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DEVELOPMENT OF A COMPUTATIONAL METHODOLOGY FOR DERIVING NATURAL LANGUAGE SEMANTIC STRUCTURES VIA ANALYSIS OF MACHINE-READABLE DICTIONARIES

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ABSTRACT

This report describes the results of a 21-month research effort to develop a computational technique for extracting semantic information from an ordinary dictionary. The technique uses computers to build databases from which all occurrences of selected words can be systematically extracted, coded by human informants for syntactic and semantic information, and then assembled by a computer program into a taxonomic-like description of the entire dictionary. The resultant graph-theoretic "forest" of semantic-based trees provides the first limited description of the organization of an entire lexicon of a language as portrayed in a dictionary.

In the report the intermediate stages of the database construction, human coding, and final graph-theoretic "forest" construction are described. This includes work performed at the University of Texas by Robert A. Amsler and Robert F. Simmons prior to the initiation of this grant in developing lexical databases and determining principles underlying lexical semantic structure, the techniques developed for coding lexical entries as developed under the project's sponsorship, and the final taxonomic database assembly task producing the existing taxonomies. Also included is a preliminary evaluation of the research results by the staff linguistic anthropologist, John White, sample appendices giving a protocol from one of the human disambiguator's sessions, a "how to" section on the use of the taxonomies for hand-evaluation of semantic fields, and samples of the final database contents.

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ACKNOWLEDGEMENTS

We are indebted to many people who have contributed to the dictionary project. In particular, John Olney must be cited as the dean of American computational lexicology. His pioneering work in creating the machine-readable transcripts of the G&C Merriam Pocket and Collegiate Dictionaries and continued research in this area for the last ten years has not only served as a source of knowledge, but has provided a sense of long-range effort without which the dedication of time and resources which lexical science research requires might never have been attempted. We would also like to thank the G&C Merriam Company, publishers of the Merriam-Webster Pocket and the Merriam-Webster Seventh Collegiate Dictionaries for permitting us to use the machine-readable texts of these in our research. Their willingness to allow academic researchers to experiment with these texts is a testimonial to their sincere interest in the quality and development of the lexical sciences. Additionally, we would like to thank the research scholars and scientists with whom contact was made during the course of the work under this grant; in particular, Scott Fahlman, George A. Miller, Paul Kay, Martin Kay, Cyril Alberga, and Patrick Suppes. Finally, a special word of thanks for Sally Sedelow whose understanding of the goals of the project and the realities of computational research in natural language processing led to the submission of the proposal for this project to NSF's Computer Sciences Division.

0. Introduction

The task which this project has performed was the creation of a taxonomy of the concepts represented by those words defined in an ordinary dictionary, and the development of a computer-assisted methodology for carrying out this task on other qualified dictionaries. While taxonomies of numerous smaller sets of vocabulary have been undertaken and vast taxonomies exist in the biological sciences, no comprehensive taxonomy has yet been undertaken which could be considered to be representative of the whole of the English lexicon. A limited version of such a taxonomy has now been produced for the contents of a pocket dictionary.

1. Motivation for Project Research

There are a number of reasons, methodological and analytical, why the undertaking of this task is valuable. Seven of these were direct consideration for the project:

a). The fundamental research question whether the English lexicon as described in an ordinary dictionary does in fact fit naturally into a taxonomic representation;

b). The creation of a methodology for building taxonomies from ordinary dictionaries for the use of other disciplines;

c). The application of taxonomies constructed from dictionaries to the development of classification systems in information science (and perhaps the possibility of building dictionaries from classification systems by reversing the process);

d). The value of taxonomic systems for computational linguistics, toward the development of useful linguistic/semantic knowledge for computer programs concerned with natural language processing (including mechanical translation) and in artificial intelligence research for providing knowledge bases for systems;

e). The implications to database management of developing such structures, particularly the storing of tree-like data in a database where the data itself, not necessarily the database, is taxonomic in nature;

f). The value of the large size and representative nature of the dictionary taxonomy as a tool in anthropological linguistics

with respect to providing a basis for comparison with English folk taxonomics and with cognitive structure theory in general and the cognitive structure of English in particular;

g). The contributions to epistemology from what analysis of the content of this structure can tell us about our division of the world into entities and events;

h). The immediate value the developed structure has for research in lexicography, the science of writing dictionaries.

2. Appropriate Texts and Formats

By no means are all books labelled 'dictionary' amenable to the methodology designed and executed in this project. The use of the term in modern reference parlance, as in "encyclopedic dictionaries" and works "in dictionary form", implies a much broader range of reference tool than is implied in the strictest sense of 'dictionary'.

2.1 Criteria for an Applicable Dictionary

The necessary conditions which a lexicon must fulfill in order to be amenable to the taxonomic structuring methodology are as follows:

(a) the 'dictionary' must contain lexical items (lexical vs. alphabetized list)

(b) each lexical item must be accompanied by a 'definition' (word list vs. dictionary)

(c) each definition must contain one or more lexical terms which are taxonomically related to the lexical item being defined (definition by genus/species)

(d) the lexical items so used in a definition must be themselves defined elsewhere in the text (closure)

[Additional value may be gained if each definition also follows the standard descriptive strategy of using differentiating phrases to distinguish it from the other definitions sharing the same taxonomic kernel, but this is not essential to the initial analysis of the data.]

Under this set of criteria certain books commonly referred to as 'dictionaries' would fail to be suitable (and equally, some books termed 'encyclopedias' might qualify). Patently, books such as "A Dictionary of Songs" and "A Dictionary of Quotations" fail to satisfy criteria (a) and (b). Books termed "A Dictionary of Spelling" or multilingual dictionaries usually fail to satisfy (b), while "encyclopedic" dictionaries often fail to contain definitions satisfying criterion (c). "Biographical" and "geographical" dictionaries often fail to satisfy the criterion in (d), though this may be remedied if the original text is supplemented with selected definitions from other standard sources containing the missing entries. Thus, defining 'Aristotle' as a 'philosopher' requires a definition of 'philosopher' be added to the lexicon in question; or defining 'Texas' as a 'state' would require a definition of 'state' be added from some other source.

These criteria are of course not always satisfied by every entry in a book which generally passes these four tests, for it is not in some cases possible to provide a 'definition' of all lexical items used in the text. There are, for example, function words whose lexical meaning has perhaps atrophied or otherwise been diminished to the point where a description of the item's usage replaces its definition, or items such as numbers whose 'definition' is not realistically expressible in words, or lexical items whose 'definitions' are really references to some sensory experience or given by illustrative examples, etc. These lexical items may have to be excluded from the above criteria. There are many alternate methods of defining; the interested reader is referred to Walpole [1941] for an enumeration of these.

2.2. Processing Formats

Beyond the problem of determining what constitutes, for this purpose, a dictionary, the next requirement is to obtain such material in machine-readable form. Until recently this required entering the relevant portions of a dictionary text into a computer via punch cards, tape, or on-line. Fortunately, publishing as an industry and dictionary publishing in particular is making increasingly greater use of computer phototypesetting techniques which replace the conventional linotype procedures. Dictionary publishers such as G&C Merriam, Random House, American Heritage, and Longman have machine-readable dictionaries available for some of their published lexicons. McGraw-Hill publishes many technical dictionaries which mention computer-preparation as one of their composing steps.

The format in which a machine-readable dictionary may be found is a separate problem in itself. Publishers use photocomposing languages to indicate type font, positioning information and other details of a dictionary's format which may be irrelevant to the task at hand.

Ten years of computational experience with the "data processing" formats in which the G&C Merriam dictionaries were originally distributed has led our group and at least one other (Cyril Alberga at IBM Yorktown Heights) to transform them back into a format as close to the original text as possible (rather than arranged in 'fields' or padded with blanks). This conversion may reflect a major programming change of the last ten years toward the greater simplicity of manipulating 'free field' text and the need to use whatever means of compaction possible to bring massive lexical files into an appropriate size for on-line manipulation (as opposed to batch-oriented magnetic tape processing). Below are presented output samples of the procedure by which the machine-readable Merriam-Webster Pocket Dictionary [MPD] was converted into a version close to that of the published book.

June 29, 1971 Original Format - J.Olney Tapes

```
F0010A                          1                    P N
P/'A^-
P/
L     +OFTEN +CAP
OTHE                              A                    1N  0   M A01M
O1ST                              A                    1N  0   M A02M
OLETTER                           A                    1N  0   M A03M
OOF                               A                    1N  0   M A04M
OTHE                              A                    1N  0   M A05M
OENGLISH                         CA                    1N  0   M A06M
OALPHABET                         A                    1N  0   M A07M
F0016A                          2                    P IA
P/*, (')A^-
P/
OONE                        S     A                    2IA 0   M A01M
OSOME                       S     A                    2IA 0   M A02M
OUSED                             A                    2IA 0   U A01M
OTO                               A                    2IA 0   U A02M
OINDICATE                         A                    2IA 0   U A03M
OAN                               A                    2IA 0   U A04M
OUNSPECIFIED                      A                    2IA 0   U A05M
OOR                               A                    2IA 0   U A06M
OUNIDENTIFIED                     A                    2IA 0   U A07M
OINDIVIDUAL                       A                    2IA 0   U A08M
OTHERE'S                          A                    2IA 0   V A01M
O[                                A                    2IA 0   V A02M
OMAN                              A                    2IA 0   V A03M
OOUTSIDE                          A                    2IA 0   V A04M
```

21 MAY 1974 Rewritten Format Used by J.Slocum (U.Texas)

```
F 1N      A          L     +OFTEN +CAP
O      0MAMTHE
O      0MAM1ST
O      0MAMLETTER
O      0MAMOF
O      0MAMTHE
O    C 0MAMENGLISH
O      0MAMALPHABET
F 2IA     A
O S    0MAMONE
O S    0MAMSOME
O      0UAMUSED
O      0UAMTO
O      0UAMINDICATE
O      0UAMAN
O      0UAMUNSPECIFIED
O      0UAMOR
O      0UAMUNIDENTIFIED
O      0UAMINDIVIDUAL
O      0VAMTHERE'S
O      0VAM[
O      0VAMMAN
O      0VAMOUTSIDE
```

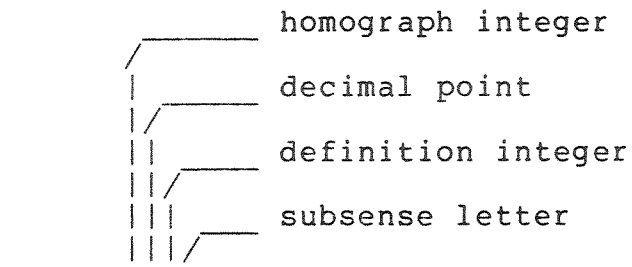
November 2, 1976 Compact MPD - R.Amsler

```
A              N 1. 0A THE 1ST LETTER OF THE ENGLISH ALPHABET
A            S IA2. 0A ONE SOME [ USED TO INDICATE AN
                       UNSPECIFIED OR UNIDENTIFIED INDIVIDUAL
                       ] < THERE'S * MAN OUTSIDE >
```

3. Structure of Lexicon and Database

3.1 Composition of MPD entries

Each definition in the Pocket Dictionary can be uniquely identified by a "sense number" comprising some combination of its homograph integer (if any), a 'decimal' point, the definition integer, and a suffixed letter if subsense divisions are present.



PLANT-2.1A - any of the great group of living things (as mushrooms, seaweeds, or trees) that usu. have no locomotor ability or obvious sense organs and have cellulose cell walls and usu. capacity for indefinite growth

Homographs are defined as main entries with exactly the same written form as another that appears either before or after it. Occasionally these are words with the same part of speech but different etymologies, but usually they are the same word manifest as different parts of speech, e.g., 'act' as a noun and as a verb. They are marked in the dictionary by super-scripted integers preceding such main entries which have more than one identical occurrence.

Following the pronunciation and part of speech indication of all main entries which have more than one sense, full-sized boldface integers precede each major definition passage.

Subsenses are indicated in the dictionary by the use of colons (always in boldface type) preceding definition passages. As a convenient means of labeling such subsenses the letter A was assigned to the definition following the first colon, B the second, C the third, etc. More than two subsenses are infrequent, more than three are very rare. Whether or not a main entry has definition integers, colons are always present, and the computational representation was always given at least an A subsense letter.

In the absence of a homograph integer the decimal point begins the identification sequence. In the absence of any definition integer a zero is used. (The convention of using zero when there are no sense numbers allows rapid identification of main entries whose definitions are unambiguous according to the Merriam-Webster lexicographers.) In the absence of a subsense, the letter A is appended.

Thus the occurrence of .0A for a definition identification indicates that there are no homographic forms of the word or word phrase being defined and that it has only one major sense in the lexicon. A 1.1A identification would imply the existence of at least one homograph, and at least a second major sense; i.e., both 2.1A (or 2.0A) and 1.2A are also present.

Definitions in the Pocket Dictionary are ordered by their usage historically, and consequently homograph numbers would appear to occur without fixed association with part of speech. Where two parts of speech are based upon the same root form the homographs appear alphabetically by the part of speech with which they are associated, e.g., adjective before noun, noun before verb, etc.

A definition of a noun, verb, or adjective is either a textual definition, a synonymous cross-reference, or a usage note.

Usage notes are rare in definitions and restricted to word senses of a highly functional (rather than content) role. Such usage notes occur in the definitions of the verbs BE-.4a, .5a, .6a, and .7a; COULD-.0b, HAVE-1.15a, DO-.23a, and of other functional parts of speech such as the indefinite article A-2.0b, preposition IN-1.5a, and 1.6a; conjunction OR-.0a, pronoun ONE-2.3a, interjection LO-.0a, and noun plural suffix -ES-1.1a. E.g.,

> to (prep) 1.18a - used for marking the following verb as an infinitive and often used by itself at the end of a clause in place of an infinitive suggested by the preceding context.

Definitions by synonymous cross-reference serve both as the listing of a synonym, and as a one-word definition. These are described in the Pocket Dictionary as not being definitions, but

"an indication that a definition at [their] boldface equivalent can be substituted at the place where the small capitals are used". The difficulty this raises is that the boldface equivalent may itself be defined by another -- often reciprocating -- synonymous cross-reference, resulting in a loop. This is not a phenomenon restricted to synonymous cross references; it probably is an inherent property which reveals itself in any attempt to completely define the lexicon within its own symbol system. We therefore are not certain the lexicographers are at fault, but certainly they are at least of suspicious intent when they do not provide a true definition at any of the main entries linked by synonymous cross-references.

The texts which define nouns are noun phrases in syntactic structure. Textual definitions of verbs begin with an infinitive verb, usually preceded by 'to', and consist of what may be termed an 'infinitive verb phrase'.

Textual definitions are usually given in terms of a more general word and associated distinguishing properties which specify the restrictions on the more general word which make its use appropriate in a definition of the main entry involved.

For nouns and verbs it is generally possible to identify a single word or set of conjoined words which are the syntactic 'kernel' of the definition. Such a word or words may be loosely described as being in an 'ISA' ("is a") relationship with the main entry subsense in whose definition it appears, as for example the word 'plant' in the definition of 'tree-1.1a',

tree-1.1a - a woody perennial PLANT usu. with a single main stem and a head of branches and leaves at the top

or the conjoined words 'bed' and 'shelter' in the definition of the noun 'nest-1.1a',

nest-1.1a - the bed or shelter prepared by a bird for its eggs and young

or the word 'make' in the definition of the verb 'beautify-.0a',

beautify-.0a - to make more beautiful

or the conjoined words 'move' and 'pass' in the definition of the verb 'fly-1.1a',

fly-1.1a - to move in or pass through the air with wings

In most cases, the kernel of a definition itself occurs as a main entry in the dictionary. Thus, the property of closure exists for the ISA relation between main entries and their definition kernels. However, no such main-entry/kernel pairs can be created without determining what homograph number, sense, and subsense are to be attributed to the kernel. Upon the discovery of this information for each definition's kernel words, the resulting paired defining and defined words can be used as the basis for constructing a taxonomy of the vocabulary of the entire dictionary.

The size of the Pocket Dictionary makes the task of assigning sense designations to kernels a massive undertaking, involving essentially the specification of the kernels of some 39,000 noun and verb definitions, the examination of the possible homographs, senses and subsenses of all these kernels' possible main entries, and the assembly of the resulting 39,000 linked pairs into their taxonomic structure.

3.2 Database Structure

By the end of November 1976 the data in the Merriam-Webster Pocket Dictionary for noun, verb and adjective definitions had been loaded into four System 2000 [S2K] databases at the University of Texas as part of Robert A. Amsler's work toward a dissertation. These databases contained, respectively:

Adjectives A CAPELLA - ZONAL = 4 million character database

Verbs ABANDON - ZOOM = 5.8 million character database

Nouns A - NAME = 10.1 million character database

Nouns NAME - ZYMASE = 7.6 million character database

(The nouns had to be divided into two segments as interactive database loading prevented sorting the whole noun database within the normal disk track limit.)

System 2000 is a traditional database management system with a hierarchical database definition structure. The definition structure used for the dictionary was as follows:

```
1\  SPELLING (NAME X(5))
2\  SENSE (NAME X(5))
3\  TYPE OF DEFINITION (NAME X)
4\  NUMBER OF POSSIBLE DESCENDANTS (INTEGER NUMBER 9999)
5\  DEFINITION (RG)
  6\  WORD (NAME X(5) IN 5)
  7\  SUFFIX (NAME X(5) IN 5)
  8\  RELATION (NAME X(5) IN 5)
 10\  WORD SENSE (NAME X(5) IN 5)
 11\  PART OF SPEECH (NAME XX IN 5)
 12\  USAGE NOTE (NON-KEY NAME X(5) IN 5)
 13\  EXAMPLE (NON-KEY NAME X(5) IN 5)
```

This definition format would contain one entry for each sense (or subsense) of each word. The decision to store datasets comprising single senses of words was made because it appeared to offer the best options for retrieval. It would allow retrieval of all the senses of a word using the identity of the SPELLING as the criterion. It would also allow convenient retrieval of all the information stored about only one sense without forcing the retrieval request to be complicated by additional restrictions -- especially where the restrictions might not be easily specified, e.g., the sense number of the dictionary would have been required to restrict a given entry to only one sense.

3.2.1 Existing Database Attributes

The attributes for which values were entered were SPELLING, SENSE, TYPE OF DEFINITION, WORD, USAGE NOTE, and EXAMPLE. Other attributes were created for possible future use after the data initially loaded was analyzed. The attributes which were initially filled in have the following meanings:

SPELLING is a main entry of some word being defined in the dictionary. The phrase was selected as most appropriate for a word form which may have more than one part of speech.

SENSE (or "sense number") is a composite of the SPELLING's homograph integer, definition integer, and subsense indication, written as a compacted decimal number with a suffixed letter for the subsense (e.g., 1.0A, 2.12C, .7A, .0A). Words which do not have any homograph numbers are pure decimals (e.g., .1A or .0B). Words which do not have more than one sense meaning are designated by .0A, .0B, .0C, etc., thus allowing their identification apart from .1A which is the first sense of a word with more than one sense meaning listed. The subsense letter is suffixed to the sense as A, B, C, etc.

TYPE OF DEFINITION is either null or S (for Synonymous Cross Reference, a quasi-synonym definition type used in the Merriam-Webster dictionaries). Additional TYPES OF DEFINITION values were reserved for later use, e.g., P for plural-only senses of words (e.g., scissors, designs vs. design, etc.), or C for capitalized sense meanings (e.g., Catholic vs. catholic, American, etc.).

DEFINITION is the name of a repeating group (i.e., may occur an indefinite number of times for each occurrence of the entry it is within) with one entry for each "word" in the definition. These include commas and semicolons as separate "words" and abbreviations with their accompanying periods as single words (e.g., ESP., etc.) as well as the more typical English words of the definition. As these words are entered sequentially according to their order within the definition they are implicitly ordered in the database and can be dependably located by position using the AT operator of S2K.

USAGE NOTE and EXAMPLE are NON-KEY elements which contain material present in definitions which should be available for understanding the meaning of the sense specified, but not retrieved by their words as they often contain vocabulary unrelated to the meaning of the word being defined. These are thus stored as non-key text, with each whole example or usage note as a string of blanks and words.

3.2.2 Future Database Values

There are at present no entries for NUMBER OF POSSIBLE DESCENDANTS, SUFFIX, RELATION, NUMBER OF DESCENDANTS, WORD SENSE, or PART OF SPEECH. These were included in the database definition for future addition as the definitions were analyzed or as contingency elements for future additions. The necessity for the latter is caused by the inability to modify the database definition once any data has been loaded.

NUMBER OF POSSIBLE DESCENDANTS and NUMBER OF DESCENDANTS are both reserved for possible use to indicate the tree-structure of the nodes. The former is currently available from the taxonomic concordance data file and could be added by means of a massive series of ADD element commands. The latter is reserved for the actual number of taxonomical descendants of any given noun sense when this is determined.

SUFFIX is a contingency component present in the event that retrieval of WORD values which have suffixes is not adequate using the SPANS operation of S2K. It would contain suffix values with the WORD entries altered to become the lexical entry form. Thus, for example, the WORD value PLANTS could be altered to PLANT with the addition of a SUFFIX value +S. The SPANS provision of S2K has for the moment removed this problem and stripping of suffixes does not seem necessary. This component may be used for syntactic or other semantic information at a later time.

PART OF SPEECH and WORD SENSE are components awaiting the respective syntactic and semantic parsing of the definition as text.

RELATION is the principal semantic component which can be added to the database. The value of RELATION would attempt to explain the relationship between the SPELLING and WORD SENSE where this is significant. Thus ISA for the genus/species relationship between words such as CAT and MAMMAL, MAMMAL and ANIMAL, etc., could be one such relation. Other relations which appear possible are ISPART (for the relation between LEAF and PLANT, PAGE and BOOK, etc.) and perhaps case-argument role relationships between the SPELLING and those WORDs in its definition which are verbs (e.g., "instrument" for the relation between VEHICLE and CARRY, SCISSORS and CUT, etc.; "agent" between PILOT and FLY, MUSICIAN and PERFORM, ACCESSORY and ASSISTS, etc.; "medium" between AIR and TRANSMISSION (of radio waves); "result of" between ABBREVIATION and ABBREVIATING).

The conditions on these relations are determined by the presence or absence of a WORD in a definition, for if a word is not present in the definition of another it cannot be noted as being related to that word under this system. In this regard such a dictionary database is less than a semantic network of knowledge, but on the other hand more information than is currently available in any existing database representative of the whole language. The dictionary database might thus be thought of as a potential semantic network awaiting arc labels for its interrelated components.

3.3 Formats of Database Output

While the S2K manual [MRI-74] gives complete descriptions of how any S2K database may be accessed it still may be useful here to provide some indication of what information can be extracted and what commands perform these retrieval operations.

The dictionary data base was constructed to provide an interactive means for analyzing the taxonomic properties of English lexical entries. To do such an analysis requires access to both the definitions of words in the dictionary and to the definitions which in turn use these words to define other meanings. Access to definitions is immediately available via printout of the entry for a particular SPELLING.

PRINT ENTRY WHERE SPELLING EQ <word>:

Access to the definitions which contain any given spelling as one of the defining words is also available via print out of the entire entry where a given WORD EQs some desired usage.

PRINT ENTRY WHERE WORD EQ <word>:

The capabilities of S2K allow for set theoretic combinations of such WORD values and therefore provide for print out of definitions which contain any given pair of words, etc., as well as definitions which contain one word but do not contain another.

PRINT ENTRY WHERE ENTRY HAS WORD EQ <word1> AND ENTRY HAS WORD EQ <word2> ... etc.:

PRINT ENTRY WHERE ENTRY HAS WORD EQ <word1> AND NOT ENTRY HAS WORD EQ <word2> ... etc:

PRINT ENTRY WHERE ENTRY HAS WORD EQ <word1> OR ENTRY HAS WORD EQ <word2> ... etc:

Because S2K also allows the retrieval of data values which span ranges and since alphabetic order on the CDC6000 system is numerically ordered as well, one can request retrievals on the basis of word stems as well as entire words. This is particularly important for plurals and conjugations of regular verbs where one is interested in all occurrences of some word regardless of its inflectional form, e.g., 'prove', 'proving', 'proves', 'proved', and 'proven'.

The syntax of the SPANS operation illustrated indicates the retrieval of all WORD values which begin with <stem> followed by any other character (including no character). This is indicated by:

	<stem>	the beginning of the range,
	*	the system separator,
and	<stem>;	the upper bound of the range (i.e., ; is 77B in CDC display code).

One could of course use any two sequences of characters as the starting and terminal bounds of the span.

PRINT ENTRY WHERE WORD SPANS <stem>*<stem>; :

Caution must be exercised in using the SPANS operator on short words. For example, while one could retrieve the words CAT and CATS using the spans expression CAT*CATS, this would also retrieve every word beginning with CAT+, including CATASTROPHIC, CATEGORY, and CATCH, etc. To retrieve such short words one must individually list the possibilities as WORD EQ CAT OR WORD EQ CATS.

Finally, one may in addition to printing out given values also perform counts of the number of occurrences which satisfy a given constraint.

PRINT COUNT DEFINITION WHERE WORD EQ <word>:

It is also possible to unload subsets of the database for later reloading into additional databases. This is useful where one desires to perform extensive additional processing upon a set of values without the overhead cost of the entire dictionary for each operation. This technique has proven the most valuable for working with semantic domains of several dozen to several hundreds of elements.

The three commands available in S2K for printing out information are the PRINT, LIST, and UNLOAD commands. The PRINT command basically prints one component's value on a line of output, optionally with the name (or component number) preceding each value output. This is adequate for enumeration of SPELLINGs, but tends to be very difficult to read for more than a few whole definitions. Examples of forms in which this command would be adequate are:

PRINT /STUB SUPPRESS/ SPELLING WHERE WORD EQ MACHINE:

PRINT /NAME,BLOCK/ SPELLING WHERE ENTRY HAS WORD EQ RAILWAY AND ENTRY HAS WORD EQ CAR:

The problem with the S2K PRINT command is that each WORD in an entry is in a separate repeating group, and consequently will be printed on a separate line. What is worse, between each repeating group's values S2K will skip a line, tending to consume inordinate amounts of paper for each retrieval of an entire definition. An example of the results of PRINTing a definition in this fashion is given below:

```
PRINT ENTRY WHERE SPELLING EQ ABACUS:

SPELLING: ABACUS
SENSE: .0A
  WORD: AN
  WORD: INSTRUMENT
  WORD: FOR
  WORD: PERFORMING
  WORD: CALCULATIONS
  WORD: BY
  WORD: SLIDING
  WORD: COUNTERS
  WORD: ALONG
  WORD: RODS
  WORD: OR
  WORD: GROOVES
```

To avoid this lengthy printout one can use the UNLOAD command. UNLOAD however is not intended for human reading, and consequently several programs for reformatting UNLOAD output have had to be written.

3.4 Generation of Coding Form Output

The task next undertaken was the extraction of all occurrences of all nouns and infinitive verbs from the Merriam-Webster Pocket Dictionary databases, with their defining contexts, such that they could be hand-analyzed by human informants to determine the part of speech and sense-numbered meaning in which each word was being used. The available formats for retrieval of such a large quantity of data, i.e., tens of thousands of definition texts, required as compact a representation as possible. It was decided to use the UNLOAD command which produces a minimally spaced (and minimally readable!) "loader stream" format in output and then to rewrite the output into a more readable format.

Sample UNLOAD output from ADJECTIVES Database

```
---
ACCESS:
---
UN BY ENTRY, C1,C2,C3,C6,C11,C12,C13 WH C6 EQ YOUNG:
FEMALE\.0A\OF\,\RELATING\TO\,\OR\BEING\THE\SEX\THAT\BEARS\YOUNG
\;\ALSO\JUVENILE\1.2A\OF\,\RELATING\TO\,\OR\CHARACTERISTIC\OF\C
HILDREN\OR\YOUNG\PEOPLE\MALE\1.1A\OF\,\RELATING\TO\,\OR\BEING\T
HE\SEX\THAT\FATHERS\YOUNG\;\ALSO\PREGNANT\.1A\CONTAINING\UNBORN
\YOUNG\PROLIFIC\.1A\PRODUCING\YOUNG\OR\FRUIT\ABUNDANTLY\VIVIPAR
OUS\. 0A\PRODUCING\LIVING\YOUNG\FROM\WITHIN\THE BODY\RATHER\THA
N\FROM\EGGS\YOUNGISH\.0 A\SOMEWHAT\YOUNG\YOUTHFUL\.2A\BEING\YOU
NG\AND\NOT\YET\MATURE\\
---
EXIT:
          END SYSTEM 2000
```

In order to unload the databases a series of UNLOAD commands had to be composed and here the question of which occurring words should be selected once again arose.

Verbs are always defined in terms of an infinitive verb, usually preceded by 'to' and hence offered no problem since the same spellings which were defined in the dictionary were to be matched as occurrences. From experience with the taxonomic concordance it was noted, however, that nouns occurring in a definition as taxonomically related to the word being defined were often plurals, e.g., 'buildings' in the definition of plant-2.2a,

plant-2.2a - the land, buildings, and machinery used in carrying on a trade or business

Ordinarily plurals are not defined in the MPD, and even when a definition that only applies to the plural of a word is included, the main entry form will be singular with the plural being mentioned under the senses to which it applies. E.g.--

dud-.1a - (pl.) CLOTHES
dud-.1b - (pl.) personal belongings
dud-.2a - one that fails completely
dud-.3a - a missile that fails to explode

Thus any effort to solely rely upon the main entries to enumerate all the possible taxonomically-related nouns occurring in noun definitions would miss this class of occurrences.

To remedy this a program was written to generate possible plurals from all nouns. The formation of the plural in English is not easily predictable from the singular, and alternate plurals can exist. Thus, rather than risk missing a plural, and to simplify the algorithm, all reasonable plurals were generated and these were pruned down by only accepting as 'true' plurals those from the generated set which matched occurrences in the dictionary. This had the added advantage of weeding out all main entries which did not occur at all, either in the singular or plural, and prevented many fruitless queries to the database which would have required processing time but not have returned any data because none in fact existed.

Of course, there were the usual confusions over noun-verbs such as 'line' with plural 'lines' equivalent to the verbal 3rd person singular verb form which resulted in the verbal forms occurring in noun definitions being selected (falsely) as candidates for taxonomic relevance.

There were many by-products from the loading of the dictionary definitions into S2K databases. These included frequency data on the number of occurrences of each spelling form used in the dictionary and frequency data on the number of different senses each spelling form of a given part of speech had as a main entry (a measure of the 'ambiguity' of a word). The more important result was that for the first time a full-scale random-access DBMS containing the dictionary definitions had been constructed and was available for retrieval of definitions satisfying simple Boolean restrictions over combinations of occurring words.

4.0 The Coding Task

The S2K databases for nouns and verbs were output into a format which allowed for easy hand-scoring by coders. Below is described the process by which coders scored each occurrence of a noun or verb in each noun or verb sense definition. For the purposes of this presentation we limit discussion to the noun scoring procedure, pointing out instances of verb scoring only where they differ significantly.

For each noun that occurred in a noun sense definition, the coder (i.e., disambiguator) was given a text in the following form:

<main entry><sense no.>.... = <focal term>..... <sense defin.>

The focal term is that noun in the definition text for which a scoring decision was to be made. For every noun in the sense-definition text, a line with the same main entry, sense number, and sense definition was given, with the noun to be considered appearing as the focal term.

DEFEATISM .0A..... = ACCEPTANCE.....	ACCEPTANCE OF OR RESIGNATION TO DEFEAT
DEFEATISM .0A..... = DEFEAT.....	ACCEPTANCE OF OR RESIGNATION TO DEFEAT
DEFEATISM .0A..... = RESIGNATION.....	ACCEPTANCE OF OR RESIGNATION TO DEFEAT

Since 'acceptance', 'defeat', and 'resignation' are all words which appear as MPD noun main entries, a scoring line appeared in in the coding sheets for each.

The contents of the coding sheets were pre-sorted alphabetically by focal term. In the examples above, the line with 'acceptance' as focal term was included in the letter A coding sheet file and occurred next to other noun sense-definitions that contained the word 'acceptance'. The clustering of definition texts by focal term presented the coder with a means of comparing scoring decisions, the advantages of which are discussed below. The consequent segregation of the three focal terms, however, created the potential for consistency control problems, since different coders were likely to have scored A-words, D-words, and R-words.

4.1 Coding Conventions

The scoring system was based on a three-level branching hierarchy along which scoring decisions were made. The structure was amenable to all focal terms, although those with special problems (see below) required further judgements.

The notion of the ISA-link is a semantic concept, and the sense decisions were ultimately based on semantic intuition. However, decisions as to the scorability of a focal term were first syntactic, appealing to a syntactically-constrained semantic judgement only after the focal term was evaluated syntactically. The priority given to syntax assured a considerable consistency in this intuitive task, since the syntax of dictionary definitions is highly regular and allows virtually total agreement in interpretation across disambiguators. The less consistent semantic decisions are constrained within narrow bounds imposed by the syntax.

The coder first determined whether the occurrence of the focal term in the sense definition was in fact as a noun. Because the string of letters that spells 'defeat', for example, can be a noun, there was a coding line for it as a focal term every time it appeared in a noun sense definition. But 'defeat' can also be a verb, as in,

COUNTERESPIONAGE .0A. = DEFEAT..... THE ATTEMPT TO DISCOVER AND DEFEAT ENEMY ESPIONAGE

where it could not be considered for scorability in a noun definition. In such cases the entry line was marked for deletion.

