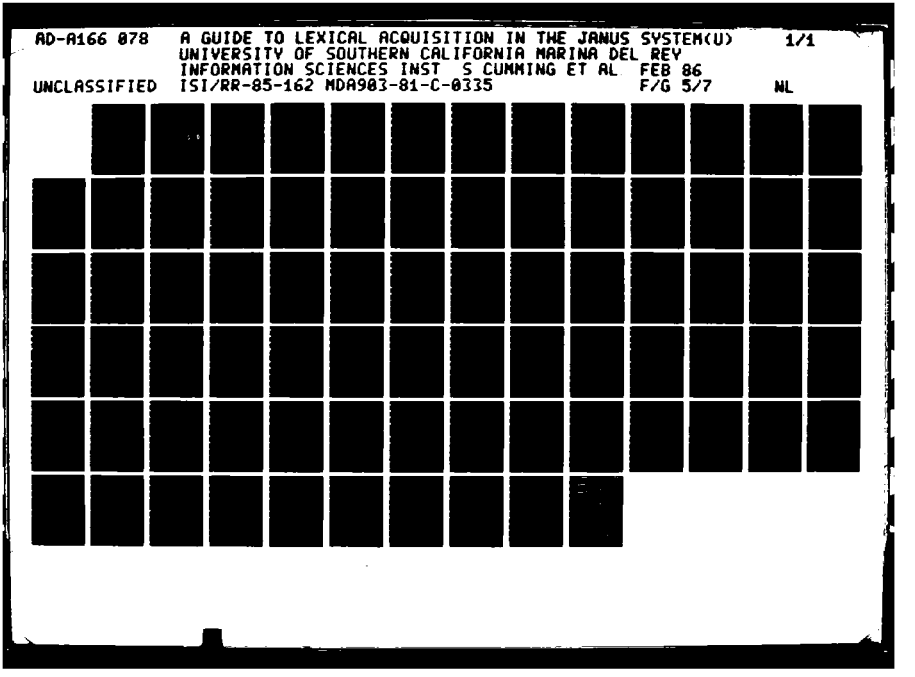
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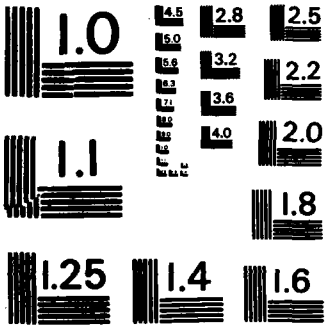

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February 1986

Susanna Cumming
Robert Albano

University of Southern California

A Guide to Lexical Acquisition in the JANUS System

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This document is a users' guide to LapItUp, the program which is used to add words to the Master Lexicon component of the JANUS natural language system, where syntactic, morphological, orthographic and semantic information particular to individual words and phrases is stored. The Master Lexicon is designed to serve all the lexical needs of the two grammars which form part of the JANUS system: RUS, an ATN parsing grammar, and Nigel, a systemic generation grammar. The user's guide contains a description of the organization of the Master Lexicon, instructions for adding words to the lexicon, and descriptions of each of the features that can be acquired using LapItUp.

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There are two important aspects to the Master Lexicon: the wordclass organization, which organizes the syntactic and morphological features used in lexical item specification, and the lexical item organization. In addition to a feature specification, the latter contains cross-indexing information or "properties", semantic pointers, and record-keeping information. LapItUp uses the wordclass hierarchy to guide the user through a series of choices, presented in the form of menus of features with accompanying descriptive text. In addition, LapItUp contains facilities for acquiring morphological information, properties, and the other kinds of auxiliary information.

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Preface

The Master Lexicon (ML) is designed to serve the lexical needs of the two grammars of the Janus system: Nigel, the generator, and RUS, the parser. All of the lexical specification needed for each of these two grammars is contained in the ML.

Both Nigel and RUS are large, complex grammars which have evolved over many years, and are still evolving. For this reason, both the original Nigel and the original RUS lexicon contain features designed to be used by parts of the grammar that are now obsolete as well as features designed to be used by parts of the grammar that have not yet been implemented. The current version of the ML supports only the features that work right now in one of the grammars. Tools exist for editing, adding to, and pruning the Master Lexicon wordclass hierarchy, which will facilitate modifying the ML to keep step with any changes in the grammars. The program documented in this manual for providing feature specifications for words is independent of any particular wordclass hierarchy, and is thus flexible with respect to grammar changes.

This document is designed for the non-specialist user of the lexicon: a person who is neither a linguist nor a computer scientist, but who will have the task of adding to and maintaining the set of lexical item definitions. It is chiefly intended to be used in conjunction with LapItUp, the online lexical acquisition tool. Except in passing, it does not deal with one very important area of lexical specification: the semantic pointer. Lexical items will have the possibility of being associated with one or more pointers to particular concepts in a knowledge base. We anticipate that these pointers will be added to the lexicon by knowledge-base specialists, and not by the same people who are charged with maintaining the grammatical aspects of lexical specification.

1. Introduction

A *lexicon* is a kind of dictionary, a place where information about words is stored; *lexical acquisition* is the process of adding words to the lexicon and specifying the necessary information for each one. Since different applications of the Janus system will need to use different words, and even use the same words in different ways, we have designed the LapItUp program to help users customize the system by controlling the content of their own lexicons, both by adding lexical items and by changing the specification of words that are already there.

In order for the system to use a lexical item correctly and appropriately, it is necessary to specify information about the kind of lexical item it is. Information about an item is stored in the form of "features". Every item in the lexicon has one or more features which give the system the information it needs to understand and use the lexical item. Features can be familiar terms such as Noun, Verb, or Adjective; less familiar features particular to the Janus system such as Experience or Questioncomp; features which give information about which endings are used to make different forms of lexical items, such as whether a noun adds *-s* or *-es* to make the plural; and features which give information about which other items in the lexicon the lexical item is related to. The set of features associated with a lexical item can be thought of as the system's "definition" of that item.

Lapitup, the acquisition component of the lexicon, is designed to make it easy to specify all this information by leading the user through a series of decisions. The decisions are structured in such a way that the choices one makes at any point in the procedure narrow the range of choices possible further on. This ensures that the user will be presented with the smallest possible number of decisions to make about any given lexical item.

We anticipate that the user will have as much use for "reacquisition", the process of changing or expanding an existing lexical item definition, as for first-time acquisition. Therefore, Lapitup contains facilities for reviewing and altering existing definitions as well as for adding new ones.

1.1. What is a word?

We are used to thinking of a "word" as a string of letters which is written with a space on either side of it. However, there are many cases in human languages where a sequence of "words" in this sense -- which we may call "orthographic words" -- needs to be entered in the dictionary as a single unit. This is because there are often cases where the meaning of the compound isn't derivable from the meanings of the orthographic words which make it up, and often the language treats these sequences as if they constituted a single unit. For example, **long** is an adjective, **island** is a common noun, and **long island** means an island which is long; there may be any number of such islands. **Long Island**, however, is a proper noun, the name of a particular place; like other proper nouns, you can't put "the" in front of it, and you have to spell it with a capital letter. Thus **Long Island** must have a distinct entry in the dictionary, even though we may already have entries for **long** and **island**. Because of cases like this, we must distinguish between "words" (in the usual sense of "orthographic words") and "lexical items", items which may consist of one or more words but which have a single distinct entry in the dictionary.

There is another case where the distinction between "word" and "lexical item" becomes useful: this is the case of "homonyms", where one word has more than one meaning. One example is **saw**, which can be either a noun, a verb meaning "cut with a saw", or the past tense form of the verb **see**. In this case, there are three lexical items corresponding to the word **saw**.

1.2. How To Use This Manual

This manual is intended primarily as a supplement to the online acquisition tool. Chapter 2 provides background information on the structure of the lexicon; it will be useful to anybody who wants to understand fully what is contained in a lexical item definition. Chapter 3 contains instructions for using the online acquisition tool, including some tips on making decisions about how to enter words. Chapter 4 gives detailed descriptions of the individual features; in most cases, the same information is available online.

Appendices contain the complete wordclass hierarchy, a listing of the "closed class" categories, and a glossary of linguistic terms used in the feature descriptions.

A beginning user should be familiar with this introduction, the contents of Chapter 3, and the introductory material at the beginning of Chapter 4; they may also want to make use of the glossary. References to feature and wordclass names used in the Janus lexicon are underlined. Descriptions of these terms are found in Chapter 4 rather than in the glossary; they may be located by using the index.

2. The Structure of the Lexicon

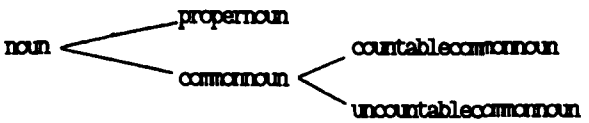
Like an ordinary dictionary, the lexicon can be thought of as a collection of entries, each of which contains pertinent information about one lexical item. In the Janus lexicon, however, the information contained is not so much concerned with what the word means as with what grammatical properties it has. This information falls into two distinct categories:

1. The *feature specification*, whose function is to relate the item to other items which have similar properties; this can be thought of as classifying information, and all the words which have a common feature can be thought of as a class of words or "wordclass". These classes have a hierarchical relationship with each other: for example, everything which is a plural noun is also a noun; everything which is an interrogative adverb is also an adverb. They also have relations of exclusion with each other: a noun can't be both proper and common. This kind of information--information about the relationships between classes of lexical items corresponding to features--is stored in the Master Lexicon's *wordclass hierarchy*.

2. The *lexical item specification*, which includes information specific to a particular lexical item. This includes cross-references to other items in the lexicon, semantic information, and bookkeeping information about the lexical entry. This kind of information is stored in the lexicon itself.

2.1. Wordclass Hierarchy

The wordclass hierarchy contains information about the relations of classes of words to each other. This information is represented by a "tree" structure. In the tree diagrams used in this manual, the "root" of the tree is on the left, while the "branches" divide towards the right. A wordclass includes all of the wordclasses to its right to which it is connected by a line; thus the wordclasses towards the left of the tree are more general and include more words, while those towards the right are more specific and include fewer words. Consider this example:



This diagram means that a noun can be either a proper noun or a common noun; a common noun can be either countable or uncountable. Furthermore, this hierarchy tells us that if a noun is in the class countablecommonnoun, then it is in the class commonnoun and also in the class noun.

The entire ML wordclass hierarchy is given in Appendix III.

Wordclasses can be divided into two types: *syntactic* classes and *inflectional* classes.

2.1.1. Syntactic Classes

Syntactic classes are classes which give the grammar information about the kinds of constructions a lexical item can enter into. For example, the information that a word is a countable common noun tells the grammar that the word can take the indefinite article "a". Some of the names of syntactic classes directly suggest the type of syntactic construction that a word can take; an example is the class objectpermittedverb, which is the class of verbs that can take direct objects. Other syntactic classes will appear to have a more direct connection with the meaning of a word; an example is the class ageadjective,

the class of adjectives which have to do with age. This is still a syntactic class, because adjectives that have to do with age must be in a certain order with respect to other classes of adjectives (you can say "the big old red house" but not "the red old big house").

2.1.2. Inflectional Classes

Inflectional information about a word has to do with what the *forms* of the word are. Nouns, verbs, and adjectives occur in different forms, marked by different endings on the word. Nouns can be in the singular or plural form (**configuration/configurations**); verbs can be in the stem, third person singular present, simple past, past participle, or present participle form (**sing/sings/sang/sung/singing**); and adjectives can be in the absolute, comparative, or superlative form (**noble/nobler/noblest**).[1]

There is only one lexical entry for all the different forms of a word: thus there will be an entry for **nice** but not for **nicer** or **nicest**. Since the grammar needs to recognize all the forms, however, it is necessary to specify how to produce the inflected forms. For "regular" words, this can be done simply by adding endings to the roots; however, what ending is appropriate depends on what the root is. In the case of **nice**, "-r" and "-st" are added to the basic form of the adjective; in the case of **sweet**, "-er" and "-est" are added to the basic form. So every noun, verb, and adjective belongs to a wordclass which specifies if it is irregular, and if not, *which* set of regular endings it takes.

In the case of words with irregular inflected forms, like **good**, **better**, and **best**, it is necessary to specify the inflected forms in the entry for the root. This is done by means of *properties* (Section 2.4.2).

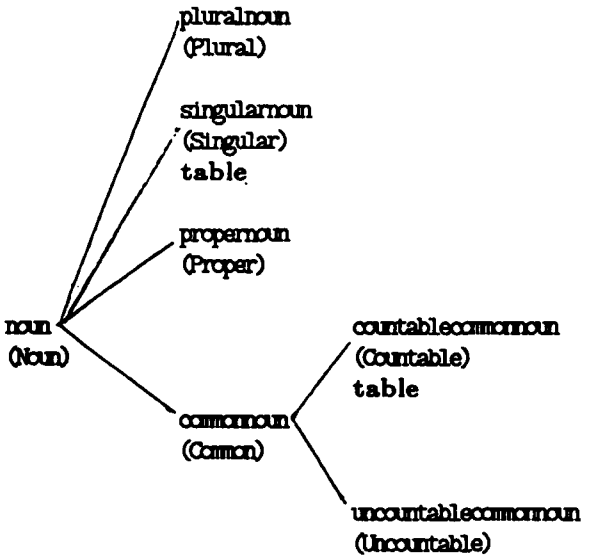
2.1.3. Wordclasses and Features

Every wordclass is associated with exactly one feature; however, the feature and the wordclass are distinct. (This distinction is signalled orthographically by capitalizing feature names and writing wordclass names in lower case: thus Noun is a feature, but noun is a wordclass). This is because some features are associated with more than one wordclass, that is, with more than one spot in the tree. For example, question words may be pronouns (**who, what**), adverbs (**when, where, why**), or determiners (**which**). All these words share the feature Interrogative, but there are three distinct wordclasses: interrogativepronoun, interrogativeadverb, and interrogativedeterminer.

The grammar of the Janus system, however, refers not to wordclasses, but to features. It collects the features which belong to a particular item by moving along the hierarchy towards the root from each of the wordclasses where the item is stored, adding the feature associated with each wordclass it encounters.

Consider the following (simplified) example, in which part of the wordclass structure associated with the noun "table" is illustrated. In this example the feature name associated with each wordclass is given under the wordclass name in parentheses, and the word "table" is shown at the appropriate locations in the hierarchy.

[1] This kind of information is sometimes also referred to as *morphological* information.



Using the method of feature accumulation, "table" will accumulate the features Countable, Common, Noun, and Singular; and this will be its feature specification in the lexicon.

2.1.4. Groups

Another kind of information about the relations of wordclasses is represented by "groups". If several wordclasses are in a group, it means that a given lexical item can't belong to more than one wordclass in the group. In the example above, propernoun and commonnoun are in a group; that means that a noun cannot be both proper and common.

There are two different kinds of groups, called *Group1* and *Group0*. If two or more features are in a Group1 relationship, a lexical item must have exactly one of the features. If two or more features are in a Group0 relationship, a lexical item may have either none of the features or one of them. The wordclasses propernoun and commonnoun are in a Group1: this means that every noun must be specified as either proper or common.

Group information is not referred to by the grammar; it is used primarily in the acquisition process. If the user has specified that a noun is common, for example, it is unnecessary to state that it is not proper; this follows from the fact that the two classes are in a group. Furthermore, the user *must* specify either proper or common; this follows from the fact that it is a Group1. Thus group information is used by the acquisition tool to determine what choices to present to the user.

2.1.5. Closed Classes

Wordclasses can be divided into two kinds, "open classes" and "closed classes". Closed classes are those which contain a small group of lexical items that behave differently from the other lexical items in the language; new lexical items which enter the language are not likely to belong to a closed class. Some examples of closed classes are the number lexical items in "ordinals" and "numeral determiners"; most kinds of prepositions, such as the "concessive prepositions" **despite, in spite of, notwithstanding, for**; many kinds of conjunctions, such as the "apposition conjuncts" **e.g.** and **i.e.**; pronouns; etc. Open classes include count nouns, transitive verbs, color adjectives, etc.

Since most of acquisition by the non-specialist user will be done on open class items, we do not provide documentation for the closed classes, and LapItUp has a special facility for adding items to closed classes. The classes we treat as closed are listed in Appendix I.

