implies that the parameter is rele-

1. On State as a parameter of Hebrew infinitives, cf. above, § 2.4.2.

vant in principle. However, some parameters may lose their relevance as a result of the assignment of combinatory values just discussed. This concerns primarily the parameters that are relevant to finite verbal forms, but not to infinite ones. The loss of relevance is again determined by combinations of morphemes, reflecting the situations in the Hebrew and Aramaic participle, infinitive, and the Aramaic infinitive *pe^cal* (cf. above, § 4.4.1).

Hebrew and Aramaic Participle, Infinitive

{!M! or no stp}	& [	& nms	→ — ps
{!! or !H!}	& [	& nms	→ — ps gn nu

Aramaic Infinitive Pe^cal

!M! & [& nms & no vsp & no :d & no :p	→ — ps gn nu st
--	-----------------

By now, the grammatical description of all the words that have morphemes other than pronominal suffixes has been completed. That is to say, the relevance and the value of each of the parameters of tense, verbal stem, person, gender, number, and state have been established. What needs to be done now, is, first, to make grammatical descriptions of some words that have no morphemes, viz. pronouns, and secondly, to assess the part of speech of each word. For this, we turn to the lexicon.

5 THE LEXICON

In the previous chapters, we have discussed the morphemes in WIT-BHS, their representation in the text, the information they contain, and the rules on how to process this information. The computer can now make a grammatical description of any word in WIT-BHS that has morphemes. This process, however, does not make available all the information that further programs need for doing distributional syntactical analysis. On the one hand, there are some words in Hebrew and Aramaic that never have morphemes, but that can be described grammatically just like words that do have morphemes. On the other hand, there is more information on words than what is contained in the grammatical description.

This non-morphemic but syntactically relevant information is related, in our view, to the lexical meaning of the words. We have, therefore, made sets of lexemes for each of the biblical languages. These two sets, or lexicons, contain all the lexemes that we consider to be present in the Hebrew and Aramaic parts of the Bible, together with specific lexical information.

5.1 Sets of Lexemes

A crucial question in making a lexicon is, which lexemes it should contain. Answers to this question are to be found in the dictionaries of Biblical Hebrew and Aramaic. The answers, however, differ in detail. There is consensus with respect to the majority of the lexemes, but there are also lexemes whose occur-

rence in the Hebrew Bible is not universally recognized.¹ The *Werkgroep Informatica* has refrained from compiling a set of lexemes of its own. It has based itself on the well-known and widely used *Lexicon in Veteris Testamenti Libros*, by Koehler-Baumgartner (2nd edition, *KBL2*). This Dictionary has been followed as closely as possible² in preparing WIT-BHS, and in defining the Hebrew and Aramaic computer lexicons.

The verbal lexemes in these lexicons all have the symbol of the subject+tense suffix "[", which is obligatory in verbs. Likewise, the nominal lexemes have the nominal suffix symbol "/". The verb דבר ("to speak"), for instance, is in the Hebrew lexicon as "DBR[", while the noun דָּבָר is represented as "DBR/". From a theoretical point of view, this is unnecessary, since the lexeme's part of speech is specified in the lexical information to be discussed in the next section. The practical advantage of this convention is that consonantly homographic lexemes such as the ones just mentioned are distinct from each other through these morpheme symbols.³

5.2 Lexical Information

The Hebrew and Aramaic lexicons of WIT-BHS contain only

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1. To give just one example: the form כָּהַן in 1 Sam. 3,13 is seen in some lexicons (among them *KBL2*) as a form of a second lexeme כָּהַן ("to rebuke") while others recognize only one lexeme כָּהַן ("to grow dim").
 2. Reconstructed lexemes in *KBL2*, such as Hebrew II. and III. **klh*, are not in our lexicons. Our handling of proper names is sometimes different from *KBL2*. The WIT-BHS Hebrew lexicon contains 8524 lexemes, the Aramaic one has 713 (count of July 1993).
 3. Homographs that belong to the same morphological part of speech category, i.e. verbal, nominal, or other, are distinguished through the homography symbol "=". The noun דָּבָר ("pestilence"), e.g., is in the lexicon as "DBR=" (cf. § 3.1.2b).

such information as we think is relevant to syntactic research. This information is specified in five parameters, which can have the values shown in Diagram 5.2.1.¹

sp	sm	ps	nu	gn
verb	vbex ²	3	s	m
	quot ³	2	d	f
subs	nnex ⁴	1	p	
	card			
	nmdi			
	mult			
	padv			
	ppre			
adjv	gntl			
	ordn			
nmpr	pers			
	gens			
	topo			
	mens			
advb				
dart	pcon ⁵			
conj				
intj				
inrg				
nega				
prep	objm ⁶			
prde				
prin				
prps				

Diagram 5.2.1: Parameters and Values of Syntactically Relevant Lexical Information

-
1. For the abbreviations, see below, Abbreviations and Sigla.
 2. Hebrew "HJH["; Aramaic "HWH[".
 3. Hebrew >MR[, DBR["; Aramaic >MR[, MLL[".
 4. Hebrew JC/, >C=/, >JN/, >L=/, BLJ/, BLTJ/; Aramaic >JTJ/.
 5. The usage which is known as *heh relativum*.
 6. Hebrew >T, not in Aramaic.

It should be stressed that the purposes served by our lexicons differ from those for which one would normally use a lexicon or a dictionary. Our main interest is not in recording the meanings, nuances, and idiomatic usages of the lexemes (although, for easy reference, our lexicons do have glosses). Nor do we seek to provide the user with philological information on textual criticism, on the occurrences of the lexemes, on the forms in which they occur, or on their etymology.

The parameter named after the traditional term of *Part of Speech* denotes a paradigmatic category whose members have the same distribution, which means that they can enter into identical syntagmatic relations¹. Part of Speech is a concept of prime importance in any approach to syntax. Each lexeme in our lexicon has exactly one part of speech.

The — experimental — parameter of *Semantic Specification* refers to a semantic category to which the lexeme belongs. It provisionally specifies such semantic categories as we think may be relevant in syntactical and discourse analysis. Sometimes the meaning of a word causes it to function differently from other words of its part of speech. The "verbs of existence", for instance, play a special role in both predication (as a copula), and discourse structuring. The Semantic Specification parameter in our lexicon differs from that of Part of Speech in that a lexeme need not have any semantic specification, and may have more than one, within certain limits.

As can be seen in the diagram, the values of the semantic specification are connected with those of Part of Speech. A verb, for instance, is never specified in the lexicon as an "ordinal number". One type of semantic specification is particularly important. Some words (lexemes) can function under specific syntactical circumstances as if they were another part of speech than they actually are. For instance, the substantives "JWM/" ("day"), and "LJLH/" ("night"), can be used adverbially. Others, such as "TXT/" ("under part") may function as a preposition.