If the focal term represented a noun usage, the second task for the coder was the determination of the syntactic status of the focal term in relation to the definition text. If the focal term was the syntactic kernel of the noun phrase that makes up a noun definition in the MPD or was one of several conjoined by 'or', then the focal term was assigned a sense score (see below for discussion of how sense scores were determined). The pairing of a main entry plus sense number to a focal term plus sense number constitutes a disambiguated one-level ISA-link, the building material of the taxonomic structure. In the DEFEATISM examples given above, 'acceptance' and 'resignation' are scorable by this criterion. We use the term 'felicitously scorable' in reference to a syntactic kernel focal term.

If a focal term was used as a noun but was not the syntactic kernel, the coder was nevertheless asked to judge the semantic value of the focal term relative to the semantic value of the kernel in serving as a member of an ISA-linked pair with the main entry being defined. (The actual kernel would be felicitously scored when it appeared as a focal term elsewhere.) While this judgment depended on semantic intuition, it was heavily constrained by the syntax of the sense definition noun phrase.

This step was necessary because of the frequent occurrence of definition texts in which the syntactic kernel was not an MPD-defined noun (e.g., GIVING, below) or was fairly vacuous in meaning (e.g., FORM), while some embedded noun (e.g., AID; IRON) was quite important as an ISA-linked constituent of the main entry.

CHARITY .3A..... = AID.....		THE GIVING OF AID TO THE POOR
WROUGHT IRON .0A..... = IRON.....		A COMMERCIAL FORM OF IRON THAT CONTAINS LESS THAN .3 PERCENT CARBON AND IS TOUGH , MALLEABLE , AND RELATIVELY SOFT

No felicitously scorable focal terms could be excluded from coding, since no certifiably consistent means of excluding them could be devised. Therefore, semantically important focal terms needed to be scored specially. The theoretical principle underlying the scoring of non-kernel focal terms was as follows:

> An ISA-link is presumed to exist between any main entry and its sense-definition; and the link possibly exists between the main entry and some other constituent member(s) of the sense definition. If the smallest constituent which carries the ISA-link contains both the focal term and the syntactic kernel, then the focal term is scorable. (Note that this principle can be said to apply generally over the entire scoring task, the felicitous scores occurring where the smallest ISA constituent, the kernel, and the focal term are all the same word.)
>
> When the focal term was not part of the syntactic kernel, but made a significant semantic contribution to an ISA-link between the main entry and the expanded noun phrase constituent, the focal term was given a score followed by a slash (/) and one of two symbols: an exclamation point (!) if the focal term was semantically more important than the kernel in the noun phrase; or a plus (+) if the focal

term was not more important. For the scoring of verbs, this set of "slash scores" was enlarged to include /C for causative constructions /N for negated constructions, and /& for conjunctive constructions.

Examples of "slash scores"

Nouns

BATEAU .0A.....	= CRAFT .3A/!.....	ANY OF VARIOUS SMALL CRAFT
DEUTERIUM .0A.....	= HYDROGEN .0A/!...	A FORM OF HYDROGEN THAT IS OF TWICE THE MASS OF ORDINARY HYDROGEN
ATLAS .0A.....	= MAPS 1.1A/+.....	A BOOK OF MAPS
FINE 1.0A.....	= PENALTY .1A/+....	MONEY EXACTED AS A PENALTY FOR AN OFFENSE

Verbs

REVISE .1A.....	= CORRECT 1.1A/!...	TO LOOK OVER SOMETHING WRITTEN IN ORDER TO CORRECT OR IMPROVE
FALSIFY .1B.....	= DECEIVE .1A/!....	CHANGE SO AS TO DECEIVE
OVERGROW .1A.....	= COVER 1.6A/+.....	TO GROW OVER SO AS TO COVER
ILLUSTRATE .3A.....	= DECORATE .1A/+...	TO SERVE TO EXPLAIN OR DECORATE
MELT .2B.....	= DISPERSE .1B/C...	TO CAUSE TO DISPERSE OR DISAPPEAR
DEPOSIT 1.3A.....	= FALL 1.12A/C.....	TO LET FALL OR SINK
MISFIRE .1A.....	= FIRE 2.4A/N.....	TO FAIL TO FIRE
DENY .2A.....	= RECOGNIZE .5A/N..	TO REFUSE TO RECOGNIZE OR ACKNOWLEDGE

```
WINK 1.1A..... = CLOSE 1.1B/&.....  TO CLOSE AND OPEN
                                    THE EYES QUICKLY

POLL 2.2A..... = RECORD 1.1A/&....  TO RECEIVE AND
                                    RECORD THE VOTES OF
```

The entry FINE 1.0A above, for example, has two links, one via the felicitous score for 'money' (scored when it occurred as a focal term), and one via a slash-score for 'penalty'. Slash-scored nodes, however, could not grow upwards in the taxonomic generation process, and thus appeared in the final output as unique beginners.

Finally, any entry line whose focal term was neither the syntactic kernel nor of semantic importance was deleted. The following diagram shows the complete decision hierarchy for scorability.

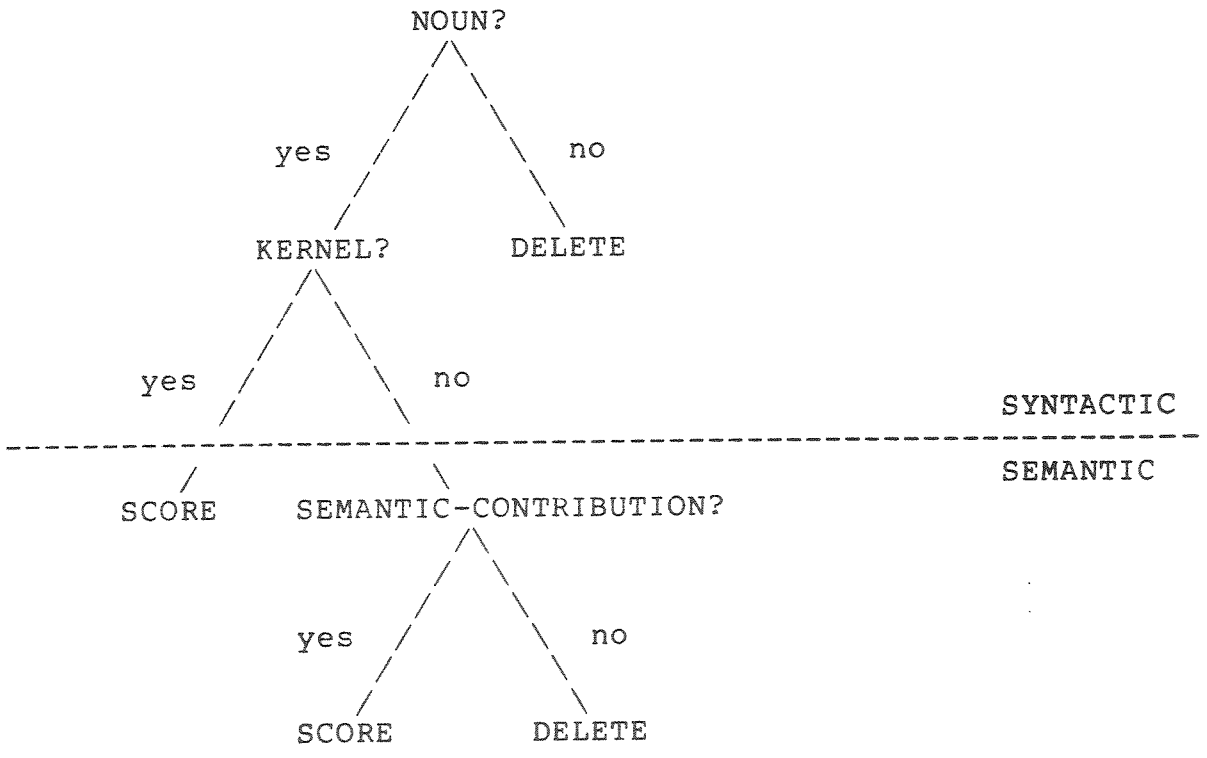


Figure 4-1 Key showing order of disambiguator scoring decisions

4.2 Special Problems

4.2.1 'AND' Conjunctions

Very often, focal terms scorable by the above criteria were part of a coordinate constructions of nouns joined by "and", "together with", and, in some cases, "with". Nouns in such constructions could not be scored without reference to the fact they were in a logical conjunction. One term in a logical conjunction cannot be considered in isolation from the other without resulting in a logically false link. Focal terms in such constructions were assigned a felicitous or slash score, followed by the ampersand, i.e., /&.

SHIP 1.3A.....	= OFFICERS .3A/&...	A SHIP'S OFFICERS AND CREW
CAFE AU LAIT .0A.....	= MILK 1.1A/&.....	COFFEE WITH USU. HOT MILK IN ABOUT EQUAL PARTS

4.2.2 Derived Nominals (RUN-ONS)

During the course of the disambiguation procedure, coders noticed that the syntactic kernel of some sense definitions were not themselves main entries in the MPD, but rather nominal words morphologically derived from verbs, adjectives, or other nouns. Since the manner in which the coding forms were constructed only mapped MPD noun occurrences to MPD noun main entries, these nominals never appeared as focal terms. They were slash-scored wherever they occurred.

After the major coding phase of the project was completed, a pass through the original alphabetic dictionary was made to check that all textual definitions of nouns had been scored and this pass discovered virtually all the remaining noun definitions with run-on nominal kernels.

For all such noun definitions, the coder looked up the main entry to which the nominal focal term was related, and entered a back-slash (\) followed by R (for runons) or I (for inflectional forms given at the beginning of irregular verb entries), followed by V (for verb), A (for adjective), or N (for noun) to indicate source main entry, followed by the most appropriate sense number.

It was believed, and confirmed during this task, that there could be a fit of sense from a verb, adjective, or noun to its use as a derived nominal.

CUSTOMER .0B..... = BUYER \RV.0A.....		A REGULAR OR FREQUENT BUYER
NIGHTFALL .0A..... = COMING \IV.2A....		THE COMING OF NIGHT
TEMPER 2.4A..... = CALMNESS \RA2.0A.		CALMNESS OF MIND

A similar instance arose in the verb coding, where verb plus particle phrases occasionally had run-on status. The same orthography was employed; however, it often happened that the verb plus particle run-on had its own definition text. In these cases the appropriate run-on score was entered between the \R and source designation.

FINISH 1.2A..... = DISPOSE OF \R.2AV.		TO USE OR DISPOSE OF ENTIRELY

4.2.3 Recourse to Other Dictionaries

For almost all scoring decisions, a reasonably appropriate sense was ultimately found within MPD. Occasionally, however, there was a focal term whose usage in the context did not fit any MPD sense. In these instances the coder looked up the focal term in Webster's Seventh Collegiate Dictionary and if successful entered the letter C, followed by any derivational information, followed by the sense number from the Collegiate. If no appropriate sense was found, the coder looked up the entry in Webster's Third International and entered the appropriate sense with the letter W in place of the C. Sometimes a C or W definition had two numbering sequences in the same definition, which segregated transitive usages from intransitive. For such entries the scoring of a verb as, say, C1.1A, was ambiguous, since there were two '.1A' senses in the entry. Accordingly, after the C or W the letters T or I were added if the sense number was in a second numbering sequence within the definition. Hence, T in a score stands for transitive usage as second sequence, and I for intransitive usage as second sequence.

Subsequent editing of the coded forms resulted in the replacement of most such scores with MPD scores. This work was accomplished by tracing the abridgement steps between MPD, the Collegiate, and the International, via the occurrence of certain phrases and example usages in all three. A considerable number of C-scored entries still remain in the verb tree, however.

An interaction between C-scoring and verb-plus-particle senses in verbs resulted in another orthographic requirement. If a C-scored verb-plus-particle focal term appeared in the Collegiate but not in MPD (i.e., if recourse to the Collegiate was not made solely for appropriateness of sense), then an asterisk was entered after the sense number and any slash information. If the appearance of the phrase in the Collegiate was as a run-on, the run-on orthography was included in the score.

RIDE 1.5A.....	= BEAR C2.1A.....	TO BEAR ALONG
EVAPORATE .1A.....	= PASS CT1.7C.....	TO PASS OFF IN VAPOR
DECOMPOSE .2A.....	= BREAK DOWN C.2A*.	TO BREAK DOWN IN DECAY
POCKET 2.3A.....	= PUT UP WITH C\R.0AV*	TO PUT UP WITH

4.2.4 Verb Particle/Idiom Scoring

In verb scoring it was found that some focal terms could not be appropriately disambiguated without recognition of the fact that either the focal term or the main entry was normally used in the context of the definition text in a phrase with other words. This problem occurred mainly with verb particles and verb idioms, where the pairing of main entry and focal verbs alone would not have resulted in capturing the information intended in the MPD. Here, the coder entered, after the sense number and before any slash information, a back slash (\) and either a hyphen (signifying "additional words go with focal term") or an asterisk (signifying "additional words go with main entry"), followed by the additional words required to make a fit of sense possible.

BUBBLE 1.0A.....	= GIVE 1.11A\-OFF..	TO FORM , RISE IN , OR GIVE OFF BUBBLES
PUFF 1.6A.....	= MAKE 1.1A *UP...	TO MAKE PROUD OR CONCEITED

4.2.5 New Additions to the Tree

The first computational growing of noun and verb trees was done without the inclusion of derivational kernels, and prior to the discovery of numerous errors. Some errors obscured valid

pairings. Subsequent versions of the trees were amended to include information previously lost. A line which did not exist in a prior version was automatically given a percent sign (%) at the end of its score. This was done to indicate that the newer version differed in this respect from previous versions.

4.3 Coding Orthography & Syntax: Summary

Each type of scoring decision has an orthographic representation and a position in the syntax of the score. Presented below is the full structural description of a score, along with co-occurrence conditions. Description of its components will serve as a summary of the preceding discussion.

Position	Values	Significance
-1	<word>	word from MPD
0	-	Separates Score from <word>
1	C or W	Collegiate or International
2	T or I	Transitive or Intransitive
3	\R or \I	Run-on or Inflected
4	<sense no.>	Sense + Subsense
5	V,N, or A	Verb, Noun or Adjective Run-on source
6	<entry no.>	Homograph no.
7	.<sense no.>	Sense + Subsense
8	\-<> or *<>	verb + particle construction
9	/+,/!,/C or /N	less,more,causative,negative flags
10	/? or /&	unknown, conjoined 'AND'
11	*	Collegiate appropriateness
12	%	addendum

Conditions:

A). Either a value for 3 or a value for 6 must occur, but not both.

B). 10 does not have a value unless 1 has a value.

C). 2 has a value if and only if 4 has a value.

Every scorable focal term must have an instantiation of slot 4 or 7, but can have empty values for any of the others. There is no indication, neither symbol nor blank space, of a null slot. With the exception of slot 6, null values usually indicate felicity of scoring and an MPD source. Indeed, the only nodes in the taxonomies which can link upward are those which only have values for 7 or 6 and 7.

Each slot represents a unique scoring decision by the disambiguator. The following is a description of the values and the criteria for choosing among them.

1. Source dictionary. Every effort was made to find an appropriate sense in the MPD to fit the usage of a word in a sense definition. When this effort was fruitless, the disambiguator looked up the entry in other Merriam-Webster dictionaries, first the Seventh Collegiate (C), and if no score was found there, the Third International (W). Null value for 1 is MPD.

2. Second sequence designation. If a verb was scored by recourse to the Collegiate or International dictionary, and took a sense number which was in the second sequence of sense numbers, a T was used to indicate that the second sequence was a transitive usage, an I to indicate intransitive.

3. Entry types. Often the kernel constituent of a sense definition did not occur as a main entry in MPD, but rather as a run-on (R) listed after the definition or as an inflection (I) of the main entry. Some constituents scored with an I did not actually appear in boldface in the definition of a main entry. Null value for 3 is main entry.

4. Run-on sense number. On a few occasions a run-on listed at the end of an entry's definition had more than one sense. A run-on cannot also be a main entry (except as homographs), and so no word with a value for 4 may have a value for 7. However, it is theoretically possible for a run-on to have a value for 6, as when the run-on is appended to a word which has several entries, some of which are the same part of speech. The resulting score, similar to \R<no.>Vl., never occurred in the actual scoring.

5. Part of speech of source main entry. This slot was included in order to show the relationship between a run-on or inflection used nominally in noun definitions and the part of speech of the main entry. Ultimately we had intended to show those places in the taxonomy where noun trees are descended from verbs, a process which has considerable value for the semantic analysis of the lexical items involved, and which serves to join the entire vocabulary into an integrated network. Accordingly, only run-ons and inflections (words scored with values for 3) have values for 5.

6. Entry number. Values for 6 are replication of the SUPERIOR NUMBERS in the MPD which precede each main entry whenever there are other main entries with the same spelling. Null value means there is only one main entry with a particular spelling.

7. Main entry sense numbers. As described above, values for 7 are composed of a numeral which matches the boldface numerals in MPD, and a letter which indicates which sub-section of a sense definition is referred to. 7 only has a null value when the value of 4 is non-null.

8. Particle-idiom information. Words or phrases (indicated in the diagram as < >) following the back-slash contribute to the semantic validity of the ISA-link between main entry and focal term. If the word is preceded by '-' the word is a part of a near-atomic phrase with the focal term. If the word is preceded by '*', the word is considered a semantically necessary part of a phrase with the main entry.

9. Non-kernel information. Words scored with values for 9 are focal terms which do not occur as the kernel of the sense definition of a particular main entry, but which have a semantic ISA relationship to the main entry. Taking the ISA-links as a relation between the main entry and the smallest constituent of the definition containing both the kernel and the focal term, the focal term was judged for its value to the ISA-link compared to the value of the syntactic kernel. If the focal term is semantically more important than the kernel, then the value for 9 is '/!'. If not more important, then the value for 9 is '/+'. A focal term which is semantically important and related to the main entry via a kernel which expresses negation or causation is scored '/N' or '/C' respectively.

10. Problematic scorables. Words scored with values for 10 are either kernels of a main entry sense definition, or have a value for 9, but were not considered felicitously scorable at the time of coding. If the word occurred in the definition text as part of an and-conjunctive phrase, the value '/&' was entered in this position. If, at the time of scoring, no available sense seemed appropriate, the coder entered '/?' in this position. Theoretically, both values could occur simultaneously (as '/&?', but no such scores appeared).

11. Exclusive source information. Words scored with a '*' in this position are lexical-item phrases which appear in the Collegiate (either as a run-on or as a main entry) but not in the MPD. This symbol is necessary to indicate that the choice of a Collegiate sense in such a case was not made solely for appropriateness of sense.

12. Tree version information. Words which are affixed with the symbol '%' appear in the final version of the noun or verb trees, but did not appear in the initial version, for any of a number of reasons. This symbol was affixed computationally as part of the final tree-growing procedure.

4.4 Sense Decisions

As indicated in the key showing order of disambiguator scoring decisions (figure 4.1), selection of the appropriate sense number to enter for a scorable focal term was fundamentally a semantic decision. Here, the constraints on coder intuition were, on the one hand, the available senses in the dictionary, and on the other, an awareness of consistency from seeing all focal term occurrences of a word together.

After determining that a focal term was scorable, the coder looked up the term in the MPD. From the senses available for the word, the coder selected the sense which best fit that term's usage in the text in which it occurred (this text being, of course, a sense definition of another word). This sense number was then entered for the focal term, along with any necessary special orthography as discussed above.

It was quite often the case that there was no perfect fit between available senses and focal term usage. Often, a sense had all the necessary attributes for a fit, but additional attributes which made it too specific. In other instances, a sense was too general to form a meaningful fit, or there was more than one sense which could be construed as appropriate.

While the coder was permitted to resort to the Seventh Collegiate dictionary for more appropriate senses, this was only done in the most hopeless circumstances. Normally, the coder found compromises which resolved these problems, by comparing the usage of a focal term in one definition text with the usage of the same term in another.

In coding, for example the noun DAY, the coder had a total of 54 definition lines to examine, and seven MPD senses of DAY from which to find a fit of sense for the scorable lines. All the occurrences of focal term DAY were in front of the coder at the same time, allowing, in unclear cases, a choice criterion beyond that of the sense definitions of DAY. The coder could test a scoring decision by comparing the usage of DAY in the definition line under consideration to the usage in another line already scored. If, say, the usage under consideration did not exactly fit any one sense of DAY better than other senses, but a previous line with a very similar usage fit sense .4A, then the coder could score the present line .4A. This process of referring to previously scored focal terms is illustrated in the disambiguation transcript, Appendix A.

Especially for huge focal term groups like that of the verb GO, the use of comparison criteria led to scoring decisions based no longer on the specifics of the sense definitions represented by those scores, but on a more vague, though quite consistent, semantic clustering by usage intuitions.

Some studies were undertaken during the course of the coding phase to determine the internal consistency resulting from use of such criteria in scoring decisions, and also to determine a measure of reliability across coders. Four coders were given the verb focal term set CUT to disambiguate, using the procedures and conventions described above. In internal consistency, the four coders were quite similar, though quite different in another respect. Specifically, the coders all arrived at the same intuitive groupings, but differed somewhat in what sense number was ascribed to those groupings.

5.0 The Tree Growing Process

The computational task of connecting a set of paired word-senses into a single data structure was handled via use of MACLISP, a version of LISP. This task has several problems inherent in its completion, some of which make LISP an ideal programming language, others which strain LISP's capabilities, and still others which require careful evaluation in order to avoid unpleasant surprises in attempting to output the assembled structure.

5.1 The Input Data

We may formally characterize the input as a set of word-sense element pairs {(A1, B1), (A2, B2), ... (An, Bn)} where Ai and Bi are both selected from a set of all word-senses of a given part of speech occurring in a dictionary. The relationship between Ai and Bi, for any given i, may be expressed as 'immediate descendant' or 'genus/species' where Ai is an immediate descendant of Bi, or Ai is a species of genus Bi. By convention adopted from previous work on semantic networks [SIMMONS-73; SIMMONS&AMSLER-75] we have used the relationship 'token', symbolized by TOK, to represent such an infix relationship in 'semantic triple notation', i.e., (Ai TOK Bi). Examples of the realization of this notation for actual word-sense elements include triples such as (MAMMAL-.0A TOK GIRAFFE-.0A), (MAMMAL-.0A TOK ZEBRA-.0A), etc. This notation can be readily extended into a form in which a list replaces the Bi component and all of the immediate descendants of any given Ai are enumerated in one pair, as (Ai TOK (B1, B2, B3, ... Bk)). An actual instantiation from the dictionary in this format is (MAMMAL-.0A TOK (AARDVARK-.0A BEAVER-.0A CHINCHILLA-.0A ... GIRAFFE-.0A ... ZEBRA-.0A))

The relationship in the dictionary which corresponds to this 'immediate descendant', 'genus/species' or 'token' (TOK) relationship is of course the relationship between a word-sense in its occurrence as main entry and the word-sense of its definition's kernel, as this word-sense was determined by the coding conventions discussed above.

We decided that the so-called slash-scores should also be included in the tree growth process. This was done because although they do not represent transitive relationships (there being no main entry defined in the dictionary with a slash score) and thus are restricted to the Ai portions of a word-sense pair, the growth process would nevertheless collect them together and enumerate them. This enumeration would display such elements in

a manner permitting evaluation of their appropriateness as topmost tree nodes -- a most important observation for those nodes marked with a /! score (i.e., nodes judged to have been better (semantic) kernels than the actual syntactic kernel selected for use without a slash score).

5.2 The Programming Language

The LISP programming language is ideally suited to representation of a structure assembled from a set of paired elements such as our input data. This is because LISP automatically handles the hash-coded access to the unique atoms Ai and Bi. Thus, each time Ai is referenced it is the same Ai regardless of whether these successive references were consecutive ones or 10,000 other word-sense nodes were created in between.

The principal limitation LISP has in this type of application is its requirement that all such word-sense nodes be resident in-core at one time. In this regard, SRI-International has apparently done some work on a "virtual atom package", though no publications on this project were available.

The huge number of occurrences of word-sense nodes found in a lexicon the size of a whole dictionary constitutes an "atomic explosion", i.e., an explosion in the number of atomic elements or nodes which LISP must maintain. The usefulness of LISP for tasks such as this is limited on small machines and will require the use of new large address space computers such as the VAX11/780 and MIT's LISP machine to apply to larger dictionaries such as the 'Collegiate' class which will become available over the next two years. At present we can load 27,000 nodes into MACLISP operating in a Honeywell 6180 with 500K words of 36-bit core running the MULTICS operating system. This is a larger address space than available on most computer systems such as conventional DEC-10 and DEC-20's. Any attempt at assembling a larger tree than can be done in-core today would require a radical change in the growth process, necessitating many passes through a series of files and assembling the structure in stages or segments on each pass.

5.3 The Program

Ideally, a program should assemble the arcs of the tree, find the highest node and then enumerate the nodes encountered, traversing all the arcs downward. If, as does occur, there is no one single node spanning the entire set of nodes (we, for example, derived a forest instead of a single tree), then the program should by logical extension find all the highest nodes and traverse all of their arcs downward, tree by tree, until the entire forest is enumerated. This however is not always possible when one deals with real data.

In our formal definition of the data set we deliberately did not distinguish the word-sense elements which can be a member of the Ai's from those which can be a member of the Bi's. Except for the "slash scores" (as mentioned already), the two sets are not, in fact, exclusive. Except for the nodes which are 'roots' or 'terminals' of some tree, every other node must appear at least once as a left-hand member of an (Ai Bi) pair and at least once as a right-hand member of an (Aj Bj) pair.

It is also true that for some (Ai Bi) there is a pair (Aj Bj) such that Ai is the same word-sense as Bj, and Aj is the same word-sense as Bi. This configuration causes a loop or circuit to occur.

In terms of instantiations from the dictionary structure, this corresponds to a pair of words which are used as the kernels of each other's definitions. As such, the two word-senses involved are effectively reduced to one sense-meaning realizable by either of two different orthographic forms; i.e., the two are synonyms.

The looping relation is often separated by a lengthy TOK path, i.e., A1 TOK B1 TOK A2 TOK B2 ... TOK Bn TOK A1. This of course makes it impossible to assign to any of the members of such a circuit the role of 'root' node, and makes it computationally very difficult to determine whether a word-sense node is a member of such a circuit or actually just a normal intermediate non-terminal node. All members of a loop appear to be intermediate nodes in structure, and would consequently be rejected as candidates for enumeration, producing a form of 'rootless' tree which would never be found and thus never enumerated.

To avoid this type of problem we chose a more redundant, yet fully complete procedure for enumerating the structures in the assembled set of word-sense element pairs. An algorithm which

simply enumerates the tree below every non-terminal word-sense element. This has an added benefit in that with complete enumeration of all non-terminals there is no requirement to provide an index to the trees for the purpose of locating specific intermediate nodes. To find out what is below a given non-terminal one merely has to look for that non-terminal in the alphabetically ordered forest of non-terminal trees. To find out what is above any non-terminal node, one can use the ordinary dictionary definitions as enumerated with their attached sense numbers to go upward one or more levels and then look at the appropriate higher non-terminal tree from that node downward.

The program always maintains a context stack of nodes whose descendants are being enumerated. Whenever any node is to be added to that context stack, a membership check is performed to see if this node would initiate a loop. If so, a warning message is output along with the contents of the stack at this point, the duplicate node is rejected, and the next node in the sequence of descendants that would normally have been selected after expanding the current (duplicate) node is immediately considered.

This procedure quickly terminates loops and marks their existence for later post-editing, while necessitating no significant back-tracking which would hinder enumeration of the entire tree.

The code for the MACLISP version of this program is given below. It is quite small and thus demonstrates the power of LISP in automatically handling what would be difficult bookkeeping and storage allocation/expansion tasks in other programming languages.

```
(defun in () (prog (toplist)
     (setsyntax 56 2 nil)
     (setq inf (openi ">udd>lrc>Amsler>tdata"))
     (setq dataout (openo ">udd>lrc>Amsler>output"))
     (defun str_help (fl sm) (structure) (return nil))
     (eoffn inf 'str_help)
 top (setq red (read inf))
     (setq red (list (car red) (cddr red)))
     (apply 'p2 red)
     (go top) ))

(defun p2 (a b) (progn
  (put a 'subs b)
  (cond ((get a 'upper) nil)
        (t (setq toplist (cons a toplist))
           (flag (list a) 'upper))) ))
```

```
(defun structure () (prog (stack)
     (setq indent 1)
 tax (cond ((null toplist) (return t))
           (t (princ "---------------" dataout)
              (terpri dataout)
              (linear (list (car toplist)))
              (setq toplist (cdr toplist))
              (go tax)))))
(defun linear (lis) (prog (g fir)
  tip (cond ((null lis)(return t))
            (t (prindent indent)
               (princ lpar dataout)
               (princ (setq fir (car lis)) dataout)
               (cond ((member fir stack)
                      (terpri dataout)
                      (princ "   ****loop****" dataout)
                      (princ (cons fir stack) dataout)
                      (terpri dataout)
                      (setq lis (cdr lis))
                      (go tip)))
               (terpri dataout)
               (setq lis (cdr lis)) ))
      (cond ((setq g (get fir 'subs))
             (setq indent (addl (addl indent)))
             (setq stack (cons fir stack))
             (linear g)
             (setq stack (cdr stack))
             (setq indent (subl (subl indent)))
             (go tip))
            (t (go tip))) ))

(defun prindent (n)
  (cond ((zerop n) t)
        (t (princ blank dataout) (prindent (subl n))) ))

(defun put (a i v) (putprop a v i))

(defun flag (list prop)
  (mapc (function (lambda (a) (put a prop t))) list))
(setq blank '/ )
(setq lpar '/()
(setq toplist nil)
```

6.0 Addition of Definition Text

After the MACLISP program grew the forest of taxonomic trees there remained the task of adding definitions to the word-senses of the tree elements as they were arranged in the output. Since the number of nodes in the trees was so large (27,000 word-sense elements for nouns; 12,000 for verbs) it was not possible to store their definitions along with the nodes in-core, so they had to be added later using traditional data processing techniques.

6.1 Stages of Text Addition

The traditional data processing technique for adding this information is to perform the operation in multiple passes over the output data, rewriting the data in a format making mutual comparisons possible, sorting to rearrange data items, and merging related data items only when they are immediately adjacent to each other. The final output is then produced by resorting the resulting data into the original output format once again.

The two data sets we wished to merge were the output of the tree growing program and the definition text of the dictionary. The result would be a data set containing the output of the tree ordering, but accompanied by the definition text appropriate for each word-sense element.

By virtue of the same disambiguation task that made possible the tree-growing process, it was possible to enhance the definition texts before they were re-attached to the word-sense elements. The disambiguated sense-number tags for the nouns and verbs were respectively merged into the alphabetically arranged noun and verb definitions. This required: (a) rewriting the coding input forms to contain the tagged word-sense in place of the original untagged word-senses, and (b) merging the multiple occurrences of definition texts so as to include in one definition all the tagged words (in the case of multiple syntactic and/or semantic kernels) that were coded for a particular sense definition. Once this was accomplished, the definitions contained all the information that we had added during the disambiguation process, and provided a convenient cross-index to the other trees under which a given word-sense is also listed.

The dictionary definitions were then rewritten into the same format as the sequence-numbered lines of the output-tree file and merged with segments of the output tree. Such a segmentation was

necessary since the output tree was too large to be processed as one file in an on-line environment. After sorting by word-senses common to both information types, a program merged the definitions of the definition/output-tree file with the word-senses which occurred on the now alphabetically ordered lines of output-tree data immediately following the definition text. Definitions which did not match any word-sense element in a file were dropped. Likewise, word-senses which did not exactly match some definition sense did not have any definition text attached. This unfortunately occurred in some cases where slash-scores or apostrophe's were involved. (The apostrophe was the LISP quote symbol and had not been specially protected).

Finally, the merged word-sense lines, which now included the appropriate definitions from the MPD, were resorted into the original output-tree order using the previously assigned sequence numbers.

As executed on the data from the disambiguated senses in MPD, the task of adding disambiguated definition text onto the tree structures may be seen as a process of nine steps, each step having an output product associated with it. Here is presented an encapsulation of these steps, accompanied by a sample of each associated output for one small tree under one node TIME-1.3A.

Stage 1 - Output-Tree Segment in Indented Format

```
(TIME-1.3A
  (AGE-1.2A
  (ARMAGEDDON-.0B
  (CANDLELIGHT-.2A
  (COMMENCEMENT-.1A
  (CONVENIENCE-.4A
  (DEADLINE-.0A
  (JUNCTURE-.3A
  (MANANA-.0A
  (MEAL-1.2A
    (BREAKFAST-.0A
      (BRUNCH-.0A
    (BUFFET-3.2B
      (SMORGASBORD-.0A
    (DINNER-.0A
    (LUNCH-1.1A
      (BRUNCH-.0A
      (LUNCHEON-.0A
    (POTLUCK-.0A
    (SUPPER-.0A
    (TABLE-D'HOTE-.0A
```

Stage 2 - Sequence-Numbered Format

Beginning with the tree structure in indented format, a sequence-numbered file was created which also included depth-numbering information. The depth refers to the number of nodes above a given node in the tree in question and is equivalent to indentation / 2 in the lines of output above. "-1 ----" was added between entries to properly note the beginning/end of consecutive trees.

```
009013 -1 ----
009014 00 TIME-1.3A
009015 01 AGE-1.2A
009016 01 ARMAGEDDON-.0B
009017 01 CANDLELIGHT-.2A
009018 01 COMMENCEMENT-.1A
009019 01 CONVENIENCE-.4A
009020 01 DEADLINE-.0A
009021 01 JUNCTURE-.3A
009022 01 MANANA-.0A
009023 01 MEAL-1.2A
009024 02 BREAKFAST-.0A
009025 03 BRUNCH-.0A
009026 02 BUFFET-3.2B
009027 03 SMORGASBORD-.0A
009028 02 DINNER-.0A
009029 02 LUNCH-1.1A
009030 03 BRUNCH-.0A
009031 03 LUNCHEON-.0A
009032 02 POTLUCK-.0A
009033 02 SUPPER-.0A
009034 02 TABLE-D'HOTE-.0A
```

Stage 3 - Segmented, Sequence-Numbered Files

A sorting of this version of the tree structure segmented the sections of the file into five letter ranges, A through C, D through G, H through N, O through R, and S through Z.