2.2. The Elements of a Lexical Item Definition

Besides membership in a wordclass (and the derived feature specification), a lexical item has associated with it the following information: a spelling (orthographic form); a word ID (unique identifier); if it has any properties, a list of property/value pairs; a semantic pointer or pointers which connect the entry to the relevant concepts in the knowledge base; and room for various kinds of supplementary information about the word for the purpose of easing maintenance and reacquisition.

2.3. Words and Word IDs

As we discussed in Section 1.1, there are many cases in English where more than one lexical entry is associated with a given spelling. The grammar requires a record of both the spelling (since that is what is input and output by the system) and a uniquely specifying name (in order to distinguish every lexical entry). This is accomplished by associating every lexical entry with both a spelling (the "word") and a unique identifier (the "word ID").

2.4. Properties

Properties are special features which specify what other lexical entries entries a particular entry is related to. They are different from ordinary features because they have one or more *values*, which are the names of other entries in the lexicon. Thus properties are used to cross-index lexical items. There are two kinds of relationships between entries which are cross-indexed *in this way in Janus*. One is the association between certain verbs and adjectives and the prepositions they frequently occur with; the other is the relationship between stem forms and irregularly inflected forms.

2.4.1. Caseprepositions

Certain verbs and adjectives are typically followed by certain prepositions, called "case prepositions", and the grammar needs to know what these are. The property Caseprepositions is used to provide this information. For example, a user entering the verb **swear** will have the opportunity to say that the verb has the case prepositions **to, off,** and **at**. These prepositions will be stored as the value of Caseprepositions as part of the definition of **swear**.

2.4.2. Inflection Properties

Every irregularly inflected stem form has properties indicating its irregular inflected forms. Thus, **good** has properties (Comparativeform **better**) and (Superlativeform **best**). (Morphological properties all end with "form", to distinguish them from inflection features.) These properties are automatically created when the user gives the acquisition device the inflected forms of a word; at the same time, the morphological feature is assigned. The most frequently assigned morphological properties are Pluralform, Pastparticipleform, Pastform, Comparativeform, and Superlativeform.

2.5. Semantic Pointers

The meaning of a lexical item is represented by a "semantic pointer", a name which corresponds to a particular node in Janus's knowledge base. A single lexical entry may have more than one semantic pointer, because a word may have different meanings which aren't reflected by grammatical differences (for example, the difference between a **bug** in a computer program and a **bug** which is an insect; they both are countable common nouns). Alternatively, the same semantic pointer may be associated with more than one lexical entry, in the case of synonyms (so **bug** and **insect** might have a semantic pointer in common); and furthermore, some words don't have a semantic pointer at all ("empty" grammatical words like **it**, **which**, **to**).

Semantic pointers are not acquired by the Lexicon acquisition tool, so they will not be discussed further here.

2.6. Supplementary Information

When adding to the lexicon and when altering existing definitions, it is convenient to have extra information available about each entry, such as who last edited it, what sense of the word they had in mind, and any other comments the user finds useful for record-keeping. There are three fields available to the user for this kind of annotation: the example sentence, the comment, and the edit record.

2.6.1. Example Sentence

This field is used to enter a sentence which will illustrate which sense of a word is represented by a particular lexical entry. It is described in more detail in Sections 3.2.4 and 3.6.1.

2.7. Comment

This (optional) field can be used any kind of comment the user wishes to insert. It is useful for indicating which entries are suspected to be in need of revision, which entries are temporary or experimental, or which entries are associated with a particular task. Currently comments must be added by using a text editor on the lexicon file.

2.7.1. Edit Record

The Edit Record field is automatically be created or updated whenever a new entry is added or an old one edited. It contains the name of the user who creates or alters the entry and the time and date of the alteration.

3. How to Use Lapitup

3.1. Invoking Lapitup

The two ways of invoking Lapitup are described below. Be sure to check with your system administrator as to how to invoke Lapitup at your site.

1. **Normal Mode** allows you to acquire *open class* words. This is the normal way in which Lapitup should be used. Invoke it by typing **(lapitup:lapitup)** at a Lisp Listener window. The difference between *open class* and *closed class* words is discussed in Section 2.1.5.

2. **Expert Mode** allows you to acquire *closed class* words. This should only be used by *wizards*. Invoke it by typing **(lapitup:lapitup T)** at a Lisp Listener window.

After Lapitup is invoked you have a choice of four options which are described below.

1. **Acquire Lexical Items** allows you to acquire lexical items and add them to a lexicon.

2. **Validate Lexicon and Wordclass** allows error checking to be performed on a previously acquired lexicon.

3. **Convert Wordclass Hierarchy** converts a wordclass hierarchy to Interlisp format. This option used by folks at USC ISI who need lexicons in an Interlisp format.

4. **Exit** exits Lapitup without doing anything.

The above choices are described in detail below.

3.2. Acquire Lexical Items

3.2.1. Selecting the Wordclass Hierarchy

After **Acquire Lexical Items** is chosen, the first screen that appears allows you to choose a wordclass hierarchy which will guide Lapitup in acquiring a lexicon. To enter the name of a wordclass hierarchy, type the wordclass hierarchy name after the prompt **Word Class Hierarchy Name:**. The wordclass hierarchy name is also actually a file name.

After you enter the wordclass hierarchy name, Lapitup will load that hierarchy. If you specify a non-existent wordclass hierarchy, you will be reprompted for an existing word class hierarchy name. You may also specify a full or partial pathname for the wordclass hierarchy, e.g., "DINNER; >pineapple >upside-down>cake.wordclass.23", as described in the next section on lexicons. The file type for all wordclass hierarchies is "wordclass". Your system administrator will explain what pathnames are appropriate at your site.

3.2.2. Selecting the Lexicon

After you select the wordclass hierarchy, Lapitup will prompt you for the name of the lexicon to which you wish to add words. To enter the name of a lexicon, type the name after the **Lexicon Name:** prompt and hit the **return** key. The name of a lexicon is actually a file name.

If you choose an already existing lexicon, Lapitup will ask you to confirm that it's OK to use the existing lexicon. Type **yes** to use the existing lexicon or **no** to not use the existing lexicon. If you type **no**, you will be prompted again for the lexicon name.

After confirming, Lapitup will "read in" the lexicon. This lexicon becomes the *current lexicon* and will contain all the items that were added to it at some previous time.

If you choose a lexicon that does not exist, Lapitup will ask you to confirm that it's OK to create a new lexicon with the name you have just entered. Type **yes** to create a new lexicon or **no** to prevent creation. If you type **no**, you will be prompted again for the lexicon name.

After confirming, Lapitup will create the new lexicon and it will become the *current lexicon*.

All lexical items that are to be added, edited or deleted will be added to, edited in, or deleted from the *current lexicon* until you tell Lapitup otherwise. You tell Lapitup that you are finished with the *current lexicon* by either exiting Lapitup (click left on **Exit Lapitup**) or choosing a new lexicon (click left on **Switch Lexicon**).

When you are finshed using the *current lexicon*, it will be "written out". Each time a lexicon is "written out" a new version of the file (lexicon) is created.

If for some reason you need to refer to an old version of a lexicon file you may use a version number. For example, when you refer to the lexicon "example", you are actually referring to a version of the lexicon described by the partial pathname "example.lexicon.newest". The first version of the lexicon would be described by "example.lexicon.1". If you wish to refer to a lexicon in a directory different from the default directory established by your system administrator, you may give a full pathname, e.g., "BREAKFAST:>pease>porridge>hot.lexicon.3". The file type for all lexicons is "lexicon". Referring to lexicons only by name without the extension ".lexicon" and version number will insure that you will get the correct (newest) version of the lexicon. To see the current contents of a lexicon file, you may view or print the file in the same way as other text files.

3.2.3. Main Menu

After you select the lexicon the *main menu* will appear at the top of the screen. There are four choices that you can make:

1. **Get Lexical Item** allows you to acquire, edit, or delete a lexical item.

2. **Exit Lapitup** exits the Lapitup program.

3. **Switch Lexicon** allows you to choose a different lexicon.

4. **Switch Wordclass Hierarchy** allows you to choose a different wordclass hierarchy.

3.2.4. Acquire Lexical Item ID, Spelling, and Sample Sentence

After you select the **Get Lexical Item** menu item, the procedure for acquiring an individual lexical item begins.

1. **Enter unique identifier for lexical item.** Enter a string that contains only letters, numerals, and hyphens; no spaces or other punctuation marks are allowed, and case is not

distinguished. Each lexical item will have a unique identifier called the *lexical item identifier* or *id*. No other lexical item in the *current lexicon* may have this same *id*. For example, "pizza" might have an *id* of *pizza*; the lexical item "run" as in "run to the store" might have an *id* of *run*; the lexical item "run" as in "run for president" might have the *id* of *run-politics*; the lexical item "run" as "the run in the stocking" might have an *id* of *run-noun-3*. The lexical item *id* should reflect the sense of the current lexical item if the same spelling has many senses.

2. **Popup menus after entering lexical item id:**

   a. **The lexical item does not exist in the lexicon.** After you enter the lexical item *id*, Lapitup checks to see if another lexical item has the same *id*. If the item does not exist you are given four choices:

      i. **Acquire** allows you to acquire a lexical item with the *id* you have entered. This is the usual choice.

      ii. **Acquire As** allows you to acquire a lexical item with the features of a previously entered lexical item. For example, if you want to enter 100 countable common nouns, you can enter just one, choose its features, and save it. Then for each additional common noun you enter its *id*, spelling, and sample sentence yourself and the features are added automatically. If all the features are not quite correct you can then edit the feature list, as explained in the next section. (In the case of nouns, verbs, and adjectives you will usually have to adjust the inflection feature for each lexical item even if all the syntactic features are identical to a previously acquired item.)

      iii. **Misspelled** is used if you misspelled the *id*. It reprompts you for the *id*.

      iv. **Main Menu** returns you to the main menu.

   b. **The lexical item already exists in the *current lexicon*.** Another lexical item already exists with the same *id* in the *current lexicon*. You are given four choices:

   c.

      i. **Edit** allows you to change the features already entered for this lexical item.

      ii. **Delete** allows you to delete this item from the *current lexicon*.

      iii. **Misspelled** is used if you misspelled the *id*. It reprompts you for the *id*.

      iv. **Main Menu** returns you to the main menu.

3. **Enter spelling for lexical item.** Enter the orthographic spelling for the lexical item. Spaces, hyphens, and punctuation are allowed. The orthographic spelling may contain several words separated by spaces, but the *id* must be a single string: if you are entering the item spelled "look over", "look-over" would be a good choice for the *id*. If the spelling contains only one word it has *unitary spelling*; if the spelling contains more than one word it has *compound spelling*. Other examples of spellings: "find out", "tree", "tic-tac-toe", "and or", "e.g.". Lapitup will inform you if you enter a lexical item with the same spelling as other lexical items in the *current lexicon* by displaying the other lexical items with the same spelling. Then you will be prompted by a menu with three choices:

   a. **Continue** The spelling is OK, continue acquiring this lexical item.

b. **Misspelled** The lexical item's spelling is incorrect, you will be reprompted for the correct spelling.

c. **Main Menu** Stop acquiring this lexical item and go back to the main menu.

4. **Enter a sentence using the lexical item you just entered.** The sentence should capture the sense of the lexical item that you are entering. For example, to capture the noun sense of "bear" (referring to an animal), the sample sentence might be "The bear ate the berries". To capture the verb sense of "bear" (meaning "carry"), the sample sentence might be "The child bore the berries to her mother". The sample sentence should be chosen carefully, especially with lexical items that have many different senses. (For more discussion of this point, see Section 3.6.1 below.)

3.2.5. Feature Selection and Editing

Once you have chosen **Acquire** or **Acquire As**, you are ready to start adding or editing features.

3.2.5.1. Selection

At this point a set of features and feature descriptions will be displayed in the large window which occupies most of the screen. Move the mouse cursor over the different feature descriptions. As you move the mouse, the feature description that the cursor is over will be outlined in a rectangular box. To choose a particular feature, click left when that feature is outlined by the rectangular box. As you make a choice you will notice that the choice is placed in the **History of Features Chosen** window on the right side of the screen. After you choose one feature, another set of features will be put up on the screen for you to choose from. Keep choosing features until no more choices can be made (the screen is empty). If the features look OK in the **History of Features Chosen** window and the properties look OK in the **Properties** window, click left on **Save Lexical Item** at *the top of* the screen. This will save the lexical item that you just entered.

Sometimes, instead of choosing a feature by clicking left *you* will be asked to answer questions by typing from the keyboard. You will know this when you see a solid black blinking cursor. Type the answer to the question and and hit the **return** key. Some questions will require a yes or no answer and other questions will require other values. Questions are asked when Lapitup is acquiring morphology and other features which have properties.

You may save the lexical item even if you have not finshed choosing all the features. The lexical item will be saved with its partially chosen set of features. When that lexical item is chosen again you will be able to continue where you left off.

If at any time you want to forget about the lexical item you are entering and start over completely, click left on **Forget Lexical Item**.

If you want to change the sample sentence, click left on **New Sentence**. Type the sentence after the prompt **Sample Sentence** and then hit the **return** key.

3.2.5.2. Editing

At any time you may change any of the features you have entered by clicking left over the feature to be deleted in the **History of Features Chosen** window. The feature to be changed and all other features which are dependent on the choice of that feature will be deleted. The dependent features are located

below and to the right of the chosen feature in the **History of Features Chosen** window. If this window fills up, it can be scrolled by moving the mouse cursor to the left edge of the window (it will become a double headed vertical arrow) and clicking left to scroll down or clicking right to scroll up. The instructions for scrolling are located in the black *mouse line* area at the bottom of the screen right above the date and time. When doing an **"Acquire As"**, you will occasionally find that all the features are off the top of the window; don't panic, they're there, you just have to scroll them down.

3.2.6. Status File

After you are done using Lapitup, you should check the *status file* that Lapitup generates. The *status file* contains warning messages about possible errors that Lapitup has found in the lexical items that you have just acquired or in the lexical items you have just validated. The status file is named after the user who was logged in when Lapitup was run. If the user logged in was "lothar" the *status file* will be named "lothar.status". The logical pathname of the directory where the *status file* is located is "lapitup: lapitup-status-pathname-default:". Your system administrator will explain how you should access this directory.

3.3. Validate Lexicon and Wordclass

Before you use a lexicon, it should be validated using this procedure. The validation procedure tests each lexical item against a wordclass hierarchy. Many checks are performed, such as making sure that a lexical item was completly acquired, and checking for features in a lexical item that are not in the wordclass. You are first prompted for a **Wordclass Hierarchy Name:** and then for a **Lexicon Name:**. See Section 3.2.1 and Section 3.2.2 for instructions on how to enter *wordclasses* and *lexicons* respectively. After running **Validate Lexicon And Wordclass**, look in the status file for the list of errors. The status file is described in Section 3.2.6.

3.4. Convert Wordclass Hierarchy

Creates a special format of wordclass files used by Interlisp machines. Not used except at USC ISI.

3.5. Exit

Exits Lapitup without doing anything.

3.6. Some Advice on Using LapItUp

Sometimes it can be difficult to decide what to treat as distinct lexical items. In general, all words should be entered in their root forms, that is, the stem form for verbs, the singular form for nouns, and the absolutive (or "positive") form for adjectives. Enter "eclipse" rather than "eclipses", "go" rather than "went", "slimy" rather than "slimiest".[2] LapItUp will take care of providing the correct inflected forms.

There may be special problems with deciding which orthographic words should have more than one lexical entry, and which words should be entered as compounds together with other words. There are no hard-and-fast rules for making these decisions, but there are some relevant considerations:

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[2] See section 4.1 if you have trouble identifying the roots.

3.6.1. "Homonyms" and Multiple Uses

Two lexical items are *homonyms* if they are spelled the same way but have different meanings. Most English words can be used in many different ways, but some of the ways may not be relevant to your needs. For example, proper nouns can't normally be pluralized: normally one says "Bob" but not "Bobs". However, when there is more than one individual of the same name, one may want to use the plural to ask questions such as "How many Bobs (i.e., persons with the first name of Bob) are there in the company?" If you think that you will ever have a use for this form, then you might want to allow **Bob** to have a plural form; otherwise, leave it out. Remember, you can always add it later if it becomes important.