1. Cf. Waltke-O'Connor (1990) § 4.2.2.

This phenomenon is accounted for in the values of "potential adverb, potential preposition, potential conjunction".¹

The other parameters are the same grammatical parameters which we defined for morpheme-based description.² They account for the inherent grammatical properties of some specific lexemes which never have morphemes, viz. pronouns and proper names.³ The personal pronoun ">TH" ("you"), for instance, never occurs with a morpheme. Yet it is reasonable to say that it has a 2nd person, a singular number, and a masculine gender. These values, in our view, are connected with the lexical meaning of the pronoun, and can, therefore, be recorded in the lexicon. The parameter of person is only used with personal pronouns; number is used with personal as well as demonstrative pronouns; while gender, finally, is used with personal and demonstrative pronouns, as well as with proper names that have the semantic specification of "person's name".⁴

-
1. The verbal-nominal nature of participles and infinitives is accounted for in their segmentation into morphemes (cf. above, § 4.4.1). The potential use of adjectives as substantives is not recorded in the lexicon, since this is a capacity of the part of speech "adjective", rather than of any specific adjective.
 2. The lexicon contains some additional information: the parameter of Form Class specifies the form class to which a lexical morpheme belongs. It is not taken into account in the morpheme- and lexeme-based grammatical description. The parameter of Gloss specifies the basic semantic meaning of the lexical morpheme. It is recorded for all lexemes, but only for the sake of convenience.
 3. The parameters of gender in lexical feminines, and of number in lexical plurals are accounted for in the segmentation into morphemes (cf. above, § 3.3.1.b).
 4. Strictly speaking, gender is not a property of a person's name but of the person this name refers to.

ABBREVIATIONS AND SIGLA

Listed below are:

- the grammatical abbreviations as they are used in the sets of morphemes and lexemes of WIT-BHS;
- the bibliographical sigla that are used in the present pages.

Morphemes

lss	=	locative/state suffix
mvp	=	marked vowel pattern
nms	=	nominal suffix
prs	=	pronominal suffix
stp	=	subject+tense prefix
sts	=	subject+tense suffix
vsp	=	verbal stem prefix

Parameters

fc	=	form class (in lexicon)
gl	=	gloss (in lexicon)
gn	=	gender
nu	=	number
ps	=	person
sm	=	semantic specification (in lexicon)
sp	=	part of speech (in lexicon)
st	=	state
vt	=	verbal tense
vs	=	verbal stem

Values of Form Class

Verb

1>	=	first <i>'aleph</i>
1g	=	first guttural
1hwj	=	first <i>heh / waw / yod</i>
1j	=	first <i>yod</i>
1n	=	first <i>nun</i>
22	=	<i>ʿayin ʿayin</i>
2>	=	second <i>'aleph</i>
2g	=	second guttural
2wj	=	second (<i>ʿayin</i>) <i>waw / yod</i>
3>	=	third <i>'aleph</i>
3g	=	third guttural
3h	=	third (<i>lamed</i>) <i>heh</i>
4	=	quadriliteral

Nominal: Vowel Pattern

ae	=	<i>/a/ — /e/</i>
ai	=	<i>/a/ — /i/</i>
ao	=	<i>/a/ — /o/</i>
au	=	<i>/a/ — /u/</i>
e	=	<i>/e/</i>
ie	=	<i>/i/ — /e/</i>
inf	=	similar to infinitive
io	=	<i>/i/ — /o/</i>
iu	=	<i>/i/ — /u/</i>
ptca	=	similar to active participle
ptcp	=	similar to passive participle
seg	=	segolate

Values of Gender

m	=	masculine
f	=	feminine
?	=	unknown

Values of Number

s	=	singular
p	=	plural
d	=	dual

Values of Person

1	=	first
2	=	second
3	=	third

Values of Semantic Specification

card	=	cardinal number
gens	=	people's name
gntl	=	gentilic adjective
mens	=	name of month
mult	=	noun of multitude
nmdi	=	distributive noun
nnex	=	noun of existence
objm	=	object marker
ordn	=	ordinal number
padv	=	potential adverb
pcon	=	potential conjunction
pers	=	person's name
ppre	=	potential preposition
quot	=	verb of quotation
topo	=	topographical name
vbex	=	verb of existence

Values of Parts of Speech

adjv	=	adjective
advb	=	adverb
conj	=	conjunction
dart	=	definite article

inrg	=	interrogative particle
intj	=	interjection
nega	=	negative particle
nmpr	=	proper name
prde	=	demonstative pronoun
prep	=	preposition
prin	=	interrogative pronoun
prps	=	personal pronoun
subs	=	substantive
verb	=	verb

Values of State

a	=	absolute
c	=	construct
d	=	determined
?	=	unknown

Values of Verbal Stem

Hebrew

et	=	etpa ^{cc} al
hi	=	hif ^c il
ho	=	hof ^c al
hot	=	hotpa ^{cc} al
htp	=	hitpa ^{cc} el
ni	=	nif ^c al
nt	=	nitpa ^{cc} el
pi	=	pi ^{cc} el
pu	=	pu ^{cc} al
qal	=	qal
pql	=	passive qal
ti	=	tif ^c al

Aramaic

ap	=	af ^c el
pa	=	pa ^{cc} el

pe	=	pe [˘] al
pi	=	pe [˘] il
pu	=	pu ^{˘˘} al
ha	=	haf [˘] el
ho	=	hof [˘] al
hs	=	hishtaf [˘] al
ht	=	hitpe [˘] el
htp	=	hitpa ^{˘˘} al
it	=	itpa ^{˘˘} el
sh	=	shaf [˘] el

Values of Verbal Tense

imp	=	imperative
inf	=	infinitive
ipf	=	imperfect
pf	=	perfect
ptc	=	participle

Bibliographical Sigla

<i>BHS</i>	Elliger, K. - W. Rudolph (eds.), <i>Biblia Hebraica Stuttgartensia</i> (Stuttgart 1977).
<i>KBL2</i>	Koehler, L. - W. Baumgartner, <i>Lexicon in Veteris Testamenti Libros</i> (Leiden 1958).
MCW-BHS	The Michigan-Claremont-Westminster Computer Text of <i>BHS</i> .
WIT-BHS	The <i>Werkgroep Informatica</i> Morphologically Analyzed Computer Text of <i>BHS</i> .

APPENDIX I HEBREW AND ARAMAIC PASSAGES FROM WIT-BHS

As examples of what texts from WIT-BHS look like, we give one Hebrew, and one Aramaic passage. The lines in these texts are formatted in such a way as to contain one syntactical clause. As it is in these pages, however, this format is only provisional.