A through C file:

```
009015 01 AGE-1.2A
009016 01 ARMAGEDDON-.0B
009024 02 BREAKFAST-.0A
009025 03 BRUNCH-.0A
009030 03 BRUNCH-.0A
009026 02 BUFFET-3.2B
009017 01 CANDLELIGHT-.2A
009018 01 COMMENCEMENT-.1A
009019 01 CONVENIENCE-.4A
```

H through N file:

```
009021 01 JUNCTURE-.3A
009029 02 LUNCH-1.1A
009031 03 LUNCHEON-.0A
009022 01 MANANA-.0A
009023 01 MEAL-1.2A
```

S through Z file:

```
009027 03 SMORGASBORD-.0A
009033 02 SUPPER-.0A
009034 02 TABLE-D'HOTE-.0A
009014 00 TIME-1.3A
```

Stage 4 - Coding Form Output

Meanwhile, the dictionary definition text was being augmented with the disambiguation information available from the merged and sorted output from the coder's forms.

From A through C:		
MEAL 1.2A.....	= ACT 1.1B.....	AN ACT OR THE TIME OF EATING A MEAL
BRUNCH .0A.....	= BREAKFAST .0A....	A LATE BREAKFAST , AN EARLY LUNCH , OR A COMBINATION OF THE TWO
SMORGASBORD .0A.....	= BUFFET 3.2B.....	A LUNCHEON OR SUPPER BUFFET CONSISTING OF MANY FOODS (AS HOT AND COLD MEATS , SMOKED AND PICKLED FISH , CHEESES , SALADS , AND RELISHES)
BRUNCH .0A.....	= COMBINATION .2A..	A LATE BREAKFAST , AN EARLY LUNCH , OR A COMBINATION OF THE TWO
From D through G:		
DEADLINE .0A.....	= DATE 2.4A.....	A DATE OR TIME BEFORE WHICH SOMETHING MUST BE DONE
From H through N:		
BRUNCH .0A.....	= LUNCH 1.1A.....	A LATE BREAKFAST , AN EARLY LUNCH , OR A COMBINATION OF THE TWO
LUNCHEON .0A.....	= LUNCH 1.1A.....	A USU. FORMAL LUNCH
MEAL 1.2A.....	= MEAL 1.1A/+.....	AN ACT OR THE TIME OF EATING A MEAL
TABLE D'HOTE .0A.....	= MEAL 1.2A.....	A COMPLETE MEAL OF SEVERAL COURSES OFFERED AT A FIXED PRICE
LUNCH 1.1A.....	= MEAL 1.2A.....	A LIGHT MEAL USU. EATEN IN THE MIDDLE OF THE DAY
BUFFET 3.2B.....	= MEAL 1.2A.....	A MEAL AT WHICH PEOPLE SERVE THEMSELVES (AS FROM A BUFFET)

SUPPER .0A.....	= MEAL 1.2A.....	THE EVENING MEAL WHEN DINNER IS TAKEN AT MIDDAY
BREAKFAST .0A.....	= MEAL 1.2A.....	THE FIRST MEAL OF THE DAY
DINNER .0A.....	= MEAL 1.2A.....	THE MAIN MEAL OF THE DAY ; ALSO
POTLUCK .0A.....	= MEAL 1.2A.....	THE REGULAR MEAL AVAILABLE TO A GUEST FOR WHOM NO SPECIAL PREPARATIONS HAVE BEEN MADE

From O through R:

TIME 1.3A.....	= PERIOD 1.6A.....	A POINT OR PERIOD WHEN SOMETHING OCCURS
TIME 1.3A.....	= POINT 1.4A.....	A POINT OR PERIOD WHEN SOMETHING OCCURS

From S through Z:

ARMAGEDDON .0B.....	= SITE .0A.....	THE SITE OR TIME OF THIS
JUNCTURE .3A.....	= STATE 1.1A.....	A CRITICAL TIME OR STATE OF AFFAIRS
JUNCTURE .3A.....	= TIME 1.3A.....	A CRITICAL TIME OR STATE OF AFFAIRS
DEADLINE .0A.....	= TIME 1.3A.....	A DATE OR TIME BEFORE WHICH SOMETHING MUST BE DONE
CONVENIENCE .4A.....	= TIME 1.3A.....	A SUITABLE TIME
MEAL 1.2A.....	= TIME 1.3A.....	AN ACT OR THE TIME OF EATING A MEAL
MANANA .0A.....	= TIME 1.3A.....	AN INDEFINITE TIME IN THE FUTURE
COMMENCEMENT .1A.....	= TIME 1.3A.....	THE ACT OR TIME OF A BEGINNING
ARMAGEDDON .0B.....	= TIME 1.3A.....	THE SITE OR TIME OF THIS
AGE 1.2A.....	= TIME 1.3A.....	THE TIME OF LIFE AT WHICH SOME PARTICULAR QUALIFICATION IS ACHIEVED ; ESP
CANDLELIGHT .2A.....	= TIME 1.3A.....	TIME FOR LIGHTING UP

From the UNTAG file (entries missed in the original scoring):

COMMENCEMENT .1A.....	= ACT 1.1A.....	THE ACT OR TIME OF A BEGINNING

Stage 5 - Merged-in Word-Sense Tags

These definition texts were altered to contain the tagged word-senses in context.

```
MEAL-1.2A              = AN ACT-1.1B OR THE TIME OF EATING A MEAL
BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY LUNCH , OR A
                COMBINATION OF THE TWO
SMORGASBORD-.0A        = A LUNCHEON OR SUPPER BUFFET-3.2B
                         CONSISTING OF MANY FOODS ( AS HOT AND
                         COLD MEATS , SMOKED AND PICKLED FISH ,
                         CHEESES , SALADS , AND RELISHES )
BRUNCH-.0A    = A LATE BREAKFAST , AN EARLY LUNCH , OR A
                COMBINATION-.2A OF THE TWO
DEADLINE-.0A = A DATE-2.4A OR TIME BEFORE WHICH SOMETHING
                MUST BE DONE
BRUNCH-.0A    = A LATE BREAKFAST , AN EARLY LUNCH-1.1A , OR A
                COMBINATION OF THE TWO
LUNCHEON-.0A = A USU. FORMAL LUNCH-1.1A
MEAL-1.2A     = AN ACT OR THE TIME OF EATING A MEAL-1.1A/+
TABLE-D'HOTE-.0A       = A COMPLETE MEAL-1.2A OF SEVERAL COURSES
                         OFFERED AT A FIXED PRICE
LUNCH-1.1A    = A LIGHT MEAL-1.2A USU. EATEN IN THE MIDDLE OF
                THE DAY
BUFFET-3.2B   = A MEAL-1.2A AT WHICH PEOPLE SERVE THEMSELVES
                ( AS FROM A BUFFET )
SUPPER-.0A    = THE EVENING MEAL-1.2A WHEN DINNER IS TAKEN AT
                MIDDAY
BREAKFAST-.0A          = THE FIRST MEAL-1.2A OF THE DAY
DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A GUEST FOR
                WHOM NO SPECIAL PREPARATIONS HAVE BEEN MADE
TIME-1.3A     = A POINT OR PERIOD-1.6A WHEN SOMETHING OCCURS
TIME-1.3A     = A POINT-1.4A OR PERIOD WHEN SOMETHING OCCURS
ARMAGEDDON-.0B         = THE SITE-.0A OR TIME OF THIS
JUNCTURE-.3A = A CRITICAL TIME OR STATE-1.1A OF AFFAIRS
JUNCTURE-.3A = A CRITICAL TIME-1.3A OR STATE OF AFFAIRS
DEADLINE-.0A = A DATE OR TIME-1.3A  BEFORE WHICH SOMETHING
                MUST BE DONE
CONVENIENCE-.4A        = A SUITABLE TIME-1.3A
MEAL-1.2A     = AN ACT OR THE TIME-1.3A OF EATING A MEAL
MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
COMMENCEMENT-.1A       = THE ACT OR TIME-1.3A OF A BEGINNING
ARMAGEDDON-.0B         = THE SITE OR TIME-1.3A OF THIS
AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME PARTICULAR
                QUALIFICATION IS ACHIEVED ; ESP
CANDLELIGHT-.2A        = TIME-1.3A FOR LIGHTING UP
COMMENCEMENT-.1A       = THE ACT-1.1A% OR TIME OF A BEGINNING
```

The tagged word-senses for these main entries were then sorted and each tagged word from a main entry which had been tagged for more than one syntactic/semantic kernel was merged into a single definition for that main entry.

For example, BRUNCH-.0A was scored for BREAKFAST, COMBINATION, and LUNCH. These definitions appeared under the B's, C's, and L's in alphabetical order by the tagged words. When the definitions with their merged tags were sorted by their main entries, there appeared under BRUNCH-.0A three definition texts, as below:

BRUNCH-.0A = A LATE BREAKFAST-.0A , AN EARLY LUNCH , OR A COMBINATION OF THE TWO
BRUNCH-.0A = A LATE BREAKFAST , AN EARLY LUNCH , OR A COMBINATION-.2A OF THE TWO
BRUNCH-.0A = A LATE BREAKFAST , AN EARLY LUNCH-1.1A , OR A COMBINATION OF THE TWO

These were merged into one definition for BRUNCH-.0A which preserved each of the individual tags, i.e.,

BRUNCH-.0A = A LATE BREAKFAST-.0A , AN EARLY LUNCH-1.1A , OR A COMBINATION-.2A OF THE TWO

This operation was carried out for every main entry which had been tagged for two or more words in its definition.

Stage 6 - Merged/Sorted/Merged Word-Senses
Forming Single Definition

```
AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME PARTICULAR
                QUALIFICATION IS ACHIEVED ; ESP
ARMAGEDDON-.0B        = THE SITE-.0A  OR TIME-1.3A OF THIS
BREAKFAST-.0A         = THE FIRST MEAL-1.2A OF THE DAY
BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY LUNCH-1.1A ,
                OR A COMBINATION-.2A OF THE TWO
BUFFET-3.2B   = A MEAL-1.2A AT WHICH PEOPLE SERVE THEMSELVES
                ( AS FROM A BUFFET )
CANDLELIGHT-.2A       = TIME-1.3A FOR LIGHTING UP
COMMENCEMENT-.1A      = THE ACT-1.1A% OR TIME-1.3A OF A
                        BEGINNING
CONVENIENCE-.4A       = A SUITABLE TIME-1.3A
DEADLINE-.0A = A DATE-2.4A OR TIME-1.3A BEFORE WHICH
               SOMETHING MUST BE DONE
DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
JUNCTURE-.3A = A CRITICAL TIME-1.3A OR STATE-1.1A OF AFFAIRS
LUNCH-1.1A    = A LIGHT MEAL-1.2A USU. EATEN IN THE MIDDLE OF
                THE DAY
LUNCHEON-.0A = A USU. FORMAL LUNCH-1.1A
MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
MEAL-1.2A     = AN ACT-1.1B  OR THE TIME-1.3A OF EATING A MEAL-1.1A/+
POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A GUEST FOR
                WHOM NO SPECIAL PREPARATIONS HAVE BEEN MADE
SMORGASBORD-.0A       = A LUNCHEON OR SUPPER BUFFET-3.2B
                        CONSISTING OF MANY FOODS ( AS HOT AND
                        COLD MEATS , SMOKED AND PICKLED FISH ,
                        CHEESES , SALADS , AND RELISHES )
SUPPER-.0A    = THE EVENING MEAL-1.2A WHEN DINNER IS TAKEN AT
                MIDDAY
TABLE-D'HOTE-.0A      = A COMPLETE MEAL-1.2A OF SEVERAL COURSES
                        OFFERED AT A FIXED PRICE
TIME-1.3A     = A POINT-1.4A OR PERIOD-1.6A WHEN SOMETHING OCCURS
```

Stage 7 - Input to Merging Program.

The augmented dictionary text was segmented into the letter sequences corresponding to the tree-growing program output. The appropriate sections from each letter group were merged and sorted by main entries, yielding the input to the final merging program.

```
009013 -1 ----
          AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME
                          PARTICULAR QUALIFICATION IS ACHIEVED ; ESP
009015 01 AGE-1.2A
          ARMAGEDDON-.0B        = THE SITE-.0A  OR TIME-1.3A OF THIS
009016 01 ARMAGEDDON-.0B
          BREAKFAST-.0A         = THE FIRST MEAL-1.2A OF THE DAY
009024 02 BREAKFAST-.0A
          BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY LUNCH-1.1A
                          , OR A COMBINATION-.2A OF THE TWO
009025 03 BRUNCH-.0A
009030 03 BRUNCH-.0A
          BUFFET-3.2B   = A MEAL-1.2A AT WHICH PEOPLE SERVE
                          THEMSELVES ( AS FROM A BUFFET )
009026 02 BUFFET-3.2B
          CANDLELIGHT-.2A       = TIME-1.3A FOR LIGHTING UP
009017 01 CANDLELIGHT-.2A
          COMMENCEMENT-.1A      = THE ACT-1.1A% OR TIME-1.3A OF
                                  A BEGINNING
009018 01 COMMENCEMENT-.1A
          CONVENIENCE-.4A       = A SUITABLE TIME-1.3A
009019 01 CONVENIENCE-.4A
          DEADLINE-.0A  = A DATE-2.4A OR TIME-1.3A BEFORE WHICH
                          SOMETHING MUST BE DONE
009020 01 DEADLINE-.0A
          DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
009028 02 DINNER-.0A
          JUNCTURE-.3A  = A CRITICAL TIME-1.3A OR STATE-1.1A OF
                          AFFAIRS
009021 01 JUNCTURE-.3A
          LUNCH-1.1A    = A LIGHT MEAL-1.2A USU. EATEN IN THE
                          MIDDLE OF THE DAY
009029 02 LUNCH-1.1A
          LUNCHEON-.0A  = A USU. FORMAL LUNCH-1.1A
009031 03 LUNCHEON-.0A
          MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
009022 01 MANANA-.0A
          MEAL-1.2A     = AN ACT-1.1B  OR THE TIME-1.3A OF EATING
                          A MEAL-1.1A/+
009023 01 MEAL-1.2A
          POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A
                          GUEST FOR WHOM NO SPECIAL PREPARATIONS
                          HAVE BEEN MADE
```

009032 02 POTLUCK-.0A
SMORGASBORD-.0A = A LUNCHEON OR SUPPER BUFFET-3.2B CONSISTING OF MANY FOODS (AS HOT AND COLD MEATS , SMOKED AND PICKLED FISH , CHEESES , SALADS , AND RELISHES)

009027 03 SMORGASBORD-.0A
SUPPER-.0A = THE EVENING MEAL-1.2A WHEN DINNER IS TAKEN AT MIDDAY

009033 02 SUPPER-.0A
TABLE-D'HOTE-.0A = A COMPLETE MEAL-1.2A OF SEVERAL COURSES OFFERED AT A FIXED PRICE

009034 02 TABLE-D'HOTE-.0A
TIME-1.3A = A POINT-1.4A OR PERIOD-1.6A WHEN SOMETHING OCCURS

009014 00 TIME-1.3A

Stage 8 - Output of Merged Word-Sense Elements Plus Definitions

After processing, the files were output with only the word-sense element lines from the original tree present, now with their accompanying definition texts.

```
009013 -1 ----
009015 01 AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME
                          PARTICULAR QUALIFICATION IS ACHIEVED ; ESP
009016 01 ARMAGEDDON-.0B       = THE SITE-.0A  OR TIME-1.3A OF
                                  THIS
009024 02 BREAKFAST-.0A        = THE FIRST MEAL-1.2A OF THE DAY
009025 03 BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
                          LUNCH-1.1A , OR A COMBINATION-.2A OF
                          THE TWO
009030 03 BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
                          LUNCH-1.1A , OR A COMBINATION-.2A OF
                          THE TWO
009026 02 BUFFET-3.2B   = A MEAL-1.2A AT WHICH PEOPLE SERVE
                          THEMSELVES ( AS FROM A BUFFET )
009017 01 CANDLELIGHT-.2A       = TIME-1.3A FOR LIGHTING UP
009018 01 COMMENCEMENT-.1A      = THE ACT-1.1A% OR TIME-1.3A OF
                                  A BEGINNING
009019 01 CONVENIENCE-.4A       = A SUITABLE TIME-1.3A
009020 01 DEADLINE-.0A = A DATE-2.4A OR TIME-1.3A BEFORE WHICH
                          SOMETHING MUST BE DONE
009028 02 DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
009021 01 JUNCTURE-.3A = A CRITICAL TIME-1.3A OR STATE-1.1A OF
                          AFFAIRS
009029 02 LUNCH-1.1A    = A LIGHT MEAL-1.2A USU. EATEN IN THE
                          MIDDLE OF THE DAY
009031 03 LUNCHEON-.0A = A USU. FORMAL LUNCH-1.1A
009022 01 MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
009023 01 MEAL-1.2A     = AN ACT-1.1B  OR THE TIME-1.3A OF EATING
                          A MEAL-1.1A/+
009032 02 POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A
                          GUEST FOR WHOM NO SPECIAL PREPARATIONS
                          HAVE BEEN MADE
009027 03 SMORGASBORD-.0A       = A LUNCHEON OR SUPPER BUFFET-3.2B
                                  CONSISTING OF MANY FOODS ( AS
                                  HOT AND COLD MEATS , SMOKED
                                  AND PICKLED FISH , CHEESES ,
                                  SALADS , AND RELISHES )
009033 02 SUPPER-.0A    = THE EVENING MEAL-1.2A WHEN DINNER IS
                          TAKEN AT MIDDAY
009033 02 TABLE-D'HOTE-.0A      = A COMPLETE MEAL-1.2A OF SEVERAL
                                  COURSES OFFERED AT A FIXED
                                  PRICE
009014 00 TIME-1.3A     = A POINT-1.4A OR PERIOD-1.6A WHEN
                          SOMETHING OCCURS
```

Stage 9 - Final Output

These files were once again sorted by sequence number and output as the fully completed trees.

```
009013 -1 ----
009014 00 TIME-1.3A     = A POINT-1.4A OR PERIOD-1.6A WHEN
                          SOMETHING OCCURS
009015 01 AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME
                          PARTICULAR QUALIFICATION IS ACHIEVED
                          ; ESP
009016 01 ARMAGEDDON-.0B       = THE SITE-.0A  OR TIME-1.3A OF
                                 THIS
009017 01 CANDLELIGHT-.2A      = TIME-1.3A FOR LIGHTING UP
009018 01 COMMENCEMENT-.1A     = THE ACT-1.1A% OR TIME-1.3A OF
                                 A BEGINNING
009019 01 CONVENIENCE-.4A      = A SUITABLE TIME-1.3A
009020 01 DEADLINE-.0A = A DATE-2.4A OR TIME-1.3A BEFORE WHICH
                          SOMETHING MUST BE DONE
009021 01 JUNCTURE-.3A = A CRITICAL TIME-1.3A OR STATE-1.1A OF
                          AFFAIRS
009022 01 MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
009023 01 MEAL-1.2A     = AN ACT-1.1B  OR THE TIME-1.3A OF
                          EATING A MEAL-1.1A/+
009024 02 BREAKFAST-.0A       = THE FIRST MEAL-1.2A OF THE DAY
009025 03 BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
                          LUNCH-1.1A , OR A COMBINATION-.2A OF
                          THE TWO
009026 02 BUFFET-3.2B   = A MEAL-1.2A AT WHICH PEOPLE SERVE
                          THEMSELVES ( AS FROM A BUFFET )
009027 03 SMORGASBORD-.0A      = A LUNCHEON OR SUPPER
                                 BUFFET-3.2B CONSISTING OF MANY
                                 FOODS ( AS HOT AND COLD MEATS
                                 , SMOKED AND PICKLED FISH ,
                                 CHEESES , SALADS , AND
                                 RELISHES )
009028 02 DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
009029 02 LUNCH-1.1A    = A LIGHT MEAL-1.2A USU. EATEN IN THE
                          MIDDLE OF THE DAY
009030 03 BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
                          LUNCH-1.1A , OR A COMBINATION-.2A OF
                          THE TWO
009031 03 LUNCHEON-.0A = A USU. FORMAL LUNCH-1.1A
009032 02 POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A
                          GUEST FOR WHOM NO SPECIAL PREPARATIONS
                          HAVE BEEN MADE
009033 02 SUPPER-.0A    = THE EVENING MEAL-1.2A WHEN DINNER IS
                          TAKEN AT MIDDAY
009033 02 TABLE-D'HOTE-.0A      = A COMPLETE MEAL-1.2A OF
                                 SEVERAL COURSES OFFERED AT A
                                 FIXED PRICE
```

6.2 Display Problems

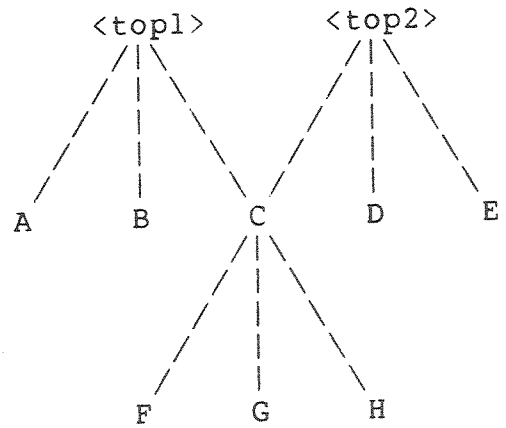
Once the forests of lexical nodes had been augmented with the definitions containing the merged disambiguator's codings, there still remained the problem of how to list these files in a usable form for subsequent analysis. The immediate output format of the tree, employing indented tree-structured display of the information, had lacked definitions and hence was incomplete. The final augmented definition version given above had definitions, but the indented notation had been abandoned for processing reasons. A simple solution was to output the final tree with both definitions and indenting. Yet this was not entirely adequate since the definitions now spilled over standard line-printer width paper onto following lines and additionally had the same problems the original tree had concerning the inability to 'track' the entries at the same depth across page boundaries. An expanse of blanks at the beginning of a line looks very much the same whether the actual depth is 8 or 10 or 12 levels down. To solve this problem a program placing ! marks down the columns of indentation to facilitate vertical tracking was employed. A sample of this type of output follows:

```
 0 TIME-1.3A     = A POINT-1.4A OR PERIOD-1.6A WHEN
 0                 SOMETHING OCCURS
 1 ! AGE-1.2A      = THE TIME-1.3A OF LIFE AT WHICH SOME
 1 !                 PARTICULAR QUALIFICATION IS ACHIEVED
 1 !                 ; ESP
 1 ! ARMAGEDDON-.0B        = THE SITE-.0A  OR TIME-1.3A OF
 1 !                         THIS
 1 ! CANDLELIGHT-.2A       = TIME-1.3A FOR LIGHTING UP
 1 ! COMMENCEMENT-.1A      = THE ACT-1.1A% OR TIME-1.3A OF
 1 !                         A BEGINNING
 1 ! CONVENIENCE-.4A       = A SUITABLE TIME-1.3A
 1 ! DEADLINE-.0A = A DATE-2.4A OR TIME-1.3A BEFORE WHICH
 1 !                 SOMETHING MUST BE DONE
 1 ! JUNCTURE-.3A = A CRITICAL TIME-1.3A OR STATE-1.1A OF
 1 !                 AFFAIRS
 1 ! MANANA-.0A    = AN INDEFINITE TIME-1.3A IN THE FUTURE
 1 ! MEAL-1.2A     = AN ACT-1.1B  OR THE TIME-1.3A OF
 1 !                 EATING A MEAL-1.1A/+
 2 ! ! BREAKFAST-.0A         = THE FIRST MEAL-1.2A OF THE DAY
 3 ! ! ! BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
 3 ! ! !                 LUNCH-1.1A , OR A COMBINATION-.2A OF
 3 ! ! !                 THE TWO
 2 ! ! BUFFET-3.2B  = A MEAL-1.2A AT WHICH PEOPLE SERVE
 2 ! !                 THEMSELVES ( AS FROM A BUFFET )
 3 ! ! ! SMORGASBORD-.0A       = A LUNCHEON OR SUPPER
 3 ! ! !                         BUFFET-3.2B CONSISTING OF MANY
 3 ! ! !                         FOODS ( AS HOT AND COLD MEATS
 3 ! ! !                         , SMOKED AND PICKLED FISH ,
 3 ! ! !                         CHEESES , SALADS , AND
 3 ! ! !                         RELISHES )
 2 ! ! DINNER-.0A    = THE MAIN MEAL-1.2A OF THE DAY ; ALSO
 2 ! ! LUNCH-1.1A.0A         = A LIGHT MEAL-1.2A USU EATEN IN
 2 ! !                         THE MIDDLE OF THE DAY
 3 ! ! ! BRUNCH-.0A    = A LATE BREAKFAST-.0A , AN EARLY
 3 ! ! !                 LUNCH-1.1A , OR A COMBINATION-.2A OF
 3 ! ! !                 THE TWO
 3 ! ! ! LUNCHEON-.0A = A USU. FORMAL LUNCH-1.1A
 2 ! ! POTLUCK-.0A   = THE REGULAR MEAL-1.2A AVAILABLE TO A
 2 ! !                 GUEST FOR WHOM NO SPECIAL PREPARATIONS
 2 ! !                 HAVE BEEN MADE
 2 ! ! SUPPER-.0A    = THE EVENING MEAL-1.2A WHEN DINNER IS
 2 ! !                 TAKEN AT MIDDAY
 2 ! ! TABLE-D'HOTE-.0A      = A COMPLETE MEAL-1.2A OF
 2 ! !                         SEVERAL COURSES OFFERED AT A
 2 ! !                         FIXED PRICE
```

There nevertheless remains a problem of gaining perspective on a tree which may span 10 or more pages. To assist in establishing one's location in the forest, the 'context' tree above each entry is repeated at the top of each new page.

Another problem is the size of the output data for the whole noun forest as redundantly enumerated in the 153,000 lines of noun trees. The possibility of assembling a "minimal spanning forest" which would only include those trees which were not duplicated elsewhere has been considered, but insufficient time was available to complete this processing under the current grant. It should be remembered that this "forest" is a "tangled" hierarchy, though, and any minimal spanning forest would have that display problem to contend with.

Consider, for example, the tangled segment:



To enumerate this structure in a tree format such as we are presently using requires three top-level trees <top1>, <top2>, and C, each of which includes the exposition of all nodes below them.

```
00 ----
01 <top1>
02   A
02   B
02   C
03   | F
03   | G
03   | H
```

```
00 ----
01 <top2>
02   C
03   |  F
03   |  G
03   |  H
02   D
02   E
```

```
00 ----
01 C
02 |  F
02 |  G
02 |  H
```

Within the requirements of the minimal spanning forest, the exposition of the separate tree for C would be eliminated, but the redundant exposition of the C tree appearing under <top1> and

<top2> would remain. As C's tree might be several thousand nodes in extent itself the dilemma becomes clear. Thus, a minimal spanning forest might not in itself remove all the redundancy from display of large tangled hierarchies. One could, optimally, trace the duplicate downward path through C from <top1> and <top2> and note that one should look up the tree under C as a separate segment when details below that node are desired. However, this decision would be most annoying if C were a small tree and had less than a dozen nodes below it. Also, this is almost what the current all non-terminal elements exposition provides, the whole problem which the development of the minimal spanning forest was supposed to solve.

Some treatment of this difficulty has been attempted by the lexicographers designing the ERIC Thesaurus of Descriptors in their seventh edition. The descriptors of the ERIC classification system are a tangled hierarchy of the same form as our lexical material. The designers devised several display techniques for their vocabulary, one of which produces an indented tree both upward and downward from every node. The node itself is represented as the left-most word in the dual-tree, with those lines above being nodes higher up in the hierarchy, one level indented to the right for each level ABOVE the node. Below the node, a similar tree is output, but here the descriptors are indented one level for each level below the node. The column alignment technique we employed (using exclamation marks) is mimicked by periods below the node described and colons above the node described.

```
<top1>          <top2>          : <top1>
  . A             . C           : <top2>
  . B             . . F       C
  . C             . . G         . F
  . . F           . . H         . G
  . . G           . D           . H
  . . H           . E
```

7.0 Interpretations and Applications

7.1 Interpretation for Cognitive Anthropology

The massive lexical networks formed by the tree-growing process on the disambiguated noun pairs provide an excellent data source to compare against current taxonomic theories in the field of anthropological cognitive semantics. Examination of the structure of the MPD noun trees reveals the differences between them and human cognitive structures, and, at those points where the two are alike, allows an evaluation of the explanations and descriptions made on much smaller samples from anthropological data gathering techniques.

7.1.1 The Noun Tree

The noun structure, consisting of a few very large trees and many small trees, has 27,000 nodes. It has a maximum real depth of about 15 levels, ignoring depths inflated by loops. Its maximum breadth, the contrast set under the (pronoun) ONE- 2.1A ("a single member or specimen"), is 3379 nodes; common large breadths are around 1500 nodes.

The major noun tree has as unique beginner not one, but an aggregate of taxa whose definitions loop them into each other, a loop strengthened, rather than broken up, by the addition of synonymous cross references and definitions from MPD's superset, Webster's 7th Collegiate. The members of the "unique aggregate" are GROUP-1.0A, KIND-1.2A, SPECIES-.1A, INDIVIDUAL-2.1A, CATEGORY-.0A, CATEGORY-.0B, DIVISION-.2A, SECTION-.2A, PART-1.1A, THING-.5A, THING-.5B, ENTITY-.2A, and (pronoun) SOMETHING-.0A. The aggregate has three 'peaks', points of intense looping with the more tenuous connections to and from other peaks. These are around GROUP-1.0A, SOMETHING-.0A, and PART-1.1A. Any upward path which reaches any of the words listed above is immediately considered as having reached the top of the main noun tree. A portion of this network centered about GROUP-1.0A is presented in Figure 7-1.

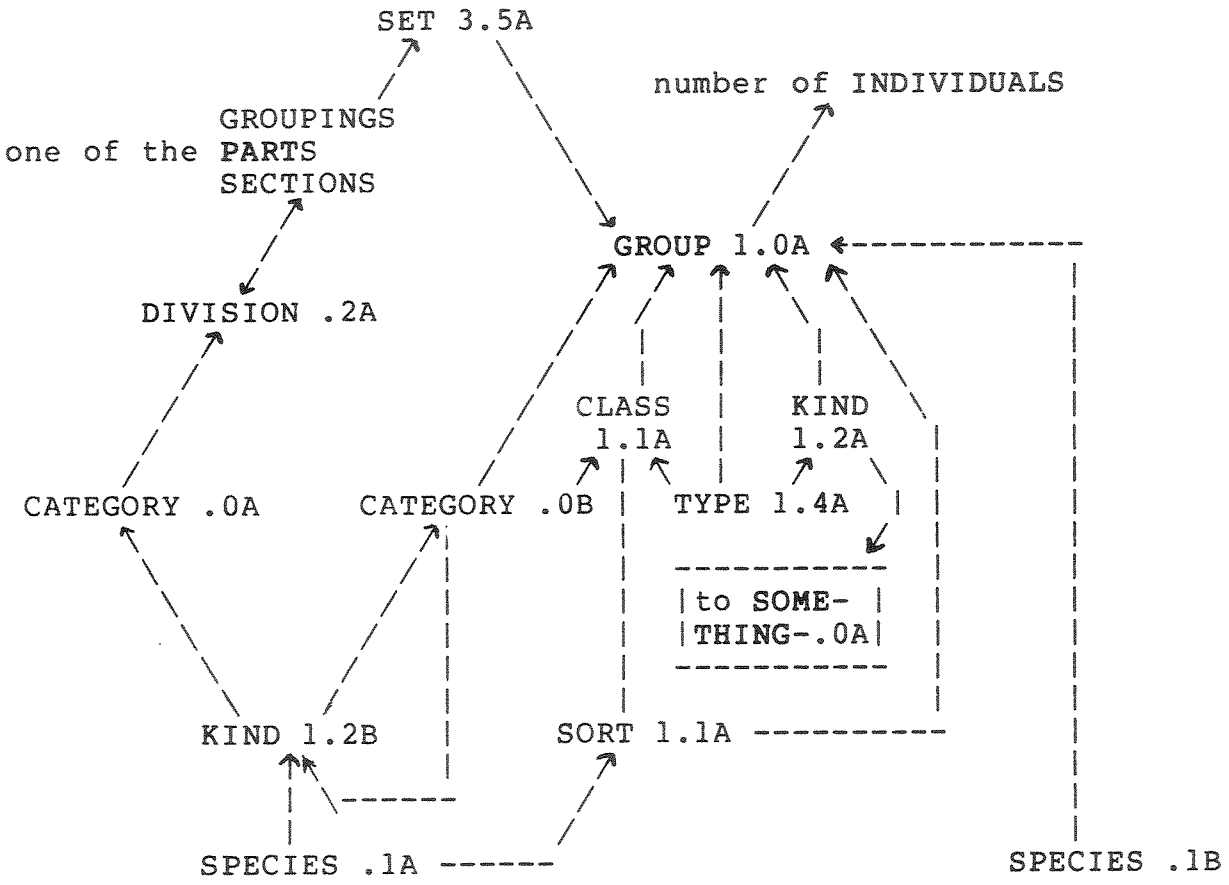


Figure 7-1 "GROUP", "PART", and "SOMETHING" peaks and some of the ISA-links between them in the MPD Unique Aggregate

7.1.2 Two Differences between Human and MPD Taxonomic Structures

7.1.2.1 Discreteness and Homonymy

Every orthographic string entered in the MPD has a denumerable set of entries and senses, which by their segregation are intended not to overlap in meaning. Each sense of an entry is presumed to be equally unlike the meaning of any other sense (though this presumption does not always correspond to disambiguator intuitions). The nodes in the trees represent word-sense elements, i.e., strings of the form WORD-<number>. In this shape, the nodes preserve this presumption of discreteness, and the structure which results from their manipulation is one lacking both homonymy and polysemy. In the MPD taxonomic structures, PLANT-2.1A is no more closely related, or similar, to PLANT-2.2A than it is to any other word. Thus the phenomenon common to folk taxonomies -- multiple occurrences of the same label on different nodes -- cannot be expected to occur here.