Sometimes you may feel that the questions being asked by the acquisition component are forcing you to make choices you don't want to make -- i.e., your lexical item can be used in two different ways, and you are forced to choose one. This might happen, for example, if you were entering the word "fish", and you had decided that you wanted to be able to use it either as a noun ("I like fish") or as a verb ("I like to fish"). The first feature question, however, asks you to decide whether your word is a noun, verb, adjective, adverb, or interjection. (You can only choose one, since these features form a "group".) This means that you will have to have two different entries for "fish" with distinct IDs -- e.g. "fish-noun" and "fish-verb".

This kind of situation gets a little more tricky when both senses of your lexical item have the same part of speech. For example, **suggest** can refer either to a speech act ("I suggested that he leave") or a state of affairs in which one circumstance brings to mind another circumstance ("the clouds suggested that it was going to rain"). The first use of **suggest** belongs to the wordclass "symbolicverb", since it refers to a verbal action, while the second use belongs to the wordclass "relationalverb", since it refers to the relationship between two things. Thus, there should be two lexical entries for **suggest**, one with each of these wordclasses.

Some of your other choices will also depend on whether the verb you have in mind is **suggest-symbolic** or **suggest-relational**. Both uses can take complement clauses beginning with "that", as illustrated in the examples above; however, **suggest-symbolic** prefers a subjunctive complement (you can't say "I suggested that he leaves"), so it should have the feature Subjunctiverequired, while **suggest-relational** shouldn't (you can't say "the clouds suggested that it rain"). Similarly, **suggest-symbolic** doesn't passivize (you can't say "that he leave was suggested by me"), so it shouldn't have the feature Passive, while **suggest-relational** should (you can say "that it was going to rain was suggested by the clouds").

In tricky cases like this, the "example sentence" can help you keep in mind the particular sense of the lexical item you are entering. When you type in an example sentence, it will remain on the screen as you complete your entry. Refer to it as you make decisions about feature assignment. This sentence will form part of the lexical item definition, so you will know later what sense of the lexical item you had in mind when you entered the definition.

If you want to use the lexical item in other types of sentences which would involve different feature choices, you can then simply define separate lexical items for each distinct feature set.

3.6.2. Multiple-Word Entries

Sometimes groups of words have special meanings and grammatical properties which can't be predicted from the meanings and grammatical properties of the words used separately. When this happens, the words should be entered into the lexicon as a single entry. However, it is often difficult to decide when to do this. Here are some examples of the most important kinds of cases in which multiple words should be entered as single items:

Verb/particle compounds[3]	**look up** **turn over** **find out** **sit around** **stick together**
Proper nouns	**Puerto Rico** **White House** **Air Force** **Long Island**
Interjections	**never mind** **so what** **big deal**
Compound modifiers (often may be spelled with hyphens)	**man machine** **light weight** **broad band** **surface to air** **year to date**
Noun/noun compounds (often may be spelled with hyphens)	**life cycle** **leap year** **vacuum cleaner** **ice cream cone**
Foreign expressions	**curriculum vitae** **habeas corpus** **vice versa** **post hoc**

3.6.3. Answering LapItUp's Questions

In general, if you don't understand a question or you aren't sure whether a particualar feature applies to your lexical item or not, it's better to pick the NOT- or NONE-OF- option so that the feature is not assigned. If there is no NOT- or NONE-OF option at the current question, go back to the last choice that had this option by buttoning the history list, and change your answer to NOT- or NONE-OF-.

[3]See the description of Immovableparticles and Caseprepositions (Sections 4.2.2.1 and 4.2.2.2) for some suggestions on how to distinguish these from a verb followed by a preposition.

4. The Features

This section contains an explanation of every open-class feature, together with several examples. For the most part, the text of these descriptions is the same as the text that appears on the screen accompanying each feature when you use LapItUp; however, in a few cases, the description given here is more complete, due to space limitations on the screen.

As in LapItUp, the examples given here are to be interpreted as sentence frames: to interpret them, you should try to substitute your word for the boldface word in the example, substituting other words as necessary to get a sentence that makes sense, and decide whether the result is grammatical or not. If the lexical item can occur in the frame, it should receive the feature; if it can't, it shouldn't. In each example, the lexical item that is being fit into the frame is in **boldface**[4] and the important features of the frame are in *italics* and ***bold italics***. Some of the examples are marked with an asterisk (*); this means that the marked sentence is ungrammatical, that is, if you fit a lexical item which has feature X into a frame of the indicated type, the result should not be a normal sentence of English. Similarly, a question mark (?) at the beginning of a sentence indicates that it is odd in some way, although it may not be entirely ungrammatical.

Each feature description is headed by a descriptive name, the feature name (capitalized), and the wordclass name (lowercase).

4.1. Morphological Features

These features are acquired during the initial phase of acquisition. Rather than asking about them directly, the program "guesses" what the inflected forms of words are; if the guesses are incorrect, it solicits the correct forms from the user, and assigns features based on the answers. This section contains explanations of the features that are assigned by this process.

4.1.1. Noun Morphology

4.1.1.1. Singular / Plural

Pluralform, nounpluralform

Most nouns have singular and plural forms. A singular noun can be the subject of the verb **is**; a plural noun can be the subject of the verb **are**.

SINGULAR	PLURAL
The **aquarium** *is* leaking	The **aquaria** *are* leaking
The **sand** *is* hot	The **sands** *are* hot
A **goose** *is* in your yard	Some **geese** *are* in your yard
That **configuration** *is* surprising	Those **configurations** *are* surprising
The **deer** *is* frightened	The **deer** *are* frightened

[4] In the on-line text, these items are in square brackets.

4.1.1.2. No inflections

Noinflections, noinflectionsnoun

Some nouns can't be plural. These are some nouns that don't have plurals:

Bob *is* in the next room	***Bob/Bobs** *are* in the next room
Linguistics *is* fun	***Linguistics** *are* fun
R&D *is* where the money is going	***R&D/R&Ds** *are* where the money is going
The **United States** *is* in North America	*The **United States** *are* in North America

4.1.1.3. Inflection features

S, Es, Irr,; snoun, esnoun, irrnoun

If a noun does have a plural form, it is necessary to specify what it is. The features available are S, Es, and Irr. S is the feature for nouns which form their plural by adding "-s", and Es is the feature for nouns that form their plural by adding "-es". Words (such as **city/cities**) which end in "y" and change the "y" to "i" before adding "-es" simply have the feature Es. In the case of irregular nouns, it is necessary to specify a separate entry for the plural form. A noun is considered irregular if it doesn't have a plural in -s or -es.

Ending	Stem	Plural
S	configuration	configurations
Es	ranch	ranches
	soliloquy	soliloquies
Irr	child	children
	woman	women
	phenomenon	phenomena
	deer	deer
	goose	geese

4.1.2. Verb Morphology

Verbs have five inflected forms: the *stem* form, the *third person singular* form, the *past* form, the *past participle* form and the *present participle* form. Several "regular" sets of endings are used to form these inflections.

4.1.2.1. Stem

The stem is the form which is used after "to" in the infinitive form of the verb, after modal auxiliaries, and in a few other contexts; it is also the form used in the simple present tense of regular verbs when the subject is "I", "you", "we", or a plural noun phrase.

I intend to **come** to the party
We **go** to the park on Sundays
You usually **arise** at eight
They **worry** about inflation all the time
She shall always **hope**
He sure can **sing**

4.1.2.2. Third Singular

Thirdsingular

The third person singular present form is used in the present tense when the subject of the verb is "he", "she", "it", or a singular noun phrase which isn't a pronoun.

The good weather **comes** and **goes**
She usually **arises** at eight
He **worries** about inflation all the time
Martha **hopes** that the steak won't be overcooked
The canary **sings** beautifully

4.1.2.3. Past

Pastform

The past form is used to refer to events in the past.

I **went** to the park last Sunday
The professor **came** to every party
You **arose** at eight this morning
She **worried** about inflation all day
We **hoped** that our steaks would be rare
They **sang** Auld Lang Syne

4.1.2.4. Past Participle

Edparticipleform

The past participle form occurs after the auxiliary "have", after the passive voice auxiliary "be", and in various other contexts.

I have **gone** to that park, and I wasn't impressed
They have **come** here before
You will have **arisen** by eight
She has **worried** about inflation all her life
We have **hoped** for a rare steak, but have continually been disappointed
The songs have all been **sung**

4.1.2.5. Present participle

Ingparticipleform

The present participle form occurs after the progressive auxiliary "be", and in various other contexts.

I am **hoping** for a rare steak
They are **coming** to the party
We have been **going** to the park every Sunday
You might have been **worrying** about inflation
She is **arising** right now

4.1.2.6. No inflections

Noinflections, noinflectionsverb

The only verbs which should have this feature are the ones which are compounds formed by a verb and a particle or an immovable particle (see Section 4.2.2.1). In these cases, since the first member of the compound (the verb) must have its own entry in the lexicon and thus will already have inflection features, it is unnecessary to specify features for the compound.

Bob couldn't **account for** the discrepancy
We've got to **stick together**
The robot **turned over** the box
Sally **looked up** the number

4.1.2.7. Inflection Features

S-d Es-ed S-ed S-*ed S-irr Es-irr *-Irr Irr:
s-dverb es-edverb s-edverb s-*edverb s-irrverb es-irrverb *-irrverb irrverb

Verbs can have the following inflection features: S-d, Es-ed, S-ed, S-*ed, S-irr, Es-irr, *-Irr, or simply Irr. Each of these feature names represents a pair. The first member (s or es) represents the ending added to the third person singular present verb form. The second member represents the ending added to the simple past and past participle form. (The present participle ending is always the same.)
The Es-ed feature applies both to verbs like **tax/taxes/taxed/taxed/taxing**, which simply add the ending, and to verbs like **apply/applies/applied/applied/applying**, which end in a consonant plus "y"; with these verbs, the "y" is changed to "i" before some endings are added.

The S-*ed feature is used for verbs which double the final consonant before adding the -ed and -ing endings: these are verbs like **dip/dips/dipped/dipped/dipping**. *-Irr is used for verbs which double the final consonant before -ing, and have irregular past and past participle endings: these are verbs like **hit/hits/hit/hit/hitting**.

The features whose second member is irr are regular in the third person singular but have irregular past and past participle forms. Irr alone is for verbs which don't have a third person singular form in "-s" or in "-es".

Examples of all these features follow.

Feature	Stem	3 singular	Past	Past part.	Present part.
S-d	create	create**s**	create**d**	create**d**	creat**ing**
Es-ed	flash	flash**es**	flash**ed**	flash**ed**	flash**ing**
	reply	repl**ies**	repl**ied**	repl**ied**	reply**ing**
S-ed	mint	mint**s**	mint**ed**	mint**ed**	mint**ing**
S-*ed	stop	stop**s**	stop**ped**	stop**ped**	stop**ping**
S-irr	rise	rise**s**	**rose**	**risen**	ris**ing**
	think	think**s**	**thought**	**thought**	think**ing**
Es-irr	catch	catch**es**	**caught**	**caught**	catch**ing**
	fly	fl**ies**	**flew**	**flown**	fly**ing**
*-Irr	run	run**s**	**ran**	**run**	run**ning**

4.1.3. Adjective Morphology

Most adjectives come in three forms: absolutive, comparative, and superlative. The absolutive form (sometimes called the "positive" form) is the stem, and the comparative and superlative forms are made either by adding endings, or by preceding the adjective with "more" and "most".

4.1.3.1. Absolutive / Comparative / Superlative

Absolutive, absolutiveadjective;
Comparative, comparativeadjective;
Superlative, superlativeadjective

A noun modified by the absolutive form of an adjective has the property expressed by the adjective. A noun modified by the comparative form has the property to a greater extent than some other thing. A noun modified by the superlative form has the property to the greatest extent relative to some set of things. The use of these forms is exemplified below:

Jill is **tall**
Jill is **taller** than Jack
Jill is the **tallest** person in her family

Jack is **dynamic**
Jack is **more dynamic** than Jill
Jack is the **most dynamic** person I know

Today is **hot**
Today is **hotter** than yesterday
Today is the **hottest** day we've had this month

4.1.3.2. No inflections

Noinflections, noinflectionsadjective

The adjectives in this class don't have comparative or superlative uses.

I live in the **northernmost** house	*My house is **more northernmost** than yours
	*I live in the **most northernmost** house
The balcony is **wrought** iron	*This iron is **wroughter** than that iron
	*That's the **most wrought** iron I've ever seen
Come meet our new **divisional** head	*He's **more divisional** than the last one was

4.1.3.3. Inflection Features

R-st, Er-est, *Er-*est, Irr;
r-stadjective, er-estadjective, *er-*estadjective, irradjective

If an adjective does have a comparative and a superlative, it is necessary to specify how they are formed. An adjective may be compared either by using More-most, or by adding an ending. The possible ending features are R-st, Er-est, *Er-*est, and Irr. The first member of each pair is the comparative ending, and the second member is the superlative ending. Er-est should be assigned to adjectives which have a final y which becomes i when inflected, like **happy/happier/happiest**. *Er-*est means that the final consonant of the adjective stem is doubled before the ending is added. Irr is a closed class which includes **good/better/best, bad/worse/worst, far/farther/farthest**, and **little/less/least**.

Ending	Stem	Comparative	Superlative
More-most	dynamic	**more** dynamic	**most** dynamic
R-st	noble	nobl**er**	nobl**est**
Er-est	shallow	shallow**er**	shallow**est**
	pretty	pretti**er**	pretti**est**
*Er-*est	wet	wet**ter**	wet**test**

4.2. Syntactic Features

There are only five open classes at the top level of the wordclass hierarchy: noun, verb, adjective, adverb, and interjection. The closed classes which exist at this level are: preposition, pronoun, determiner (articles, numbers, quantifiers such as "some", "many", "all"), linker (words such as "and", "but", "however"), the ordinal numbers, and the genitive particle "'s".

4.2.1. Noun

Noun, noun

Nouns are names of conscious beings and non-conscious things: physical objects, substances, institutions, and abstractions. They are recognizable in that they can usually occur in both singular and plural form:

The **duck** is on the lake The **ducks** are on the lake

They can usually be modified by determiners (words like "the", "a", "some"), adjectives (words like "big", "green", "Albanian"), and relative clauses (modifying clauses beginning with "which", "who", "that", etc.):

The big green **frog** is on the lily pad
The **frog** *which was on the lily pad* just jumped away
Some **frogs** don't know a good lily pad when they see one

They can function as the subject or object of a verb or as the object of a preposition:

Ducks *eat* **frogs**
I need to talk *with* **Bill**

4.2.1.1. Proper

Proper, propernoun

Proper nouns are names of specific, individual things, usually spelled with a capital letter. Usually it sounds funny if you modify a proper noun with a word like "a", or an adjective used to distinguish this particular entity from other similar ones. You can say "How is my adorable Joey?", but it means "Joey (who happens to be adorable)", not "Adorable Joey (as opposed to some repulsive Joeys)". Some examples:

Bob	?a healthy **Bob**
the **United States**	?Some big **United States**
ARPA	?an **ARPA**
New Jersey	?a strange **New Jersey**
the Renaissance	?a wonderful **Renaissance**

If your lexical item is capitalized but you can modify it freely with articles and adjectives, you're probably dealing with a sense of the item which isn't a proper noun. Remember, not everything that is capitalized is a proper noun. Some non-nouns derived from proper nouns, such as **Albanian**, **Americanize**, etc., are capitalized even though they're not nouns at all. And some common nouns derived from proper nouns are capitalized: **Ajax** is a proper noun when it refers to a Greek hero or when it refers to a company, but it is a common noun in the following sentence: "Harry, you spilled the Ajax all over the floor".

4.2.1.2. Period

Period, periodnoun

Some proper nouns are names of time periods. They can be used to classify other nouns as being associated with or representative of a particular period.

a **Sixties** child
your **Wednesday** appointment
those vicious **January** storms
beautiful **Baroque** music

4.2.1.3. Provenance noun

Provenance, provenancenoun

Some proper nouns which are names of places can modify another noun to express where it comes from.

the new **Pentagon** policy
the latest **Cote d'Azur** swimsuit fashions
exotic **Southern California** leisure activities

4.2.1.4. Determiner required

Determinerrequired, determinerrequired

Some proper nouns must be preceded by the word "the" when they don't modify another noun. (In these cases, the feature Determinerrequired should simply be assigned to the proper noun itself without "the". Thus e.g. "the Hague" shouldn't be entered as a compound.)