I.A Ruth 1

```
#language hebrew
Ruth 1,01 W:n-!J!HJ(H[ B-J(WM/J
Ruth 1,01 !!CPV[/:c H-CPV[/JM
Ruth 1,01 W:n-!J!HJ(H[ R<B/ B-(H->RY/:a
Ruth 1,01 W:n-!J!(HLK[ >JC/ M(N-BJT_LXM/
JHWDH/
Ruth 1,01 L-!!GWR[/:c B-FD(H/J MW>B/
Ruth 1,01 HW> W->C(H/T+W W-CN(J(M/J= BN/J+W
Ruth 1,02 W-CM/ H->JC/ >LJMLK/
Ruth 1,02 W-CM/ >C(H/T+W N<MJ=/
Ruth 1,02 W-CM/ CN(J(M/J= BN/J+W MXLWN/
W-KLJWN=/
Ruth 1,02 >PRT(J/JM M(N-BJT_LXM/ JHWDH/
Ruth 1,02 W:n-!J!B(W>[W FD(H/J MW>B/
Ruth 1,02 W:n-!J!HJ(H[W CM
Ruth 1,03 W:n-!J!M(WT[ >LJMLK/ >JC/ N<MJ=/
Ruth 1,03 W:n-!T=!](N]C>R[ HJ> W-CN(J(M/J=
BN/J+H
Ruth 1,04 W:n-!J!(NF>[W L+HM (>&NC(H/JM
M(W>BJ/WT
Ruth 1,04 CM/ H->X(D/T <RPH/
Ruth 1,04 W-CM/ H-CNJ/T RWT/
Ruth 1,04 W:n-!J!(JCB[W CM K-<FR=/ CN(H/JM
Ruth 1,05 W:n-!J!MWT[W GM CN(J(M/J=+HM MXLWN/
W-KLJWN=/
```

Ruth 1,05 W:n-!T=!](N]C>R[H->C(H/H
 M(N-CN(J(M/J= JLD/J+H
 W-M(N->JC/+H
 Ruth 1,06 W:n-!T=!Q(WM[HJ> W-KL(H/(WTJ+H
 Ruth 1,06 W:n-!T=!C(WB[M(N-FD(H/J MW>B/
 Ruth 1,06 KJ CM<[H B-FDH/:c MW>B/
 Ruth 1,06 KJ PQD[JHWH/ >T <M/+W
 Ruth 1,06 L-!!(NT(N[/T L+HM LXM/:a
 Ruth 1,07 W:n-!T=! (JY>[MN H-MQWM/:a
 Ruth 1,07 >CR HJ(H[&TH CM~H
 Ruth 1,07 W-C(N(J(M/TJ KL(H/(WTJ+H <M+H
 Ruth 1,07 W:n-!T=! (HLK[NH B-(H-DRK/
 Ruth 1,07 L-!!CWB[/:c >L >RY/ JHWDH/
 Ruth 1,08 W:n-!T=!>MR[N<MJ=/ L-C(N(J(M/TJ
 KL(H/(WTJ+H
 Ruth 1,08 !! (HLK[NH
 Ruth 1,08 !!C(WB[NH >C(H/H L-BJT/:c >M/+H
 Ruth 1,08 !J!<FH[JHWH/ <M+KM XSD/
 Ruth 1,08 K->CR <F(H[&JTM <M H-M(WT[/JM
 W-<MD/+J
 Ruth 1,09 !J!(NTN[JHWH/ L+KM
 Ruth 1,09 W-!!MY>[N(H MNWX(H/H >C(H/H BJT/:c
 >JC/+H
 Ruth 1,09 W:n-!T=! (NCQ[L+HN
 Ruth 1,09 W:n-!T=! (NF>[NH QWL/+N
 Ruth 1,09 W:n-!T=!BK(H[&JNH
 Ruth 1,10 W:n-!T=!>MR[NH L+H
 Ruth 1,10 KJ >T==+K= !N!CWB[L-<M/+K=
 Ruth 1,11 W:n-!T=!>MR[N<MJ=/
 Ruth 1,11 !!C(WB[NH B(T&N/(WT(J+J
 Ruth 1,11 LMH !T!(HLK[NH <M+J
 Ruth 1,11 H=-<WD/ L+J BN/JM B-M<(J(M/(J+J
 Ruth 1,11 W-HJ(H[W L+KM L->(J&NC/JM
 Ruth 1,12 !!C(WB[NH B(T&N/(WT(J+J
 Ruth 1,12 !! (HLK[N(H
 Ruth 1,12 KJ ZQN[TJ
 Ruth 1,12 M(N-!!HJ(H[/WT L->JC/
 Ruth 1,12 KJ >MR[TJ
 Ruth 1,12 JC/ L+J TQW(H/H
 Ruth 1,12 GM HJ(H[&JTJ H-LJLH/ L->JC/
 Ruth 1,12 W-GM JLD[TJ BN/JM
 Ruth 1,13 H=-LHN !T!FBR[NH:d
 Ruth 1,13 <D >CR !J!GDL[W
 Ruth 1,13 H=-LHN !T!] (N]<G(N[NH

Ruth 1,13 L-BLTJ/ !!HJ(H[/WT L->JC/
 Ruth 1,13 >L= B(T&N/(WT(J+J
 Ruth 1,13 KJ MR(R[L+J M>D/ M(N+KM
 Ruth 1,13 KJ JY>[H B+J JD/:c JHWH/
 Ruth 1,14 W:n-!T=!(NF(>[NH QWL/+N
 Ruth 1,14 W:n-!T=!BK(H[&JNH <WD/
 Ruth 1,14 W:n-!T=!(NCQ[<RPH/ L-XMW(T/T+H
 Ruth 1,14 W-RWT/ DBQ[H B+H
 Ruth 1,15 W:n-!T=!>MR[
 Ruth 1,15 HNH C(WB[H JBM(H/T+K= >L <M/+H W->L
 >LH(J(M/J+H
 Ruth 1,15 !!CWB[J >XR/J JBM(H/T+K=
 Ruth 1,16 W:n-!T=!>MR[RWT/
 Ruth 1,16 >L= !T!PG<[J B+J
 Ruth 1,16 L-!!<ZB[/+K=
 Ruth 1,16 L-!!CWB[/:c M(N->XR/J+K=
 Ruth 1,16 KJ
 Ruth 1,16 >L >CR !T!(HLK[J
 Ruth 1,16 !>!(HLK[
 Ruth 1,16 W-B->CR !T!LJN[J
 Ruth 1,16 !>!LJN[
 Ruth 1,16 <M/+K= <M/+J
 Ruth 1,16 W->LH(J(M/J+K= >LH(J(M/(J+J
 Ruth 1,17 B->CR !T!MWT[J
 Ruth 1,17 !>!MWT[
 Ruth 1,17 W-CM !>!)(N]QBR[
 Ruth 1,17 KH !J!<FH[JHWH/ L+J
 Ruth 1,17 W-KH !J!)(H](JS&JP[
 Ruth 1,17 KJ H-MWT/:a !J!)(H]PR&JD[BJN/+J
 W-BJN/+K=
 Ruth 1,18 W:n-!T=!R>(H[
 Ruth 1,18 KJ !M!)(HT]>MY[/T HJ>
 Ruth 1,18 L-!!(HLK[/T >T==+H
 Ruth 1,18 W:n-!T=!XDL[
 Ruth 1,18 L-!!DBR[/:d >L+&JH
 Ruth 1,19 W:n-!T=!(HLK[NH C(N(J(M/TJ+HM
 Ruth 1,19 <D !!B(W>[/+N&H BJT_LXM/
 Ruth 1,19 W:n-!J!HJ(H[
 Ruth 1,19 K-!!B(W>[/+N&H BJT_LXM/
 Ruth 1,19 W:n-!T=!)(N]H(WM[KL/ H-<JR/ <L+&JHN
 Ruth 1,19 W:n-!T=!>MR[NH
 Ruth 1,19 H=-Z>T N<MJ=/
 Ruth 1,20 W:n-!T=!>MR[>L+&JHN
 Ruth 1,20 >L= !T!QR>[NH L+J N<MJ=/