7.1.2.2 The ISA Relation

The formal taxonomic structure, on which a folk taxonomy can be mapped, is an ordered pair of the form (T,>), where T is the set of taxa and the relation on it is proper subset [KAY-71; GREGG-64]. The ISA relation [RAPHAEL-68; RUMMELHART&NORMAN-75; EVENS-et-al.-76] obtaining in the MPD is not quite proper, coming rather close to subset. The specific relation between ISA-linked pairs can be, among other relations, synonymy or exemplification as well as strict inclusion.

7.1.3 The 'OR' Problem

As stated earlier, multiple kernels joined by logical conjunctions were scored specially to avoid certain logical fallacies in the trees. The multiple kernels conjoined by OR, however, were presumed to be scorable, on the assumption that the trace through any or all of the multiple kernels could be true. Certain problems arose from that assumption, perhaps stemming from our treatment of English exclusive-OR as if it were logically inclusive, but also from certain implications that come from the dictionary's use of 'or' in certain definition frames.

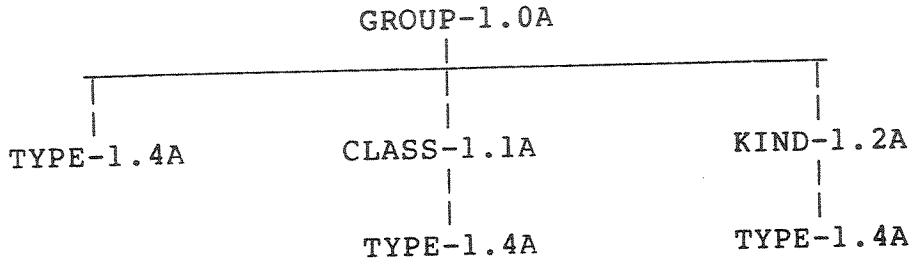
LOUSE .2A..... =	PEST .3A.....	A PLANT PEST (AS AN APHID)
PEST .3A..... =	PLANT 2.1A.....	A PLANT OR ANIMAL DETRIMENTAL TO MAN

As currently formulated, a taxon must be included by all taxa which occur as its (disjoint) syntactic kernels, allowing a tangled hierarchy in which nodes branch upward as well as downward. As the above example shows, the preservation of all OR-links can result in semantic anomalies. By virtue of the OR in the definition of PEST-.3A, LOUSE-.2A ISA PLANT-2.1A. There is no mechanism by which a taxon can select among the OR-conjoined paths its superordinate can follow. One solution lies in human intuitive evaluation of all such paths, and marking the most favorable upward path for each taxon. This has been attempted in the verb tree with at least a measure of success, but raises some other crucial issues, among them the apparent global nature of path evaluation. In considering the path upward from a taxon B, such as B ISA C ISA D-OR-E, the evaluator selected as most favorable the path BCE. But when a new lowest taxon, A, was introduced, the best path was ABCD. One hesitates to impose a mechanism of such power as to permit one node to determine the path of another, especially when the two are quite distant. The final solution to this problem therefore remains to be found.

There are other problems associated with OR, which, together with the problems stated above, indicate that some analysis of the lexicographer's intent in using 'or' could be fruitful. One of these problems involves the multiple occurrence of a taxon, due to OR-links, in the same general area of a tree.

CLASS 1.1A..... =	GROUP 1.0A.....	A GROUP OF THE SAME GENERAL STATUS OR NATURE
KIND 1.2A..... =	GROUP 1.0A.....	A GROUP UNITED BY COMMON TRAITS OR INTERESTS
TYPE 1.4A..... =	GROUP 1.0A.....	A CLASS , KIND , OR GROUP SET APART BY COMMON CHARACTERISTICS
TYPE 1.4A..... =	CLASS 1.1A.....	A CLASS , KIND , OR GROUP SET APART BY COMMON CHARACTERISTICS
TYPE 1.4A..... =	KIND 1.2A.....	A CLASS , KIND , OR GROUP SET APART BY COMMON CHARACTERISTICS

In this example, TYPE-1.4A is both in the contrast set of CLASS-1.1A and KIND-1.2A, and also the hyponym of both of them:



Bearing in mind that ISA is not as uniform a relation as KIND-OF, the incestuous appearance of TYPE-1.4A three times in a small area suggests that some extra-logical information has been implied by the usage of 'or'.

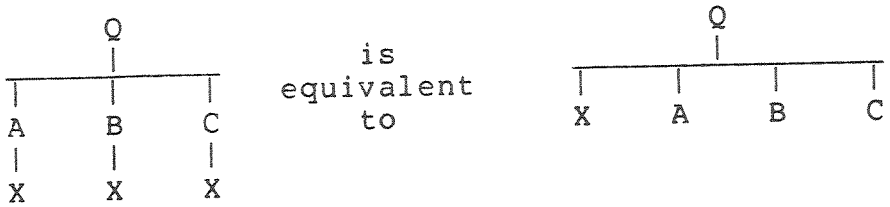
It is often possible to interpret an 'or'- definition of the form,

"X ISA A, B, OR C (VP)"

as actually being of the form,

"X is like A, B, and C with the peculiar properties of..."

Such a statement is one of direct contrast; consequently, if this interpretation is valid, then,



TYPE-1.4A shows an occurrence directly under the topmost node, and so for this reason its other links could simply be eliminated.

7.1.4 Discovery of Taxonomic Categories

Various subtrees of the MPD noun structures have been analyzed with a view toward establishing some means of mapping category labels onto taxonomic levels. Ability to specify taxa as phylum, generic, specific, etc., was seen as a way to organize the structure toward ease of access. Accordingly, the MPD noun tree for the "composite node" formed from the felicitously scored plural and the <score>/! occurrences of the singular and plural for LIQUID-2.0A, i.e., the node LIQUID(S)-2.0A(/!), (Figure 7-2), was compared with the folk taxonomic structure discovered by ethnosemanticists.

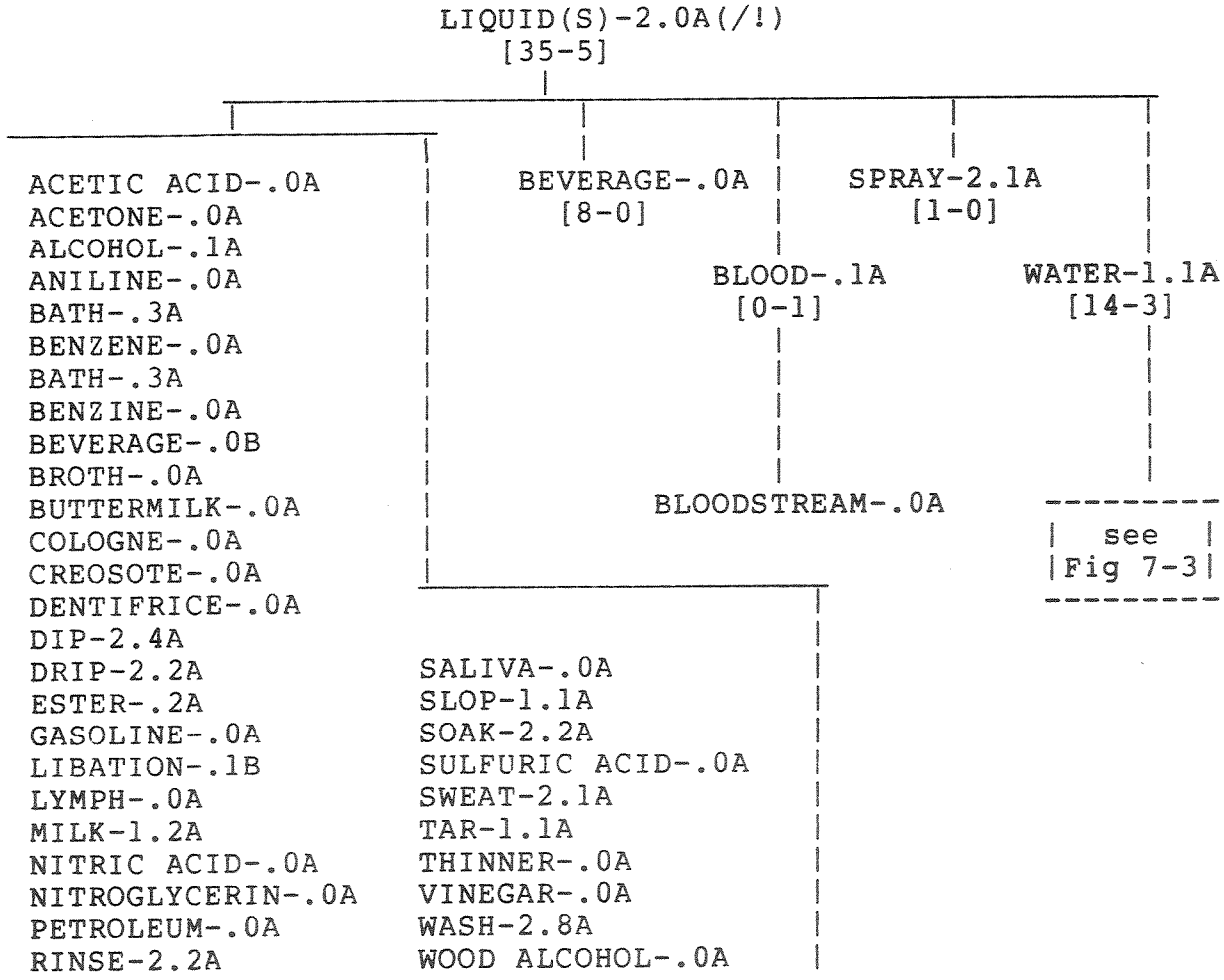


Figure 7-2 The Contrast Set Included by LIQUID(S)-2.0A(/!)

Berlin [72] and Berlin, Breedlove, and Raven [68, 73, 74] have shown that folk botanical taxonomies have a dimension of folk category levels, which they refer to by such terms as "unique beginner", "intermediate," "life form", "genus", "species", and "variety". The level of a taxon can be determined by its lexemic status. Lexemic status is established by a) analyzability of the lexeme, and b) analyzability of the lexemes in the same contrast set and the taxon which includes them. Primary lexemes are associated with unique beginner, life form, and generic categories; secondary lexemes occur in species and variety categories.

Beginning in the LIQUID(S)-2.0A(/!) tree with the contrast set included by WATER-1.1A (Figure 7-3), we can determine the folk category level by examining and comparing the analyzability of the lexemes (we ignore sense-numbers for the moment).

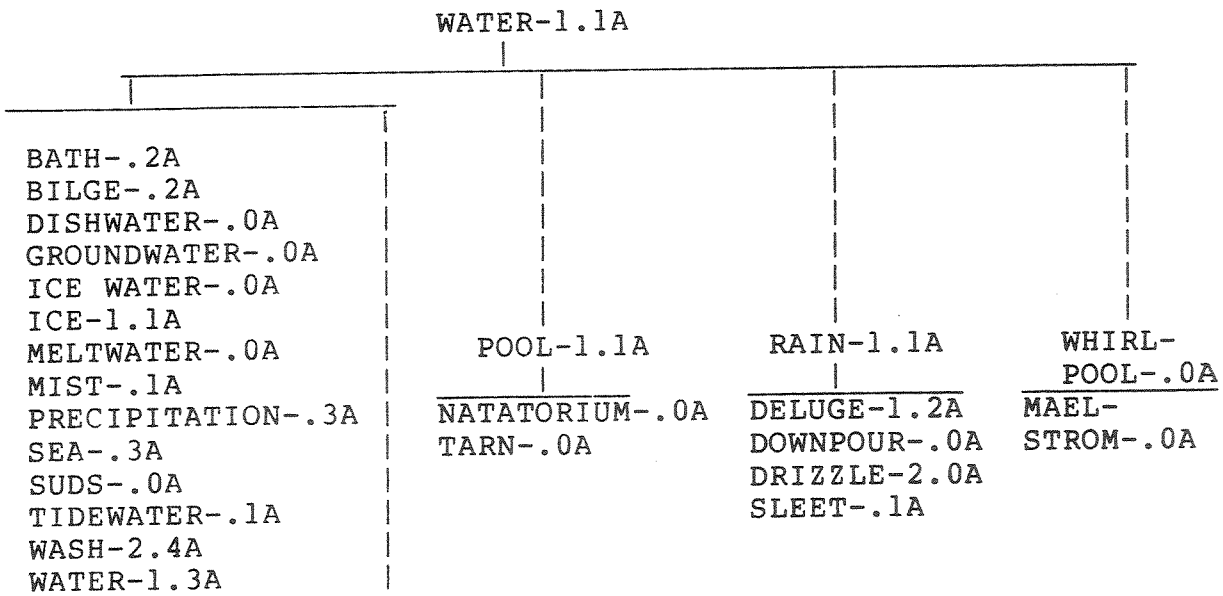
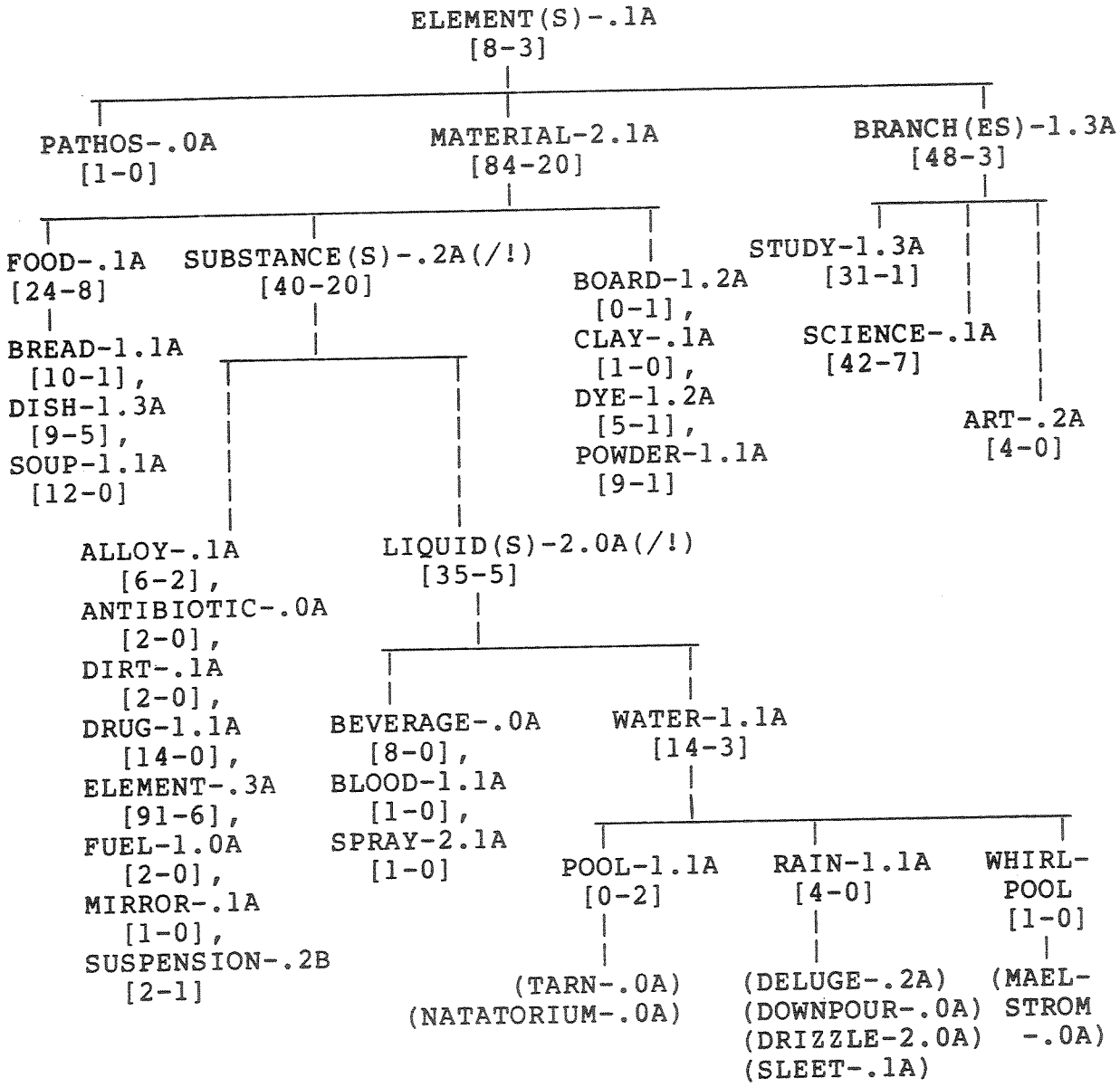


Figure 7-3 The Contrast Set Included by WATER-1.1A

'Rain' and 'pool' are primary unanalyzable lexemes. Given the unanalyzable status of 'natatorium' and 'tarn' under 'pool', 'whirlpool' would be classed as a primary productive were it also under 'pool', but under 'water' it is primary unproductive. Six of the terminals under WATER-1.1A (counting WATER-1.3A) have the word 'water' as part of their labels; taken with the unanalyzability of the other contrast set members, these are primary productive lexemes. Having established that all taxa which WATER-1.1A immediately precedes are primary lexemes, WATER-1.1A may be identified as a life form.

Let us now consider the lexemic status of the whole LIQUID(S)-2.0A(/!) tree, as shown in Figure 7-2. Theoretically, all members of the contrast set are primary (unanalyzable or unproductive) lexemes, since none of them have the word 'liquid' in them. Many lexemes, such as 'acetic acid', 'nitric acid', 'wood alcohol', and 'buttermilk' would be secondary lexemes if they were preceded by 'acid', 'alcohol', or 'milk', respectively, but as hyponyms of 'liquid' they are primary. Since LIQUID(S)-2.0A(/!) is itself preceded by a taxon (SUBSTANCE-.2A), it cannot be the unique beginner and is thus a life form ('blood' is thus probably genus, and 'bloodstream' species).

Our examination of two levels of the LIQUID(S)-2.0A(/!) tree has shown two life forms, one immediately preceded by the other. Nothing in the Berlin et al. system provides for structures of this form. The highest non-looping node in the tree of which LIQUID(S)-2.0A(/!) is a descendant of the composite node ELEMENT(S)-.1A. A cursory check of this tree (Figure 7-4) reveals other instances of life forms descended from life forms.



notes:
a) contrast set size, ratio of terminals to non-terminals indicated in [<terminals>-<non-terminals>] listed under each node, e.g., [1-0] under PATHOS-.0A indicates 1+0 in contrast set, 1 terminal (not shown), and no non-terminals.
b) nodes surrounded by commas are terminals.

Partial Expansion of the complete node ELEMENT(S)-.1A

Figure 7-4

Two possible resolutions to the disparity between folk category structure and MPD structure prèsent themselves. One lies in the specification of conditions under which recursion of category levels is possible. We presently have no such set of conditions, and in any case the statement of a condition may weaken the Berlin-Breedlove-Raven model considerably. However, we continue to investigate the possibility of recursion on lexemic grounds.

Another possible relationship between the MPD structure and its lexemes occurs variably at each level in the ELEMENT(S)-.1A tree. The contrast set descended from ELEMENT(S)-.1A has only primary unanalyzable lexemes; those under MATERIAL-2.1A, SUBSTANCE-.2A, and LIQUID-2.0A have both unanalyzable and unproductive primary lexemes, in what appears to be increasing order; and yet WATER-1.1A again has all types of primary lexemes among its hyponyms. The hypothesis that this forms a recurring pattern throughout the MPD lexicon would require much more investigation, however..

7.1.5 Discovery of Covert Structures

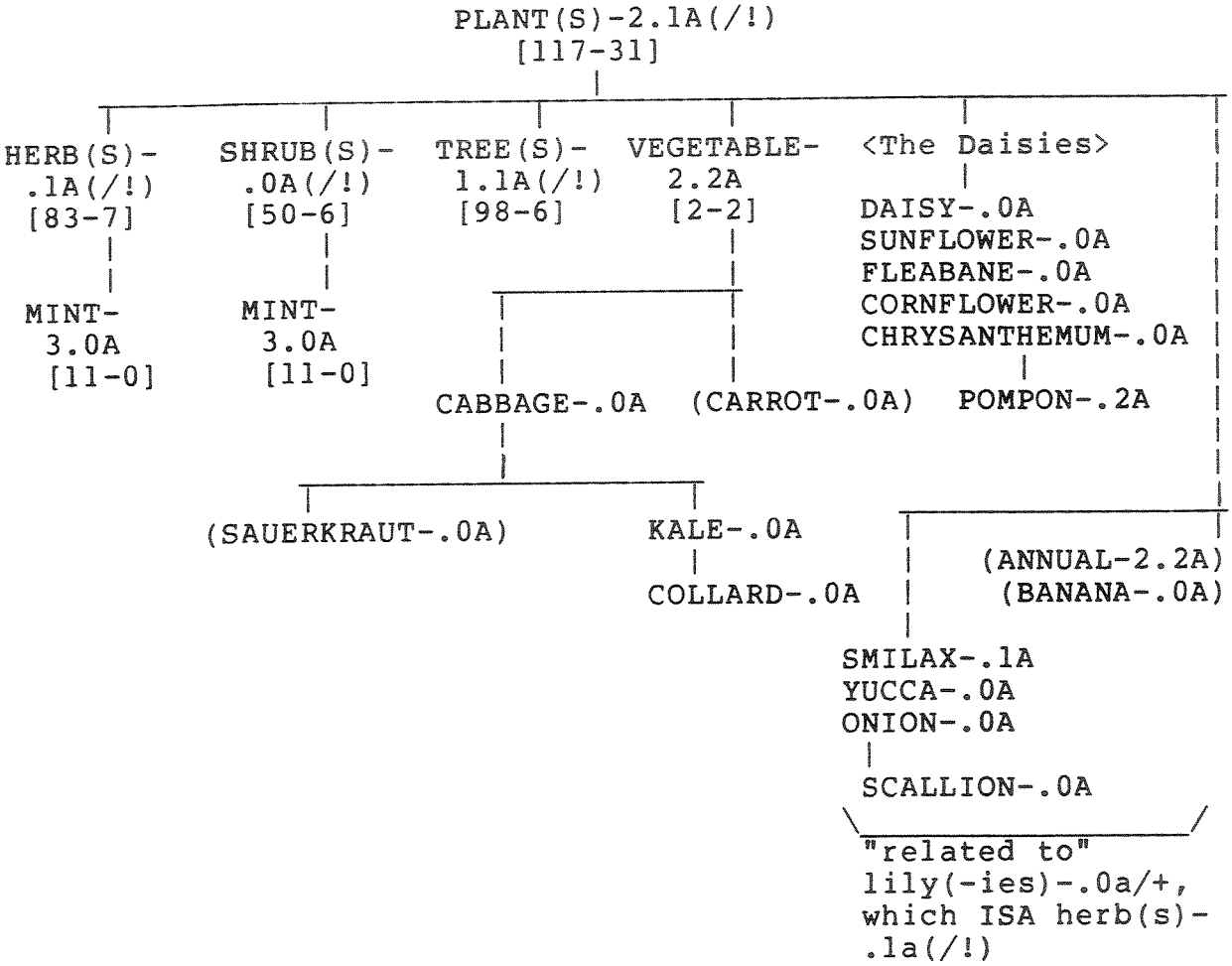
In eliciting a taxonomy from a human informant, certain responses lead the investigator to postulate the existence of an unlabelled taxon, or a taxon whose provenience is obscured by other taxa with the same label. One indication of the presence of some invisible structure is the elicitation of an inordinately large contrast set, one whose size does not fall near the "magic number" [BERLIN-et-al.-68, MILLER-56]. In such instances, the investigator will normally impose certain tests, such as sorting or triads, to reveal the hidden structure.

There is no reason to assume that a large contrast set elicited from the dictionary necessarily indicates the presence of such structures; nor, of course, can the standard discovery tasks be performed on a dictionary. It appears to be true, however, that something analogous to covert structures does exist in at least some large contrast sets, and that there is a means of discovering it.

These structures, which we will call "covert taxa" [TYLER-69, BLACK-69, KAY-66] are discoverable by the use of definition frames which use additional taxonomic information beyond the ISA information of the syntactic/semantic kernels. The frame,

<NP> "related to" <NP>,

reveals such information in the tree whose composite head is PLANT(S)-2.1A(/!).



notes:
a) Same conventions as used in Figure 7-4, plus
b) Covert Taxa listed in <lower-case> bracketed text.
c) Tangled hierarchical property indicated by multiple listing of nodes (e.g., see MINT-3.0A)

Partial Expansion of the complete node PLANT(S)-2.1A(/!)

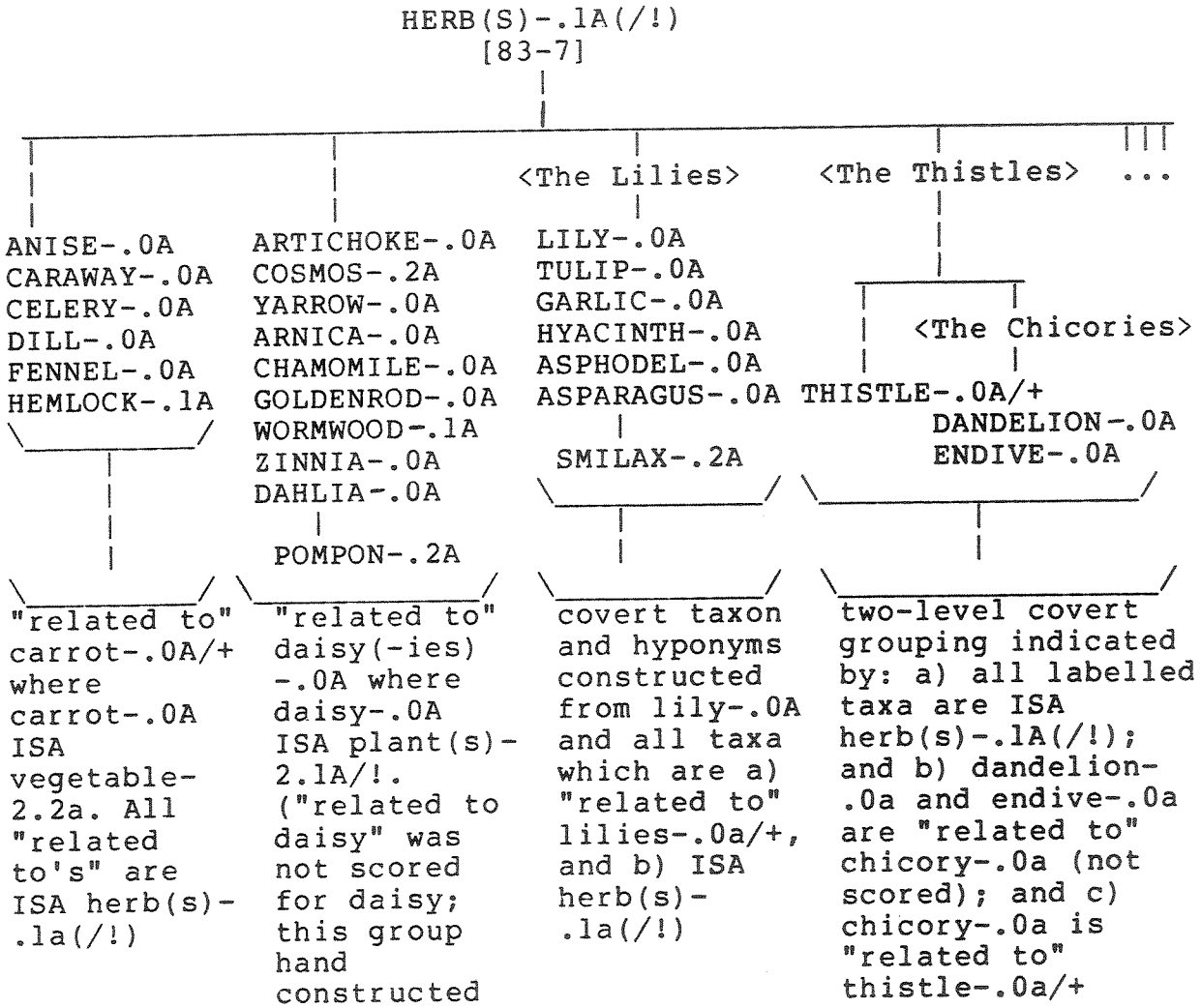
Figure 7-5

ARNICA .1A.....	= HERBS .1A/!.....	ANY OF SEVERAL HERBS RELATED TO THE DAISY
HELLEBORE .2A.....	= PLANT 2.1A.....	A POISONOUS PLANT RELATED TO THE LILIES
CELERY .0A.....	= HERB .1A.....	AN HERB RELATED TO THE CARROT AND WIDELY GROWN FOR ITS CRISP EDIBLE PETIOLES
AGAVE .0A.....	= PLANTS 2.1A/!....	ANY OF SEVERAL SPINY-LEAVED PLANTS RELATED TO THE AMARYLLIS

The usage of "related to" in the MPD definitions is quite like its usage where, after comparing Latin, French, and Hebrew, one concludes that Latin is related to French, and French to Latin. Their similarities are substantial and attributable to some 'historical' or 'genetic' phenomenon, yet their mere contrast with Hebrew reveals nothing beyond that. A safe way to represent the relatedness of the two is to postulate an abstract entity X which immediately precedes both. Such a construct, with the condition that the abstract entity may be equal to either of its hyponyms, allows all possible cases; French "comes from" Latin (=X), Latin "comes from" French (=X), or both come from a third language (=X).

At various places in the PLANT(S)-2.1A(/!) structure, all the necessary components for such abstract entities exist. There are words with sense definitions of the form (X ISA) Y, and groups of words whose sense definitions are of the form (Z ISA) Y RELATED TO X. All these words can be grouped under a covert taxon "the X's", so named to designate the hyponym the others are "related to", but still theoretically capable of instantiation by any one of its hyponyms.

Figures 7-5 (above) and 7-6 show some of the covert groupings discoverable by the "related to" frame in partial expansions of the trees under PLANT(S)-2.1A(/!) and HERB(S)-.1A(/!). All links drawn between labelled taxa are explicit ISA-links.



notes: a) all taxa terminal unless descendants are specified.
b) HERB(S)-.1A(/!) ISA PLANT(S)-2.1A(/!)

Partial expansion of the composite node HERB(S)-.1A(/!)

Figure 7-6

Several behavioral traits of these covert taxa are noteworthy. First, their recursive capability is evident in the <The chicories> --> <The thistles> structure, formed by virtue of the facts that CHICORY-.0A is "related to" THISTLE-.0A, that DANDELION-.0A and ENDIVE-.0A are "related to" CHICORY-.0A, and all are ISA HERB(S)-.1A(/!).

Of perhaps more significance is the fact that the groupings under HERB(S)-.1A(/!) and PLANT(S)-2.1A(/!) lack one of the criteria for formation of a covert taxon, i.e., the taxon that all the other members of the group are "related to" is not in itself in an ISA-relationship to the same node as the rest. This phenomenon occurs with groups "related to" CARROT-.0A/+ and "related to" DAISY-.0A under HERB(S)-.1A(/!), and with the groups "related to" LILY-.0A/+ under PLANT(S)-2.1A(/!). The ISA-links to and from CARROT-.0A/+ and LILY-.0A/+ are relevant because the scoring of them as /+ was based on the "related to" frame itself. Otherwise, <score>/+ links are considered too tenuous to include at this stage of the analysis.

By appeal to the Collegiate, which does link CARROT to HERB, a case could be made for a covert taxon <The carrots>, since all other nodes in its "related to" complex are ISA HERB(S)-.1A(/!). For other groups, however, there is much less ground for forming a covert taxon, because some "related to X" have ISA-links to PLANT(S)-2.1A(/!), and others to HERB(S)-.1A(/!). Such is the case with the groups "related to" LILY-.0A/+ and "related to" DAISY-.0A. Postulating covert groups <The lilies> under PLANT(S)-2.1A(/!), and <The daisies> under HERB(S)-.1A(/!) would result in different nodes with the same labels, a property uncharacteristic of the MPD structures in general, as noted earlier.

As we have seen, covert groupings can serve to break up large contrast sets. Possible covert group frames can also be useful in distinguishing among semantic subgroupings under a single node. The semantic relation between a taxon and its superordinate is often not the same as that between another member of the contrast set and the same superordinate.

Under FISH-1.1B, for example, we find COD-.0A, MARLIN-.0A, GUPPY-.0A, which are all "kinds" of fish, along with KIPPER-.0A and SARDINE-.0A which are prepared states of fish, SEAFOOD-.0A, which is quite general, and FRY-3.1A, which is a developmental state. These subgroupings could be sorted and named by intuition alone, but it often clear that sufficient justification for a covert subgroup node exists in the MPD text itself; its formation by textual criteria is a stronger claim than its formation by intuition.

For FISH-1.1B, the prepared-state hyponyms can be segregated from the rest by the frame "A FISH...PREPARED....," as occurs in the definitions of KIPPER-.0A and SARDINE-.0A. Other segregations are less obvious, depending more on the meanings of certain adjectives and less on a particular syntactic/semantic frame.