My parents live in the **Hague**	*My parents live in **Hague**
The **White House** is exquisitely decorated	***White House** is exquisitely decorated
I love to visit the **Bronx**	*I love to visit **Bronx**
The **Renaissance** was Italy's flowering	***Renaissance** was Italy's flowering
We should learn from the **French Revolution**	*We should learn from **French Revolution**

4.2.1.5. Common

Common, commonnoun

A common noun can refer to any of a class of similar things. Unlike proper nouns, common nouns most commonly occur with a determiner (like "the" or "a") and can be freely modified with adjectives, etc. Some examples of common nouns:

a beautiful **country**
the most difficult **period**
every sunny **day**
Margaret's new **aquarium**
a fascinating **configuration**
all this glorious **sand**

4.2.1.6. Countable

Countable, countablecommonnoun

Some nouns (often called "count nouns" in traditional grammar) refer to distinguishable, discrete individuals. These nouns can be singular or plural equally easily; they can be preceded by "a", numbers, and words like "several".

I just bought *a* **table**
I just bought *some* **tables**
I just bought *three* **tables**
I just bought *several* **tables**

4.2.1.7. "That"-complement

Thatcomp, thatcompnoun

Some nouns can be followed by a complete sentence with a finite verb introduced by the word "that".

The **idea *that*** *he is on his way here* terrifies me
You'll just have to accept the **fact *that*** *you're ugly*
Did you hear Sandy's **claim *that*** *she's the Lost Dauphin?*
Ignore the **rumors *that*** *the boss is a failed movie star*

These complements should be distinguished from relative clauses, which may also follow nouns and be preceded by "that". In a relative clause, the "that" may be replaced by "which", "who", or "whom" (and usually the clause itself is incomplete in some way). The following are examples of relative clauses, not that-complements:

The **person *that/whom*** *I saw yesterday* is here
I don't like the **idea *that/which*** *he suggested*
Ignore the **rumors *that/which*** *have been going around*

4.2.1.8. Uncountable

Uncountable, uncountablecommonnoun

Some nouns (often called "mass nouns" in traditional grammar) refer to things which are treated as a mass. While these nouns can sometimes be made plural or preceded by a number, doing this often changes the meaning of the word. For example, "three snows" means something like "three occasions on which snow has fallen", or possibly "three different types of snow". Uncountable nouns rarely occur in the plural and are usually preceded by nothing or by words like "much" or "a lot of".

I like **snow**
*I like **snows**
I don't like too *much* **snow**
There's usually *a lot of* **snow** in February

4.2.1.9. Material

Material, materialnoun

Material nouns are the names of materials; they are frequently used as a modifier of another noun to express what it's made of.

Joey wanted a a **chocolate** *rabbit*	It was made of **chocolate**
Sandy prefers **silk** *scarves*	They're made of **silk**
My true love gave me five **gold** *rings*	They were made of **gold**

4.2.1.10. Process Nominalization (Property)

Nominalization, nominalization

Some nouns are formed from verbs and refer to the process expressed by the verb. These nouns can generally be paraphrased by "act of <verb>ing".

Bob's **refusal** to comply got him into trouble
Bob's *act of refusing* to comply got him into trouble

The acrobat's **gyrations** amused everybody
The acrobat's *acts of gyrating* amused everybody

The **abolishment** of slavery was a great step forward
The *act of abolishing* slavery was a great step forward

In the above examples, the noun is related to the verb by the addition of an ending. However, there are some cases of nominalization where the two words aren't similar.

Bill's **idea** that he was invited was mistaken
Bill's *act of thinking* that he was invited was mistaken

I was surprised by his **race** to the finish
I was surprised by his *act of running* to the finish

He was saved only by his rapid **flight**
He was saved only by his rapid *act of fleeing*

4.2.2. Verb

Verb, verb

Verbs are names of processes. They are recognizable in that they can be inflected for tense: the form of a present tense verb changes depending on the subject (if the subject is third person singular, an ending is added; otherwise, the stem form is used); and they form participles.

She **wants** her dinner	They **want** their dinners
We **wanted** our dinner	We will **want** our dinner
We have always **wanted** our dinner	When will you be **wanting** dinner?

4.2.2.1. Particles / Immovable particles (Property)

Particles, particles; Immovableparticles, immovableparticles

Some verbs combine with words called "particles", prepositions or adverbs like **for, on, up, back, off**, or **away**, which combine with the verb to give it a special meaning. The verb-particle combination usually means something more than the meaning of the two words taken separately:

Verb-particle compound	Meaning
look up	find in a reference work
look over	examine
turn over	invert
sniff out	discover
account for	explain
ask for	request
back out	retreat

Verb-particle compounds with movable particles are different from those with immovable particles in that movable particles can appear either directly following the verb or directly following the direct object. Obviously, a verb-particle compound can fit this pattern only if it takes a direct object; verb-particle compounds which don't take a direct object are Immovableparticles.
Movable particles:

Sally **looked up** the number	Sally **looked** the number **up**
The chairman **looked over** the candidate	The chairman **looked** the candidate **over**
The robot **turned over** the box	The robot **turned** the box **over**
Your job is to **sniff out** the criminals	Did you **sniff** them **out**?

Immovable particles:

I love to just **sit around**	
We've got to **stick together**	
You can't **back out** now!	
Hezekiah **asked for** two months off	*Hezekiah **asked** two months off **for**
Bob couldn't **account for** the discrepancy	*Bob couldn't **account** the discrepancy **for**

Transitive verbs with immovable particles can be distinguished from intransitive verbs with case prepositions in that it is possible to passivize verb-immovable particle compounds without separating the verb and the preposition. Thus, the following must be verb-particle compounds and not verbs with case prepositions:

Don't **tread on** the banana peel	It's been **trodden on** already
Go ahead, **stare at** me	I like to be **stared at**
She **sheared off** the fleece	When the wool had been **sheared off**, she spun it.

4.2.2.2. Case prepositions (Property)

Caseprepositions, verbcaseprepositions

Some verbs are typically followed by prepositional phrases with particular prepositions.

Peter **built** a model of Chartres entirely *out of* toothpicks
The project members **channelled** their energies *into* ordering dinner
Tom was happily **spraying** the wall *with* paint
The spider relentlessly **moved in** *on* its helpless victim
The arrival of reinforcements **liberated** the hero *from* his tormentor

An intransitive verb which has case prepositions can be distinguished from a transitive verb immovable particle compound in that you can't move the object of the case preposition to the front of the sentence by passivizing it.

She **stuck** *by* me	*I was **stuck** *by* (by her)
The dancers **spread** *over* the stage	*The stage was **spread** *over* (by the dancers)
He never **shrank** *from* danger	*Danger was never **shrunk** *from* (by him)

Since Caseprepositions is a property, it must have a value. The value of Caseprepositions is the preposition which the verb typically takes.

4.2.2.3. Object permitted

Objectpermitted, objectpermittedverb

Some verbs can take a direct object. "The bug" is a direct object in all of the following sentences:

The cat **saw** *the bug*
We **instructed** *the bug* to depart
The spider **wrapped** *the bug* **up**
Mary **presented** *the bug* to her teacher
The teacher **gave** me *the bug*
I couldn't **account for** *the bug*

If your verb *can* take a direct object, it belongs in this class, even if it *doesn't always* take one.

4.2.2.4. Passive

Passive, passiveverb

Most verbs which can take a direct object also permit passivization. The following sentence pairs illustrate the relationship between active and passive sentences:

ACTIVE	PASSIVE
the cat **saw** the bug	the bug **was seen** (by the cat)
we **instructed** the bug to depart	the bug **was instructed** (by us) to depart
I couldn't **account for** the bug	the bug couldn't **be accounted for** (by me)

In a passive sentence, the noun phrase which is the direct object of the sentence's active counterpart (here, "the bug") becomes the subject of the sentence, the main verb is marked by a form of "be" and appears in its past participle form, and the noun phrase which is the subject of the sentence's active counterpart usually may appear after the verb, preceded by the word "by".

Most verbs which can take objects can occur in passive sentences, but a few cannot:

the cat **weighed** five pounds	*five pounds **were weighed** (by the cat)
the candy bar **cost** a quarter	*a quarter **was cost** (by the candy bar)

4.2.2.5. Participle complement

Participlecomp, participlecompverb

These verbs take a complement clause whose verb is either a present or a past participle. A verb can belong to this class in two ways: either by allowing a present participle to follow the verb directly, or by allowing a noun phrase and then either a present or a past participle to follow the verb.

VERB – PRESENT PARTICIPLE
She **quit** ***smoking***
The bat **practiced** ***catching*** *bugs*
I **deny** ***sending*** *the letter*

VERB – NP – PAST PARTICIPLE	VERB – NP – PRESENT PARTICIPLE
I **want** it ***fixed***	I **want** it ***working*** *by tomorrow*
We **found** the cheesecake partially ***eaten***	We **found** the cat ***eating*** *the cheesecake*
This weather **keeps** the plants ***watered***	This weather **keeps** the flowers ***blooming***

4.2.2.6. NP - "to" complement

Np-tocomp, np-tocompverb

These verbs require an object noun phrase before the "to" complement.

I **advised** him *to go*	*I **advised** *to go*
I **invited** him *to come* to dinner	*I **invited** *to come* to dinner
I **sent** her *to buy* milk	*I **sent** *to buy* milk

4.2.2.7. Indirect object

Indirectobject, indirectobjectverb

Verbs in this class can take an indirect object marked by the prepositions "to" or "for".

Nancy **fed** all the figs *to the canary*
Chris **lent out** his books *to all and sundry*
Bill **introduced** me *to a very competent harpist*
Santa Claus **brought** an adorable stuffed iguana *for Jerry*
Bob **donated** his entire fortune *to the Society for a Cleaner Dubuque*

Most of these verbs can also occur in a construction in which the indirect object directly follows the verb (preceding the direct object) and is not marked by "to".

Nancy **fed** *the canary* all the figs
Santa Claus **brought** *Jerry* an adorable stuffed iguana

4.2.2.8. Movable "for"-object

Movableforobject, movableforobjectverb

To have this feature, a verb must take an indirect object which can occur in either of two positions: 1) following the direct object and marked with "for" (as in the examples on the left), and 2) between the verb and the direct object, without "for" (as in the examples on the right).

Santa Claus **brought** an iguana *for Jerry*	Santa Claus **brought** *Jerry* an iguana
Chris **knitted** a tea-cozy *for Peter*	Chris **knitted** *Peter* a tea-cozy
Let me **heat up** some lasagna *for you*	Let me **heat** *you* **up** some lasagna

When assigning this feature, make sure that your verb fits into both sentence types mentioned here. Almost any verb can be followed by a prepositional phrase marked with "for", but only a few can take two unmarked noun phrases after the verb. The following verbs *don't* belong in this class, since they don't have the second pattern:

She has **danced** "Swan Lake" *for the Queen*	*She has **danced** *the Queen* "Swan Lake"
They **discussed** politics *for hours on end*	*They **discussed** *hours on end* politics
We've **followed** this track *for twenty miles*	*We've **followed** *twenty miles* this track

4.2.2.9. Bitransitive

Bitransitive, bitransitiveverb

These verbs take two noun phrases (the first of which is an indirect object) directly after the verb; however, they do not occur in sentences in which the indirect object is preceded by "to" or "for".

That iguana **cost** *me* fifty dollars	*That iguana **cost** fifty dollars *to for me*
Can I **ask** *you* a question?	*Can I **ask** a question *to for you*?
Edwina **refused** *the bum* a quarter	*Edwina **refused** a quarter *to for the bum*

4.2.2.10. "That"-complement

Thatcomp, thatcompverb

Some verbs can be followed by a complete sentence with a finite verb introduced by the word "that".

I **pointed out** to him ***that*** *he would get wet*
Write down ***that*** *I am not responsible*
He has **revealed** to us ***that*** *he is actually a duck*
The mud on his feet **implies** ***that*** *it's raining*
He **tells** us ***that*** *he likes rain*

4.2.2.11. NP "That"-complement

Npthatcomplement,npthatcomplementverb

A verb is in this class if it can take a noun phrase object followed by a "that" complement.

Nancy **told** *everybody* ***that the canary was hungry***
Bill **promised** *me* ***that the harpist could play "Happy Birthday"***
Jerry **showed** *his teacher* ***that the iguana was harmless***

4.2.2.12. "That" required

Thatrequired, thatrequiredverb

The "that" introducing a finite complement is usually optional:

He **tells** us ***that*** *he likes rain*	He **tells** us *he likes rain*
Bill **promised** me ***that*** *he would come*	Bill **promised** me *he would come*

However, the verbs in this class require it.

We **arranged** *that* she would come at six	*We **arranged** she would come at six
It **occurred** to me *that* she was late	*It **occurred** to me she was late
She **satisfied** me *that* it could work	*She **satisfied** me it could work

4.2.2.13. Subjunctive required

Subjunctiverequired,subjunctiverequiredverb

Some verbs which take that-complements require that the verb in the complement clause be in the "subjunctive", i.e., the verb appears in its stem form and can't take the third person singular ending.

I **demand** that he *come*
*I **demand** that he *comes is coming*

The professor **requires** that every student *write* a paper
*The professor **requires** that every student *writes* a paper

4.2.2.14. "To"-complement

Tocomp, tocompverb

Some verbs take complement clauses in which the verb occurs in its stem form introduced by "to". This is also called an "infinitive complement".

You can **learn** ***to draw*** *in thirty days*
We **prepared** ***to leave*** *at eight*
We **appealed** to Fred ***to bring*** *his concertina*
Kim **assisted** him ***to roll back*** *the rugs*
We **arranged** for Leslie ***to set up*** *the equipment*

Infinitive complement clauses should be distinguished from purpose clauses: they look alike, but the "to" of a purpose clause can always be substituted by "in order to". Virtually any verb can be followed by a purpose clause, but only some verbs can take an infinitive complement.

PURPOSE CLAUSES

I **live** *to* eat
She **exercises** *to* keep fit
Lois **writes** her songs *to* entertain

I **live** *in order to* eat
She **exercises** *in order to* keep fit
Lois writes her songs *in order to* entertain

INFINITIVE COMPLEMENTS

I **like** *to* eat
She **hopes** *to* keep fit
Lois **wants** her songs *to* entertain

*I **like** *in order to* eat
*She **hopes** *in order to* keep fit
*Lois **wants** her songs *in order to* entertain

4.2.2.15. "For"-NP permitted

Fornppermitted, fornppermittedverb

Some verbs allow "for" followed by a noun phrase to follow the verb directly, before the infinitive complement:

I'd **prefer** *for Junior* to take up the harp and give up the trombone
We would **hate** *for anything* to happen to you
Robin **provided** *for everyone* to have a warm shelter

Verbs which allow a "for-NP" which can't immediately follow the main verb *don't* belong in this class:

That canary **needs** desperately *for someone* to feed it
*That canary **needs** *for someone* to feed it

4.2.2.16. Question complement

Questioncomp, questioncompverb

Some verbs take complement clauses which are "embedded questions": the complement clause is introduced by a question word (who, what, where, when, whether, how, why).

She **asked** me *whether* I liked her petunias
No one **knows** *where* the captain is buried
Today we will **learn** *who* invented electricity
I can never **remember** *when* William invaded England
That guy doesn't **care** *what* people think

4.2.2.17. Object not required

Objectnotrequired, objectnotrequiredverb

These verbs may occur without a direct object.

The children **ate**
Don't mind us, we're just **looking**
Somehow, the facts don't **add up**

4.2.2.18. Object not permitted

Objectnotpermitted, objectnotpermittedverb

These verbs may occur without a direct object, and MAY NOT occur with one.

I always **arise** early
The snakes **writhed** on the ground
The students are **rioting** again

*Don't **arise** *me* too late
*They **writhed** *each other*
*They're **rioting** *the administration*

4.2.2.19. Subject complement

Subjectcomp, subjectcompverb

Some verbs can have subjects which are whole sentences introduced by "that". These sentences also have a form in which "it" is the subject and the "that"-clause follows the verb.

That my favorite mongoose has vanished **concerns** me
It **concerns** me *that my favorite mongoose has vanished*

That the moon is made of green cheese **remains** unproven
It **remains** unproven *that the moon is made of green cheese*

That the sun is shining **pleases** the children
It **pleases** the children *that the sun is shining*

4.2.2.20. Middle / Effective

Middle, middleverb; Effective, effectiveverb

A verb can be classified as either "middle" or "effective". It is effective if it can have a subject which is an agent, i.e., something or someone which is separate from the entity that undergoes the process described by the verb (this entity is called the "medium") and which causes the process expressed by the verb to occur.
A middle verb, on the other hand, expresses a process as occurring without being externally caused (while the process may be externally caused in the real world, this relationship is not expressed grammatically). A middle verb can have the medium as its subject. Some verbs can be used in either a middle or an effective sense; these two senses should be considered distinct lexical entries.