Ruth 1,20 !!QR>[N(H L+J MR/(H&>
 Ruth 1,20 KJ]H]MR(R[CDJ/ L+J M>D/
 Ruth 1,21 >NJ ML>/H HLK[TJ
 Ruth 1,21 W-RJQM]H]C(W&JB[+NJ JHWH/
 Ruth 1,21 LMH !T!QR>[NH L+J N<MJ=/
 Ruth 1,21 W-JHWH/ <NH[B+J
 Ruth 1,21 W-CDJ/]H]R(<[L+J
 Ruth 1,22 W:n-!T=!C(WB[N<MJ=/
 Ruth 1,22 W-RWT/ H-MW>BJ/H KL(H/T+H <M+H
 Ruth 1,22 H-C(WB[/H M(N-FD(H/J MW>B/
 Ruth 1,22 W-HMH B(W>[W BJT_LXM/ B-TXL(H/T:c
 QYJR/:c F<R(H/JM

I.B Daniel 2,4b-23

#language aramaic
 Dan 2,04 MLK/~>
 Dan 2,04 L-<LM/JN !!XJ(H[&J
 Dan 2,04 !!>MR[XLM/~> L-<BD/J+K
 Dan 2,04 W-PCR/~> !N!XW(H[&>:d
 Dan 2,05 <NH[/ MLK/~>
 Dan 2,05 W->MR[/ L-KFD(J/J~>
 Dan 2,05 ML(H/T~> MN+J >ZD/(H&>
 Dan 2,05 HN L> !T!]H&W)(JD<[WN+NJ XLM/~>
 W-PCR/+H
 Dan 2,05 HDM/JN !T!](HT]<BD[WN
 Dan 2,05 W-B(JT/J+KWN NWL(W/&J !J!](HT]F(JM[WN
 Dan 2,06 W-HN XLM/~> W-PCR/+H !T!]H]XW(H[(WN
 Dan 2,06 MTN(H/N W-NBZB(H/H W-JQR/ FGJ>/
 !T!QBL[WN:d MN QDM/(J+J
 Dan 2,06 LHN XLM/~> W-PCR/+H !!]H]XW(H[(W+NJ
 Dan 2,07 <N(H[W TNJNWT
 Dan 2,07 W->MR[/JN
 Dan 2,07 MLK/~> XLM/~> !J!>MR[L-<BD/W+HJ
 Dan 2,07 W-PCR/~(>&H !N!]H]XWH[
 Dan 2,08 <NH[/ MLK/~>
 Dan 2,08 W->MR[/
 Dan 2,08 MN JYJB/ JD<[/ >NH
 Dan 2,08 DJ <DN/~> >NTWN ZBN[/JN
 Dan 2,08 K-L QBL/ DJ XZ(H[&JTWN
 Dan 2,08 DJ >ZD/(H&> MN+J ML(H/T~>

Dan 2,09 DJ HN XLM/~> L> !T!]H&W](JD<[(WN+NJ
 Dan 2,09 XD/H HJ> DT/+KWN
 Dan 2,09 W-ML(H/H KDB(H/H W-CX&JT[/H:p
]H(T]ZMN[TWN
 Dan 2,09 L-!M!>MR[/ QDM/(J+J
 Dan 2,09 <D DJ <DN/~> !J!](>(T]C&TN(H[&>
 Dan 2,09 LHN XLM/~> !!>MR[W L+J
 Dan 2,09 W-!>!(J&ND<[
 Dan 2,09 DJ PCR/+H !T!]H]XW(H[(WN+NJ
 Dan 2,10 <N(H[W KFD(J/J~> QDM/ MLK/~>
 Dan 2,10 W->MR[/JN
 Dan 2,10 L> >JTJ/ >NC/ <L JBC(H/T~>
 Dan 2,10 DJ ML(H/T MLK/~> !J&W!(JKL[
 Dan 2,10 L-!!]H]XW(H[/&JH
 Dan 2,10 K-L QBL/ DJ KL/ MLK/ RB/ W-CLJV/
 ML(H/H K-DNH L> C>L[
 L-KL/ XRVM/ W->CP/ W-KFDJ/
 Dan 2,11 W-ML(H/T~>
 Dan 2,11 DJ MLK/~(>&H C>L[/
 Dan 2,11 JQJR/H
 Dan 2,11 W->XRN/ L> >JTJ/
 Dan 2,11 DJ !J!XW(H[:d+&NH= QDM/ MLK/~>
 Dan 2,11 LHN= >LH/JN
 Dan 2,11 DJ MD(WR/+HWN <M BFR/~> L>
 >JT(J/+&WHJ
 Dan 2,12 K-L QBL/ DNH MLK/~> BNS[
 Dan 2,12 W-QYP[FGJ>/
 Dan 2,12 W->MR[
 Dan 2,12 L-!!]H&W](>BD[/H L-KL/ XKJM/J BBL/
 Dan 2,13 W-DT/~> NPQ[T
 Dan 2,13 W-XKJM/J~> !M!](HT]QVL[/JN:d
 Dan 2,13 W-B<(H[W DNJ>L/ W-XBR/W+HJ
 Dan 2,13 L-!!]HT]QVL[/H
 Dan 2,14 B->DJN DNJ>L/]H]T(W&JB[<V(H/&>
 W-V<M/ L->RJWK/ RB=/
 VBX/J~> DJ MLK/~>
 Dan 2,14 DJ NPQ[
 Dan 2,14 L-!!QVL[/H:d L-XKJM/J BBL/
 Dan 2,15 <NH[/
 Dan 2,15 W->MR[/ L->RJWK/ CLJV/~> DJ MLK/~>
 Dan 2,15 <L MH DT/~> !M!]H]XYP[/H MN QDM/
 MLK/~>
 Dan 2,15 >DJN ML(H/T~>]H&W](JD<[>RJWK/
 L-DNJ>L/