Of course, any division by componential analysis is possible, but it is felt that components should be derived in some consistent, retrievable manner from information in the sense-definitions, lest the lexicographic version of psychological validity be lost. With regards to this, there is a test involving human intuition which seems valuable for altering the natural state of these contrast sets with respect to some cases of this eclecticism problem. A human informant can be asked whether any taxon in the contrast set can also be a type of another member of the same set. In the FABRIC-.2A tree, for example, CORDUROY-.0A, BURLAP-.0A, and CLOTH-.1A are sister hyponyms. Applying this heuristic in this case causes CLOTH-.1A to fall out.

7.2 How to Use the Taxonomic Hierarchy, An Example Based on the Word "WOMAN"

Suppose we are interested in the taxonomic structure of terms referring to women in the Merriam-Webster Pocket Dictionary. The first matter to consider is how would the terms we are interested in be defined, i.e., would they be defined in terms of "woman", or "women", or both? The simplest method of determining this is to look up definitions which are deemed likely to be included in the domain we intend to investigate, such as, for example, those for "wife" and "waitress":

wife <n, pl> wives
1 <dial> : WOMAN
2 : a woman acting in a specified capacity -- used in combination
3 : a married woman
-- wifehood n
-- wifely adj

waitress <n> : a girl or woman who waits on table

From these definitions and their kernels we see that "girl" will probably yield additional information so we add it to our list of nodes to be looked up. However, since "woman" was in all the definitions listed it looks to be the right term, so we search the noun taxonomy for the "woman" entry.

An entry is found for WOMAN-.4A,

WOMAN-.4A = A FEMALE SERVANT-.0A OR ATTENDANT-2.0A

and seemingly three entries for WOMAN-.1A,

WOMAN-.1A = AN ADULT FEMALE PERSON-.1A

Upon careful examination of the way WOMAN-.1A is used in the text of these definitions however, we see that the occurrences of WOMAN-.1A in two of the listings are for WOMAN-.1A/& and WOMAN-.1A/. From the scoring conventions guide (Section 4) we note that these "slash-scores" were used whenever the word involved was not a syntactic kernel of the definition in which it occurred (/! and /+) or was involved with a conjoined set of kernels (/&). Looking below the entry for WOMAN-.1A/ we see:

SOUBRETTE-.0A = A COQUETTISH MAIDSERVANT-.0A OR A FRIVOLOUS YOUNG WOMAN-.1A/ IN A COMEDY ; ALSO

For the purposes of our work the / score seems to be an error so we make a note to include this definition in the tree under WOMAN-.1A if it is not already there. (It could be there because MAIDSERVANT-.0A might itself be defined in terms of WOMAN-.1A.) We are curious about the "; ALSO" in the definition and note that as the dictionary uses any occurrence of a bold-face colon to indicate a division between two subsenses of a main definition the "; ALSO" is an artifact left on the end of the first subsense of "soubrette" when the separation of subsenses was computationally accomplished. Curious about what followed the main sense we must again turn to the dictionary and see it was,

": an actress playing such a part",

which will thus appear in the taxonomic listing under ACTRESS with some attached sense number. (Once again we note that "actress" is on our list of possible tree entries for woman, unless it too is defined in terms of WOMAN-.1A and thus is already enumerated under that entry).

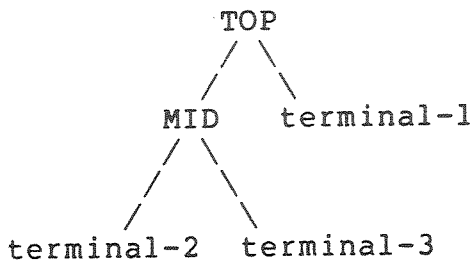
We decide to check out the other WOMAN-.1A/& entry before proceeding to the main WOMAN-.1A entry. There is a lone definition under WOMAN-.1A/&, namely:

COUPLE-2.3B = A MAN-1.1B/& AND A WOMAN-.1A/& MARRIED OR OTHERWISE PAIRED

This entry would seem valid and genuinely indicative that "couple" requires both "man" and "woman" in its definition. We decide to proceed to the main entry for WOMAN-.1A.

We find 141 nodes under WOMAN-.1A and examine the tree-structure. Each line appears with a sequence number, a space, a two-digit depth number, and then word and definition. The two-digit depth figures tell us that every node with a depth of 01 was immediately connected to WOMAN-.1A; and whenever two successive lines list depths of 01 this indicates that the first line is a terminal node in the tree. This is part of the general rule that whenever the depth-level of a line immediately under a given preceding line fails to increase, the term on the upper line was a terminal.

For example, a tree such as,



would be represented as,

```
000001 00 TOP
000002 01 MID
000003 02 terminal-2
000004 02 terminal-3
000005 01 terminal-1
000006 -1 ----
```

Examining the nodes listed under WOMAN-.1A for 01 depths which are terminal, we arrive at the following list:

```
AMAZON-.2A       BAGGAGE-.2A      BARONESS-.2A     BEGUM-.0A
BELDAM-.0A       BELLE-.0A        BLUESTOCKING-.0A
BRIDE-.0A        CAT-.3A          CHARMER-.0B      CHIT-1.2A
CONCUBINE-.0A    COUNTESS-.2A     CRONE-.0A        DAIRYMAID-.0A
DAME-.1A         DAME-.2A         DEBUTANTE-.0A    DEMIMONDAINE-.0A
DEMOISELLE-.0A   DIVORCEE-.0A     DOLL-.2A         DONA-.0A
DOWAGER-.2A      DUCHESS-.0A      DUENNA-.1A       EMPRESS-.2A
FIANCEE-.0A      FISHWIFE-.1A     FISHWIFE-.2A     FLAPPER-.2A
FLOOZY-.0A       FORELADY-.0A     GAMMER-.0A       GENTLEWOMAN-.1A
GENTLEWOMAN-.2A  GIRL-.1B         GIRL-.1C         GODDESS-.2A
GRANDAM-.0A      HAG-.2A          HARPY-.2A        HARRIDAN-.0A
HEADMISTRESS-.0A                  HEROINE-.0A      HORSEWOMAN-.0A
HOUSEMOTHER-.0A  HOUSEWIFE-.1A    HOYDEN-.0A       HUSSY-.1A
INAMORATA-.0A    INGENUE-.0A      JADE-1.2A        JILT-1.0A
LADY-.1B         LADY-.10         MADEMOISELLE-.0A
MAENAD-.1A       MAENAD-.2A       MAID-.1A         MANNEQUIN-.2A
MARCHIONESS-.2A  MASSEUSE-.0A     MATRIARCH-.0A    MATRON-.1A
MISS-3.2A        MISTRESS-.3A     MOTHER-1.2A      NEEDLEWOMAN-.0A
NUN-.0A          POSTMISTRESS-.0A                  QUEAN-.0A
QUEEN-.3A        SALESWOMAN-.0A   SCHOOLMARM-.1A   SCHOOLMISTRESS-.0A
SEAMSTRESS-.0A   SHREW-.1A        SIREN-.1A        SLATTERN-.0A
SLUT-.1A         SPINSTER-.0A     SQUAW-.0A        SUFFRAGETTE-.0A
SYLPH-.2A        TERMAGANT-.0A    TRAMP-2.3A       TROLLOP-.1A
TROLLOP-.2A      VAMPIRE-.2B      VAMP-3.0A        VIRAGO-.0A
VIRGIN-1.3A      VISCOUNTESS-.2A  VIXEN-.2A        WAITRESS-.0A
WASHERWOMAN-.0A  WENCH-.1A        WHITE-SLAVE-.0A  WITCH-1.2A
WITCH-1.3A       XANTHIPPE-.0A
```

This list of 102 terminals, apart from its morphological indications of gender such as +ESS (from BARONESS, COUNTESS, DUCHESS, MARCHIONESS, MISTRESS, etc.) and combining forms such as +LADY, +MAID, +MISTRESS, +WIFE, +WOMAN also tells something about the type of definitions which were given. The sense number .0A present on some 50 entries (e.g., -.0A, -1.0A, -2.0A, etc.) indicates that these definitions were unambiguous in the Pocket Dictionary. Any sense which does not have a .0A has other senses which, unless they occur in this tree, were defined in terms of words other than "woman". For example, "amazon-.2a", "baggage-.2a", "cat-.3a", "chit-1.2a", "countess-.2a", etc., all have other senses. For "cat" and "baggage" it is obvious that the other sense(s) will be the more conventional ones, but we are curious about what words other than "woman" were used to define terms such as "amazon-.1a" and "countess-.1a"? Returning to the dictionary we find,

amazon-.1a <cap> : a member of a race of female warriors repeatedly warring with the ancient Greeks of mythology

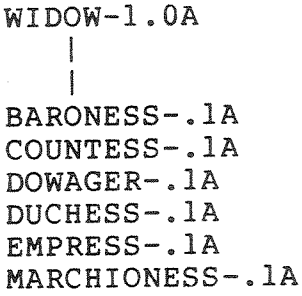
countess-.1a : the wife or widow of a count or an earl

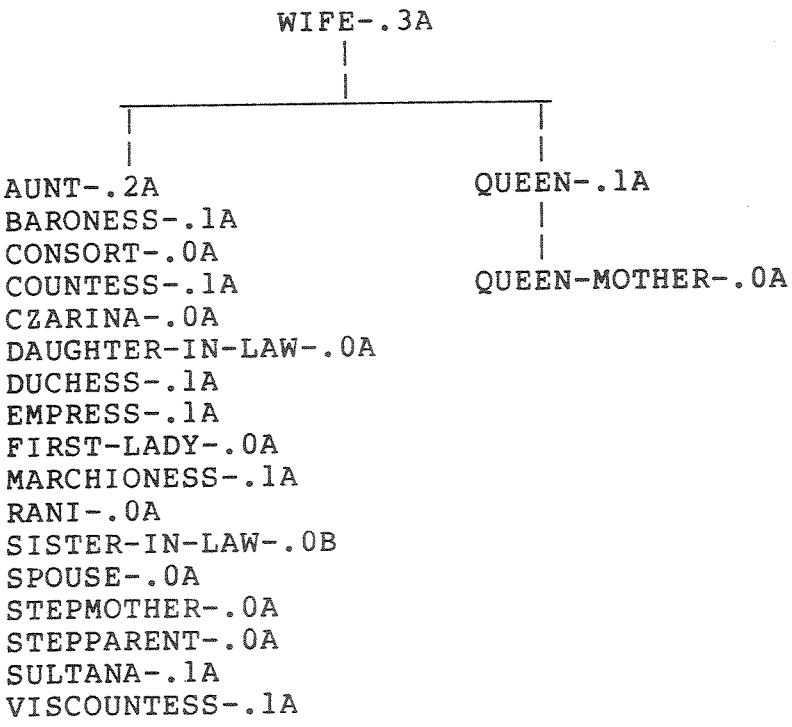
Thus, "female" as an adjective was used in some definitions in combination with a neutral gender term such as "warriors" to define some classes of women. This type of attributive use cannot be tracked through the noun taxonomy since it is based upon the adjective rather than the noun use. Moreover, the noun itself is only noted in the MPD as a run-on under the entry for the adjective "female". [Note: the full concordance index of MPD words would include these instances, so they could be obtained from that original database produced nearly ten years ago.]

"Countess", however, could be examined under "wife" or "widow" because these are nouns. We do not have to turn to these segments though, since the non-terminals we have under WOMAN-.1A include:

HOSTESS-.0A	MISTRESS-.1A	NURSE-1.1A	PROSTITUTE-2.0A
VIRGIN-1.1A	WIDOW-1.0A	WIFE-.3A	QUEEN-.1A

Of these, HOSTESS-.0A, MISTRESS-.1A, NURSE-1.1A, PROSTITUTE-2.0A, and VIRGIN-1.1A have single descendants (i.e. FIRST-LADY-.0A, CHATELAINE-.0A, AYAH-.0A, MAGDALEN-.0A, and VESTAL-2.2A respectively) and really are just barely considerable as non-terminals. WIDOW-1.0A and WIFE-.3A however, have sizeable trees:

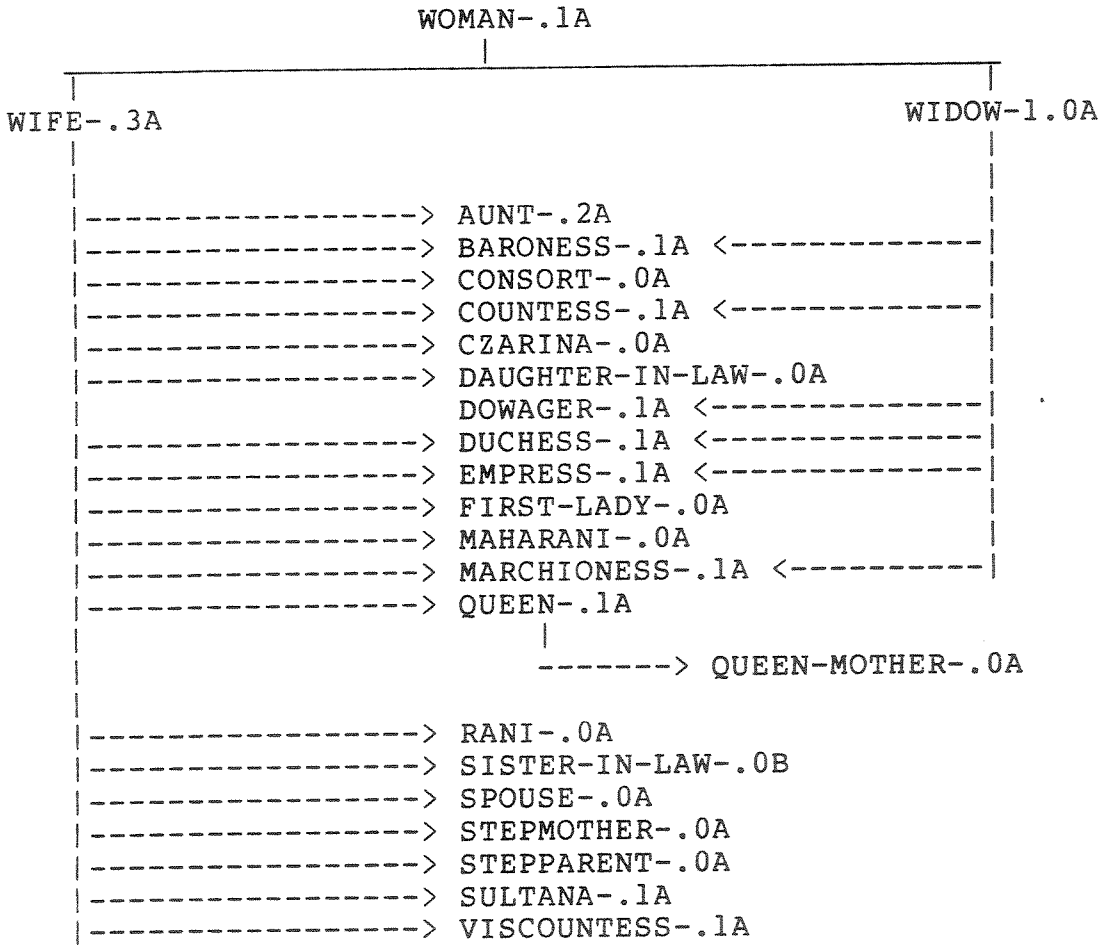




Looking at the definitions of BARONESS-.1A, COUNTESS-.1A, DUCHESS-.1A, EMPRESS-.1A, and MARCHIONESS-.1A we note a pattern common to all of these,

"the wife-.3a or widow-1.0a of a(n) X ..."

As a consequence of this "frame" we might choose to rewrite the tangled taxonomy as a joint taxonomic structure shared between its two topmost nodes.



At this point we would begin a conventional componential analysis of the text of the definitions or proceed to another taxonomic tree in the output listings.

8.0 Conclusions

On the basis of the work on this project, insight into several of our initial assumptions and working hypotheses concerning dictionaries and the MPD in particular has developed.

8.1 Working Hypotheses and Assumptions

1) A meaningful (valid) tree-like structure is inherent in a dictionary and can be revealed by applying the methodology developed and used in this project.

2) There exists an inherent semantic transitivity with respect to the taxonomic relation, and with respect to (other) attributive properties from the general to the specific.

3) The basis of the noun tree is nominal, the basis of the verb tree is verbal. Verbal taxonomic kernels are manifest as infinitives; nominal taxonomic kernels are manifest as singular or plural nouns.

4) All kernels of sense definitions themselves appear as main entry senses in the MPD.

5) The senses of words defined in the dictionary are distinct and non-overlapping in meaning. Only one sense of a word applies to any given usage in another definition or text.

6) Human coders (disambiguators) can identify the sense of a word used in a sense definition kernel.

1) A counter hypothesis that the dictionary is a tangled hierarchy for nouns and verbs is borne out by our observations. An important new hypothesis here is that the hierarchy seems inherently "tangled" and we believe efforts to untangle it would not be representative of natural language structure. This in turn suggests that the properties of tangled hierarchies as data structures be more carefully explored in areas such as database design and graph theory. It would also seem worthwhile to consider whether formal taxonomic descriptions in some other areas might not be better considered as tangled rather than forcing them to fit untangled representations. In at least one extensive classification effort, the ERIC Thesaurus of Descriptors, this approach has been successfully taken. (See Section 6.2.)

2) The essential function a tree-like structure in the dictionary is to guarantee the semantic class inclusion and attributive inheritance such a structure offers. In this regard the dictionary appears to support the hypothesis that such relationships are preserved when the individual taxonomic linkages are properly selected. "Properly selected" entails successful handling of several complications which were not fully treated in our taxonomic data because of the time and funding limitations of our project. These include the OR's (Section 7.1.3) and AND's (Section 4.2.1) in definition kernels, and the question of availability of adequate sense meanings for each usage (Section 4.2.3). A relevant definition may simply not occur in the MPD, or even if there is one, it may be too idiomatic, or involve particles (for verbs) (Section 4.2.4) which are not specified as being part of the semantic meaning of the verb. The Collegiate class of dictionaries appears to do better, but in at least one instance our disambiguators could not find an adequate sense description for a usage in the MPD even through use of the Third International.

The requirements that (a) the definitions used in a dictionary should contain only usages of words which themselves are defined in the dictionary and (b) that a reader should be enabled to determine which sense of a word is being used in a definition from the information given with that word's own definition in the same dictionary seem to be fundamental criteria for future lexicographic excellence. These form a standard which we are afraid most dictionaries fail to attain. Partly this may be due to false beliefs about the universal applicability of definition by genus and species or unwillingness to treat more difficult senses of words with correspondingly greater detail in their definitions. But regardless of causes it is a fact that today's dictionaries contain many definitions for the commonest words of the language which cannot be understood well enough to be distinguishable from each other by skilled users of the language.

3) As the basis for constructing a taxonomic-like description of definitions it is evident that nouns do of course serve as the basis for the definitions of other nouns, and that verbs serve as the basis of the definition of other verbs. This conclusion however should be moderated by the existence of two other significant tendencies in the definition texts. These are the use of conjoined ("and") definitions as discussed elsewhere (Section 4.2.1), and the ultimate basis of nominal taxonomies in nouns derived by case argument relationships from verbs or via relationships other than the ISA relationship from other nouns.

Thus "vehicle" as the topmost node of a nominal taxonomy has a clear linkage to the instrumental case argument role of the verb "transport". It should be emphasized that we are not saying every noun in the dictionary is directly linked to a corresponding verb, but only that the topmost nouns of most nominal trees appear to be so linked. "Cow" as a noun is obviously not directly linked to any verb, but it eventually finds its taxonomic root in "living being" which undeniably can be paraphrased with use of the verbs BE and LIVE.

Additionally other significant noun roots appear to derive not from additional ISA linkages, but instead from part/whole-type relationships to other nouns. Thus terms such as "leaf" are defined by being "part of" a plant and indeed do not seem to possess any alternative defining mechanism. The use of the preposition "of" often syntactically signals such a noun's dual role. Thus a series of expressions such as "a part of" or "a group of" may precede a word which serves a key semantic role in a definition, though not as the surface-level syntactic kernel.

The following list of words in this set of nouns has been compiled:

1.0 **QUANTIFIERS**

1.1 GROUP NAMES
- pair
- collection
- group
- cluster
- band (of people)
- bunch

1.2 INDIVIDUATORS
- member
- unit
- item
- article
- strand
- branch (of science,etc)

2.0 **SHAPE UNITS**

2.1 PIECE UNITS
- sample
- bit
- piece
- tinge
- tint

2.2 WHOLE UNITS
- mass
- stock
- body
- quantity
- wad

2.3 SPACE SHAPES
- bed
- layer
- strip
- belt
- crest
- fringe
- knot
- knob
- tuft

3.0 **EXISTENTIAL UNITS**

3.1 VARIANT
- version
- form
- sense

3.2 STATE
- state
- condition

4.0 **REFERENCE UNITS**

4.1 LOCUS UNITS
- place
- end
- ground
- point

4.2 PROCESS UNITS
- cause
- source
- means
- way
- manner

5.0 **SYSTEM UNITS**
- system
- course
- chain
- succession
- period

6.0 **EVENT UNITS**
- act
- discharge
- instance

7.0 **EXCEPTIONS**
- growth
- study

4) The property of "closure" for the lexicon, i.e., the guarantee that every word appearing as a kernel of a definition is itself part of a defining entry in the dictionary, is valid. However, being part of an entry and having a definition in that entry are two different matters. Definitions frequently contain words which are themselves only listed as "run-on's" under their root-form entry. Some of these run-on's are nouns listed under verb main entries, etc., so that one cannot always find a definition accompanying each kernel term. By and large these words follow a reasonable pattern of semantic extension from the main entry they occur within, and could have definitions written for them based upon a reader's world knowledge and the other information in the entry. So, with this reservation we can still say the MPD is semantically closed.

The problem of finding a definition text for each kernel is not restricted to those which do not have existence as separate main entries, but also occurs for the synonymous cross-references which often have nothing except reciprocating synonyms as definitions. Additionally, "something" and "one" occur as kernels and break the closure of the forest by being pronouns rather than nouns.

These difficulties do not seem any more serious than other semantic problems in the dictionary and, while annoying, are not critical to construction to most of the taxonomic forest.

5) This hypothesis has been substantiated, but it is often one which the novice dictionary lexicologist has trouble believing. The main reason it is so hard to accept at face value is that while the senses presented in the dictionary are intended as being distinct and non-overlapping, there is often insufficient information in the MPD for this to be understood. The key comes from recognizing that the MPD is actually a scaled-down version of the Seventh Collegiate, which in turn is a scaled-down version of the Third International. The concept of distinct sense meanings requires recourse to these larger dictionaries.

One exception to this rule may be the situation of the subsenses of a given sense. Subsenses in the MPD are inconsistently used both as synonymous cross-references and as distinct senses of words. Synonymous cross-references, in turn, are occasionally used as true definition substitutes, and as their name would imply, mere cross-references to senses which appear elsewhere. That is to say, some subsenses of definitions are really just cross-references, others are truely distinct meanings. When we began the project we were aware that synonymous cross-references were not typically usable as taxonomic ISA links because they did not represent upward generalization in the tree, but a sidewards "cross-reference" to another node at the same level. What we were essentially unaware of was that some synonymous cross-

references were quite distinct subsenses and hence essential to the tree, while others appear to be listed as a form of "see also" reference.

This merely goes to indicate that there is occasionally considerable overlap between subsenses when one is a synonymous cross-reference. Our coders were instructed in such instances to ignore the subsense which was the synonymous cross-reference.

6) This hypothesis, as might be expected, is not universally supported. Some disambiguators could recognize the senses much better than others. We are reminded of an anecdote relayed to us by John Olney concerning Merriam-Webster's hiring procedures in testing potential new lexicographers. The candidates are each given a set of example usages of a word and asked to sort these into as many/few piles of different senses as possible. The results indicate, for Merriam-Webster, that there are two groups of individuals, those labeled "meaning finders" and those labeled "meaning losers". The "meaning finders" apparently manage to construct semantic generalizations of the senses involved whereas the "meaning losers" get progressively more and more confused as the number of usages increases.

Our experience has been similar. Some individuals just do not do well when asked to "find the sense most appropriate to this usage". Experiments were made with evaluating the discrimination capabilities of our coders on the verb "cut". The results indicated that some individuals produced much more finely subdivided divisions of the senses used, but not necessarily more valid ones.

Additionally, as with most tasks, practice improves one's ability. The disambiguation transcript in Appendix A contains an 85% agreement with scoring performed several months earlier; and 8% of the "disagreement" is actually additional coded information for "slash scores" which were initially passed over as not being semantically related to the main entry. This seems to us to indicate an increased "fluency" at disambiguation with time.

8.2 Considerations for Future Work

Two major conclusions are derivable from the application of this procedure on the MPD:

(1) Some method of compensating for syntactic paraphrases of dictionary definitions and their impact on the tree should be developed. At present different taxonomies would result from the use of different dictionaries. How different these taxonomies would be we cannot really estimate, but the fact that without intending to do so, minor syntactic paraphrases of the definitions would result in altering the connectivity of the trees cannot be overlooked as a cause of difficulty.

(2) A single storage system should contain all the data developed and added to definitions. The difficulties with this are considerable in that we are talking about millions of bytes of data. Yet the unfortunate consequences of separating the data into taxonomic information, definition texts, lists of usages, counts of the size and breadth of trees, status of nodes as terminals and non-terminals, etc., are no less considerable. This approach causes considerably more errors to be introduced into the databases, necessitating repetitive correction of the same errors in several different data sets and thereby introducing the definite possibility for additional errors brought about by the correction procedures themselves.

Most desirable would be to prepare one database from which all the datasets developed during this study would be derivable. This task was not practical under the constraints of computer funding and hardware available to this grant. However, the introduction of the VAX11/780 system during the existence of this grant has given definite hope that such a large address space machine with suitable disk resources could provide the necessary computer hardware within which to construct such a lexical database under affordable economic limits.

It is noteworthy that having the data in separate datasets does not prevent one from continuing to manipulate the data to derive further results. It does however render it successively more and more difficult to maintain the consistency of all the datasets when changes or corrections are introduced at some point. Often, the rearrangement of the data provides evidence of some new flaw

in the dictionary (or the procedures being used) which cannot then be uniformly corrected without effectively regenerating all the preceding data from the original source of the flaw's introduction. As this is usually prohibitively expensive computationally, the flaw is compensated for in just the dataset in which it shows up, and those generated afterwards are the only ones in which the problem has been fixed. For instance, the % score introduced in the coding conventions (Section 4.3, item 12) was used to note words in definitions which were not included in the noun tree when it was last grown because they were not found and disambiguated until afterwards. Had a single database existed (and such was not possible given the existing computing environment and costs) these could have been added to the already grown trees, connecting together disjoint segments of tree when they were entered.

The problems with a unified database containing both the original dictionary and the subsequent taxonomic organization are not inconsiderable. There are two fundamental organizations of the definitional text which must be accommodated by any such system.

First, the text must be alphabetically available by the terms being defined or the usage vocabulary. This provides the conventional 'inverted file' organization of a standard Data Base Management System (DBMS).

Second, the data must be available in taxonomic order. The entire dictionary assembled as a taxonomic structure does not so much resemble the data of a taxonomic database management system as it does a definition schema for such a system expecting data values to be entered. For example, the tree of vehicle types resembles the definition for a taxonomic DBMS expecting actual vehicle registrations or identification numbers to be entered. This is true for most segments of the taxonomy. The list under PERSON is broken down by classes such as occupations, titles, and geographic, historic, or political origins. It is the natural structure into which to input data about people in these classes.

To the best of our knowledge, designers of DBMS systems have never really considered the consequences of having a database schema occupying more storage than the database values. Yet this would be the natural environment in which a dictionary taxonomy would find application. Artificial Intelligence and Natural Language Processing applications on a large scale are likely to need this type of database facility, and the evolution of a general database definition which is based upon the assumption of classes of real world objects based upon portions of dictionary taxonomy would seem potentially useful.

Finally, there is a growing sense that this project has not been an exploration within the framework of a known discipline as much as an exploration of the boundaries of a new discipline. Computational Lexicology may mean many diverse things to its other practitioners, but to those of us engaged in the analysis of the MPD the feeling is that we have created a new discipline in itself-- one which will necessitate its own history, methods, discoveries, research tools and specialists to adequately develop. There were many instances in which we barely scratched the surface of an immense unexplored question of semantics, computational technique, or of a psycholinguistic, linguistic, or anthropological phenomenon. But to even complete the taxonomy on schedule it was necessary to press forward without following up these numerous issues. We can therefore expect more results to be derived from this project over the next several years of investigation, while noting somewhat wistfully that we wished we had had more time during the exploration to follow up the many side trails. It is likely that all explorers of new, uncharted territory have shared this feeling to some degree.

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APPENDIX A: DISAMBIGUATION TRANSCRIPT

Transcribed Tape Recorded Protocol of the Disambiguation Procedure

This session was recorded on April 26, 1979, well after the completion of the actual disambiguation phase. Thus, this present task provides both data on intuitive criteria as well as a consistency comparison with the scores assigned to the focal terms in the actual procedure. The coder, GAH, was provided a blank coding form consisting of noun main entries with sense definitions and focal terms beginning with the letter M; as well as a copy of the MPD for reference. Presented here are excerpts of the session, for the focal terms MACHINE and MARK. Also present at the session was project supervisor RA.

The text is extracted verbatim from the transcribed tape recording with <,> text added to show what portion of the coding form or dictionary was being examined. Centered text segments contained within ===='s are boundaries of extracts. [,]'s contain scores entered during the session, separated by a semicolon from the original score entered several months ago. Horizontal spacing is indicative of short pauses, vertical spacing represents longer pauses. The ... segments do not represent omitted material, but are used for speech which trailed off into a pause. {,}'s represent non-text exclamations. Asterisks within <,>'s mark where material was obscured on the coding form.

=== BEGINNING OF FOCAL TERM "MACHINE" ===

<NEUTRAL 2.3A..... = MACHINE..... THE POSITION OF MACHINE GEARS IN WHICH THE MOTOR IMPARTS NO MOTION>

neutral - the position of machine gears

machine is what we're looking for,
"position of gears"

"position" and "gears" could be scored
"machine" cannot be as an adjective here
[X entered for NEUTRAL 2.3A in left margin; X]

<OUTPUT .0A..... = MACHINE..... THE AMOUNT PRODUCED (AS BY A MACHINE OR FACTORY)>

output - the amount produced as by a machine or factory

again, it is not scorable here
[X ; X]

=== GAP WHILE METHODOLOGY OF PROTOCOL ELICITATION DISCUSSED ===
=== RA RESUMES SCORING ===

<PART 1.2A..... = MACHINE..... A SPARE PIECE FOR A MACHINE>

part-1.2a - machine - a spare piece for a machine

[Question to GAH]
OK, now the machine gets scored as a something else there?

No

GAH: no, "for a machine", no

RA: OK, now
er, where's one that is, OK,

<PRESS 1.2A..... = MACHINE..... A MACHINE FOR EXERTING PRESSURE (AS FOR STAMPING , PUSHING A TOOL , OR EXPRESSING LIQUID) ; ESP>

press-.2a - machine - a machine for exerting pressure (as for stamping, pushing a tool, or expressing liquid); esp

OK, that is a machine, uhm, so now I have to go to the dictionary and look at the senses of machine

<1 machine <n> 1 : CONVEYANCE, VEHICLE; esp : AUTOMOBILE 2 : a combination of mechanical parts that transmit forces, motion, and energy one to another to some desired end (as for sewing, printing, or hoisting) 3 : an instrument (as a pulley or lever) for transmitting or modifying force or motion 4 : a highly organized political group under the leadership of a boss or small clique>

1, the first one is an automobile type thing
2nd one is a combination of mechanical parts
  - that sounds very likely
"as for printing" yeah, and a press is, is in that category too
 so,
Ah, an instrument or, er, pulley for transmitting,
 that's, that's a Basic machine
that's the ones they talked about in Physics
and 4, a highly organized political group,
well that's people, so

OK, so, its gotta be 2 - so that's machine, and 2 is a,
1 is a homograph ...