Note that the middle effective distinction is *not* the same as the transitive intransitive distinction: some middle verbs can have direct objects. In the examples of effective verbs, the agent is italicized.

MIDDLE	EFFECTIVE
The bananas **ripened**	*The sun* **ripened** the bananas
The bomb **exploded**	*The police* **exploded** the bomb
Mary **believed** the report	*The report* **convinced** Mary
My grandmother **sighed**	*The heat* **irritated** my grandmother
The boy **laughed at** the clown	*The clown* **amused** the boy
Everyone **noticed** the siren	*The siren* **frightened** everyone

4.2.2.21. Do-verb

Doverb, doverb

Do-verbs describe material actions; they may be either abstract or concrete. Unlike most experience verbs, state verbs, and symbolic verbs, it is possible to ask about the action expressed by a do-verb by substituting "do" for the verb you are asking about. Thus, all of the following sentences could be answers to the question "What did Sandy do to disturb you?"

She **avoided** me yesterday at the dance
She **constructed** a high-tech gazebo next door
She **washed** the dog with tomato juice
She **laughed** when I walked by

The middle effective distinction is especially important for do-verbs. The do-verb subclasses which are middle are behaviouralverb and eventverb, distinguished by whether the medium can be human or not; the effective subclasses are "creation" and "disposal", distinguished by whether the medium comes into existence as the result of the process referred to by the verb, or existed previously and is affected by the process.

4.2.2.22. Behaviour

Behaviour, behaviouralverb

These are verbs of physiological and psychological behaviour. Like experience verbs, the medium of a behaviour verb must be conscious; however, behaviour verbs are different in that they can be questioned using "do".

When he **smiled**, we thought we heard violins
I'm **thinking**, don't bother me
Don't **look** now, but someone's following us
I love to **roller-skate** in the summer

Some behaviour verbs might seem to be effective verbs (for example, disposal verbs), because they have both a subject and an object:

At midnight everyone started **singing** Auld Lang Syne
The hikers **climbed** the mountain
The whole family is **playing** croquet

However, these are actually middle verbs: the subject rather than the object is the medium (the object can't be said to undergo the action expressed by the verb). They can be distinguished from disposal verbs by the fact that it seems odd to ask about them using "do to with", the test for disposal.

?What did they do with to Auld Lang Syne? They **sang** it.
?What did the hikers do to with the mountain? They **climbed** it.
?What did the family do to with croquet? They **played** it.

4.2.2.23. Event

Event, eventverb

Event verbs are middle do-verbs whose subject doesn't have to be conscious.

The train **left** at midnight
The iceberg **moved** slowly past the ship
This flight **goes** to Reno
The ice **melted**

4.2.2.24. Disposal

Disposal, disposalverb

Disposal verbs refer to processes in which an agent does something to or with a pre-existing object, affecting it in some way.

Bill **washes** *the floors* on Sundays
Peter **gave** *the shrimp chips* to Nancy
Little Joey **hugged** *his Aunt Louise*
Bob **killed** *the fly with great enthusiasm*

You can ask about processes of disposal using questions of the form "What did X do to with Y?"

What did Bill do to the floors? He **washed** them.
What did Peter do with the shrimp chips? He **gave** them to Nancy.
What did Little Joey do to his Aunt Louise? He **hugged** her.
What did Bob do to the fly? He **killed** it.

This characteristic distinguishes disposal verbs both from Creation verbs and from Behaviour verbs which have an object.

4.2.2.25. Creation

Creation, creationverb

Creation verbs refer to processes in which an agent brings an object into being.

Some beavers **built** *a dam* in Uncle Albert's back lot
You'll **create** *a riot* if you go around looking like that
Little Joey **made** *a log cabin* out of popsicle sticks in kindergarten last week

It usually sounds odd to ask about a creative process using "do to/with"; this distinguishes them from disposal verbs.

?What did the beavers do to with the dam?	They **built** it.
?What did you do to/with the riot?	I **created** it.
?What did Joey do to with the log cabin?	He **made** it out of popsicle sticks.

4.2.2.26. Experience

Experienceverb, experienceverb

Experience verbs have to do with mental processes or processes of sensing. They relate an experiencer, which must refer to a person or at least a sentient being, to something felt or thought. In the case of a middle experience verb, the experiencer is the subject of an active clause; in the case of an effective experience verb, the experiencer is the object of an active clause.

In the examples, the experiencer is in italics.

Rhonda **liked** the daffodils	The daffodils **delighted** *Rhonda*
I **believe** you	The quiet **puzzles** *me*
She **felt** a throbbing	It **hurt** *her ears*

It usually sounds odd to question an experience verb with "do":

?What did Rhonda do?	*She* **liked** the daffodils.
?What did the daffodils do?	They **pleased** *Rhonda*.

4.2.2.27. Reaction

Reaction, reactionverb

Reaction verbs describe the experiencer's attitude towards a phenomenon.

Everyone **enjoys** this kind of weather
Your pet pangolin **alarms** *me*
The chairman's statement was designed to **anger** *the committee*

4.2.2.28. Like

Like, likeverb

"Like"-verbs describe a positive reaction:

I just **adore** her new Peruvian ruana
The committee was deeply **impressed** by the presentation
The daffodils **delighted** *Rhonda*

4.2.2.29. Dislike

Dislike, dislikeverb

"Dislike"-verbs describe a negative reaction on the part of the experiencer.

Do *you* **mind** my smoking?
The guests were **irritated** by her pet pangolin
The chairman's statement was designed to **anger** *the committee*

4.2.2.30. Fear

Fear, fearverb

"Fear"-verbs describe a reaction of fright on the part of the experiencer.

Fear not!
Your pet pangolin **alarms** *me*
Little Joey is easily **frightened**

4.2.2.31. Cognition

Cognition, cognitionverb

Cognition verbs refer to cognitive processes such as thinking and having opinions. They all take complement clauses which refer to facts, i.e. either noun phrases like "fact", "idea", "question", or finite complements (question complements or "that"-complements). In this respect they are like symbolic verbs. Like other experience verbs, they may be either middle or effective, that is, the experiencer may be either the subject or the object of the verb.

I wonder whether it will rain
Don't **forget** that Joe is coming to dinner!
I **guess** it's time for lunch
It **interests** *me* that you're wearing green
His story **convinced** *nobody*

4.2.2.32. Epistemic

Epistemic, epistemicverb

Epistemic verbs have to do with the state of the experiencer's knowledge or belief.

I **wonder** whether it will rain.
You must **understand** that we are making an exception.
His story **convinced** *nobody*

4.2.2.33. Mnemonic

Mnemonic, mnemonicverb

Mnemonic verbs refer to processes having to do with the memory.

The name of the author of Gulliver's Travels momentarily **escapes** *me*
Don't **forget** that Joe is coming to dinner!
Your cat **reminds** *me* of my uncle Albert

4.2.2.34. Opining

Opining, opiningverb

In the case of opining verbs, the experiencer is not willing to commit him- or herself to the validity of the complement. Opining verbs are all middle verbs: the experiencer is the subject.

I **guess** you're right
Do *you* **suppose** it could still rain?
The painter **estimated** that it would cost fifty dollars to do this room

4.2.2.35. Wonder

Wonder, wonderverb

Wonder verbs express the experiencer's surprise at or interest in the complement. They are all effective verbs: the experiencer (which is the medium) is the direct object in an active sentence, the subject in a passive sentence.

It **amazed** *Julie* that Joe didn't show up for the party
The fact that the planets move through the sky **puzzled** *observers* for centuries
I am strangely **interested** by your story

4.2.2.36. Perception

Perception, perceptionverb

Perception verbs refer to processes of sensing. Most are middle: in an active sentence, the experiencer is the subject and the phenomenon which is sensed (which may be a thing or a fact) is the object. Middle perception verbs differ from other experience verbs in that they can take a complement with a present participle, and often also a complement which has an infinitive verb with no "to" (a bare infinitive).

She **heard** ***their plan***	*She* **heard** ***them planning to rebel*** *She* **heard** ***them plan to rebel***
Henry **saw** ***Anne***	*Henry* **saw** ***Anne trotting across the field*** *Henry* **saw** ***Anne trot across the field***
Can *you* **smell** ***the cabbage?***	Can *you* **smell** ***Ed cooking cabbage***?

There are a few effective perception verbs, in which the subject is the phenomenon perceived and the object is the perceiver:

The commotion **struck** *all of us*
The dust, heat, and crowds **assailed** *our senses*

The closed classes at this level are auditoryverb, olfactoryverb, gustatoryverb, and tactileverb.

4.2.2.37. Visual

Visual, visualverb

Visual verbs have to do with seeing, i.e. sight perception.

I **noticed** ***Sean sneaking across the field***
Sean had **spotted** ***a rare lizard***
Together *we* **watched** ***it consume several flies***

4.2.2.38. General perception

Generalperception, generalperceptionverb

General perception verbs are perception verbs which could apply to any of the senses or to no sense in particular.

Sean instantly **sensed** ***something amiss***.
I was **struck** by ***the commotion around me***.
Only with difficulty could *we* **perceive** ***Amanda running across the moor.***

4.2.2.39. Relational

Relational, relationalverb

Relational verbs express a state of affairs; they relate a thing or circumstance to another thing or circumstance or to an attribute that it has.

The fair will **last** all day
Sarah **seems** wise
Peter **owns** the piano
On the wall there **hangs** a picture
The baby **turned into** a pig

Relational verbs are often distinguishable from material verbs in that the form of the present tense which is most frequently used is the simple present, as opposed to the present progressive ("be" plus the present participle).

?The fair is **lasting** all day
?Sarah is **seeming** wise
?Peter is **owning** the house

Unfortunately, this test does not work equally well for all examples. The following sentences contain relational verbs, but are fine in the progressive tense.

The picture is **hanging** on the wall
There is **lying** on the bed an evening gown
Joe is **proving** unreliable

4.2.2.40. Circumstantion

Circumstantion, circumstantionverb

Circumstantial processes relate a participant to a circumstance, usually one having to do with the location or extent of the participant. They are usually paraphrasable by the verb "be" plus a preposition:

The bridge **spans** the chasm	The bridge *is over* the chasm
The fair **lasts** the whole day	The fair *was for* the whole day
The appendices **follow** the text	The appendices *are after* the text

Care must be taken not to confuse circumstantion verbs with often homonymous verbs which belong to other classes. In the following examples, the verb on the left is circumstantial, while the one on the right is a do-verb.

The airplane's path **described** a circle	She **described** an event
The appendix **followed** the text	The detective **followed** the suspect
The hummingbird **hung** in midair	They **hanged** the villain

The open subclasses of cirumstantionverb are locationverb and extentverb; the other subclasses (accompanimentverb, causeverb, mannerverb, matterverb, roleverb) are all very small and have been treated as closed.

4.2.2.41. Location

Location, locationverb

Location verbs express the location in space or time of two participants with respect to each other.

The hedge **circumscribed** the estate
The picture **hangs** in the gallery
The appendices **follow** the text
A game of chess **followed** the sumptuous dinner

4.2.2.42. Extent

Extent, extentverb

Extent verbs describe the extent of their subject in space or time.

The fair **lasted** all day
The bridge **spanned** the chasm
The estate **covered** fifty acres

4.2.2.43. Existential

Existential, existentialverb

Some verbs can be used with the "dummy subject" *there* to express that an object exists. Besides "be", these are typically verbs of posture. They are static, i.e. they don't imply any motion.

On the corner there **stands** an old house
In the doorway there **sat** a wrinkled old man
There **lay** on the bed an elegantly beaded evening dress

These static, postural existential verbs should be distinguished from "presentatives", which also occur with "there" as subject, but which are not static (they are often event verbs).

There **arrived** three visitors from Sulawesi
Across the bay there **sailed** a whole fleet

Verbs of this type should *not* be classified as existential.

4.2.2.44. Intension

Intension, intensionverb

These verbs specify a relation between an entity and a property or class, or between an entity and something it stands for.

The bill **comes out to** $16.98
That cloud of dust **spells** danger
The dove **stands for** peace
A certain employee has **proven** unreliable
She **remains** unbeguiled

4.2.2.45. Equality

Equality, equalityverb

Equality verbs relate two entities which are the same.

The bill **comes out to** $16.98
Two plus two **equals** four
One more **makes** five

4.2.2.46. Signification

Signification, significationverb

Signification verbs relate two entities, one of which can be seen as implying the existence of the other due to a natural relationship between them.

That cloud of dust **spells** danger
That chartreuse jacket **expresses** his personality perfectly
Those footprints **suggest** an intruder

4.2.2.47. Symbol

Symbol, symbolintensiveverb

Symbol verbs relate two entities, one of which stands for the other due to a conventional relationship between them.

The dove **stands for** peace
This sculpture **represents** man's inhumanity to man
The senior member will **act as** the chairman
Norm **played** Hamlet

4.2.2.48. Appearance

Appearance, appearanceverb

These verbs have to do with how an event is perceived. (This class has a subclass, seemingverb, which is closed.)

The orchestra **sounds** out of tune
The mattress **feels** lumpy
This situation **looks** awfully fishy
In the end, the clerk **proved** trustworthy

4.2.2.49. Phase

Phase, phaseverb

Phase verbs have to do with the stability of a state. Thus they either describe processes of change of state, like "become", or of non-changing state, like "remain". They take adjective complements, and may take noun complements as well.

Julia frequently **becomes** angry.
The puppy suddenly **turned** vicious.
Sandy **keeps** healthy by eating garlic.
I **became** a licensed contractor yesterday.

A verb should only receive this feature if it takes a wide range of adjective complements. There are some verbs that appear to be phase verbs, but which only occur with a small number of adjectives. These *do not* belong in this class:

She **went** crazy
The brook **ran** dry
The speaker **fell** silent
*She **went** tired vicious healthy
*The brook **ran** full noisy wet
*The speaker **fell** loud crazy angry

4.2.2.50. Symbolic

Symbolicverb, symbolicverb

Symbolic verbs are verbs of symbolic exchange of meaning, i.e. various kinds of saying. Symbolic verbs are similar to cognition verbs in that they take complements which refer to statements about the world, that is, "that"-complements and question complements. Symbolic verbs are distinguished from cognition verbs, however, in that they imply the existence of two participants, a sayer and an addressee, while cognition verbs require only one. Symbolic verbs differ in how many of these participants they actually express; the only essential one is the sayer. In the following examples, the addressee is in ***bold italics*** and the message is in *italics*.

The notice **warns** ***you*** *that it's illegal to loiter*
My watch **says** *that it's time to go*
The candidate **notified** ***us*** *of the problems of pangolins*
We **talked** *about his sailboat all evening*

4.2.2.51. Telling

Telling, tellverb

These are the symbolic verbs which are also effective. They take a subject which represents the sayer, a direct object representing the hearer, and a complement representing the message.

The notice **warns** ***you*** *that it's illegal to loiter*
My neighbor **asked** ***me*** *what a pangolin is*
Do you **promise** ***me*** *that you'll feed my Venus's-flytrap?*

4.2.2.52. Saying

Saying, sayverb

Saying verbs are middle symbolic verbs for which the subject is the sayer, there is a complement which is the message, and the addressee is optional: if it is expressed, it is expressed in a prepositional phrase with "to".

The weatherman **said** *that it would rain today*
The teacher **explained** ***(to the class)*** *that Columbus wasn't the first to discover America*
Julie **whispered** ***(to Lee)*** *that she had a new pair of shoes*

4.2.2.53. Speaking

Speaking, speakverb

Speaking verbs are [illegible] symbolic verbs which require neither an addressee nor a message to be expressed. If the addressee is expressed, it is in a prepositional phrase with "with" or "to"; if the content of the message is expressed, it is in a prepositional phrase with "about", "concerning" etc.

Julie and Patricia **chatted** *about the weather*
The President **spoke** ***to the committee***
I just spent two hours **conversing** ***with the cab-driver*** *about brussels sprouts*

4.2.3. Adjective

Adjective, adjective

Adjectives are lexical items which modify nouns. They can occur in two places: in the noun phrase directly preceding the noun, as in "the **fierce** lion", or following the verb "is" (or a few other verbs), as in "the lion is **fierce**". Many adjectives have a comparative and a superlative form (**fierce/fiercer/fiercest**); they may sometimes be modified with adverbs like "very".