Dan 2,16 W-DNJ>L/ <L(L[
 Dan 2,16 W-B<H[MN MLK/~>
 Dan 2,16 DJ ZMN/ !J!NTN[L+H
 Dan 2,16 W-PCR/~> L-!!]H]XW(H[/&JH L-MLK/~>
 Dan 2,17 >DJN DNJ>L/ L-BJT/+H >ZL[
 Dan 2,17 W-L-XNNJH/ MJC>L/ W-<ZRJH/ XBR/W+HJ
 ML(H/T~>]H&W)(JD<[
 Dan 2,18 W-RXM(J(N/JN L-!M!B<(H[/&> MN QDM/
 >LH/ CM(J(N/J~> <L RZ/~(>&H DNH
 Dan 2,18 DJ L> !J!]H)(>BD[WN DNJ>L/ W-XBR/W+HJ
 <M C>R/ XKJM/J BBL/
 Dan 2,19 >DJN L-DNJ>L/ B-XZW/~> DJ LJLJ/~>
 RZ/~(>&H GL(H[&J:p
 Dan 2,19 >DJN DNJ>L/ BRK[:d L->LH/ CM(J(N/J~>
 Dan 2,20 <NH[/ DNJ>L/
 Dan 2,20 W->MR[/
 Dan 2,20 !L!HW(H[&> CM/+H DJ >LH/~>
 !M!BRK[/:dp MN <LM/~> W-<D <LM/~>
 Dan 2,20 DJ XKM(H/T~> W-GBWR(H/T~>
 Dan 2,20 DJ L+H HJ>
 Dan 2,21 W-HW> !M!]H]CN(H[/&> <DN/J~>
 W-ZMN/J~>
 Dan 2,21 !M!]H]<DH[/ MLK/JN
 Dan 2,21 W-!M!]H]Q(W&JM[/ MLK/JN
 Dan 2,21 JHB[/ XKM(H/T~> L-XKJM/JN W-MND</~>
 L-JD<[/J BJN(H/H
 Dan 2,22 HW> GL(H[/&> <MJQ/T=~>
 W-!M!STR[/T=~>:dp
 Dan 2,22 JD<[/
 Dan 2,22 MH B-XCWK/~>
 Dan 2,22 W-NH(W&JR/~> <M+H CR(H[/&>:p
 Dan 2,23 L+K >LH/ >B/&HT+J !M!]H&W)(JD(H[/&>
 Dan 2,23 W-!M!CBX[/:d >NH
 Dan 2,23 DJ XKM(H/T~> W-GBWR(H/T~> JHB[T= L+J
 Dan 2,23 W-K<N]H&W)(JD<[T=+NJ
 Dan 2,23 DJ B<(H[&JN> MN+K
 Dan 2,23 DJ ML(H/T MLK/~>]H&W)(JD<[T=+N>

APPENDIX II EXTRACTS FROM THE HEBREW AND ARAMAIC LEXICONS

II.A The Lexemes in Ruth 1

">XD/ "	:sp=subs:sm=card:gl=one:
">XR/ "	:sp=subs:sm=ppre,padv:gl=after:
">JC/ "	:sp=subs:sm=nmdi:gl=man:
">L"	:sp=prep:gl=to:
">L="	:sp=nega:gl=not:
">LHJM/ "	:sp=subs:gl=god(s):
">LJMLK/ "	:sp=nmpr:sm=pers:gn=m:
">M/ "	:sp=subs:gl=mother:
">MY["	:sp=verb:fc=1>:gl=to be strong:
">MR["	:sp=verb:fc=1>:sm=quot:gl=to say:
">NJ"	:sp=prps:ps=1:gn=c:nu=sg:gl=i:
">PRTJ/ "	:sp=adv:sm=gntl:
">RY/ "	:sp=subs:fc=seg:gl=earth:
">CH/ "	:sp=subs:sm=nmdi:gl=woman:
">CR"	:sp=conj:gl=<relative particle>:
">T"	:sp=prep:sm=objm: gl=<nota accusativi>:
">T=="	:sp=prep:gl=together with:
"B"	:sp=prep:gl=in:
"BW>["	:sp=verb:fc=2wj,3>:gl=to come:
"BJN/ "	:sp=subs:sm=ppre:gl=interval:
"BJT/ "	:sp=subs:fc=seg:gl=house:
"BJT_LXM/ "	:sp=nmpr:sm=topo:
"BKH["	:sp=verb:fc=3h:gl=to weep:
"BLTJ/ "	:sp=subs:sm=nnex:gl=<no existence>:
"BN/ "	:sp=subs:gl=son:
"BT/ "	:sp=subs:gl=daughter:
"GDL["	:sp=verb:gl=to be strong:
"GWR["	:sp=verb:fc=2wj:gl=to dwell:
"GM"	:sp=conj:gl=even:
"DBQ["	:sp=verb:gl=to cleave:
"DBR["	:sp=verb:sm=quot:gl=to speak:
"DRK/ "	:sp=subs:sm=ppre:fc=seg:gl=way:
"H"	:sp=art:gl=the:

"H="	:sp=inrg:gl=<interrogative>:
"HW>"	:sp=prps:ps=3:gn=m:nu=sg:gl=he:
"HWM["	:sp=verb:fc=2wj:gl=to stir:
"HJ>"	:sp=prps:ps=3:gn=f:nu=sg:gl=she:
"HJH["	:sp=verb:fc=3h:sm=vbex:gl=to be:
"HLK["	:sp=verb:fc=1hwj:gl=to walk:
"HMH"	:sp=prps:ps=3:gn=m:nu=pl:gl=they:
"HNH"	:sp=intj:sm=pcon:gl=behold:
"W"	:sp=conj:gl=and:
"Z>T"	:sp=prde:nu=sg:gn=f:gl=this:
"ZQN["	:sp=verb:gl=to be old:
"XDL["	:sp=verb:fc=lg:gl=to cease:
"XMWT/"	:sp=subs:fc=ao:gl=mother-in-law:
"XSD/"	:sp=subs:fc=seg:gl=loyalty:
"JBMH/"	:sp=subs:gl=brother's widow:
"JD/"	:sp=subs:gl=hand:
"JHWDH/"	:sp=nmpr:sm=pers, gens, topo:
"JHWH/"	:sp=nmpr:sm=pers:gn=m:
"JWM/"	:sp=subs:sm=padv:gl=day:
"JLD["	:sp=verb:fc=1hwj:gl=to bear:
"JLD/"	:sp=subs:fc=seg:gl=boy:
"JSP["	:sp=verb:fc=1hwj:gl=to add:
"JY>["	:sp=verb:fc=1hwj, 3>:gl=to go out:
"JC/"	:sp=subs:sm=nnex:
"JCB["	:sp=verb:fc=1hwj:gl=to sit:
"K"	:sp=prep:gl=as:
"KH"	:sp=advb:gl=thus:
"KJ"	:sp=conj:gl=that:
"KL/"	:sp=subs:sm=nmdi:gl=whole:
"KLH/"	:sp=subs:gl=bride:
"KLJWN="/	:sp=nmpr:sm=pers:gn=m:
"L"	:sp=prep:gl=to:
"LHN"	:sp=advb:gl=therefore:
"LXM/"	:sp=subs:fc=seg:gl=bread:
"LJLH/"	:sp=subs:sm=padv:gl=night:
"LJN["	:sp=verb:fc=2wj:gl=to spend night:
"LMH"	:sp=inrg:gl=why:
"M>D/"	:sp=subs:sm=padv:gl=might:
"MW>B/"	:sp=nmpr:sm=pers, gens, topo:gn=m:
"MW>BJ/"	:sp=adv:sm=gntl:
"MWT["	:sp=verb:fc=2wj:gl=to die:
"MWT/"	:sp=subs:fc=seg:gl=death:
"MXLWN/"	:sp=nmpr:sm=pers:gn=m:

"ML> / " :sp=adv:fc=ae:sm=adv:gl=full:
 "MN" :sp=prep:gl=from:
 "MNWXH/ " :sp=subs:gl=resting place:
 "M<JM/ " :sp=subs:gl=bowels:
 "MY>[" :sp=verb:fc=3>:gl=to find:
 "MQWM/ " :sp=subs:fc=ao:gl=place:
 "MR/ " :sp=adv:gl=bitter:
 "MRR[" :sp=verb:fc=22:gl=to be bitter:
 "N<MJ=/ " :sp=nmpr:sm=pers:gn=f:
 "NF>[" :sp=verb:fc=1n,3>:gl=to lift:
 "NCQ[" :sp=verb:fc=1n:gl=to kiss:
 "NTN[" :sp=verb:fc=1n:gl=to give:
 "<GN[" :sp=verb:fc=1g:gl=to withdraw:
 "<D" :sp=prep:gl=unto:
 "<WD/ " :sp=subs:sm=adv:gl=duration:
 "<ZB[" :sp=verb:fc=1g:gl=to leave:
 "<JR/ " :sp=subs:gl=town:
 "<L" :sp=prep:gl=upon:
 "<M" :sp=prep:gl=with:
 "<M/ " :sp=subs:gl=people:
 "<MD/ " :sp=subs:sm=ppre:gl=company:
 "<NH[" :sp=verb:fc=1g,3h:gl=to answer:
 "<RPH/ " :sp=nmpr:sm=pers:gn=f:
 "<FH[" :sp=verb:fc=1g,3h:gl=to make:
 "<FR=/ " :sp=subs:fc=seg:gl=group of ten:
 "PG<[" :sp=verb:fc=3g:gl=to meet:
 "PQD[" :sp=verb:gl=to miss:
 "PRD[" :sp=verb:gl=to divide:
 "QBR[" :sp=verb:gl=to bury:
 "QWL/ " :sp=subs:gl=sound:
 "QWM[" :sp=verb:fc=2wj:gl=to arise:
 "QYJR/ " :sp=subs:fc=ai:gl=harvest:
 "QR>[" :sp=verb:fc=3>:gl=to call:
 "R>H[" :sp=verb:fc=2>,3h:gl=to see:
 "RWT/ " :sp=nmpr:sm=pers:gn=f:
 "RJQM" :sp=advb:gl=with empty hands:
 "R<B/ " :sp=subs:gl=hunger:
 "R<<[" :sp=verb:fc=2g,22:gl=to be evil:
 "FBR[" :sp=verb:gl=to examine:
 "FDH/ " :sp=subs:fc=ae:gl=open field:
 "F<RH/ " :sp=subs:gl=barley:
 "C>R[" :sp=verb:fc=2>:gl=to remain:
 "CDJ/ " :sp=nmpr:sm=pers:gn=m:
 "CWB[" :sp=verb:fc=2wj:gl=to return:

"CM" :sp=advb:gl=there:
 "CM/" :sp=subs:gl=name:
 "CM<[" :sp=verb:fc=3g:gl=to hear:
 "CNH/" :sp=subs:gl=year:
 "CNJ/" :sp=adv:sm=ordn:gl=second:
 "CNJM/" :sp=subs:sm=card:gl=two:
 "CPV[" :sp=verb:gl=to judge:
 "TXLH/" :sp=subs:gl=beginning:
 "TQWH/" :sp=subs:gl=hope:

II.B The Lexemes in Daniel 2,4b-23

">B/" :sp=subs:gl=father:
 ">BD[" :sp=verb:fc=1>:gl=perish:
 ">DJN" :sp=conj:gl=then:
 ">ZD/" :sp=adv:gl=promulgated:
 ">ZL[" :sp=verb:fc=1>:gl=go:
 ">XRN/" :sp=adv:gl=another:
 ">JTJ/" :sp=subs:sm=nmes:gl=existence:
 ">LH/" :sp=subs:gl=god:
 ">MR[" :sp=verb:sm=quot:fc=1>:gl=say:
 ">NH" :sp=prps:ps=1:nu=sg:gn=c:gl=I:
 ">NC/" :sp=subs:sm=nmdi:gl=mankind:
 ">NTWN" :sp=prps:ps=2:nu=pl:gn=m:gl=you:
 ">RJWK/" :sp=nmpr:sm=pers:gn=m:gl=Arioch:
 ">CP/" :sp=subs:gl=enchanter:
 "B" :sp=prep:gl=in:
 "BBL/" :sp=nmpr:sm=topo:gl=Babylon:
 "BJNH/" :sp=subs:gl=discernment:
 "BJT/" :sp=subs:gl=house:
 "BNS[" :sp=verb:gl=become angry:
 "B<H[" :sp=verb:fc=3h:gl=seek:
 "BRK[" :sp=verb:gl=bless:
 "BFR/" :sp=subs:gl=flesh:
 "GBWRH/" :sp=subs:gl=power:
 "GLH[" :sp=verb:fc=3h:gl=reveal:
 "DJ" :sp=conj:gl=<relativum>:
 "DNH" :sp=prde:nu=sg:gn=m:gl=this:
 "DNJ>L/" :sp=nmpr:sm=pers:gn=m:gl=Daniel:
 "DT/" :sp=subs:gl=law:
 "HDM/" :sp=subs:gl=limb:

"HW> "	:sp=prps:ps=3:nu=sg:gn=m:gl=he:
"HWH["	:sp=verb:sm=vbes:fc=3h:gl=be:
"HJ> "	:sp=prps:ps=3:nu=sg:gn=f:gl=she:
"HN "	:sp=conj:gl=if:
"W "	:sp=conj:gl=and:
"ZBN["	:sp=verb:gl=buy:
"ZMN["	:sp=verb:gl=arrange:
"ZMN/ "	:sp=subs:gl=time:
"XBR/ "	:sp=subs:gl=colleague:
"XD/ "	:sp=subs:sm=card:gl=one:
"XWH["	:sp=verb:fc=3h:gl=know:
"XZH["	:sp=verb:fc=3h:gl=see:
"XZW/ "	:sp=subs:gl=vision:
"XJH["	:sp=verb:fc=3h:gl=live:
"XKJM/ "	:sp=adjv:gl=wise:
"XKMH/ "	:sp=subs:gl=wisdom:
"XLM/ "	:sp=subs:gl=dream:
"XNNJH/ "	:sp=nmpr:sm=pers:gn=m: gl=Hananiah:
"XYP["	:sp=verb:gl=be bare:
"XRVM/ "	:sp=subs:gl=magician:
"XCWK/ "	:sp=subs:gl=darkness:
"VBX/ "	:sp=subs:gl=executioner:
"V<M/ "	:sp=subs:gl=sense:
"JBCH/ "	:sp=subs:gl=land:
"JDH["	:sp=verb:fc=1j,3h:gl=praise:
"JD<["	:sp=verb:fc=1j:gl=know:
"JHB["	:sp=verb:fc=1j:gl=give:
"JKL["	:sp=verb:fc=1j:gl=be able:
"JYJB/ "	:sp=adjv:gl=reliable:
"JQJR/ "	:sp=adjv:gl=difficult:
"JQR/ "	:sp=subs:gl=dignity:
"K "	:sp=prep:gl=like:
"KDBH/ "	:sp=subs:gl=lies:
"KL/ "	:sp=subs:sm=nmdi:gl=whole:
"K<N "	:sp=advb:gl=now:
"KFDJ/ "	:sp=adjv:sm=gntl:gl=Chaldaeian:
"L "	:sp=prep:gl=to:
"L> "	:sp=nega:gl=not:
"LHN "	:sp=conj:gl=therefore:
"LHN= "	:sp=conj:gl=but:
"LJLJ/ "	:sp=subs:gl=night:
"MDWR/ "	:sp=subs:gl=dwelling:
"MH "	:sp=prit:gl=what:

"MJC>L/ "	:sp=nmpr:sm=pers:gn=m:gl=Mishael:
"MLH/ "	:sp=subs:gl=word:
"MLK/ "	:sp=subs:gl=king:
"MN "	:sp=prep:gl=from:
"MND</ "	:sp=subs:gl=knowledge:
"MTNH/ "	:sp=subs:gl=gift:
"NBZBH/ "	:sp=subs:gl=present:
"NHWR/ "	:sp=subs:gl=light:
"NWLW/ "	:sp=subs:gl=dunghill:
"NPQ["	:sp=verb:fc=1n:gl=go out:
"NTN["	:sp=verb:fc=1n:gl=give:
"STR["	:sp=verb:gl=hide:
"<BD["	:sp=verb:gl=do:
"<BD/ "	:sp=subs:gl=servant:
"<D "	:sp=prep:gl=until:
"<DH["	:sp=verb:fc=3h:gl=go:
"<DN/ "	:sp=subs:gl=time:
"<ZRJH/ "	:sp=nmpr:sm=pers:gn=m:gl=Azariah:
"<VH/ "	:sp=subs:gl=advice:
"<L "	:sp=prep:gl=upon:
"<LL["	:sp=verb:fc=22:gl=enter:
"<LM/ "	:sp=subs:gl=eternity:
"<M "	:sp=prep:gl=with:
"<MJQ/ "	:sp=adjv:gl=deep:
"<NH["	:sp=verb:fc=3h:gl=answer:
"PCR/ "	:sp=subs:gl=interpretation:
"QBL["	:sp=verb:gl=receive:
"QBL/ "	:sp=subs:sm=ppre:gl=opposite:
"QDM/ "	:sp=subs:sm=ppre:gl=before:
"QWM["	:sp=verb:fc=2wj:gl=stand:
"QVL["	:sp=verb:gl=kill:
"QYP["	:sp=verb:gl=get angry:
"RB/ "	:sp=adjv:gl=great:
"RB= / "	:sp=subs:gl=chief:
"RZ/ "	:sp=subs:gl=secret:
"RXMJN/ "	:sp=subs:gl=mercy:
"FGJ>/ "	:sp=adjv:gl=much:
"FJM["	:sp=verb:fc=2wj:gl=place:
"C>L["	:sp=verb:gl=ask:
"C>R/ "	:sp=subs:gl=rest:
"CBX["	:sp=verb:gl=praise:
"CXT["	:sp=verb:gl=spoil:
"CLJV/ "	:sp=adjv:gl=mighty:
"CM/ "	:sp=subs:gl=name:

"CMJN/ "	:sp=subs:gl=heaven:
"CNH["	:sp=verb:fc=3h:gl=be different:
"CRH["	:sp=verb:fc=3h:gl=loosen:
"TWB["	:sp=verb:fc=2wj:gl=return:
"TNJNWT "	:sp=advb:gl=again:

b. Hebrew שפטים CPV[/JM

Lexeme: CPV[
Morphemes: [/JM
Default values: perfect; qal; 3rd person
unknown gender; sing. number
unknown state

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
[/JM				m	p	a

Combination of morphemes: no stp & [and nms → vt = ptc
Parameters switched off: ps
Description: participle; qal
masc. gender; plural number
absolute state

c. Hebrew תשאַר !T=!](N]C>R[

Lexeme: C>R[
Morphemes: !T=!]N] [
Default values: perfect; qal; 3rd person
unknown gender; sing. number

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
!T=!]N] [	ipf	ni	3	f		

Combination of morphemes: none
Parameters switched off: none
Description: imperfect; niph^{al}; 3rd person
fem. gender; sing. number

d. Hebrew

שְׁנִיָּהֶם

CN (J (M / J = +HM

Lexeme: CNJM/
 Morphemes: /J= +HM
 Default values: unknown gender; sing. number
 unknown state

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
/J=					d	c
+HM			3	m	p	

Combination of morphemes: no stp & nms & prs → st = a
 Parameters switched off: none
 Description: unknown gender; dual number
 absolute state
 has pronominal suffix

e. Aramaic

ܘܢܝܗܘܢ

!! XJ (H [& J

Lexeme: XJH[
 Morphemes: !! [
 Default values: perfect; pe^cal; 3rd person
 unknown gender; sing. number

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
!!						
[

Combination of morphemes: !! & [& no nms
 → vt = imp; ps = 2; gn=m
 Parameters switched off: none
 Description: imperative; pe^cal; 2nd person
 masc. gender; sing. number

f. Aramaic כְּחַוָּא !N!XW(H[&> :d

Lexeme: XWH[
 Morphemes: !N! [:d
 Default values: perfect; pe^cal; 3rd person
 unknown gender; sing. number

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
!N! [:d	ipf		1		p	

Combination of morphemes: no vsp & :d & no :p → vs = pa
 Parameters switched off: none
 Description: imperfect; pa^{cc}el; 1st person
 unknown gender; plural number

g. Aramaic כְּשָׂדִיָּא KFD(J/J~>

Lexeme: KFDJ/
 Morphemes: /J ~>
 Default values: unknown gender; sing. number
 unknown state

Morphemes marked for:

morph	vt	vs	ps	gn	nu	st
/J ~>				m	p	c d

Combination of morphemes: none
 Parameters switched off: none
 Description: masc. gender; plural number
 determined state

APPENDIX IV THE ANALYTICAL LEXICON

WIT-BHS, as has been stressed several times in these pages, constitutes an analysis in morphological terms of the text of the Hebrew Bible. To be more exact, it is a series of analyses of all the words in this text in the order in which they occur. However, many Hebrew and Aramaic words can be analyzed in more than one way. Well-known examples of ambiguity are the verbs *mediae waw*, whose QAL PF 3 M S and PTC M S forms are homographic, but there are many more cases. WIT-BHS, as it is, contains just one analysis of each word that occurs in the Hebrew Bible. This analysis reflects our understanding of the texts. To make sure that the alternative analyses are readily accessible to the user, we have made so-called analytical lexicons on the Hebrew and Aramaic parts of WIT-BHS.

The analytical lexicons are databases containing all the different "graphical words" of the Hebrew and Aramaic parts of the Hebrew Bible, and their analyzed representations in WIT-BHS. The basis of the analytical lexicon is the text of MCW-BHS, which is a graphical representation of BHS (see above, Chapter 1). This text has been subjected to a series of modifications, including its being stripped of the representations of cantillation accents, its transliteration system being changed to make it conform to our own alphabet, and our word division being introduced into it. The strings of characters thus created (strings which are separated by spaces and hyphens) are the "graphical words" just mentioned, i.e. the graphical representations of what we see as Hebrew and Aramaic words.