[background] GAH: 1.2A
RA: 1.2A
[1.2A ; 1.2A]

=== GAP WHILE GAH NOW RESUMES PROTOCOL MONOLOG ===

<PRINTING PRESS .0A... = MACHINE..... A MACHINE BY WHICH PRINTING IS DONE FROM TYPE OR PLATES>

GAH: Printing press .0A - machine - a machine, same kinda machine as the one which was just previous to this, we can just put down 1.2A
[1.2A ; 1.2A]

<ROBOT .1A..... = MACHINE..... A MACHINE THAT LOOKS AND ACTS LIKE A HUMAN BEING>

robot - machine - a machine that looks and acts like a human being
This is again a combination, of instruments and parts
so we will put 1.2A
[1.2A ; 1.2A]

<ROTARY 2.1A..... = MACHINE..... A ROTARY MACHINE>

rotary - machine - a rotary machine
same type of machine as the one above,
1.2A
[1.2A ; 1.2A]

<RUN 2.5B..... = MACHINE..... A PERIOD OF OPERATION (AS OF A MACHINE OR PLANT)>

run - machine - a period of operation, as of a machine or plant

no, machine is not scorable here
[X ; X]

<SCALE 1.3A..... = MACHINE..... A WEIGHING MACHINE>

scale - machine - a weighing machine
this was possibly, uhm, 3, let me look at 3
an instrument for transmi... OK
this is not that, so it is the one prior to this, it is 1.2A
[1.2A ; 1.2A]

<SCREW 1.1B..... = MACHINE..... A DEVICE WITH A SPIRALLY GROOVED CYLINDER USED AS A MACHINE>

screw - a device with a spirally grooved cylinder
used as a machine, yes, yes, indeed here "used as a machine"
is a, not the kernel, but it is a slash plus [/+] score
because uh screw is a device Used as a... now to determine
what kind of, machine it is
a screw is not a combination, it is an Instrument
for transmitting or modifying forces, that is indeed it
1.3A
[1.3A/+ ; X]

<SHEAR 2.2A..... = MACHINE..... A MACHINE FOR CUTTING METAL>

shear - a machine for cutting metal

this is, an instrument,
its not a combination of parts
[1.3A ; 1.2A]

we're now getting to the point where we understand there's a
difference between, the different way the,
the difference between 1.2A and 1.3A
that 1.2A is a conglomeration, whereas 1.3A is an individual
instrument

so that, will, continue to help us
as we go down, this list

<SLOT MACHINE .0A..... = MACHINE..... A MACHINE WHOSE OPERATION IS BEGUN BY DROPPING A COIN INTO A SLOT>

slot machine - a machine whose operation is 1.2A
since slot machine is more than one
[1.2A ; 1.2A]

<SLUG 2.2A..... = MACHINE..... A METAL DISK FOR USE (AS IN A SLOT MACHINE) IN PLACE OF A COIN>

slug - is a metal disc, for use, and then a slot machine
in place of a coin - OK this is, that's horrible
[X ; X]

<SPINNING WHEEL .0A... = MACHINE..... A SMALL DOMESTIC MACHINE FOR SPINNING THREAD OR YARN IN WHICH A LARGE WHEEL DRIVES SINGLE SPINDLE>

spinning wheel - a small domestic machine for spinning thread

a combination of things are going on there so that's 1.2A
[1.2A ; 1.2A]

<SWATH .1A..... = MACHINE..... THE SWEEP OF A SCYTHE OR MOWING MACHINE OR THE PATH CUT IN MOWING>

swath - the sweep of a scythe or mowing machine
the sweep of a machine
OK, sweep, machine is not scorable here
[X ; X]

<TOOL 1.2A..... = MACHINE..... THE CUTTING OR SHAPING PART IN A MACHINE ; ALSO>

tool - the cutting or shaping part in a machine
this is not scorable,
tool is a part, well that's not true, tool is a part of a machine

and they're talking about machine here as
a General thing, a combination of things
so we're gonna score it as 2.A/+
that's a little on the outside but we'll use it anyway
[1.2A/+ ; X]

have to turn the page now

[Turns Page of Computer Output]
<TOOL 1.2B..... = MACHINE..... A MACHINE FOR SHAPING METAL IN ANY WAY>

OK, {sigh}
tool - a machine for shaping metal

this is going to be
1.2A
[1.2A ; 1.3A]

<TOTALIZATOR .0A..... = MACHINE..... A MACHINE FOR REGISTERING AND INDICATING THE NATURE AND NUMBER OF BETS MADE ON A H*
*E OR DOG RACE>

total... gawd, what a word
totaliza... I've never heard of that one before
a machine for registering and indicating the nature of Bets made on a...

horse or dog race

OK, this is 1.2A
[1.2A ; 1.2A]

<TRAP 1.3A..... = MACHINE..... A MACHINE FOR THROWING OBJECTS INTO THE AIR TO BE TARGETS FOR SHOOTERS ; ALSO>

trap - a machine for throwing objects

now this very well could be an instrument

{tch}

I'm reading tha... definition,
an instrument as a pulley of lever for transmitting or modifying force or motion

well a trap transmits motion to a disk
it works on a spring
it might better be thought of as an instrument than
a combination of mechani... Well

Let's see

a combination of mechanical parts that transmits forces
motion and energy one to another or to some desired end

as for sewing, printing, or hoisting

hoisting

pulley or a level is the next one
hoisting, they must be talking about a wench, maybe?
{tch}, alright, I would a put 1.3A
more than likely be argued out of it
{tch}
[1.3A ; 1.2A]

<TREADLE .0A..... = MACHINE..... A LEVER DEVICE PRESSED BY FOOT TO DRIVE A MACHINE>

treadle - a lever, device pressed by the foot
to drive a machine

no, it's not scorable
[X ; X]

<TURRET .2A..... = MACHINE..... A REVOLVABLE HOLDER IN A MACHINE TOOL>

a revolv.... OK, this is turret
a revolvable holder in a machine tool,
not scorable, adjective
[X ; X]

<TYPEWRITER .1A..... = MACHINE..... A MACHINE FOR WRITING IN CHARACTERS SIMILAR TO THOSE PRODUCED BY PRINTERS' TYPES B* *EANS OF TYPES STRIKING THROUGH AN INKED RIBBON>

typewriter - a machine for writing characters

OK, this is 1.2A
[1.2A ; 1.2A]

<UNION .6A..... = MACHINE..... ANY OF VARIOUS DEVICES FOR CONNECTING PARTS (AS OF A MACHINE) ; ESP>

union - any of various devices for connecting parts, as of a machine

so that's all the way down the end, it's not a scorable
[X ; X]

<VENDOR .2A..... = MACHINE..... A VENDING MACHINE>

vendor - a vending machine is 1.2A
[1.2A ; 1.2A]

=== END OF FOCAL TERM "MACHINE" ===

=== BEGINNING OF FOCAL TERM "MARK" ===

<PATHFINDER .0B..... = MARK..... ONE THAT EXPLORES UNTRAVELED REGIONS TO MARK OUT A NEW ROUTE>

GAH: pathfinder - the one that explores untraveled regions to mark out a new route

verb
[X ; X]

<PERIOD 1.3A..... = MARK..... A PUNCTUATION MARK $161$1 USED ESP. TO MARK THE END OF A DECLARATIVE SENTENCE OR A* *BBREVIATION>

a punctuation mark , period

[turning pages in dictionary]

<1 mark <n> 1 : TARGET; also : GOAL, OBJECT 2 : something (as a line or fixed object) designed to record position; also : the starting line or position in a track event 3 : BUTT 4 : the question under discussion 5 : NORM <not up to the ~> 6 : a visible sign : INDICATION; also :

CHARACTERISTIC 7 : a written or printed symbol
8 : GRADE < a ~ of B+> 9 : IMPORTANCE, DISTINCTION
10 : a lasting impression>

OooK
[Clears throat] Target
something designed to record, position
the starting line

question, norm, a visible sign, indication or characteristic
a written or printed symbol
here we go, that's probably it
grade, importance, distinction
a lasting impression

OK, it's 1.7A
{tch}
[1.7A ; 1.7A]

<POINT 1.7A..... = MARK..... A PUNCTUATION MARK
; ESP>

point

a punctuation mark ... the same thing
[1.7A ; 1.7A]

<POINT 1.8A..... = MARK..... A DECIMAL MARK>

point a decimal mark

is a written symbol
[1.7A ; 1.7A]

<POST 1.2A..... = MARK..... A POLE OR STAKE
SET UP AS A MARK OR
INDICATOR>

post - a poll or stake set up As a mark
OK, this is set up As a visible sign

that's 1.6 A

slash plus since it is not in the kernel
[1.6A/+ ; X]

<POSTMARK .0B..... = MARK..... THE MARK CANCELING
THE POSTAGE STAMP>

postmark - the mark canceling the postage stamp

{tch} well, now this is very interesting

{tch} postmark is a visible sign
it is also a printed sym... no its not a symbol

something designed to record position no
no
a visible sign
{tch} {sigh} {tch-tch tch-tch}
well, it's not the same kind of visible sign that
a pole or stake is

{?? Oh ??}, but I'd still 1.6A
{tch}, alright
[1.6A (later changed to 1.7A - see ahead) ; 1.7A]

<PRICK 1.1A..... = MARK..... A MARK OR SMALL WOUND MADE BY A POINTED INSTRUMENT>

prick - a mark or small wound

not a target, not designed to record, not the starting line
not the butt, not a question under discussion or a norm

again this is a visible sign
[1.6A ; 1.6A]

<PRINT 1.1A..... = MARK..... A MARK MADE BY PRESSURE>

print - a mark made, by pressure
{tch} a visible sign
[1.6A ; 1.6A]

<PROFESSIONALISM .1A.. = MARK..... THE CONDUCT , AIMS , OR QUALITIES THAT CHARACTERIZE OR MARK A PROFESSION OR A PROF* *IONAL PERSON>

professionalism - the conduct, aims or qualities that
characterize or mark,

verb,

[X ; X]

<QUESTION MARK .0A.... = MARK..... A PUNCTUATION MARK $18$1 USED ESP. AT THE END OF A SENTENCE TO INDICATE A DIRECT Q* *TION>

a question-mark, a punctuation mark is 1.7 A
[1.7A ; 1.7A]

<SCAR .0A..... = MARK..... A MARK LEFT AFTER INJURED TISSUE HAS HEALED>

scar - a mark left after injured tissue has healed

Ah HA - a visible sign? Yes
[1.6A ; 1.6A]

<SCRATCH 2.1A..... = MARK..... A MARK MADE AS OR AS IF BY SCRATCHING ; ALSO>

scratch - a mark made by or as if by scratching

a visible sign
[1.6A ; 1.6A]

<SEAL 3.3A..... = MARK..... A MARK ACCEPTABLE AS HAVING THE LEGAL EFFECT OF AN OFFICIAL SEAL>

seal - a mark acceptable as having the legal effect of an official seal

a mark?

I think that this is a written or printed symbol

yes
[1.7A ; 1.7A]

{tch}
which makes me want to go back and reconsider postmark again

and I'm going to change that one
to 7A as a written symbol
[erases 6 in score for MARK in POSTMARK .0B
  and enters 7 in its place]

<SEMICOLON .0A..... = MARK..... A PUNCTUATION MARK
$167$1 USED ESP.
ESP. IN A
COORDESP. INATESP.
ING FUNCTION BETW*
MAJOR SENTENCE
ELEMENTS>

{tch} semicolon, a punctuation mark is 1.7A
[1.7A ; 1.7A]

<STAMP 2.2A..... = MARK..... THE MARK MADE BY
STAMPING ; ALSO>

stamp - the mark made by stamping 1.7A
[1.7A ; 1.7A]

=== END OF SESSION ===

Note: Consistency results indicate that out of the 37 scores entered during these two sessions, 31 were identical (84%), 3 were additions of a /+ score where the entry had been deleted (8%) and 3 more were differences between two senses which were noted as being difficult to decide between during this session (8%). Adding the /+'s in does not truly affect the validity of the tree produced, so one might characterize consistency as 84%; omissions 8%; and inconsistency 8%.