Adjectives should be distinguished from other things that modify nouns. These include other nouns, as in "the **art** expert", and past and present participles of verbs, as in "the **exhausted** Saint Bernard" or "a **running** jump". A word should only be classed as an adjective if it *can't* be a noun or a verb with the same meaning. We know **art** can be a noun because it has a plural form (**arts**); similarly, **exhaust** has all the verb forms (**exhausts/exhausted/exhausted/exhausting**), as does **run** (**runs/ran/run/running**).

4.2.3.1. Case prepositions (Property)

Caseprepositions, adjectivecaseprepositions

Some adjectives are typically followed by prepositional phrases with particular prepositions.

He was never **content** *with* our quiet life
Professor Smith became **angry** *at* anyone who contradicted him
The results of this experiment are **crucial** *to* my career

Since Caseprepositions is a property, it must have a value. The value of Caseprepositions is the preposition which the adjective typically takes.

4.2.3.2. Predicate only

Predicateonly, predicateonlyadjective

Some adjectives can never be used directly before the noun, only as part of the complement. This is referred to as the "predicate" position.

All the students fell **asleep**	*The **asleep** students failed the class
Little Joey is **afraid**	*The **afraid** little boy
The hotel was instantly **ablaze**	*The **ablaze** hotel burned to the ground

4.2.3.3. Degree

Degree, degreeadjective

Some adjectives describe qualities which are scalar, that is, a thing can have the attribute to a greater or lesser degree. These are called "degree" adjectives. Usually there is another lexical item which describes the opposite end of the scale: thus you have pairs like "happy/sad", "tall/short", "hot/cold", "difficult/easy". Degree adjectives can naturally be compared or intensified.

Nancy is **happy**	Nancy is **happier** than Peter	Nancy is very **happy**
Hot soup is good	The **hottest** soup is the best	Very **hot** soup is good
This is an **easy** job	This job is **easier**	This job is extremely **easy**

4.2.3.4. Nondegree

Nondegree, nondegreeadjective

Nondegree adjectives, on the other hand, describe attributes which are non-scalar -- an entity has the attribute or it doesn't. Thus, there is no scale, and hence typically no lexical item for the opposite quality.

Although these adjectives can be used in the comparative form and with intensifiers (as in the examples on the right below), it always suggests that some non-central aspect of the attribute is being compared, not the central one. This is why, for example, "He's very English" sounds somewhat amusing.

I like the **purple** flower	?I like the **purpler** flower
	?I like the very **purple** flower
John is **English**	?John is less **English** than Bill
	?John is slightly **English**
The patient is **alive**	?The patient is more **alive** today
	?The patient is extremely **alive**
Julie is a **doctoral** student	*Julie is a more **doctoral** student than Sue
	?Julie is a highly **doctoral** student

This is a different wordclass from noinflectionsadjective, which should be assigned only when you cannot have a comparative even with a "funny" interpretation.

4.2.3.5. Complement permitted

Complementpermitted, complementpermittedadjective

Some adjectives, like verbs, can take various kinds of complements when they follow the verb "be". Often the complement can either come after the adjective or in place of the subject before "be".

It's **possible** *that it will rain tonight*
That it will rain tonight is **possible**

Josephina is **unlikely** *to come to the party*
For Josephina to come to the party is **unlikely**

It is **unbelievable** *that Little Joey ran away to the circus*
That Little Joey ran away to the circus is **unbelievable**

It would be **strange** *for him to show up after all these years*
For him to show up after all these years would be **strange**

4.2.3.6. "To"-complement

Tocomp, tocompadjective

These adjectives take infinitive complement clauses, those in which the verb occurs in its stem form preceded by "to".

It is **difficult** for him *to hear*
Josephina is **careful** *to appear calm*
Bill is **easy** *to please*
Our Irish Setter is **unlikely** *to win first prize*

4.2.3.7. Subject lowering / Subject holding

Subjectlowering, subjectloweringadjective; Subjecthold, subjectholdadjective

Adjectives which take infinitive complements are of two types. In one type, the subject of the main sentence is understood to be the same as the subject of the complement clause; in the other, the subject of the main verb is understood to be the same as the object of the complement clause, and the subject of the complement clause can be interpreted as "people", "one" or the like. The former type is called "subject lowering"; the latter type is called "subject holding".

SUBJECT LOWERING:	SUBJECT HOLDING:
Josephina is **careful** *to appear calm*	Josephina is **difficult** *to upset*
Our Irish Setter is **likely** *to win first prize*	Our Irish Setter is **tough** *to beat*
Bill is **eager** *to please*	Bill is **easy** *to please*

4.2.3.8. "For"-NP permitted

Fornppermitted, fornppermittedadjective

Some adjectives which take a to-complement permit the subject of the complement clause to occur marked by the preposition "for". The occurrence of "for"-NP is always optional.

It's **difficult** to leave here
That's **easy** to say
This book is **impossible** to read

It's **difficult** *for us* to leave here
That's **easy** *for you* to say
This book is **impossible** *for you* to read

4.2.3.9. "That"-complement

Thatcomp, thatcompadjective

Some adjectives can occur after the verb "to be" and be followed by a finite clause introduced by "that".

I'm **afraid** ***that*** *it's going to rain*
It's **likely** ***that*** *it will be dark before we're done*
Everyone is **happy** ***that*** *the quiche was such a success*

4.2.3.10. Subject complement

Subjectcomp, subjectcompadjective

Some adjectives can be the complement of a verb whose subject is a whole sentence introduced by "that". These sentences also have a form in which "it" is the subject and the "that"-clause follows the adjective.

That *Sam wears polyester* is **abhorrent** to Felicia
It is **abhorrent** to Felicia ***that*** *Sam wears polyester*

That *Ramona should have missed her wedding* seems **curious**
It seems **curious** ***that*** *Ramona should have missed her wedding*

That *Egmont may never come back* is **hard** to accept
It is **hard** to accept ***that*** *Egmont may never come back*

4.2.3.11. Appropriateness

Appropriateness, appropriateadjective

Appropriateness adjectives can take either a that-complement with the verb in the subjunctive (i.e. the verb is in the stem form with no -s ending, even with a third person singular subject), or else a to-complement whose subject may be marked with *for*. Their meaning has to do with the appropriateness of an event.

It's only **fitting** *that Mark cook the fish*
It's only **fitting** ***(for Mark)*** *to cook the fish*

It's **improper** *that he be allowed to shirk this responsibility*
It's **improper** ***(for him)*** *to be allowed to shirk this responsibility*

4.2.3.12. Possiblity

Possibilityproperty, possibilityadjective

Possibility adjectives have to do with the degree of likelihood of an event. They take that-complements, but unlike appropriateness adjectives, the complement verb isn't in the subjunctive.

It is **probable** *that the weather will clear up*
It's even **possible** *that it will get warm*
That it will be comfortable for swimming isn't **likely**

4.2.3.13. Obviousness

Obviousness, obviousadjective

These adjectives all take finite that-complements, but no other complement types:

It is **apparent** *that she has been here*	*It is **apparent** ***(for her)*** *to have been here*
It is **obvious** *that they are gone now*	*It is **obvious** ***(for them)*** *to be gone now*
That they didn't stay long is **evident**	*It is **evident** ***(for them)*** *not to stay long*

4.2.3.14. Intrinsic

Intrinsic, intrinsicadjective

Intrinsic adjectives are those that don't take complements. A few categories of intrinisic adjectives usually occur in a particular order:

The **little old** lady	*The **old little** lady
The **green Egyptian** scarab	*The **Egyptian green** scarab
Some **English woolen** socks	*Some **woolen English** socks
Our **new red** barn	*Our **red new** barn

As these examples show, the order is Size, Age, Colour, Provenance, Material. Because of this ordering restriction, special categories are necessary for some intrinsic adjectives.

4.2.3.15. Size

Size, sizeadjective

These adjectives refer to size (in any dimension). They must occur before age adjectives.

A **small** *old* car is cheapest
Josephina doesn't like being **short**
That's a **long** cigar!

4.2.3.16. Age

Age, ageadjective

These adjectives refer to age. They occur after size adjectives and before colour adjectives.

The *big* **old** *red* barn burned down
That's an **ancient** ruin
Which duckling is the **youngest**?

4.2.3.17. Colour

Colour, colouradjective

These adjectives refer to colour. They occur after age adjectives and before provenance adjectives.

The sky is **blue** today
The night is getting **dark**
You look fetching in your *new* **mauve** *Indian* scarf

4.2.3.18. Provenance

Provenance, provenanceadjective

Provenance adjectives have to do with where something or someone comes from. They're usually derived from a place name. They occur after colour adjectives and before material adjectives.

Please bring me a *red* **Chinese** *silken* gown
Everyone is intimidated by an **English** accent
The **Greek** alphabet comes from the **Phoenecian** writing system

4.2.3.19. Material

Material, materialadjective

Material adjectives refer to the material which something is made of; they often end in *-en*. They occur after provenance adjectives.

The queen wore a **golden** crown
Wooden canoes are much the cheapest
It's time to get out your *French* **woolen** underwear

4.2.4. Adverb

Adverb, adverb

Adverbs are lexical items which modify verbs, adjectives, other adverbs, prepositions, or whole clauses. They often (but by no means always) end in *-ly*. (In these examples, the thing modified is in italics.)

The pangolin *ran* **quickly** towards its lair
Peter and Nancy *strolled* through the park **side by side**
Peter makes an **extremely** *good* quiche
Today's weather is **relatively** *warm*
Pangolins can run **especially** *quickly*
Initially *we had great hopes*
We **obviously** *didn't have enough experience*

Adverbs tend to be quite free about where in a sentence they can occur, although there can be differences in meaning associated with the different positions:

Quickly the pangolin ran towards its lair
The pangolin **quickly** ran towards its lair
The pangolin ran **quickly** towards its lair
The pangolin ran towards its lair **quickly**

There are quite a few closed classes of adverbs: question variable adverbs, intensifier adverbs, the negative adverb, limiter adverbs, phoric time adverbs, comparative adverbs. The open classes are described below.

4.2.4.1. Adjective modifier

Adjectivemodifier, adjectivemodifieradverb

These adverbs can modify adjectives.

Bob was **already** *tired* after only one mountain
The houses in this area are **predominantly** *wooden*
The Director is **currently** *unavailable*

4.2.4.2. Attitudinal

Attitudinal, attitudinaladverb

These are sentence-modifying adverbs which express the speaker's attitude towards the proposition expressed in the sentence.

Surprisingly, Bill is cheerful today
Fortunately, we never saw him again
Sadly, we never saw Spot again either

4.2.4.3. Manner

Manner, manneradverb

These are verb-modifying adverbs which express the manner in which the process referred to by the verb is carried out.

Bob **rhythmically** chopped the celery
Christian peeled the tomatoes **skillfully**
Slowly, Nancy melted the butter in the pan

4.2.4.4. Other

Other, otheradverb

An adverb which is neither a manner adverb nor an attitudinal adverb belongs in this class.

This toast is **delightfully** crisp
Pangolins can run **especially** quickly
Initially we had great hopes

4.2.5. Interjection

Interjection, interjection

These are lexical items which can occur by themselves as a complete utterance.

Wow!
Adieu.
Hello!
Huh?
Yes.

There are two special subclasses: Greeting and Exclamation.

4.2.5.1. Greeting

Greeting, greeting

Greetings are used to open or close a communicative interaction.

Hello!
Greetings.
Farewell.

4.2.5.2. Exclamation

Exclamation, exclamation

Exclamations are interjections which are used to respond to something in the interaction.

Oh.
Wow!
Awesome!

Appendix I
Closed Classes

The following are the closed wordclasses, listed alphabetically. These classes are not documented, and should not have words added to them except by experts. Special techniques are required to add words to these classes using LapItUp.

abilitypossibilitymodal
accompanimentverb
additiveconjunct
additiveconjunctive
adjectivecompverb
adverseconjunct
adverseconjunctive
appearanceverb
appositionconjunct
auditoryverb
auxverb
bareinfinitivecompverb
beaux
case
causalconjunct
causalconjunctive
causeverb
comparativeadverb
concessivepreposition
conjunct
conjunctive
copulaverb
countablenumerativedeterminer
deicticdeterminer
determiner
determinernumber
determinerstemform
doaux
firstsingularform
firstsingularpastform
futureauxiliary
genitives
goingtoaux
gustatoryverb
indefinitepronoun
intensifieradverb
interrogativedeterminer
interrogativepronoun
interrogativeadverb
limiteradverb
linker
locationpreposition
locationpronoun
makecompverb
mannerverb
matterpreposition
matterverb
meteorologyverb
modalauxiliary
modalitynegativemodal
month
necessitymodal
negativeadverb
negativeaux
noloweringverb
noninflectableverb
nonnumeraldeterminer
nonreducedaux
nopostmodifierspronoun
numeraldeterminer
numeralarabic
numerativedeterminer
objectnotrequiredpreposition
olfactoryverb
ordinal
ordinalarabicprop
phorictimeadverb
pluralpastform
possessionverb
possessivedeterminer
possessivepronoun
possibilitymodal
ppobjectpreposition
preposition
processnegativemodal
pronoun
pronounnumber
pronounstemform
provingverb
punctuation
purposepreposition
reducedaux
rolepreposition
roleverb
secondsingularform
secondsingularpastform
seemingverb
sensationverb
sentenceconjunction
special
subordinator
subjecthold

subjectloweringverb
substitutenoun
suggestiveparticle
tactileverb
thirdsingularpastform
uncountablenumerativedeterminer
verbpluralform
volitionmodal

Appendix II
Glossary of Linguistic Terms

These are terms which are used without definition in the manual. If a term you don't understand isn't defined here, chances are it is defined elsewhere in the manual: look it up in the index.

In the following descriptions, references to other glossary entries are in **boldface**, while references to feature descriptions are underlined.

adjective phrase — An adjective phrase is an adjective together with its modifiers. Some examples are "That house is *extremely big*", "Your chickens are *bigger than my chickens*", "That's the *most beautiful* hydrangea I've ever seen".

auxiliary — An auxiliary is one of a small class of verbs which directly precede another verb and modify its meaning. They often are used to mark **tense**. It is possible to have more than one auxiliary in a row. The auxiliaries in the following sentences are italicized: "She *has* gone", "She **is** going", "She *should* go", "She *has been* going", "She *was* hugged", "She *will have been being* hugged", etc. Auxiliaries require the following verb to be in a particular inflectional form: thus "be" requires the following verb to be a present participle (if it is marking **present tense**) or a past participle (if it is marking passive voice); "have" requires the following verb to be a past participle; and "will", "would", "shall", "should", "can", "could", and a few others (called the "modal auxiliaries") require the following verb to be in the stem form.

clause — A clause is a grammatical unit which contains a verb and its complements. Clauses may be **finite** (like "she said that *she was ready*") or **non-finite** (like "she expected *to be ready*").

complement — A complement is a **noun phrase**, adjective phrase, **prepositional phrase** or **clause** which follows a verb in the same clause. "Subject complements" are so called even though they can precede the verb because they can also follow it: "*That he didn't come* annoyed me" / "It annoyed me *that he didn't come*."

determiner — A determiner is part of the **noun phrase**. The determiner precedes any adjectives: an adjective may not precede the determiner. The determiner in the following noun phrases is italicized: "*the* red book", "*some* peculiar events", "*these* erratic art experts", "*three* French hens".

finite — A **clause** is finite if its verb is inflected. The clause *he is coming* in "I know *he is coming*" is finite because "is" is the third person inflected form of **be**: *he went* is finite in "I know where *he went*" because "went" is the past tense inflected form of **go**. Finite clauses are often preceded by "that" ("I know that *he is coming*") or a question word, like what, which, who, why, when, where, how ("I know when *he is coming*", "I know who *he talks to*", etc.) See **non-finite** and entries for Thatcomp and Questioncomp.

first person — See **person**.

future tense — See **tense**.

inflection — See **morphology**.

modal auxiliary — See **auxiliary**.

morphology — Morphology is the part of grammar which is concerned with the forms of words, i.e. how words are derived from other related words by adding endings (like **dog/dogs**) or changing the spelling (like **sing/sang**). "Inflection" is a kind of morphological process: it refers to such processes as adding endings to nouns to make them plural and adding endings to verbs to change the **person, number,** or **tense**.