Corresponding to each graphical word there is at least one morphological analysis. If a graphical word can be analyzed in more than one way, all possibilities are included in the analytical lexicon, such as "Q(WM[" (QAL PF 3 M S), and "Q(WM[/" (QAL PTC M S) as analyses of the graphical word "Q@M" (מָן). Included are all graphical forms that are attested in MCW-BHS, and all possible analyses of each form, regardless of their attestation in WIT-BHS (which is, after all, a hypothetical text, see

above, Chapter 1). The Hebrew analytical lexicon contains 37551 different graphical forms, 34859 different analyzed forms and 42027 entries, i.e. different combinations of one graphical and one analyzed form. The Aramaic analytical lexicon has 1726 different graphical forms, 1598 different analyzed forms, and 1769 entries.¹

As an example, we cite the verse Ruth 1,1. This passage, in its graphical form (a modified version of MCW-BHS, which was quoted above, Chapter 1) reads:

```
1:1 WAJ:HIJ B.IJM;J C:POV HAC.OP:VIJM
WAJ:HIJ R@<@B B.>@REY WAJ.;LEK: >IJC
MIB.;JT_LEXEM J:HW.D@H L@GW.R B.IF:D;J
MOW>@B HW.> W:>IC:T.OV W.C:N;J B@N@JW
```

The consonants in this passage are those of WIT-BHS (cf. above, § 3.1.1). In addition, the following letters and symbols are used to transcribe the Hebrew vowels:

.	=	<i>dageš</i> in preceding letter (<i>W.</i> = <i>šureq</i>)
:	=	<i>š^ewa</i> (combination with following vowel: <i>hateph</i>)
;	=	<i>šere</i>
A	=	<i>pataḥ</i>
@	=	<i>qameš</i>
E	=	<i>s^egol</i>
I	=	<i>hireq</i>
O	=	<i>ḥolem</i>
U	=	<i>qibbuš</i>

As an extract from the analytical lexicon, the graphical words of this verse and their possible analyses are listed below, in alphabetical order.

1. Count of July 1993, *ketib-qere* combinations included.

Graphical Form Based on MCW-BHS	Analyzed Form in WIT-BHS
>@REY	* >RY/ :a
>IC:T.OW	* >C(H/T+W
>IJC	* >JC/
>IJC	>&JC= /
B. ;JT_LEXEM	* BJT_LXM/
B.@	B
B.@	* B- (H
B.I	* B
B@N@JW	* BN/J+W
GW.R	!!GWR[
GW.R	* !!GWR[/ :c
HA	* H
HA	H=
HW.>	* HW>
W.	* W
W:	* W
WA	W
WA	* W:n
J. ;LEK:	* !J! (HLK[
J:HIJ	* !J!HJ(H[
J:HW.D@H	* JHWDH/
JM;J	* J(WM/J
L@	* L
L@	L- (H
MI	* M(N
MOW>@B	* MW>B/
R@<@B	* R<B/
F:D;J	* FD(H/J
C.OP:VIJM	* CPV[/JM
C:N;J	* CN(J(M/J=
C:N;J	CN(H/J
C:POV	* !!CPV[/ :c
C:POV	!!CPV[

The analyzed forms that are marked with an asterisk * are in the passage of Ruth 1,1 in WIT-BHS (cf. above, Appendix I.A). The unmarked forms may or may not occur elsewhere in the Hebrew Bible (in fact, all of them do, except "!!GWR[").

BIBLIOGRAPHY

Garr, W. Randall 1992

"The Linguistic Study of Morphology", in: W.R. Bodine (ed.), *Linguistics and the Hebrew Bible* (Winona Lake, Indiana), pp. 49-64.

Hardmeier, C. - E. Talstra 1989

"Sprachgestalt und Sinngehalt. Wege zu neuen Instrumenten der computergestützten Textwahrnehmung", *ZAW* 101:408-428.

Hughes, John J. 1987

Bits, Bytes, & Biblical Studies. A Resource Guide for the Use of Computers in Biblical and Classical Studies (Grand Rapids, Michigan).

Joüon, P. - T. Muraoka 1991

A Grammar of Biblical Hebrew (Rome).

Richter, W. 1978

Grundlagen einer althebräischen Grammatik. I. Arbeiten zu Text und Sprache im Alten Testament 8 (St Ottilien).

Richter, W. 1983

Transliteration und Transkription. Objekt- und metasprachliche Metazeichensysteme zur Wiedergabe hebräischer Texte. Arbeiten zu Text und Sprache im Alten Testament 19 (St Ottilien).

Richter, W. 1991

Biblia Hebraica transcripta: BH^t. 1. Genesis. Arbeiten zu Text und Sprache im Alten Testament 33.1 (St Ottilien).

Rosenthal, F. 1983

A Grammar of Biblical Aramaic. Porta Linguarum Orientalium, N.S. 5, fifth printing (Wiesbaden).

Talstra, E. 1986

"An Hierarchically Structured Data Base of Biblical Hebrew", in: *Actes du Premier Colloque International "Bible et Informatique: Le Texte"*, Louvain-la-Neuve 1985 (Paris/Genève), pp. 335-349.

Talstra, E. 1987

"Towards a Distributional Definition of Clauses in Classical Hebrew: a Computer-Assisted Description of Clauses and Clause Types in Deut. 4,3-8", *Ephemerides Theologicae Lovanienses* 63:95-105.

Talstra, E. (ed.) 1989a

Computer Assisted Analysis of Biblical Texts. Papers read at the Workshop on the Occasion of the Tenth Anniversary of the "Werkgroep Informatica", Faculty of Theology, Vrije Universiteit, Amsterdam, November 5-6, 1987. Applicatio 7 (Amsterdam).

Talstra, E. 1989b

"The Production of a Syntactically Orientated Concordance of Biblical Hebrew Texts", in *Actes du Second Colloque International "Bible et Informatique: Méthodes, Outils, Résultats"*, Jérusalem, 9-13 juin 1988 (Paris/Genève), pp. 563-580.

Talstra, E. - F. Postma 1989

"On Text and Tools. A Short History of the "Werkgroep Informatica" (1977-1987)", in: Talstra 1989a, pp. 9-27.

Waltke, B.K. - M. O'Connor 1990

An Introduction to Biblical Hebrew Syntax (Winona Lake, Indiana).

GRAMMATICA DIGITALIS I

The morphological code in the «*Werkgroep Informatica*» computer text of the Hebrew Bible

Arian J.C. Verheij

The *Werkgroep Informatica* is a research group at the theological faculty of the Vrije Universiteit, Amsterdam, which has been specializing since 1977 in the computer-assisted study of the Hebrew Bible. The *Werkgroep* has developed a computer text of the Hebrew Bible, which through a code of symbols, reflects the morphemic structure of each word; it is a so-called morphologically coded text.

This book is, in the first place, a description of the morphological code itself: a presentation of the symbols that are used in the text, and their meanings. As such, it may serve as a reference manual for those who work with the text. In addition, it describes the theory behind the code, and explains how the code is evaluated by computer programs. These pages may, therefore, also be read as a practical essay in the computer assisted processing of basic linguistic information.

Arian J.C. Verheij is a researcher at the *Werkgroep Informatica*.

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