APPENDIX B: SAMPLE OF NOUN TAXONOMY

```
000001 -1 ----
000002 00 ZOOLOGY-.0A    = A SCIENCE-.1A THAT DEALS WITH ANIMALS
                            AND THE ANIMAL KINGDOM
000003 01 ENTOMOLOGY-.0A        = A BRANCH-1.3A OF ZOOLOGY-.0A/+
                                  THAT DEALS WITH INSECTS
000004 01 ICHTHYOLOGY-.0A       = A BRANCH-1.3A OF ZOOLOGY-.0A/+
                                  DEALING WITH FISHES
000005 01 ORNITHOLOGY-.0A       = A BRANCH-1.3A OF ZOOLOGY-.0A/+
                                  DEALING WITH BIRDS
000006 -1 ----
000007 00 ZINC-.0A        = A BLUISH WHITE CRYSTALLINE METALLIC
                            CHEMICAL ELEMENT-.3A THAT TARNISHES
                            ONLY SLIGHTLY IN MOIST AIR AT
                            ORDINARY TEMPERATURES AND IS USED TO
                            MAKE ALLOYS AND AS A PROTECTIVE COATING
                            FOR IRON

000008 01 BRASS-.1A       = AN ALLOY-.1A OF COPPER AND ZINC-.0A/+
                            ; ALSO
000009 02 ORMOLU-.0A      = A BRASS-.1A MADE TO IMITATE GOLD AND
                            USED FOR DECORATIVE PURPOSES
000010 01 CALAMINE-.0A    = A MIXTURE-.2A OF OXIDES OF ZINC-.0A/+
                            AND IRON USED IN LOTIONS AND OINTMENTS
000011 01 NICKEL-SILVER-.0A      = A SILVER-WHITE ALLOY-.1A OF
                                    COPPER , ZINC-.0A/+  , AND
                                    NICKEL
000012 01 ZINC-OINTMENT-.0A      = AN OINTMENT-.0A CONTAINING 20
                                    PERCENT OF ZINC-.0A/+  OXIDE
                                    AND USED FOR SKIN DISORDERS
000013 -1 ----
000014 00 ZEBRA-.0A       = ANY OF SEVERAL AFRICAN MAMMALS-.0A/!
                            RELATED TO THE HORSE-.1A/+  AND ASS
                            BUT CONSPICUOUSLY STRIPED WITH
                            BLACK OR BROWN AND WHITE OR BUFF
000015 01 COLT-.0B        = A YOUNG MALE HORSE-.1A , ASS-.1A , OR
                            ZEBRA-.0A
000016 -1 ----
000017 00 ZEBRA-.0A       = ANY OF SEVERAL AFRICAN MAMMALS-.0A/!
                            RELATED TO THE HORSE-.1A/+  AND ASS
                            BUT CONSPICUOUSLY STRIPED WITH
                            BLACK OR BROWN AND WHITE OR BUFF
000018 01 MARE-.0A        = A FEMALE OF AN ANIMAL ( AS A HORSE ,
                            ZEBRA-.0A/+ , OR ASS ) OF THE HORSE
                            GROUP
000019 -1 ----
000020 00 ZEAL-.0B
000021 01 FLAME-.5A       = BURNING ZEAL-.0B OR PASSION-.2A
000022 -1 ----
000023 00 ZEAL-.0A        = EAGER AND ARDENT INTEREST-1.5A IN THE
                            PURSUIT OF SOMETHING
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000024 01 EVANGELISM-.2A          = MILITANT OR CRUSADING ZEAL-.0A
000025 -1 ----
000026 00 Z-.0A = THE 26TH LETTER-1.1A OF THE ENGLISH ALPHABET
000027 01 ZED-.0A          = THE LETTER-1.1A Z-.0A
000028 -1 ----
000029 00 YOUTH-.2A        = A YOUNG MAN-1.1A ; ALSO
000030 01 MASTER-1.6A      = A YOUTH-.2A OR BOY-.1A  TOO YOUNG TO
                            BE CALLED MISTER USED AS A TITLE
000031 -1 ----
000032 00 YOUTH-.1A        = THE PERIOD-1.6A OF LIFE BETWEEN
                            CHILDHOOD AND MATURITY
000033 01 NONAGE-.2A       = A PERIOD-1.6A OF YOUTH-.1A/+
000034 -1 ----
000035 00 YOUNGSTER-.1A = A YOUNG PERSON-.1A
000036 01 URCHIN-.0A       = A PERT OR MISCHIEVOUS YOUNGSTER-.1A
000037 02 GUTTERSNIPE-.0A          = A STREET URCHIN-.0A
000038 -1 ----
000039 00 YOUNG-2.0A       = YOUNG PERSONS-.1A OR LOWER ANIMALS
000040 01 FOAL-.0A         = THE YOUNG-2.0A OF AN ANIMAL OF THE
                            HORSE GROUP
000041 02 COLT-.0A         = FOAL-.0A ; ALSO
000042 01 SPAT-2.0A        = THE YOUNG-2.0A OF A BIVALVE
                            MOLLUSK-.0A/+  ( AS THE OYSTER )
000043 01 WHITEBAIT-.0A = THE YOUNG-2.0A OF A HERRING OR A
                            SIMILAR SMALL FISH-1.1B/+  ESTEEMED A
                            DELICACY
000044 -1 ----
000045 00 YOUNG-2.0A       = YOUNG PERSONS-.1A OR LOWER ANIMALS
000046 01 PUP-.0B          = ONE-2.1A OF THE YOUNG-2.0A/!  OF SOME
                            OTHER ANIMALS
000047 01 WHELP-1.1A       = ONE-2.1A OF THE YOUNG-2.0A/! OF
                            VARIOUS CARNIVOROUS MAMMALS-.0A/+  (
                            AS A DOG )
000048 -1 ----
000049 00 YOLK-.1A         = THE YELLOW ROUNDED INNER MASS-1.1A OF
                            THE EGG OF A BIRD OR REPTILE
000050 01 YELLOW-3.2B     = THE YOLK-.1A OF AN EGG
000051 -1 ----
000052 00 YIELD-2.0B       = THE AMOUNT-2.1A OR QUANTITY-.1A
                            PRODUCED OR RETURNED
000053 01 VINTAGE-.1A     = A SEASON'S YIELD-2.0B OF GRAPES-.1A/+
                            OR WINE
000054 -1 ----
000055 00 YIELD-2.0A       = SOMETHING-.0A% YIELDED ; ESP
000056 01 CROP-1.3B        = THE YIELD-2.0A AT HARVEST
000057 01 PICKINGS-.2A    = YIELD-2.0A FOR EFFORT EXPENDED
000058 -1 ----
000059 00 YELLOW-3.1A      = A COLOR-1.1B BETWEEN GREEN AND ORANGE
                            IN THE SPECTRUM
000060 01 CANARY-.3A       = A BRIGHT YELLOW-3.1A
000061 -1 ----
000062 00 YEAST-.5A        = SOMETHING-.0A% THAT CAUSES FERMENT OR
                            ACTIVITY
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000063 01 FERMENT-2.1A   = AN AGENT-.1A ( AS YEAST-.5A/+  ) THAT
                           CAUSES FERMENTATION
000064 01 LEAVEN-1.1A     = A SUBSTANCE-.2A ( AS YEAST-.5A/+  )
                           USED TO PRODUCE FERMENTATION ( AS IN
                           DOUGH )
000065 -1 ----
000066 00 YEARS-.4A
000067 01 TEENS-.0B       = THE YEARS-.4A 13 TO 19 IN A PERSON'S
                           LIFE
000068 -1 -- -
000069 00 YEARS-.1A/+
000070 01 CENTURY-.3A     = A PERIOD-1.6A OF 100 YEARS-.1A/+  ESP.
                           OF THE CHRISTIAN ERA OR THE PRECEDING
                           PERIOD
000071 01 DECADE-.0A      = A PERIOD-1.6A OF 10 YEARS-.1A/+
000072 01 MILLENNIUM-.1A          = A PERIOD-1.6A OF 1000
                                    YEARS-.1A/+  MENTIONED IN
                                    REVELATION 20 WHEN HOLINESS IS
                                    TO PREVAIL AND CHRIST IS TO
                                    REIGN ON EARTH
000073 01 QUADRENNIUM-.0A         = A PERIOD-1.6A OF 4 YEARS-.1A/+
000074 -1 ----
000075 00 YEARNING-.0A   = A TENDER OR URGENT LONGING-.0A
000076 01 NOSTALGIA-.2A = A WISTFUL YEARNING-.0A FOR SOMETHING
                           PAST OR IRRECOVERABLE
000077 -1 ----
000078 00 YEAR-.5A       = A PERIOD-1.6A OF TIME OTHER THAN A
                           CALENDAR YEAR THE SCHOOL *
000079 01 SEMESTER-.0A   = HALF-1.1A A YEAR-.5A/+  ; ESP
000080 -1 ----
000081 00 YEAR-.2B       = A CALENDAR YEAR-.2A SPECIFIED USU. BY
                           A NUMBER
000082 01 DATE-2.1A      = THE DAY-.3A , MONTH-.0A , OR YEAR-.2B
                           OF AN EVENT-.2A/+
000083 01 TIME-1.8A      = A MOMENT-.1A , HOUR-.1A , DAY-.3A , OR
                           YEAR-.2B  AS INDICATED BY A CLOCK OR
                           CALENDAR WHAT * IS IT
000084 02 BELL-1.2B      = TIME-1.8A SO INDICATED
000085 02 DAYLIGHT-SAVING-TIME-.0A
000086 02 HOUR-.2A       = THE TIME-1.8A OF DAY
000087 -1 ----
000088 00 YEAR-.2A       = A CYCLE-.4A IN THE GREGORIAN CALENDAR
                           OF 365 OR 366 DAYS BEGINNING WITH
                           JANUARY 1 ; ALSO
000089 01 LEAP-YEAR-.0A = A YEAR-.2A CONTAINING 366 DAYS WITH
                           FEBRUARY 29 AS THE EXTRA DAY
000090 01 YEAR-.2B       = A CALENDAR YEAR-.2A SPECIFIED USU. BY
                           A NUMBER
000091 02 DATE-2.1A      = THE DAY-.3A , MONTH-.0A , OR YEAR-.2B
                           OF AN EVENT-.2A/+
000092 02 TIME-1.8A      = A MOMENT-.1A , HOUR-.1A , DAY-.3A , OR
                           YEAR-.2B  AS INDICATED BY A CLOCK OR
                           CALENDAR WHAT * IS IT
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000093 03 BELL-1.2B      = TIME-1.8A SO INDICATED
000094 03 DAYLIGHT-SAVING-TIME-.0A
000095 03 HOUR-.2A       = THE TIME-1.8A OF DAY
000096 01 YESTERYEAR-.1A         = LAST YEAR-.2A
000097 -1 ----
000098 00 YEAR-.2A       = A CYCLE-.4A IN THE GREGORIAN CALENDAR
                          OF 365 OR 366 DAYS BEGINNING WITH
                          JANUARY 1 ; ALSO
000099 01 MONTH-.0A      = ONE-2.1A OF THE TWELVE PARTS-1.1A/+
                          INTO WHICH THE YEAR-.2A/+  IS DIVIDED
000100 02 APRIL-.0A      = THE 4TH MONTH-.0A OF THE YEAR HAVING
                          30 DAYS
000101 02 AUGUST-.0A     = THE 8TH MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000102 02 DATE-2.1A      = THE DAY-.3A , MONTH-.0A , OR YEAR-.2B
                          OF AN EVENT-.2A/+
000103 02 DECEMBER-.0A   = THE 12TH MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000104 03 CHRISTMAS-.0A  = DECEMBER-.0A 25 CELEBRATED AS A CHURCH
                          FESTIVAL-.1B/+ IN COMMEMORATION OF THE
                          BIRTH OF CHRIST
                          AND OBSERVED AS A LEGAL HOLIDAY-.2B/+
000105 02 FEBRUARY-.0A   = THE 2ND MONTH-.0A OF THE YEAR HAVING
                          28 AND IN LEAP YEARS 29 DAYS
000106 03 WASHINGTON'S-BIRTHDAY-.0A
000108 02 INSTANT-1.2A   = THE PRESENT OR CURRENT MONTH-.0A YOUR
                          LETTER OF THE 10TH *
000109 02 JANUARY-.02
000110 02 JULY-.0A       = THE 7TH MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000111 03 INDEPENDENCE-DAY-.0A
000112 02 JUNE-.0A       = THE 6TH MONTH-.0A OF THE YEAR HAVING
                          30 DAYS
000113 02 MARCH-.0A      = THE 3RD MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000114 02 MAY-.0A        = THE 5TH MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000115 02 NOVEMBER-.0A   = THE 11TH MONTH-.0A OF THE YEAR HAVING
                          30 DAYS
000116 03 VETERANS-DAY-.0A       = NOVEMBER-.0A 11 OBSERVED AS A
                                   LEGAL HOLIDAY-.2B/+  IN
                                   COMMEMORATION OF THE END OF
                                   HOSTILITIES IN 1918 AND 1945
000117 02 OCTOBER-.0A    = THE 10TH MONTH-.0A OF THE YEAR HAVING
                          31 DAYS
000118 02 SEPTEMBER-.0A  = THE 9TH MONTH-.0A OF THE YEAR HAVING
                          30 DAYS
000119 01 NEW-YEAR-.0B   = THE FIRST DAYS-.3A OF THE YEAR-.2A/+
000120 02 ROSH-HASHANAH-.0A      = THE JEWISH NEW-YEAR-.0B
                                   OBSERVED AS A RELIGIOUS
                                   HOLIDAY-.1A/+ IN SEPTEMBER OR
                                   OCTOBER
000121 -1 ----
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000122 00 YEAR-.1A          = THE PERIOD-1.6A OF ABOUT 365$146$1
                              SOLAR DAYS REQUIRED FOR ONE REVOLUTION
                              OF THE EARTH AROUND THE SUN
000123 01 MIDYEAR-.1A       = THE MIDDLE-2.1A OF A YEAR-.1A/+
000124 01 SEASON-1.1A        = ONE-2.1A OF THE DIVISIONS-.6A/! OF THE
                              YEAR-.1A/+ ( AS SPRING , SUMMER-.0A/+
                              , AUTUMN , OR WINTER )
000125 02 AUTUMN-.0A         = THE SEASON-1.1A BETWEEN SUMMER AND
                              WINTER
000126 02 SPRINGTIME-.0A          = THE SEASON-1.1A OF SPRING
000127 02 SPRING-2.3A        = THE SEASON-1.1A BETWEEN WINTER AND
                              SUMMER
000128 02 SUMMER-.0A         = THE SEASON-1.1A OF THE YEAR IN A
                              REGION IN WHICH THE SUN SHINES MOST
                              DIRECTLY
000129 02 WINTERTIDE-.0A          = THE SEASON-1.1A OF WINTER
000130 02 WINTER-1.1A        = THE SEASON-1.1A OF THE YEAR-.1A/+ IN
                              ANY REGION IN WHICH THE NOONDAY SUN
                              SHINES MOST OBLIQUELY
000131 02 WINTER-1.3A        = A TIME-1.1A OR SEASON-1.1A  OF
                              INACTIVITY OR DECAY
000132 01 SUMMER-.0B         = THE WARMEST PERIOD-1.6A OF THE
                              YEAR-.1A/+
000133 01 WINTER-1.1A        = THE SEASON-1.1A OF THE YEAR-.1A/+ IN
                              ANY REGION IN WHICH THE NOONDAY SUN
                              SHINES MOST OBLIQUELY
000134 -1 ----
000135 00 YARN-.1A           = A CONTINUOUS OFTEN PLIED STRAND-3.2A
                              COMPOSED OF FIBERS OR FILAMENTS AND
                              USED IN WEAVING AND KNITTING TO FORM
                              CLOTH
000136 01 ANGORA-.2A         = YARN-.1A OR CLOTH-.1A  MADE FROM THE
                              HAIR OF AN ANGORA GOAT OR RABBIT
000137 01 CANDLEWICK-.0A          = A SOFT COTTON YARN-.1A ; ALSO
000138 01 CASHMERE-.0A       = FINE WOOL-.1B FROM THE UNDERCOAT OF AN
                              INDIAN GOAT OR A YARN-.1A  SPUN OF
                              THIS ; ALSO
000139 01 CHENILLE-.0A       = A WOOL , COTTON , SILK , OR RAYON
                              YARN-.1A WITH PROTRUDING PILE ; ALSO
000140 01 FILLING-.2A        = THE YARN-.1A INTERLACING THE WARP IN A
                              FABRIC
000141 01 FLOSS-.3A          = A LIGHTWEIGHT WOOL KNITTING YARN-.1A
000142 01 LINEN-.1B          = THREAD-.1A OR YARN-.1A  SPUN FROM FLAX
000143 01 MERINO-.2A         = A FINE SOFT FABRIC-.2A OR YARN-.1A  OF
                              WOOL OR WOOL AND COTTON
000144 01 MOHAIR-.0A         = A FABRIC-.2A OR YARN-.1A  MADE WHOLLY
                              OR IN PART FROM THE LONG SILKY HAIR OF
                              THE ANGORA GOAT
000145 -1 ----
000146 00 YARN-.1A           = A CONTINUOUS OFTEN PLIED STRAND-3.2A
                              COMPOSED OF FIBERS OR FILAMENTS AND
                              USED IN WEAVING AND KNITTING TO FORM
                              CLOTH
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000147 01 SKEIN-.0A       = A LOOSELY TWISTED QUANTITY-.1A ( AS OF
                            YARN-.1A/+  ) AS IT IS TAKEN FROM THE
                            REEL
000148 -1 ----
000149 00 YARDS-1.1A/+
000150 01 ACRE-.2A         = A UNIT-.2A OF AREA EQUAL TO 4840
                            SQUARE YARDS-1.1A/+
000151 01 FURLONG-.0A      = A UNIT-.2A OF LENGTH EQUAL TO 220
                            YARDS-1.1A/+
000152 01 YARDAGE-.0A      = AN AGGREGATE-3.0B NUMBER-1.2A OF
                            YARDS-1.1A/+  ; ALSO
000153 -1 ----
000154 00 YARD-2.4A        = AN AREA-.3A SET ASIDE FOR A PARTICULAR
                            BUSINESS OR ACTIVITY A NAVY *
000155 01 WOODYARD-.0A     = A YARD-2.4A FOR STORING OR SAWING WOOD
000156 -1 ----
000157 00 YARD-2.3A        = AN ENCLOSURE-\RV.1B% FOR LIVESTOCK
000158 01 STOCKYARD-.0A    = A YARD-2.3A FOR STOCK ; ESP
000159 -1 ----
000160 00 YARD-2.2A        = THE GROUNDS-1.8A OF A BUILDING
000161 01 CHURCHYARD-.0A          = A YARD-2.2A THAT BELONGS TO A
                                    CHURCH AND IS OFTEN USED AS A
                                    BURIAL GROUND
000162 01 DOORYARD-.0A     = A YARD-2.2A OUTSIDE THE DOOR OF A
                            HOUSE
000163 -1 ----
000164 00 YARD-1.2A        = A LONG SPAR-.0A TAPERED TOWARDS THE
                            ENDS THAT SUPPORTS AND SPREADS THE
                            HEAD OF A SAIL
000165 01 SPAR-1.0A        = A ROUNDED WOOD OR METAL PIECE-1.2B (
                            AS A MAST-1.2A/+ , YARD-1.2A/+  , BOOM
                            , OR GAFF ) FOR SUPPORTING SAIL
                            RIGGING
000166 01 YARDARM-.0A      = EITHER END-1.1B OF THE YARD-1.2A/+  OF
                            A SQUARE-RIGGED SHIP
000167 -1 ----
000168 00 WRONGS-1.2A/&
000169 01 MERIT-1.3A       = THE INTRINSIC RIGHTS-2.1A/& AND
                            WRONGS-1.2A/&  OF A LEGAL CASE ; ALSO
000170 -1 ----
000171 00 WRITINGS-.2A
000172 01 APOCRYPHA-.1A = WRITINGS-.2A OF DUBIOUS AUTHENTICITY
000173 01 APOCRYPHA-.3A = EARLY CHRISTIAN WRITINGS-.2A NOT
                          INCLUDED IN THE NEW TESTAMENT
000174 01 BIOGRAPHY-.0B = SUCH WRITINGS-.2A IN GENERAL
000175 01 LITERATURE-.2A        = WRITINGS-.2A IN PROSE OR VERSE
000176 02 BELLES-LETTRES-.0A    = LITERATURE-.2A OF AESTHETIC
                                  RATHER THAN UTILITARIAN VALUE
000177 02 FICTION-.2A     = FICTITIOUS LITERATURE-.2A ( AS
                            NOVELS-.0A/+ AND SHORT STORIES-1.1A/+ )
000178 01 REMAINS-.2A     = WRITINGS-.2A LEFT UNPUBLISHED AT AN
                            AUTHOR'S DEATH
000179 01 SCRIPTURE-.2A = THE SACRED WRITINGS-.2A OF A RELIGION
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000180 -1 ----
000181 00 WRITINGS-.2A/!
000182 01 VEDA-.0A       = ANY OF A CLASS-1.1A OF HINDU SACRED
                           WRITINGS-.2A/!
000183 -1 ----
000184 00 WRITINGS-.2A/+
000185 01 CORPUS-.2A     = A BODY-.5A OF WRITINGS-.2A/+
000186 -1 ----
000187 00 WRITING-.5A    = THE OCCUPATION-.1B OF A WRITER
000188 01 JOURNALISM-.2A         = WRITING-.5A DESIGNED FOR OR
                                   CHARACTERISTIC OF NEWSPAPERS
000189 -1 ----
000190 00 WRITING-.4A    = A STYLE-1.2A OR FORM-1.8A OF
                           COMPOSITION-.2A/+
000191 01 CRYPTOGRAM-.0A         = A WRITING-.4A IN CIPHER OR
                                   CODE
000192 01 FUSTIAN-.2A    = PRETENTIOUS WRITING-.4A OR SPEECH-.3A
000193 01 GRAMMAR-.2B    = SPEECH-.3A OR WRITING-.4A% EVALUATED
                           ACCORDING TO ITS CONFORMITY TO THE
                           PRINCIPLES OF GRAMMAR
000194 01 PANEGYRIC-.0A = A EULOGISTIC ORATION-.0A OR
                           WRITING-.4A
000195 01 POETRY-.1A     = METRICAL WRITING-.4A
000196 -1 ----
000197 00 WRITING-.2A    = SOMETHING ( AS A LETTER , BOOK-1.1A/+
                           , OR DOCUMENT)
000198 01 APOCALYPSE-.0A         = A WRITING-.2A PROPHESYING A
                                   CATACLYSM IN WHICH EVIL FORCES
                                   ARE DESTROYED
000199 01 HYMNODY-.1A    = HYMN SINGING OR WRITING-.2A
000200 01 JABBERWOCKY-.0A        = MEANINGLESS SPEECH-.3A OR
                                   WRITING-.2A
000201 01 MANUSCRIPT-.2A         = WRITING-.2A AS OPPOSED TO
                                   PRINT
000202 01 PARCHMENT-.0B = A WRITING-.2A ON SUCH MATERIAL
000203 01 POLICY-2.0A    = A WRITING-.2A WHEREBY A CONTRACT OF
                           INSURANCE IS MADE
000204 01 RECEIPT-1.4A   = A WRITING-.2A ACKNOWLEDGING THE
                           RECEIVING OF MONEY OR GOODS
000205 01 SERIAL-2.0A    = A SERIAL STORY-1.1A OR OTHER
                           WRITING-.2A
000206 01 SQUIB-.2A      = A BRIEF WITTY WRITING-.2A OR
                           SPEECH-.3A
000207 01 STUFF-1.4A     = WRITING-.2A , TALK-2.1B , OR IDEAS-.1A
                            OF LITTLE OR TRANSITORY WORTH
000208 -1 ----
000209 00 WRITING-.2A    = SOMETHING ( AS A LETTER , BOOK-1.1A/+
                           , OR DOCUMENT)
000210 01 BRAILLE-.0A    = A SYSTEM-.3A OF WRITING-.2A/+  FOR THE
                           BLIND THAT USES CHARACTERS MADE UP OF
                           RAISED DOTS
000211 -1 ----
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000212 00 WRITING-.1B
000213 01 HANDWRITING-.0A        = WRITING-.1B DONE BY HAND ;
                                  ALSO
000214 02 CALLIGRAPHY-.1A        = BEAUTIFUL OR ELEGANT
                                  HANDWRITING-.0A ; ALSO
000215 01 SCRIBBLE-2.0A = HASTY OR CARELESS WRITING-.1B
000216 -1 ----
000217 00 WRITING-.1B/+
000218 01 STENOGRAPHY-.0A        = THE ART-.3A OR PROCESS-1.4A OF
                                  WRITING-.1B/+  IN SHORTHAND
000219 -1 ----
000220 00 WRITING-.1A   = THE ACT-1.1B OF ONE THAT WRITES ; ALSO
000221 01 SKYWRITING-.0A         = WRITING-.1A IN THE SKY FORMED
                                  BY SMOKE EMITTED FROM AN
                                  AIRPLANE
000222 -1 ----
000223 00 WRITER-.0B
000224 01 BOHEMIAN-.3A  = A WRITER-.0B OR ARTIST-.1A  LIVING AN
                          UNCONVENTIONAL LIFE
000225 01 EVANGELIST-.1A         = THE WRITER-.0B OF ANY OF THE
                                  FOUR GOSPELS
000226 01 FATHER-1.5A   = AN EARLY CHRISTIAN WRITER-.0B ACCEPTED
                          BY THE CHURCH AS AN AUTHORITATIVE
                          WITNESS TO ITS TEACHING AND PRACTICE
000228 00 WRITER-.0A    = ONE-2.2A THAT WRITES ESP. AS A
                          BUSINESS OR OCCUPATION
000229 01 HACK-3.4A     = A WRITER-.0A WHO WORKS MAINLY FOR HIRE
000230 01 HISTORIAN-.0A = A STUDENT-.0A OR WRITER-.0A  OF
                          HISTORY
000231 01 HISTORIOGRAPHER-.0A    = A USU. OFFICIAL WRITER-.0A OF
                                  HISTORY
000232 01 PLAYWRIGHT-.0A         = A WRITER-.0A OF PLAYS
000233 01 POET-.0A       = A WRITER-.0A OF POETRY ; ALSO
000234 02 POETASTER-.0A = AN INFERIOR POET-.0A
000235 01 REVIEWER-.0B   = A WRITER-.0A OF CRITICAL REVIEWS
000236 -1 ----
000237 00 WRIT-.2A       = A LEGAL ORDER-1.6A IN WRITING ISSUED
                          IN THE NAME OF THE SOVEREIGN POWER OR
                          IN THE NAME OF A COURT OR
                          JUDICIAL AUTHORITY COMMANDING THE
                          PERFORMANCE OR NONPERFORMANCE OF A
                          SPECIFIED ACT
000238 01 HABEAS-CORPUS-.0A      = A WRIT-.2A ISSUED TO BRING A
                                  PARTY BEFORE A COURT
000239 01 INJUNCTION-.2A         = A COURT WRIT-.2A WHEREBY ONE
                                  IS REQUIRED TO DO OR TO
                                  REFRAIN FROM DOING A SPECIFIED
                                  ACT
000240 01 MANDAMUS-.0A   = A WRIT-.2A ISSUED BY A SUPERIOR COURT
                          COMMANDING THAT A SPECIFIED OFFICIAL
                          ACT OR DUTY BE PERFORMED
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000241 01 SUBPOENA-1.0A = A WRIT-.2A COMMANDING THE PERSON NAMED
                          IN IT TO ATTEND COURT UNDER PENALTY
                          FOR FAILURE TO DO SO
000242 01 WARRANT-1.2B  = A LEGAL WRIT-.2A AUTHORIZING AN
                          OFFICER TO TAKE ACTION ( AS IN MAKING
                          AN ARREST , SEIZURE , OR SEARCH )
000243 -1 ----
000244 00 WRINKLE-1.1A   = A CREASE OR SMALL FOLD-4.2A ON A
                          SURFACE ( AS IN THE SKIN OR IN CLOTH )
000245 01 FURROW-.2A     = A NARROW GROOVE-.1A ( AS A
                          WRINKLE-1.1A/+ )
000246 -1 ----
000247 00 WRENCH-2.2A    = A TOOL-1.1A FOR EXERTING A TWISTING
                          FORCE ( AS ON A NUT OR BOLT )
000248 01 MONKEY-WRENCH-.0A      = A WRENCH-2.2A WITH ONE
                                   ADJUSTABLE JAW
000249 -1 ----
000250 00 WRECKAGE-.2A   = THE REMAINS-.1A OF A WRECK
000251 01 FLOTSAM-.0A    = FLOATING WRECKAGE-.2A OF A SHIP OR ITS
                          CARGO
000252 -1 ----
000253 00 WREATH-.0A     = SOMETHING ( AS BOUGHS-.0A/+ OR
                          FLOWERS-1.1B/! ) INTERTWINED INTO A
                          CIRCULAR SHAPE
000254 01 CHAPLET-.1A    = A WREATH-.0A FOR THE HEAD
000255 01 GARLAND-.0A    = A WREATH-.0A OR ROPE-1.3A  OF LEAVES
                          OR FLOWERS
000256 01 LEI-1.0A       = A WREATH-.0A OR NECKLACE-.0A  USU. OF
                          FLOWERS
000257 -1 ----
000258 00 WRAPPER-.1A    = THAT-1.4A% IN WHICH SOMETHING IS
                          WRAPPED
000259 01 COVER-2.7A     = AN ENVELOPE-.2A OR WRAPPER-.1A  FOR
                          MAIL
000260 02 FOLDER-.3A     = A FOLDED COVER-2.7A OR LARGE
                          ENVELOPE-.2A  FOR LOOSE PAPERS
000261 03 CALENDAR-1.1B = A SHEET-1.2A OR FOLDER-.3A  CONTAINING
                          SUCH AN ARRANGEMENT FOR A PERIOD ( AS
                          A YEAR )
000262 04 ALMANAC-.0A    = A CALENDAR-1.1B CONTAINING
                          ASTRONOMICAL AND METEOROLOGICAL DATA
                          AND OFTEN A MISCELLANY OF OTHER
000263 03 MATCHBOOK-.0A = A SMALL FOLDER-.3A CONTAINING ROWS OF
                          PAPER MATCHES
000264 01 PAPILLOTE-.0A = A GREASED PAPER WRAPPER-.1A IN WHICH
                          FOOD IS COOKED
000265 -1 ----
000266 00 WRAP-2.2A      = AN ARTICLE-.4A OF CLOTHING-.0A/+  THAT
                          MAY BE WRAPPED AROUND A PERSON ; ESP
000267 01 ROBE-1.2A      = A WRAP-2.2A OR COVERING FOR THE LOWER
                          BODY ( AS FOR SITTING OUTDOORS )
000268 02 RUG-.2A        = A LAP ROBE-1.2A
000269 01 THROW-2.4A     = A WOMAN'S SCARF-.1A OR LIGHT WRAP-2.2A
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000270 -1 ----
000271 00 WOUND-1.1A      = AN INJURY-.2A IN WHICH THE SKIN IS
                            BROKEN ( AS BY VIOLENCE OR BY SURGERY )
000272 01 BITE-2.3A       = A WOUND-1.1A MADE BY BITING ; ALSO
000273 01 HURT-2.1A       = A BODILY INJURY-.2A OR WOUND-1.1A
000274 02 WOUND-1.2A      = AN INJURY-.2A OR HURT-2.1A  TO
                            FEELINGS OR REPUTATION
000275 01 INCISION-.0B    = A SURGICAL WOUND-1.1A
000276 02 CESAREAN-.0A    = SURGICAL INCISION-.0B OF THE WALLS OF
                            THE ABDOMEN AND UTERUS FOR DELIVERY OF
                            OFFSPRING
000277 01 PRICK-1.1A      = A MARK-1.6A OR SMALL WOUND-1.1A  MADE
                            BY A POINTED INSTRUMENT
000278 01 STAB-2.1A       = A WOUND-1.1A GIVEN BY A POINTED WEAPON
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APPENDIX C: SAMPLE OF VERB TAXONOMY

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000001 -1 ----
000002 00 ZIP-3.0A/N
000003 01 UNZIP-.0A        = TO ZIP-3.0A/N OPEN
000004 -1 ----
000005 00 YIELD-1.6A/N     = TO GIVE-1.17A\-WAY WAY ( AS TO FORCE
                             OR INFLUENCE )
000006 01 DEFY-.2A         = TO REFUSE BOLDLY TO OBEY-.2A/N OR TO
                             YIELD-1.6A/N  TO
000007 -1 ----
000008 00 YIELD-1.6A       = TO GIVE-1.17A\-WAY WAY ( AS TO FORCE
                             OR INFLUENCE )
000009 01 TRUCKLE-2.0A     = TO YIELD-1.6A SLAVISHLY TO THE WILL
                             OF ANOTHER
000010 01 SURRENDER-1.1A          = TO YIELD-1.6A TO THE POWER OF
                                    ANOTHER
000011 02 CAPITULATE-.1A          = TO SURRENDER-1.1A ESP. ON
                                    CONDITIONS AGREED UPON
000012 02 ADDICT-1.0A     = TO DEVOTE-.2A OR SURRENDER-1.1A  (
                             ONESELF ) TO SOMETHING HABITUALLY OR
                             EXCESSIVELY
000013 01 INDULGE-.2A     = TO YIELD-1.6A TO THE DESIRE OF
000014 02 SURFEIT-2.0A     = TO FEED-1.1A , SUPPLY-1.2A , OR
                             INDULGE-.2A  TO THE POINT OF SURFEIT
000015 03 CLOY-.0A         = TO SURFEIT-2.0A WITH AN EXCESS OF
                             SOMETHING ORIG. PLEASING
000016 02 REMINISCE-.0A = TO INDULGE-.2A IN REMINISCENCE
000017 02 PRIDE-2.0A      = TO INDULGE-.2A IN PRIDE
000018 03 PREEN-.3A       = TO PRIDE-2.0A ( ONESELF ) FOR
                             ACHIEVEMENT
000019 02 PLUME-2.2A      = TO INDULGE-.2A ( ONESELF ) IN PRIDE
000020 02 HIT-1.8A        = TO INDULGE-.2A IN OFTEN TO EXCESS
000021 02 FLOUT-1.2A      = TO INDULGE-.2A IN SCORNFUL BEHAVIOR
000022 02 DREAM-2.2A      = TO INDULGE-.2A IN DAYDREAMS OR
                             FANTASIES
000023 01 GIVE-1.17A      = TO YIELD-1.6A TO FORCE , STRAIN , OR
                             PRESSURE
000024 02 YIELD-1.7A      = TO GIVE-1.17A PLACE
000025 02 WALK-1.5B       = TO GIVE-1.17A A BASE ON BALLS TO
000026 02 FORSAKE-.1A     = TO GIVE-1.17A UP
000027 01 DEFER-2.0A      = TO SUBMIT-.2A OR YIELD-1.6A  TO THE
                             OPINION OR WISHES OF ANOTHER
000028 -1 ----
000029 00 YIELD-1.3A      = TO BEAR-2.4B AS A NATURAL PRODUCT
000030 01 MILK-2.0B       = TO DRAW-1.7A OR YIELD-1.3A  MILK
000031 01 BLOOM-2.1A      = TO PRODUCE-1.2A OR YIELD-1.3A
                             FLOWERS
000032 -1 ----
000033 00 YIELD-1.2A      = TO GIVE-1.17A\-UP UP ; ESP
000034 01 CEDE-.1A        = TO YIELD-1.2A OR GIVE-1.17A\-UP  UP
                             ESP. BY TREATY
000035 -1 ----
000036 00 YIELD-1.1A      = TO GIVE-1.3A AS FITTING , OWED , OR
                             REQUIRED
000037 01 GIVE-1.3A       = TO ACCORD-1.1A OR YIELD-1.1A  TO
                             ANOTHER
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000038 02 YIELD-1.2B     = TO GIVE-1.3A UP POSSESSION OF ON
                           CLAIM OR DEMAND
000039 02 YIELD-1.1A     = TO GIVE-1.3A AS FITTING , OWED , OR
                           REQUIRED
000040 02 SUBSCRIBE-.2A = TO GIVE-1.3A CONSENT BY OR AS IF BY
                           SIGNING ONE'S NAME
000041 03 UNDERWRITE-.3A        = TO SUBSCRIBE-.2A TO
000042 02 SHORE-2.0A     = TO GIVE-1.3A SUPPORT TO
000043 02 SANCTION-2.0A = TO GIVE-1.3A APPROVAL TO
000044 02 HEARKEN-.0A    = TO GIVE-1.3A ATTENTION
000045 02 GO-DOWN-THE-LINE-1.0A = TO GIVE-1.3A WHOLEHEARTED
                                  SUPPORT
000046 02 GLORIFY-.4A    = TO GIVE-1.3A GLORY TO ( AS IN WORSHIP
                           )
000047 03 PRAISE-.2A     = TO GLORIFY-.4A ( A DIVINITY OR A
                           SAINT ) ESP. IN SONG
000048 04 CHANT-1.3A     = TO CELEBRATE-.4A OR PRAISE-.2A  IN
                           SONG
000049 02 FORGO-.0A      = TO GIVE-1.3A UP
000050 02 FORGIVE-.2A    = TO GIVE-1.3A UP RESENTMENT OF
000051 03 CONDONE-.0A    = TO OVERLOOK-.4A OR FORGIVE-.2A  ( AN
                           OFFENSE ) BY TREATING THE OFFENDER AS
                           IF HE HAD DONE NOTHING WRONG
000052 02 DEVOTE-.2A     = TO GIVE-1.3A UP TO WHOLLY OR CHIEFLY
000053 03 ADDICT-1.0A    = TO DEVOTE-.2A OR SURRENDER-1.1A  (
                           ONESELF ) TO SOMETHING HABITUALLY OR
                           EXCESSIVELY
000054 02 CONSENT-1.0A   = TO GIVE-1.3A ASSENT OR APPROVAL
000055 03 PERMIT-1.1A    = TO CONSENT-1.0A TO
000056 04 TRUST-2.4A     = TO PERMIT-1.1A TO STAY OR GO OR TO
                           ACT WITHOUT FEAR OR MISGIVING
000057 04 RUN-1.26A      = TO PERMIT-1.1A TO ACCUMULATE-.0A/+
                           BEFORE SETTLING
000058 04 RELEASE-1.4A   = TO PERMIT-1.1A PUBLICATION OR
                           PERFORMANCE ( AS OF A NEWS STORY OR A
                           MOTION PICTURE ) ON BUT NOT BEFORE A
                            SPECIFIED DATE
000059 05 PUBLISH-.2A    = TO PRODUCE-1.4C OR RELEASE-1.4A  FOR
                           SALE TO THE PUBLIC
000060 06 SYNDICATE-2.2A        = TO PUBLISH-.2A THROUGH A
                                  SYNDICATE
000061 04 RECEIVE-.3A    = TO PERMIT-1.1A TO ENTER-.1A/+
000062 03 GRANT-1.1A     = TO CONSENT-1.0A TO
000063 -1 ----
000064 00 WRITE-.3A
000065 01 VERSIFY-.1A    = TO WRITE-.3A VERSE
000066 01 VERBALIZE-.1A = TO SPEAK-.2A , WRITE-.3A , OR
                           EXPRESS-3.1B  IN WORDY OR EMPTY
                           FASHION
000067 01 TRANSPOSE-.2A = TO WRITE-.3A OR PERFORM-.5B  ( A
                           MUSICAL COMPOSITION ) IN A DIFFERENT
                           KEY
000068 01 TRANSCRIBE-.1A        = TO WRITE-.3A A COPY OF
000069 01 SING-.5A       = TO WRITE-.3A POETRY ; ALSO
000070 01 RHYME-2.1B     = TO WRITE-.3A POETRY
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000071 01 REVIEW-2.3A    = TO WRITE-.3A A CRITICAL EXAMINATION
                           OF
000072 01 QUOTE-.1A      = TO SPEAK-.2A OR WRITE-.3A  A PASSAGE
                           FROM ANOTHER USU. WITH ACKNOWLEDGMENT
                           ; ALSO
000073 02 MISQUOTE-.0A   = TO QUOTE-.1A INCORRECTLY
000074 01 GHOSTWRITE-.0A       = TO WRITE-.3A FOR AND IN THE
                                 NAME OF ANOTHER
000075 01 EXPATIATE-.0A = TO TALK-1.1A OR WRITE-.3A  AT LENGTH
000076 01 ENLARGE-.3A    = TO SPEAK-.2A OR WRITE-.3A  AT LENGTH
000077 01 DWELL-.4A      = TO WRITE-.3A OR SPEAK-.2A  AT LENGTH
                           OR INSISTENTLY
000078 02 HARP-2.2A      = TO DWELL-.4A ON A SUBJECT TIRESOMELY
000079 01 DRAW-1.22A     = TO WRITE-.3A OUT IN DUE FORM
000080 01 DESCANT-.2A    = TO DISCOURSE-2.1A OR WRITE-.3A  AT
                           LENGTH
000081 01 ANSWER-2.1A    = TO SPEAK-.2A OR WRITE-.3A  IN REPLY
                           TO
000082 02 SATISFY-.3A    = TO ANSWER-2.1A OR DISCHARGE-1.7A  ( A
                           CLAIM ) IN FULL
000083 02 RETORT-1.2A    = TO ANSWER-2.1A ( AN ARGUMENT ) BY A
                           COUNTER ARGUMENT
000084 02 RETORT-1.1B    = ANSWER-2.1A BACK USU. SHARPLY
000085 03 LASH-1.3A      = TO ATTACK-1.1B OR RETORT-1.1B
                           VERBALLY
000086 02 PLEAD-.2A      = TO ANSWER-2.1A TO A CHARGE OR
                           INDICTMENT
000087 -1 ----
000088 00 WRITE-.2A      = TO FORM-2.1A THE LETTERS OR THE WORDS
                           OF ( AS ON PAPER )
000089 01 SIGN-2.4A      = TO WRITE-.2A ONE'S NAME ON IN TOKEN