non-finite — A **clause** is non-finite if its verb is not inflected, i.e. occurs in the stem form, even when the subject is third person. See **finite**, and entries on Tocomp.

noun phrase — A noun phrase consists of a noun together with its modifiers. A noun phrase may be replaced in its entirety by a pronoun (which is just another kind of noun phrase). The following are example of noun phrases: "the girl I saw yesterday", "another big red house", "Bill", "rock and roll", "you", "four big red ones", "the fifth elevator operator".

number — Noun phrases can have singular number or plural number. A verb is considered "singular" if it has a singular subject, like *smells* in "This flower *smells* nice"; it is considered "plural" if it has a plural subject, like *smell* in "These flowers *smell* nice". Determiners can also be singular or plural, like *this* and *these* in the examples above. Most pronouns also have different forms for singular and plural: thus **I** is called first **person** singular, while **we** is first **person** plural; **you** is both second **person** singular and second **person** plural; and **she, he, it** are third **person** singular, while **they** is third **person** plural.

object — An object **noun phrase** usually follows the verb or preposition of which it is the object. In the case of a transitive verb, the object is usually the thing which undergoes the process expressed by the verb. The pronouns **me, him, her, them** are special forms which can only be used as objects, while **I, he, she, they** can only be used as subjects. If you want to know if a noun phrase is an object, try replacing it with a pronoun and see which form you get. In "The duck quacked at *the woman in the dark blue suit*", "*the woman in the dark blue suit*" is the object because you would say "the duck quacked at *her*", not "the duck quacked at *she*".

past tense — See **tense**.

person — Noun phrases can be divided into three persons. First person noun phrases include the speaker (I, me, we, us, etc.); second person noun phrases refer to the hearer (you); and third person noun phrases refer to any other entity (he, she, it, they; that ball, those guys, an ice cream cone). A verb is called "first person" if its subject is **I** or **we**, "second person" if its subject is **you**, and "third person" otherwise. (Also see **number**.)

plural — See **number**.

prepositional phrase — A prepositional phrase is a preposition with its object, which may be a **noun phrase** or another prepositional phrase. Some examples: "We went *over the river* and *through the woods*"; "Alicia climbed *up into the attic*"; "*On Monday* I got a raise"; "*Up until last year* I was living in the suburbs".

present tense — See **tense**.

second person — See **person**.

semantics — Semantics is the part of grammar which is concerned with the meanings of words and sentences.

singular — See **number**.

subject — The subject of a **finite clause** which isn't a question is the **noun phrase** which precedes the verb, and with which the verb agrees in **person** and **number**. If the clause is active (see passive), the subject is usually the thing that performs the action or is in the state expressed by the verb. If the clause is a question, the subject follows the verb or an auxiliary: "Is *he* in the house?" "Will *she* come home soon?" The pronouns **I, he, she, they** are special forms which can only be used as subjects, while **me, him, her, them** can only be used as objects. If you want to know if a noun phrase is a subject, try replacing it with a pronoun and see which form you get: in a sentence like "*that guy* came late", *that guy* is the subject because you would say "*he* came late", not "*him* came late".

syntax — Syntax is the part of grammar which is concerned with sentence patterns and the order of words in a sentence. Syntactic features contain information about what kind of sentence patterns a word fits into.

tense — Tense refers to the time of occurrence of the process referred to by a verb. "I walk" or "I am walking" is present tense, "I will walk" or "I am going to walk" is future tense, and "I walked" or "I was walking" is past tense. Tense can be expressed either by verb inflection ("walk" vs. "walked") or by preceding the verb with **auxiliaries** ("will walk", "going to walk"), or both ("have walked", "am walking").

third person — See **person**.

Appendix III
The Wordclass Hierarchy

The full wordclass hierarchy for the ML is given in the following figures. These figures include both open and closed classes. The name of each wordclass is followed by the name of the added feature for that wordclass. Classes which are in a group are boxed and joined to a common node; dark boxes and a "1" node label indicate a Group1, while light boxes and a "0" node label indicate a group0. Unboxed classes are not in groups. An asterisk by a node indicates that that node is further expanded in a subsequent figure. "Lexstart" is the name of the highest order wordclass which contains all other wordclasses.

Figure III-1: Lexstart: the top-level distinctions

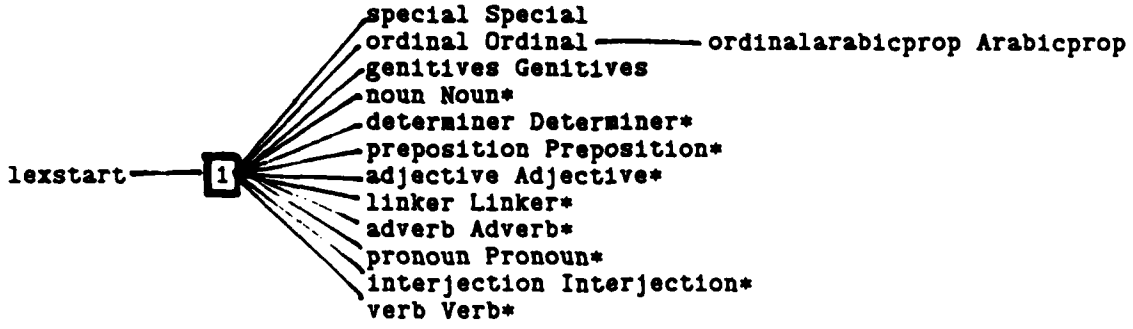
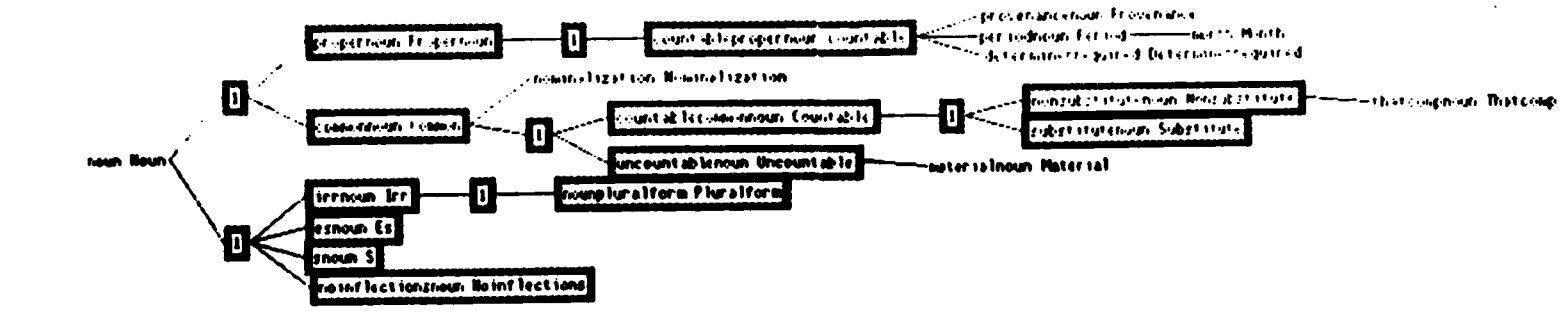
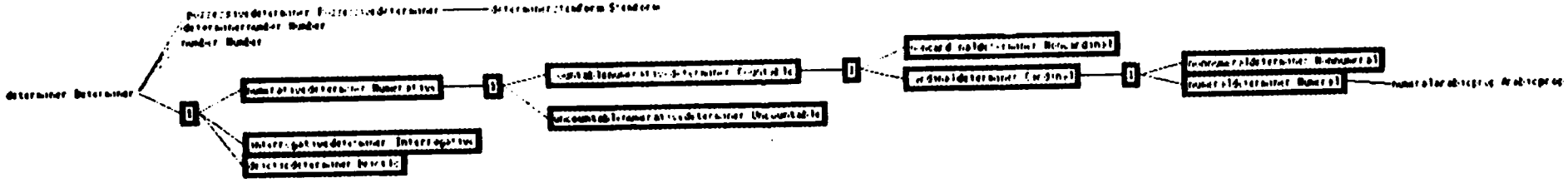


Figure III-2: The Noun, Determiner, and Preposition Hierarchies





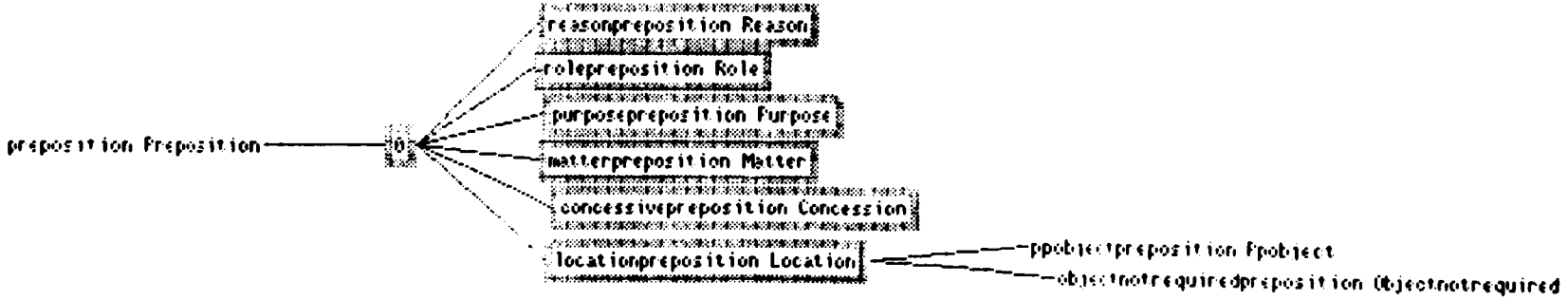


Figure III-3: The Adjective Hierarchy

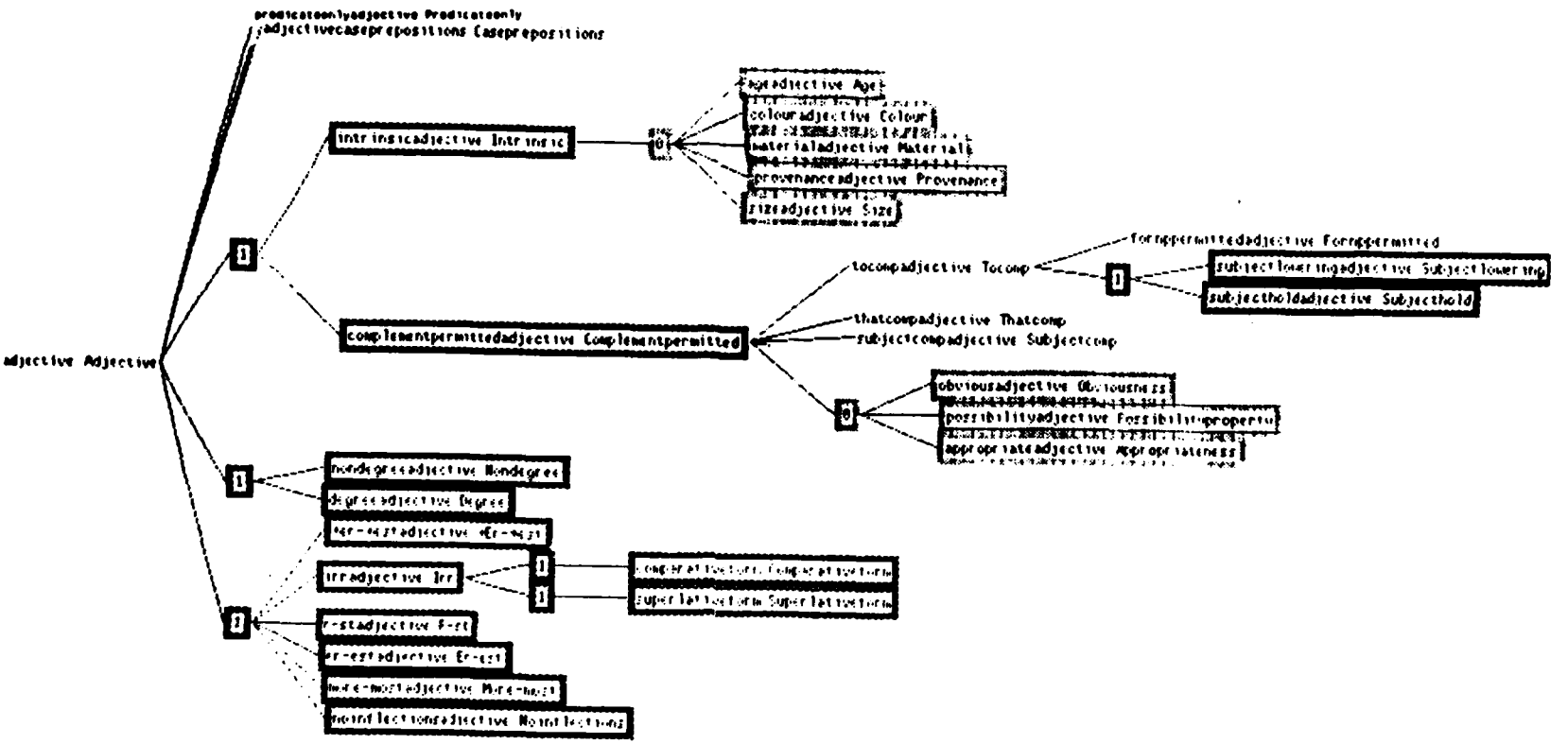


Figure III-4: The Linker, Adverb, Pronoun and Interjection Hierarchies

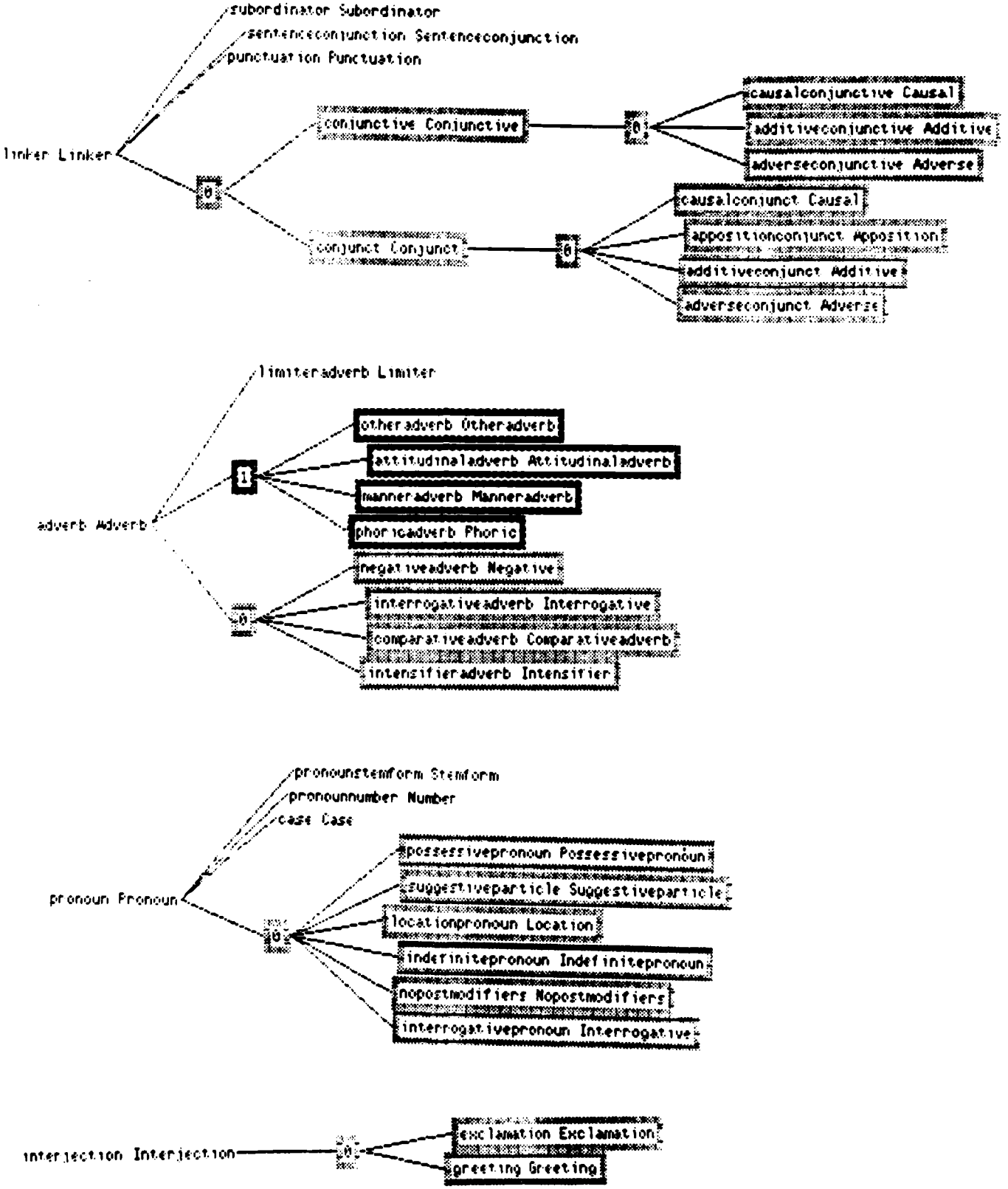


Figure III-5: The Top Part of the Verb Hierarchy: Modals and Auxiliaries

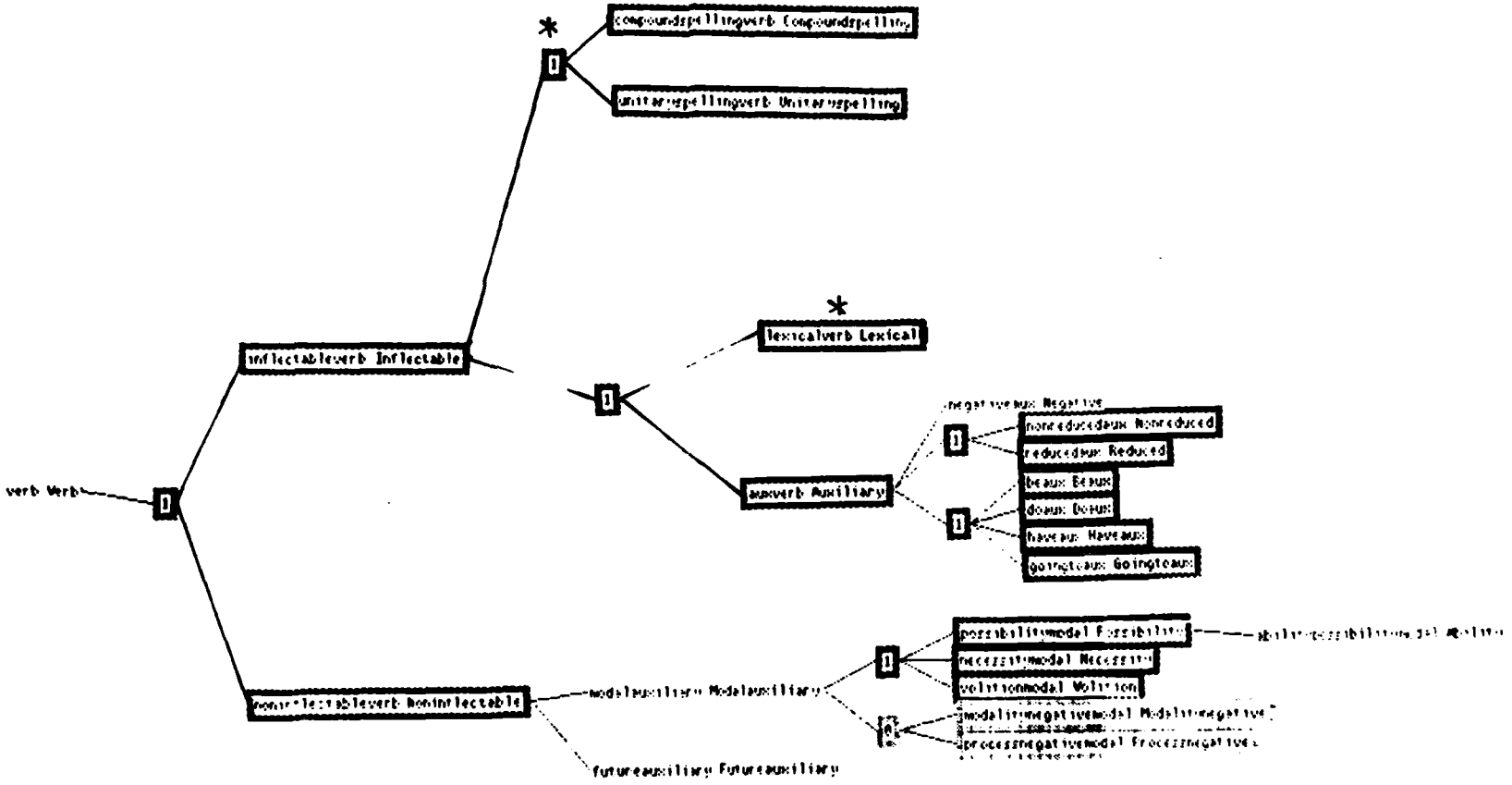


Figure III-6: The Morphology Part of the Verb Hierarchy

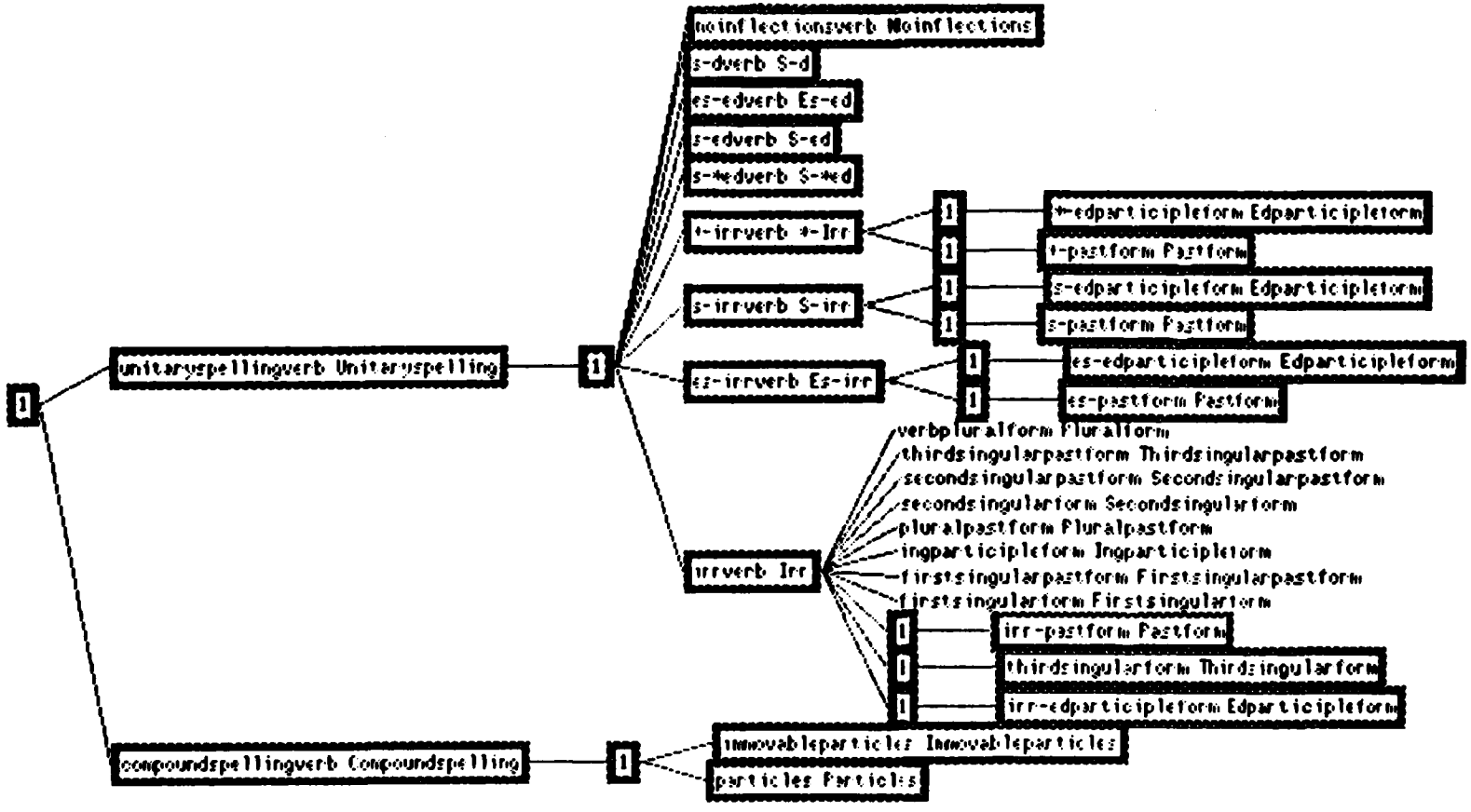


Figure III-7: The Top Part of the Lexical Verb Hierarchy

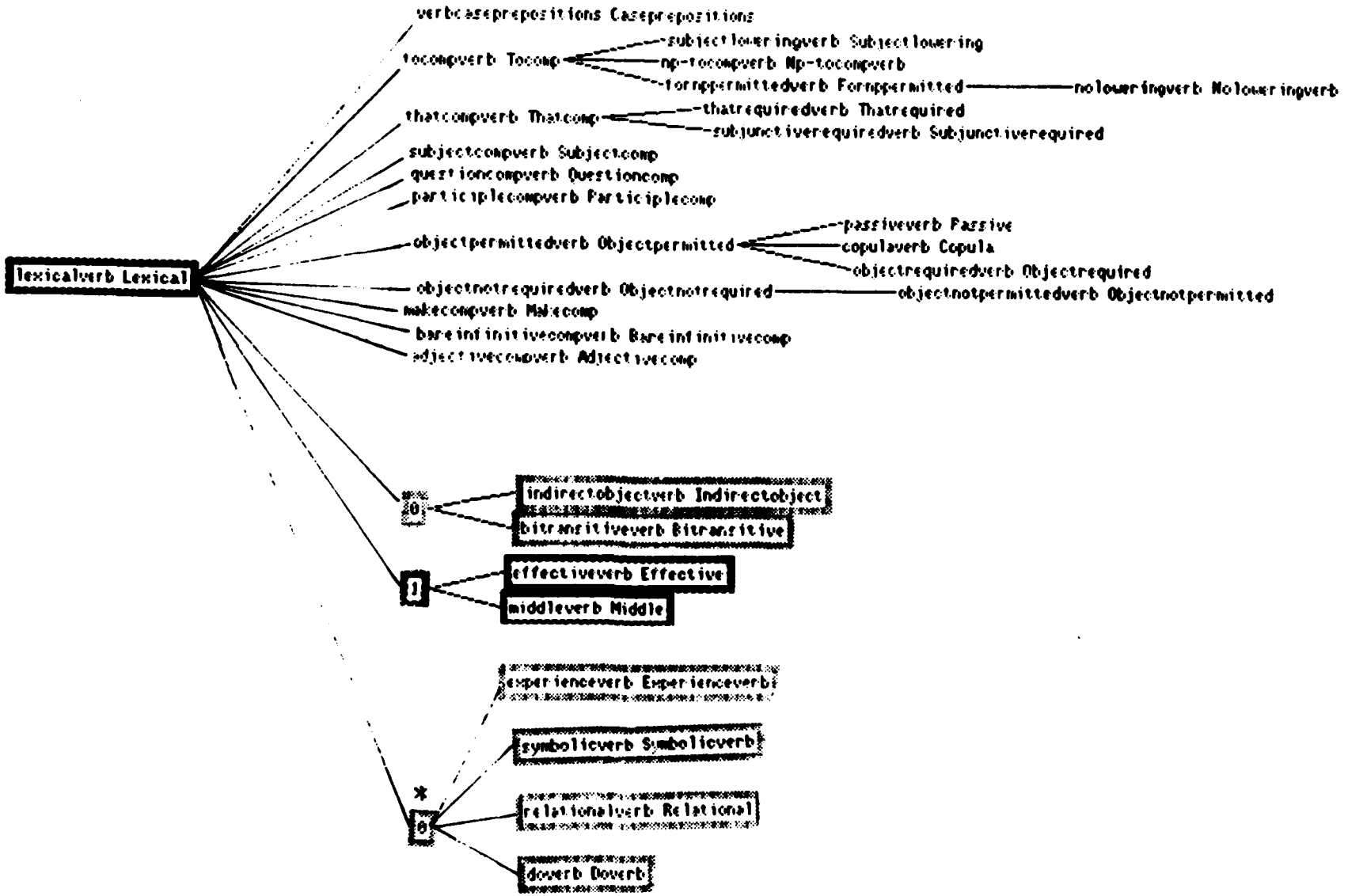
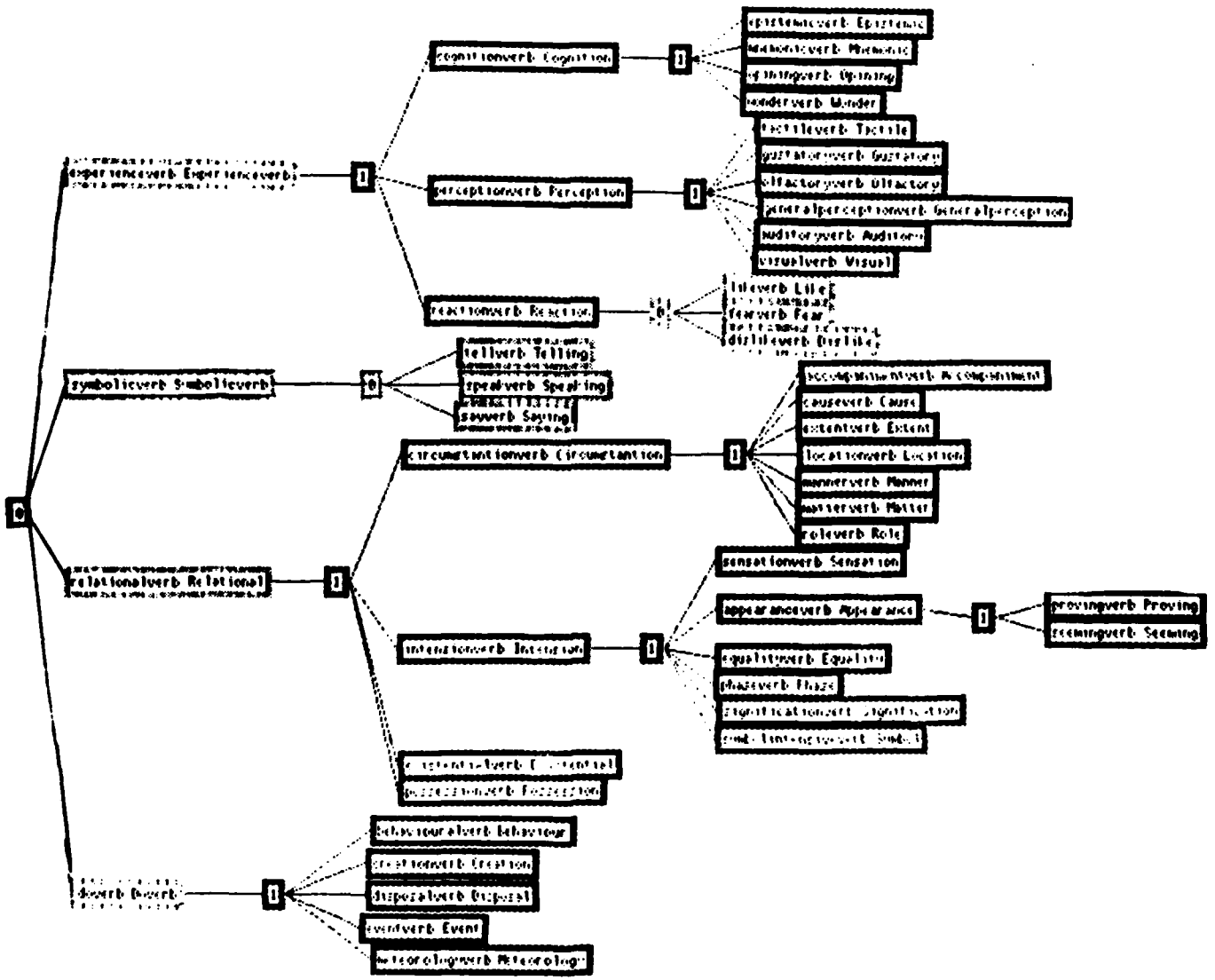


Figure III-8: The Lower Part of the Lexical Verb Hierarchy



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