                           OF ASSENT OR OBLIGATION
000090 02 SUBSCRIBE-.1A = TO SIGN-2.4A ONE'S NAME TO A DOCUMENT
000091 02 ENDORSE-.1A    = TO SIGN-2.4A ONE'S NAME ON THE BACK
                           OF ( AS A CHECK ) FOR SOME PURPOSE
000092 01 INSCRIBE-.3A   = TO WRITE-.2A , ENGRAVE-.1A , OR
                           PRINT-2.2A  CHARACTERS UPON
000093 01 INSCRIBE-.1A   = TO WRITE-.2A , ENGRAVE-.2A , OR
                           PRINT-2.2A  ESP. AS A LASTING RECORD
000094 01 AUTOGRAPH-2.0A       = TO WRITE-.2A ONE'S SIGNATURE
                                 ON
000095 -1 ----
000096 00 WRITE-.1A      = TO FORM-2.1A CHARACTERS , LETTERS ,
                           OR WORDS ON A SURFACE ( AS WITH A PEN
                           )
000097 01 UNDERWRITE-.1A       = TO WRITE-.1A UNDER OR AT THE
                                 END OF SOMETHING ELSE
000098 01 TYPEWRITE-.0A = TO WRITE-.1A WITH A TYPEWRITER
000099 02 WRITE-.5A      = TO PEN-4.0A , TYPEWRITE-.0A , OR
                           DICTATE-1.1A  A LETTER TO
000100 01 SURCHARGE-1.2A       = TO PRINT-2.1A OR WRITE-.1A  A
                                 SURCHARGE ON ( POSTAGE STAMPS
                                 )
000101 01 SUPERSCRIBE-.0B       = WRITE-.1A A NAME OR ADDRESS
                                 ON THE OUTSIDE OR COVER OF
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000102 01 SUPERSCRIBE-.0A        = TO WRITE-.1A ON THE TOP OR
                                   OUTSIDE
000103 01 SPELL-2.1A     = TO NAME-2.2A , WRITE-.1A , OR
                          PRINT-2.3A  IN ORDER THE LETTERS OF A
                          WORD
000104 02 MISSPELL-.0A   = TO SPELL-2.1A INCORRECTLY
000105 01 SCRIBBLE-1.0A  = TO WRITE-.1A HASTILY OR CARELESSLY
000106 01 SCRAWL-.0A      = TO WRITE-.1A HASTILY AND CARELESSLY
000107 01 PRINT-2.3A      = TO WRITE-.1A IN LETTERS LIKE THOSE OF
                          PRINTER'S TYPE
000108 02 SPELL-2.1A      = TO NAME-2.2A , WRITE-.1A , OR
                          PRINT-2.3A  IN ORDER THE LETTERS OF A
                          WORD
000109 03 MISSPELL-.0A   = TO SPELL-2.1A INCORRECTLY
000110 02 ITALICIZE-.0A  = TO PRINT-2.3A IN ITALICS
000111 02 CAPITALIZE-.1A        = TO WRITE-.1A OR PRINT-2.3A
                                   WITH AN INITIAL OR IN
                                   CAPITALS
000112 01 PENCIL-2.0A     = TO PAINT-1.2B , DRAW-1.21A , OR
                          WRITE-.1A  WITH A PENCIL
000113 01 JOT-2.0A        = TO WRITE-.1A BRIEFLY AND HURRIEDLY
000114 01 ENGROSS-.1A     = TO COPY-2.1A OR WRITE-.1A  IN A LARGE
                          HAND ; ALSO
000115 01 CAPITALIZE-.1A        = TO WRITE-.1A OR PRINT-2.3A
                                   WITH AN INITIAL OR IN
                                   CAPITALS

000116 -1 ----
000117 00 WRINKLE-2.0A   = TO DEVELOP-.5A OR CAUSE-2.0A  TO
                          DEVELOP WRINKLES
000118 01 FROWN-.1A      = TO WRINKLE-2.0A THE FOREHEAD ( AS IN
                          ANGER , DISPLEASURE , OR THOUGHT )

000119 -1 ----
000120 00 WRENCH-1.4A    = TO CHANGE-1.1A ( AS THE MEANING OF A
                          WORD ) VIOLENTLY
000121 01 WREST-1.3A     = TO WRENCH-1.4A ( A WORD OR PASSAGE )
                          FROM ITS PROPER MEANING OR USE

000122 -1 ----
000123 00 WRAP-1.7A      = TO CONCEAL-.0A AS IF BY ENVELOPING OR
                          ENFOLDING
000124 01 MUFFLE-.1A      = TO WRAP-1.7A UP SO AS TO
                          CONCEAL-.0A/+  OR PROTECT

000125 -1 ----
000126 00 WRAP-1.5A
000127 01 SWADDLE-.2A    = TO WRAP-1.5A UP
000128 01 MUFFLE-.2A      = TO WRAP-1.5A OR PAD-2.1A  WITH
                          SOMETHING TO DULL THE SOUND OF
000129 02 MUTE-3.0A       = TO MUFFLE-.2A OR REDUCE-.1A  THE
                          SOUND OF

000130 -1 ----
000131 00 WRAP-1.4A      = TO COIL-1.0A , FOLD-3.4A , DRAW-1.2A
                          , OR TWINE-2.3A  ABOUT SOMETHING
000132 01 WHIP-1.4B      = TO WIND-4.5A OR WRAP-1.4A  AROUND
                          SOMETHING
000133 01 WHIP-1.4A      = TO BIND-.6A OR WRAP-1.4A ( AS A ROPE
                          OR ROD ) WITH CORD IN ORDER TO
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                                PROTECT-.0A/+  AND STRENGTHEN ; ALSO
000134 01 FURL-.1A          = TO WRAP-1.4A OR ROLL-2.6A  ( AS A
                                SAIL OR A FLAG ) CLOSE TO OR AROUND
                                SOMETHING
000135 -1 ----
000136 00 WRAP-1.1A         = TO COVER-1.1A ESP. BY WINDING OR
                                FOLDING
000137 01 SWATHE-.0A        = TO BIND-.4A OR WRAP-1.1A  WITH OR AS
                                IF WITH A BANDAGE
000138 -1 ----
000139 00 WOUND-2.0A        = TO INFLICT-.0A A WOUND TO OR IN
000140 01 WING-2.5B         = TO WOUND-2.0A WITHOUT KILLING
000141 01 WING-2.5A         = TO WOUND-2.0A IN THE WING ; ALSO
000142 01 STAB-1.0A         = TO PIERCE-.1A OR WOUND-2.0A  WITH OR
                                AS IF WITH A POINTED WEAPON ; ALSO
000143 02 KNIFE-2.0A        = TO STAB-1.0A , SLASH-1.1A , OR
                                WOUND-2.0A  WITH A KNIFE
000144 02 BAYONET-2.0A      = TO USE-2.2A OR STAB-1.0A  WITH A
                                BAYONET
000145 01 SHOOT-1.2A        = TO HIT-1.2A , KILL-1.1A , OR
                                WOUND-2.0A  WITH A MISSILE
000146 01 MAIM-.0A          = TO MUTILATE-.1A , DISFIGURE-.0A , OR
                                WOUND-2.0A  SERIOUSLY
000147 01 KNIFE-2.0A        = TO STAB-1.0A , SLASH-1.1A , OR
                                WOUND-2.0A  WITH A KNIFE
000148 01 GORE-3.0A         = TO PIERCE-.1A OR WOUND-2.0A  WITH A
                                HORN OR TUSK
000149 -1 ----
000150 00 WORST-4.0A
000151 01 WHIPSAW-2.2A      = TO WORST-4.0A IN TWO OPPOSITE WAYS AT
                                ONCE , BY A TWO-PHASE OPERATION , OR
                                BY THE COLLUSIVE ACTION OF TW
                                O OPPONENTS
000152 -1 ----
000153 00 WORRY-1.2A
000154 01 HARASS-.1A        = TO WORRY-1.2A AND IMPEDE-.0A/&  BY
                                REPEATED RAIDS
000155 01 DOG-2.2A          = TO WORRY-1.2A AS IF BY DOGS
000156 -1 ----
000157 00 WORK-3.6A\-OUT          = TO SOLVE-.0A BY REASONING OR
                                    CALCULATION
000158 01 LABOR-2.5A        = TO TREAT-1.2A OR WORK-3.6A\-OUT  OUT
                                LABORIOUSLY
000159 -1 ----
000160 00 WORK-3.5A         = TO SET-1.4A OR KEEP-1.11A  IN
                                OPERATION
000161 01 PEDAL-3.1A        = TO USE-2.2A OR WORK-3.5A  A PEDAL (
                                AS OF A PIANO OR BICYCLE )
000162 -1 ----
000163 00 WORK-3.4A         = TO BRING-.3A INTO A DESIRED FORM BY A
                                GRADUAL PROCESS OF CUTTING ,
                                HAMMERING , SCRAPING , PRESSING , OR
                                STRETCHING
000164 01 INGRAIN-1.0A      = TO WORK-3.4A INDELIBLY INTO THE
                                NATURAL TEXTURE OR MENTAL OR MORAL
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CONSTITUTION

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000165 -1 ----
000166 00 WORK-3.3A/&     = TO PREPARE-.1A FOR USE ESP. BY
                            STIRRING OR KNEADING
000167 01 KNEAD-.0A       = TO WORK-3.3A/& AND PRESS-2.4A/&  INTO
                            A MASS WITH THE HANDS ; ALSO

000168 -1 ----
000169 00 WORK-3.3A       = TO PREPARE-.1A FOR USE ESP. BY
                            STIRRING OR KNEADING
000170 01 PLOW-2.1A       = TO OPEN-2.4A , BREAK-1.1B UP , OR
                            WORK-3.3A  WITH A PLOW

000171 -1 ----
000172 00 WORK-3.2A       = TO FASHION-2.1A OR INFLUENCE-2.1A/+
                            BY PERSUADE-.0A/+\*ON LABOR OR
                            EXERTION UPON
000173 01 TAT-.0A         = TO WORK-3.2A AT OR MAKE-1.2A  BY
                            TATTING
000174 01 DABBLE-.3A      = TO WORK-3.2A OR CONCERN-1.3A  ONESELF
                            LIGHTLY OR WITHOUT SERIOUS EFFORT
000175 01 COLLABORATE-.1A        = TO WORK-3.2A JOINTLY WITH
                                    OTHERS ( AS IN WRITING A BOOK
                                    )
000176 01 CHISEL-2.1A     = TO WORK-3.2A WITH OR AS IF WITH A
                            CHISEL
000177 01 CARVE-.4A       = TO WORK-3.2A AS A SCULPTOR OR
                            ENGRAVER

000178 -1 ----
000179 00 WORK-3.19A\-IN          = TO MOVE-1.3A SLIGHTLY IN
                                    RELATION TO ANOTHER PART ;
                                    ALSO
000180 01 WEAVE-1.6A      = TO WORK-3.19A\-IN IN
000181 -1 ----
000182 00 WORK-3.14A      = TO FUNCTION-2.2A ACCORDING TO PLAN OR
                            DESIGN
000183 01 FACTOR-2.2A     = TO WORK-3.14A AS A FACTOR
000184 01 CLICK-2.2A      = TO FIT-3.2A OR WORK-3.14A  TOGETHER
                            SMOOTHLY

000185 -1 ----
000186 00 WORK-3.13A\-THROUGH     = TO EXERT-.0A ONESELF
                                    PHYSICALLY OR MENTALLY ; ESP
000187 01 SERVE-1.4A      = TO WORK-3.13A\-THROUGH THROUGH OR
                            PERFORM-.1A  A TERM OF SERVICE ( AS
                            IN THE ARMY )
000188 02 SOLDIER-2.1A    = TO SERVE-1.4A AS A SOLDIER
000189 02 REPRESENT-.8A   = TO SERVE-1.4A AS AN ELECTED
                            REPRESENTATIVE OF

000190 -1 ----
000191 00 WORK-3.13A/+    = TO EXERT-.0A ONESELF PHYSICALLY OR
                            MENTALLY ; ESP
000192 01 SOLDIER-2.2A    = TO PRETEND-.2A TO WORK-3.13A/+  WHILE
                            ACTUALLY DOING NOTHING

000193 -1 ----
000194 00 WORK-3.13A/!    = TO EXERT-.0A ONESELF PHYSICALLY OR
                            MENTALLY ; ESP
000195 01 ATTACK-1.2A     = TO SET-1.4A TO WORK-3.13A/!  ON
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000196 -1 ----
000197 00 WORK-3.13A     = TO EXERT-.0A ONESELF PHYSICALLY OR
                           MENTALLY ; ESP
000198 01 TOIL-2.1A      = TO WORK-3.13A HARD AND LONG
000199 01 TILL-2.0A      = TO WORK-3.13A BY PLOWING , SOWING ,
                           AND RAISING CROPS FROM
000200 01 SWEAT-1.3A     = TO WORK-3.13A SO THAT ONE SWEATS
000201 01 SLAVE-2.0A     = TO WORK-3.13A LIKE A SLAVE
000202 01 SERVE-1.1A     = TO WORK-3.13A AS A SERVANT
000203 02 VALET-2.0A     = TO SERVE-1.1A AS A VALET
000204 01 SCRABBLE-.3A   = TO WORK-3.13A HARD AND LONG
000205 01 SCAVENGE-.0A   = TO WORK-3.13A OR FUNCTION-2.2A  AS A
                           SCAVENGER
000206 01 SCAB-2.2A      = TO WORK-3.13A AS A SCAB
000207 01 RANCH-2.0A     = TO LIVE-1.4A OR WORK-3.13A  ON A
                           RANCH
000208 01 RAILROAD-2.2A  = TO WORK-3.13A ON A RAILROAD
000209 01 PRACTICE-1.1A  = TO PERFORM-.2A OR WORK-3.13A  AT
                           REPEATEDLY SO AS TO BECOME PROFICIENT
000210 01 PLY-3.1A       = TO USE-2.2A , PRACTICE-1.3A , OR
                           WORK-3.13A  DILIGENTLY
000211 01 PLOD-.2A       = TO WORK-3.13A LABORIOUSLY AND
                           MONOTONOUSLY
000212 01 PIDDLE-.0A     = TO ACT OR WORK-3.13A IDLY
000213 01 PEG-2.2A       = TO WORK-3.13A HARD AND STEADILY
000214 01 MOIL-.0A       = TO WORK-3.13A HARD
000215 01 MODEL-2.2A     = TO WORK-3.13A AS A FASHION MODEL
000216 01 HUSTLE-1.3A    = TO WORK-3.13A ENERGETICALLY
000217 01 GARDEN-2.0A    = TO DEVELOP-.3A OR WORK-3.13A  IN A
                           GARDEN
000218 01 ELECTIONEER-.0A       = TO WORK-3.13A FOR THE
                                  ELECTION OF A CANDIDATE OR
                                  PARTY
000219 01 DO-.5A          = TO WORK-3.13A AT
000220 02 SERVICE-2.0A    = TO DO-.5A MAINTENANCE OR REPAIR WORK
                           ON OR FOR
000221 02 JOB-2.1A        = TO DO-.5A OCCASIONAL PIECES OF WORK
                           FOR HIRE
000222 02 EMBROIDER-.1A   = TO ORNAMENT-2.0A WITH OR DO-.5A
                           NEEDLEWORK
000223 03 HEMSTITCH-.0A   = TO EMBROIDER-.1A ( FABRIC ) BY
                           DRAWING OUT PARALLEL THREADS AND
                           STITCHING THE EXPOSED THREADS IN
                           GROUPS
                           TO FORM-2.2A/+  VARIOUS DESIGNS
000224 02 DRUDGE-.0A      = TO DO-.5A HARD , MENIAL , OR
                           MONOTONOUS WORK
000225 02 CHAUFFEUR-2.1A        = TO DO-.5A THE WORK OF A
                                  CHAUFFEUR
000226 01 DIG-1.6A        = TO WORK-3.13A HARD
000227 01 COORDINATE-3.2A       = TO WORK-3.13A OR ACT TOGETHER
                                  HARMONIOUSLY
000228 01 COMBAT-.2A      = TO STRUGGLE-1.1A OR WORK-3.13A
                           AGAINST
000229 01 CHAR-3.0A       = TO WORK-3.13A AS A CHARWOMAN
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000230 01 CATCH-UP-.0A   = TO TRAVEL-1.1A OR WORK-3.13A FAST
                           ENOUGH TO OVERTAKE-.0A/! OR
                           COMPLETE-2.2A/!
000231 01 BUSTLE-1.0A    = TO MOVE-1.1A OR WORK-3.13A  IN A
                           BRISK FUSSY WAY

000232 -1 ----
000233 00 WORK-3.10A
000234 01 ELABORATE-2.1A        = TO WORK-3.10A OUT IN DETAIL
000235 02 EMBROIDER-.2A = TO ELABORATE-2.1A WITH FLORID DETAIL
000236 -1 ----
000237 00 WITHSTAND-.1A
000238 01 RESIST-.1A     = TO WITHSTAND-.1A THE FORCE OR EFFECT
                           OF
000239 02 TOLERATE-.2A   = TO ENDURE-.3A OR RESIST-.1A  THE
                           ACTION OF ( AS A DRUG )

000240 -1 ----
000241 00 WITHHOLD-.2A   = TO REFRAIN-1.0B\-FROM FROM GRANTING ,
                           GIVING , OR ALLOWING
000242 01 DISSENT-1.1A   = TO WITHHOLD-.2A ASSENT
000243 01 DISBELIEVE-.2A        = TO WITHHOLD-.2A OR
                                   REJECT-1.3A  BELIEF
000244 01 DECLINE-1.5A   = TO WITHHOLD-.2A CONSENT ; ALSO
000245 -1 ----
000246 00 WITHHOLD-.1A   = TO HOLD-1.5B BACK
000247 01 SUSPEND-.3A    = TO WITHHOLD-.1A ( JUDGMENT ) FOR A
                           TIME

000248 -1 ----
000249 00 WITHER-.1A
000250 01 SHRIVEL-.0B    = WITHER-.1A UP
000251 -1 ----
000252 00 WITHDRAW-1.4A
000253 01 SECEDE-.0A     = TO WITHDRAW-1.4A FROM AN ORGANIZED
                           BODY AND ESP. FROM A POLITICAL BODY
000254 01 RETIRE-.3A     = TO WITHDRAW-1.4A FROM ONE'S
                           OCCUPATION OR POSITION

000255 -1 ----
000256 00 WITHDRAW-1.3A
000257 01 RETIRE-.2A     = TO WITHDRAW-1.3A ESP. FOR PRIVACY
000258 01 RELINQUISH-.1A       = TO WITHDRAW-1.3A OR
                                   RETREAT-2.0B  FROM
000259 01 EVACUATE-.3A   = TO REMOVE-1.2A OR WITHDRAW-1.3A  FROM
000260 01 DESERT-4.1A    = TO WITHDRAW-1.3A FROM
000261 -1 ----
000262 00 WITHDRAW-1.2A
000263 01 COUNTERMAND-.0A       = TO WITHDRAW-1.2A ( AN ORDER
                                   ALREADY GIVEN ) BY A CONTRARY
                                   ORDER

000264 -1 ----
000265 00 WITHDRAW-1.1A
000266 01 RETRACT-.2A    = TO WITHDRAW-1.1A ( AS A CHARGE OR
                           PROMISE )
000267 01 RETIRE-.5A     = TO WITHDRAW-1.1A FROM CIRCULATION OR
                           FROM THE MARKET OR FROM USUAL USE OR
                           SERVICE
000268 01 EXTRACT-1.2A   = TO WITHDRAW-1.1A ( AS A JUICE OR A
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                                CONSTITUENT ) BY A PHYSICAL OR
                                CHEMICAL PROCESS
000269 02 TRY-1.5A          = TO EXTRACT-1.2A OR CLARIFY-.0A  ( AS
                                LARD ) BY MELTING
000270 02 STEEP-3.1B         = TO EXTRACT-1.2A THE ESSENCE OF BY
                                SOAKING
000271 02 RENDER-.1A         = TO EXTRACT-1.2A ( AS LARD ) BY
                                HEATING
000272 02 DISTILL-.2A        = TO OBTAIN-.1A OR EXTRACT-1.2A  BY
                                DISTILLATION
000273 -1 ----
000274 00 WISH-1.2A          = TO FORM-2.4A OR EXPRESS-3.1A  A WISH
                                CONCERNING
000275 01 ROOT-4.2A          = TO WISH-1.2A SUCCESS OR LEND-.2A\*FOR
                                 SUPPORT TO
000276 -1 ----
000277 00 WISH-1.1A          = TO HAVE-1.8A A DESIRE
000278 01 DESIRE-1.1A        = TO LONG-4.0A , HOPE-1.0A , OR
                                WISH-1.1A  FOR
000279 02 WANT-1.5A          = TO DESIRE-1.1A EARNESTLY
000280 02 HOPE-1.0A          = TO DESIRE-1.1A WITH EXPECTATION OF
                                FULFILLMENT
000281 03 DESIRE-1.1A        = TO LONG-4.0A , HOPE-1.0A , OR
                                WISH-1.1A  FOR
000282 02 HANKER-.0A         = TO DESIRE-1.1A STRONGLY OR
                                PERSISTENTLY
000283 -1 ----
000284 00 WIPE-1.4A          = TO PASS-1.3B OR DRAW-1.1A  OVER A
                                SURFACE
000285 01 SWIPE-2.1A         = TO STRIKE-1.2A OR WIPE-1.4A  WITH A
                                SWEEPING MOTION
000286 -1 ----
000287 00 WIPE-1.3A\-OUT            = TO ERASE-.0A COMPLETELY
000288 01 ANNIHILATE-.0B           = WIPE-1.3A\-OUT OUT
000289 -1 ----
000290 00 WIPE-1.1A          = TO CLEAN-2.0A OR DRY-2.0A  BY RUBBING
000291 01 WHISK-2.4A         = TO BRUSH-3.2A OR WIPE-1.1A  OFF
                                LIGHTLY
000292 01 SPONGE-2.2A        = TO BATHE-.1A OR WIPE-1.1A  WITH A
                                SPONGE
000293 -1 ----
000294 00 WIND-4.5A          = TO ENCIRCLE-.0A OR COVER-1.1A  WITH
                                SOMETHING PLIABLE
000295 01 WHIP-1.4B          = TO WIND-4.5A OR WRAP-1.4A  AROUND
                                SOMETHING
000296 01 REEL-2.1A          = TO WIND-4.5A ON OR AS IF ON A REEL
000297 01 CRINKLE-.0A        = TO TURN-1.10A OR WIND-4.5A  IN MANY
                                SHORT BENDS OR CURVES ; ALSO
000298 01 COIL-1.0A          = TO WIND-4.5A IN A SPIRAL SHAPE
000299 02 WREATHE-.3A        = TO FOLD-3.4A OR COIL-1.0A  AROUND
000300 02 WRAP-1.4A          = TO COIL-1.0A , FOLD-3.4A , DRAW-1.2A
                                , OR TWINE-2.3A  ABOUT SOMETHING
000301 03 WHIP-1.4B          = TO WIND-4.5A OR WRAP-1.4A  AROUND
                                SOMETHING
000302 03 WHIP-1.4A          = TO BIND-.6A OR WRAP-1.4A ( AS A ROPE
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OR ROD) WITH CORD IN ORDER TO PROTECT-.0A/+ AND STRENGTHEN ; ALSO

000303 03 FURL-.1A = TO WRAP-1.4A OR ROLL-2.6A (AS A SAIL OR A FLAG) CLOSE TO OR AROUND SOMETHING

000304 02 TWINE-2.3A = TO COIL-1.0A ABOUT A SUPPORT

000305 03 WRAP-1.4A = TO COIL-1.0A , FOLD-3.4A , DRAW-1.2A , OR TWINE-2.3A ABOUT SOMETHING

000306 04 WHIP-1.4B = TO WIND-4.5A OR WRAP-1.4A AROUND SOMETHING

000307 04 WHIP-1.4A = TO BIND-.6A OR WRAP-1.4A (AS A ROPE OR ROD) WITH CORD IN ORDER TO PROTECT-.0A/+ AND STRENGTHEN ; ALSO

000308 04 FURL-.1A = TO WRAP-1.4A OR ROLL-2.6A (AS A SAIL OR A FLAG) CLOSE TO OR AROUND SOMETHING

000309 01 BELAY-.1A = TO WIND-4.5A (A ROPE) AROUND A PIN OR CLEAT IN ORDER TO HOLD-1.4A/+ SECURE

000310 -1 ----

000311 00 WIN-1.5A = TO SOLICIT-.2A AND GAIN-2.5A/& THE FAVOR OF ; ESP

000312 01 INVEIGLE-.1A = TO WIN-1.5A OVER BY FLATTERY

000313 01 DISARM-.3B = WIN-1.5A OVER

000314 01 CONCILIATE-.1A = TO WIN-1.5A OVER FROM A STATE OF HOSTILITY

000315 -1 ----

000316 00 WIN-1.3A = TO GAIN-2.2A IN OR AS IF IN BATTLE OR CONTEST ; ALSO

000317 01 GATHER-1.4A = TO GAIN-2.9A OR WIN-1.3A BY GRADUAL INCREASE

000318 01 FORCE-2.4A = TO ACHIEVE-.0A OR WIN-1.3A BY STRENGTH IN STRUGGLE OR VIOLENCE

000319 02 ERUPT-.1A = TO FORCE-2.4A OUT OR RELEASE-1.1A USU. SUDDENLY AND VIOLENTLY

000320 02 DRUM-2.5A = TO DRIVE-1.1A OR FORCE-2.4A BY STEADY EFFORT

000321 02 DRAGOON-2.0A = TO FORCE-2.4A OR ATTEMPT-.0A TO FORCE INTO SUBMISSION BY VIOLENT MEASURES

000322 02 BREAK-1.1B = COME-.3A OR FORCE-2.4A APART

000323 03 TWIST-1.6A = TO PULL-1.4B/*OFF OFF OR BREAK-1.1B BY TORSION

000324 04 WARP-2.1A = TO TURN-1.10A OR TWIST-1.6A OUT OF SHAPE ; ALSO

000325 04 DISTORT-.2A = TO TWIST-1.6A OUT OF A NATURAL , NORMAL , OR ORIGINAL SHAPE OR CONDITION

000326 05 GARBLE-.0A = TO DISTORT-.2A THE MEANING OR SOUND OF

000327 04 DISTORT-.1A = TO TWIST-1.6A OUT OF THE TRUE MEANING

000328 04 CONTORT-.0A = TO TWIST-1.6A OUT OF SHAPE

000329 03 TEAR-2.4A = TO BREAK-1.1B OFF

000330 03 SHEAR-1.2A = TO CUT-1.1A OR BREAK-1.1B SHARPLY

000331 03 PLOW-2.1A = TO OPEN-2.4A , BREAK-1.1B UP , OR

APPENDIX D: SAMPLE OF NEW SEMANTIC DICTIONARY OF NOUNS

A-1.0A = THE 1ST LETTER-1.1A OF THE ENGLISH ALPHABET

AARDVARK-.0A = A LARGE BURROWING ANT-EATING AFRICAN MAMMAL-.0A

ABACUS-.0A = AN INSTRUMENT-.2A FOR PERFORMING CALCULATIONS BY SLIDING COUNTERS ALONG RODS OR GROOVES

ABALONE-.0A = A LARGE EDIBLE SEA MOLLUSK-.0A WITH AN EAR-SHAPED SHELL

ABANDON-2.1A = A THOROUGH YIELDING-\IV1.6A% TO NATURAL IMPULSES

ABATEMENT-.2A = AN AMOUNT-2.1A ABATED ; ESP

ABATEMENT-.2B = A DEDUCTION-.1A FROM THE FULL AMOUNT OF A TAX

ABATIS-.0A = A DEFENSIVE BARRIER-.0A OF FELLED TREES WITH SHARPENED BRANCHES TURNED OUTWARD

ABBACY-.0A = THE OFFICE-.1B OR TERM-1.2A OF OFFICE OF AN ABBOT OR ABBESS

ABBE-.0A = A MEMBER-.2A OF THE FRENCH SECULAR CLERGY-.0A/+ USED AS A TITLE

ABBESS-.0A = THE SUPERIOR-2.1B OF AN ABBEY FOR WOMEN

ABBEY-.2A = AN ABBEY-.2A CHURCH-.1A

ABBOT-.0A = THE SUPERIOR-2.1B OF AN ABBEY FOR MEN

ABBREVIATION-.1A = THE ACT-1.1A OR RESULT-2.1A OF ABBREVIATING

ABBREVIATION-.2A = A SHORTENED FORM-1.20A OF A WORD OR PHRASE USED FOR BREVITY ESP. IN WRITING

ABDOMEN-.0A = THE CAVITY-.0A IN OR AREA OF THE BODY BETWEEN THE CHEST AND THE PELVIS

ABECEDARIAN-.0A = ONE-2.2A LEARNING THE RUDIMENTS OF SOMETHING (AS THE ALPHABET)

ABERRATION-.1A = DEVIATION-\RV.0A% FROM NORMAL OR USUAL

ABERRATION-.2A = FAILURE-.2A OF A MIRROR OR LENS TO PRODUCE EXACT POINT-TO-POINT CORRESPONDENCE BETWEEN AN OBJECT AND ITS IMAGE

ABEYANCE-.0A = A CONDITION-1.3A OF SUSPENDED ACTIVITY

ABILITY-.0A = THE QUALITY-.1A OF BEING ABLE

ABODE-.2A = THE PLACE-1.3A WHERE ONE ABIDES

ABOLITIONIST-.0A = ONE-2.2A IN FAVOR OF THE ABOLITION OF SLAVERY

ABOMINATION-.1A = SOMETHING-.0A% ABOMINABLE

ABORIGINE-.0A = A MEMBER-.2A OF THE ORIGINAL RACE-3.1A/+ OF INHABITANTS OF A REGION

ABORTION-.0A = A PREMATURE BIRTH-.1A OCCURRING BEFORE THE FETUS CAN SURVIVE ; ALSO

ABORTION-.0B = AN INDUCED EXPULSION-.0A OF A FETUS

ABORTIONIST-.0A = A PRODUCER-\RV1.4B% OF ILLEGAL

ABORTIONS
ABOUT-FACE-.0A = A REVERSAL-.0A OF DIRECTION OR ATTITUDE
ABRACADABRA-.1A = A MAGICAL CHARM INCANTATION-.0B AGAINST CALAMITY
ABRASIVE-.0A = A SUBSTANCE-.2A (AS EMERY-.0A/+ , PUMICE-.0A/+ , OR FINE SAND) FOR GRINDING , SMOOTHING , OR POLISHING
ABSCESS-.0A = A COLLECTION OF PUS-.0A/+ SURROUNDED BY INFLAMED TISSUE
ABSENCE-.1A = FAILURE-.1A TO BE PRESENT
ABSENCE-.3A = LACK-2.0A OF ATTENTION
ABSENTEE-.0A = ONE-2.2A THAT IS ABSENT OR ABSENTS HIMSELF
ABSENTEEISM-.0A = CHRONIC ABSENCE-.1A FROM WORK
ABSINTHE-.0A = A LIQUEUR-.0A FLAVORED ESP. WITH WORMWOOD AND ANISE
ABSOLUTION-.0A = THE ACT-1.1A OF ABSOLVING ; ESP
ABSOLUTION-.0B = A REMISSION-.0A OF SINS PRONOUNCED BY A PRIEST IN THE SACRAMENT OF PENANCE
ABSOLUTISM-.1A = THE THEORY-.2A THAT A SOVEREIGN SHOULD HAVE UNLIMITED POWER
ABSOLUTISM-.2A = GOVERNMENT-.4A BY AN ABSOLUTE RULER
ABSORPTION-.1A = A PROCESS-1.3A OF ABSORBING OR BEING ABSORBED
ABSORPTION-.2A = CONCENTRATION-.1C OF ATTENTION
ABSTINENCE-.0A = VOLUNTARY REFRAINING-\IV.0B% ESP. FROM EATING CERTAIN FOODS OR DRINKING LIQUOR
ABSTRACT-2.2A = AN ABSTRACT THING-.5A , STATE-1.1A , OR WORD-1.2A
ABSTRACTION-.1A = THE ACT-1.1A OF ABSTRACTING
ABSTRACTION-.1B = THE STATE-1.1A OF BEING ABSTRACTED
ABSTRACTION-.2A = AN ABSTRACT IDEA-.2A
ABSTRACTION-.3A = AN ABSTRACT WORK-1.5B OF ART
ABUSE-2.3A = A CORRUPT PRACTICE-2.2A
ABUSE-2.4A = COARSE AND INSULTING SPEECH-.3A
ABUTMENT-.0A = A STRUCTURE-.2A THAT SUPPORTS WEIGHT OR WITHSTANDS LATERAL PRESSURE (AS AT EITHER END OF A BRIDGE OR ARCH)
ABUTTALS-.0A = THE BOUNDARIES-.0A OF LANDS WITH RESPECT TO OTHER CONTIGUOUS LANDS OR HIGHWAYS BY WHICH THEY ARE BOUNDED
ABYSS-.1A = THE BOTTOMLESS PIT-1.1A OF OLD ACCOUNTS OF THE UNIVERSE
ABYSS-.2A = AN IMMEASURABLE DEPTH-.3A
ACACIA-.0A = ANY OF NUMEROUS LEGUMINOUS TREES-1.1A/! OR SHRUBS-.0A/! WITH ROUND WHITE OR YELLOW FLOWER CLUSTERS

ACADEME-.0A = SCHOOL ; ALSO
ACADEME-.0B = ACADEMIC ENVIRONMENT-.0A
ACADEMICIAN-.0A = A MEMBER-.2A OF A SOCIETY OF SCHOLARS OR ARTISTS
ACADEMICISM-.0A = MANNER-.2A , STYLE-1.5A , OR CONTENT-4.2A CONFORMING TO THE TRADITIONS OR RULES OF A SCHOOL OR AN OFFICIAL ACADEMY
ACADEMY-.1A = A SCHOOL-1.1A ABOVE THE ELEMENTARY LEVEL ; ESP
ACADEMY-.1B = A PRIVATE SECNDARY SCHOOL-1.1A
ACADEMY-.2A = A SOCIETY-.4A OF SCHOLARS , ARTISTS , OR LEARNED MEN
ACANTHUS-.0A = AN ORNAMENTATION-\RV2.0A% (AS ON A COLUMN) REPRESENTING THE LEAVES OF A PRICKLY HERB OF THE MEDITERRANEAN REGION
ACCENT-1.1A = A DISTINCTIVE MANNER-.2A OF PRONUNCIATION A FOREIGN *
ACCENT-1.2A = PROMINENCE-\RA.2A% GIVEN TO ONE SYLLABLE OF A WORD ESP. BY STRESS
ACCENT-1.3A = A MARK-1.7A (AS $164$1 , $155$1 , $114$1) OVER A VOWEL IN WRITING OR PRINTING USED USU.TO INDICATE A DIFFERENCE IN PRONUNCIATION (AS STRESS) FROM A VOWEL NOT SO MARKED
ACCEPTANCE-.1A = THE ACT-1.1A OF ACCEPTING
ACCEPTANCE-.2A = THE STATE-1.1A OF BEING ACCEPTED OR ACCEPTABLE
ACCEPTANCE-.3A = AN ACCEPTED BILL-3.1A OF EXCHANGE
ACCEPTATION-.0A = THE MEANING-.1B IN WHICH A WORD IS GENERALLY UNDERSTOOD
ACCESS-.3A = A WAY-.1A OF APPROACH
ACCESSION-.1A = SOMETHING-.0A% ADDED
ACCESSION-.2A = INCREASE-2.2A BY SOMETHING ADDED
ACCESSION-.3A = THE ACT-1.1A OF ACCEDING (AS TO A THRONE)
ACCESSORY-.1A = SOMETHING-.0A% HELPFUL BUT NOT ESSENTIAL
ACCESSORY-.2A = A PERSON-.1A WHO THOUGH NOT PRESENT ABETS OR ASSISTS IN THE COMMISSION OF AN OFFENSE
ACCIDENCE-.0A = THE PART-1.1A OF GRAMMAR THAT DEALS WITH INFLECTIONS
ACCIDENT-.1A = SOMETHING-.0A% OCCURRING BY CHANCE OR WITHOUT INTENTION
ACCIDENT-.3A = A NONESSENTIAL PROPERTY-.1A
ACCIDENTAL-2.0A = A NOTE-2.4A (AS A SHARP OR FLAT-2.3A/+) NOT BELONGING TO THE KEY INDICATED BY THE SIGNATURE OFA MUSICAL COMPOSITION
ACCLAMATION-.0A = AN OVERWHELMING AFFIRMATIVE VOTE-1.2B BY SHOUTING OR

APPLAUSE RATHER THAN BY BALLOT
ACCLIVITY-.0A = A STEEP UPWARD SLOPE-2.2A
ACCOLADE-.0A = A RECOGNITION-.1C OF MERIT
ACCOMMODATION-.1A = SOMETHING-.0A% SUPPLIED TO SATISFY A NEED
ACCOMMODATION-.2A = THE ACT-1.1A OF ACCOMMODATING
ACCOMPANIMENT-.0A = SOMETHING-.0A% THAT ACCOMPANIES SOMETHING ELSE ; ESP
ACCOMPANIMENT-.0B = SUBORDINATE MUSIC-.1B TO SUPPORT A PRINCIPAL VOICE OR INSTRUMENT
ACCOMPLICE-.0A = AN ASSOCIATE-2.1B IN CRIME
ACCOMPLISHMENT-.2A = SOMETHING-.0A% COMPLETED OR EFFECTED
ACCOMPLISHMENT-.3A = AN ACQUIRED EXCELLENCE-.2A OR SKILL-.2A
ACCORDANCE-.2A = THE ACT-1.1A OF GRANTING
ACCORDION-1.0A = A PORTABLE MUSICAL INSTRUMENT-.3A WITH A BELLOWS , KEYS , AND REEDS
ACCOUNT-1.2A = A STATEMENT-.2A OF BUSINESS TRANSACTIONS
ACCOUNT-1.3A = AN ARRANGEMENT-\RV.2A% WITH A VENDOR TO SUPPLY CREDIT
ACCOUNT-1.6A = A SUM-1.1A OF MONEY-.1A/+ DEPOSITED IN A BANK AND SUBJECT TO WITHDRAWAL BY THE DEPOSITOR
ACCOUNTANT-.0A = A PERSON-.1A SKILLED IN ACCOUNTING
ACCOUNTING-.1A = THE ART-.3A OR SYSTEM-.3A OF KEEPING FINANCIAL RECORDS
ACCOUNTING-.2A = AN EXPLANATION-\RV.2A% OF ONE'S BEHAVIOR
ACCRETION-.1A = GROWTH-.2A ESP. BY ADDITION FROM WITHOUT
ACCRETION-.2A = A PRODUCT-.1A OF ACCRETION
ACCULTURATION-.0A = A PROCESS-1.3A OF INTERCULTURAL BORROWING BETWEEN DIVERSE PEOPLES RESULTING IN NEW AND BLENDED PATTERNS
ACCURACY-.0A = FREEDOM-.2A FROM MISTAKE
ACE-1.1A = A PLAYING CARD-3.1A BEARING A SINGLE LARGE PIP IN ITS CENTER
ACE-1.2A = A POINT-1.10A (AS IN TENNIS) WON BY A SINGLE STROKE
ACE-1.4A = AN AVIATOR-\RN.1A% WHO HAS BROUGHT DOWN 5 OR MORE ENEMY PLANES
ACE-1.5A = ONE-2.2A THAT EXCELS
ACETANILIDE-.0A = A DRUG-1.1A% USED TO RELIEVE PAIN OR FEVER
ACETATE-.1A = A SALT-1.3A OR ESTER-.0A OF ACETIC ACID
ACETATE-.2A = A FAST-DRYING FABRIC-.2A MADE OF FIBER

DERIVED FROM CELLULOSE AND ACETIC ACID ; ALSO
ACETATE-.2B = A PLASTIC-2.0B OF SIMILAR COMPOSITION USED FOR WRAPPING FILM AND PHONOGRAPH RECORDS
ACETIC-ACID-.0A = A COLORLESS BITING LIQUID-2.0A THAT IS FAMILIAR AS THE CHIEF ACID-2.2A/+ OF VINEGAR AND IS USU. MANUFACTURED
ACETONE-.0A = A VOLATILE FLAMMABLE LIQUID-2.0A OF PLEASING ODOR USED AS A SOLVENT
ACETYLENE-.0A = A COLORLESS FLAMMABLE GAS-.2A USED FOR LIGHTING AND AS A FUEL IN WELDING AND SOLDERING
ACID-2.1A = A SOUR SUBSTANCE-.2A
ACID-2.2A = A USU. WATER-SOLUBLE CHEMICAL COMPOUND-3.1B THAT HAS A SOUR TASTE , REACTS WITH A BASE TOFORM A
ACIDOSIS-.0A = AN ABNORMAL STATE-1.1A OF REDUCED ALKALINITY OF THE BLOOD AND BODY TISSUES
ACK-ACK-.0A = AN ANTIAIRCRAFT GUN-1.1A ; ALSO
ACK-ACK-.0B = ITS FIRE-1.5A
ACME-.0A = THE HIGHEST POINT-1.5A
ACNE-.0A = A SKIN DISORDER-2.3B MARKED BY INFLAMMATION OF SKIN GLANDS AND HAIR FOLLICLES AND BY PIMPLE FORMATION ESP. ON THE FACE
ACOLYTE-.0A = A MAN-1.1B OR BOY-.1A WHO ASSISTS THE CLERGYMAN IN A LITURGICAL SERVICE
ACONITE-.1A = ANY OF SEVERAL BLUE-FLOWERED OR PURPLE-FLOWERED POISONOUS PLANTS-2.1A/! RELATED TO THE BUTTERCUPS
ACONITE-.2A = A DRUG-1.1A% OBTAINED FROM A COMMON OLD WORLD ACONITE
ACORN-.0A = THE NUT-.1A OF THE OAK
ACOUSTICS-.1A = THE SCIENCE-.1A% DEALING WITH SOUND-2.1A%
ACOUSTICS-.2A = THE QUALITIES-.4A IN A ROOM THAT MAKE IT EASY OR HARD FOR A PERSON IN IT TO HEAR DISTINCTLY
ACQUAINTANCE-.1A = PERSONAL KNOWLEDGE-.1A
ACQUAINTANCE-.2A = A PERSON-.1A WITH WHOM ONE IS ACQUAINTED
ACQUIREMENT-.1A = THE ACT-1.1A OF ACQUIRING
ACQUISITION-.2A = SOMETHING-.0A% ACQUIRED
ACRE-.2A = A UNIT-.2A OF AREA EQUAL TO 4840 SQUARE YARDS-1.1A/+
ACREAGE-.0A = AREA-.2A IN ACRES
ACRIMONY-.0A = HARSH OR BITING SHARPNESS OF LANGUAGE OR FEELING-1.5A/+
ACROBAT-.0A = A PERFORMER-\RV.5A% OF GYMNASTIC FEATS
ACROBATICS-.0A = THE PERFORMANCES-.3A OF AN ACROBAT

ACRONYM-.0A = A WORD-1.2B (AS RADAR) FORMED FROM THE INITIAL LETTER OR LETTERS OF EACH OF THE SUCCESSIVE PARTS OR MAJOR PARTS OF A COMPOUND TERM

ACROPHOBIA-.0A = ABNORMAL DREAD-2.0A OF BEING AT A GREAT HEIGHT

ACROPOLIS-.0A = THE UPPER FORTIFIED PART-1.1A OF AN ANCIENT GREEK CITY

ACROSTIC-.1A = A COMPOSITION-.5B USU. IN VERSE IN WHICH THE INITIAL OR FINAL LETTERS OF THE LINES TAKENIN ORD

ACROSTIC-.2A = A SERIES-.0A OF WORDS OF EQUAL LENGTH ARRANGED TO READ THE SAME HORIZONTALLY OR VERTICALLY

ACT-1.1A = A THING-.4A DONE

ACT-1.3A = A MAIN DIVISION-.2A OF A PLAY ; ALSO

ACT-1.3B = AN ITEM-.1A ON A VARIETY PROGRAM

ACT-1.4A = AN INSTANCE-1.2A OF INSINCERE BEHAVIOR-.0A/+

ACTINIUM-.0A = A RADIOACTIVE METALLIC CHEMICAL ELEMENT-.3A

ACTION-.1A = A LEGAL PROCEEDING-.4A

ACTION-.2A = THE MANNER-.3A OR METHOD OF PERFORMING

ACTION-.7A = THE EVENTS-.1A OF A LITERARY PLOT

ACTION-.8A = AN OPERATING MECHANISM-.1A * OF A GUN ; ALSO

ACTION-.8B = THE WAY-.5A% IT OPERATES < STIFF * >

ACTIVITY-.1A = THE QUALITY-.1A OR STATE-1.1A OF BEING ACTIVE

ACTIVITY-.2A = AN OCCUPATION-.1B IN WHICH ONE IS ENGAGED

ACTOR-.0A = ONE-2.2A THAT ACTS IN A PLAY OR MOTION PICTURE

ACTUARY-.0A = AN EXPERT-2.0B WHO CALCULATES INSURANCE RISKS AND PREMIUMS

ACUITY-.0A = KEENNESS-\RA1.5A% OF PERCEPTION-.3A% ESP. VISUALLY

ACUMEN-.0A = MENTAL KEENNESS-\RA1.4A% AND PENETRATION-\RV.3A%

ADAGE-.0A = AN OLD FAMILIAR SAYING-.0A

ADAGIO-2.1A = AN ADAGIO MOVEMENT-.5A

ADAGIO-2.2A = A BALLET DUET-.0A OR TRIO-.2A DISPLAYING FEATS OF LIFTING AND BALANCING

ADAM'S-APPLE-.0A = THE PROJECTION-\RV2.3A% IN FRONT OF THE NECK FORMED BY THE LARGEST CARTILAGE OF THE LARYNX-.0A%

ADAMANT-1.0A = A STONE-1.3A BELIEVED TO BE OF IMPENETRABLE HARDNESS

ADDENDUM-.0A = SOMETHING-.0A% TO BE ADDED

ADDER-1.1A = A POISONOUS EUROPEAN VIPER-.2A OR A RELATED SNAKE

ADDER-1.2A = ANY OF VARIOUS HARMLESS NO. AMERICAN SNAKES-.1A/! (AS THE)

ADDER-2.0A = ONE-2.2A THAT ADDS
ADDICT-2.0A = ONE-2.2A WHO IS ADDICTED (AS TO A DRUG)
ADDICTION-.0A = THE QUALITY-.1A OR STATE-1.1A OF BEING ADDICTED ; ESP
ADDICTION-.0B = COMPULSIVE USE-1.1A OF HABIT-FORMING DRUGS
ADDITION-.1A = THE ACT-1.1A OR PROCESS-.14A OF ADDING ; ALSO
ADDITION-.1B = SOMETHING-.0A% ADDED
ADDITION-.2A = THE ADDING-\IV.2A% OF NUMBERS TO OBTAIN THEIR SUM
ADDRESS-2.1A = SKILLFUL MANAGEMENT-.2A
ADDRESS-2.2A = A FORMAL SPEECH-.4A
ADDRESS-2.3A = THE PLACE-1.1A WHERE A PERSON OR ORGANIZATION MAY BE COMMUNICATED WITH
ADDRESS-2.4A = THE DIRECTIONS-.3A FOR DELIVERY PLACED ON MAIL
ADDRESSEE-.0A = ONE-2.2A TO WHOM SOMETHING IS ADDRESSED
ADENOID-.0A = AN ENLARGED MASS-1.1A OF TISSUE-.4A/+ NEAR THE OPENING OF THE NOSE INTO THE THROAT USU. USED INPL.
ADHESION-.1A = THE ACT-1.1A OR STATE-1.1A OF ADHERING
ADHESION-.2A = BODILY TISSUES-.4A ABNORMALLY GROWN TOGETHER AFTER INFLAMMATION
ADHESIVE-2.0A = AN ADHESIVE SUBSTANCE-.2A
ADJECTIVE-.0A = A WORD-1.2A THAT TYPICALLY SERVES AS A MODIFIER OF A NOUN
ADJUNCT-.0A = SOMETHING-.0A% JOINED OR ADDED TO ANOTHER THING BUT NOT ESSENTIALLY A PART OF IT
ADJUTANT-.0A = ONE-2.2A WHO ASSISTS ; ESP
ADJUTANT-.0B = AN OFFICER-.3A WHO ASSISTS A COMMANDING OFFICER BY HANDLING CORRESPONDENCE AND KEEPING RECORDS
ADJUVANT-2.0A = SOMETHING-.0A% THAT ENHANCES THE EFFECTIVENESS OF MEDICAL TREATMENT
ADMAN-.0A = ONE-2.2A WHO WRITES , SOLICITS , OR PLACES ADVERTISEMENTS
ADMINISTRATION-.1A = THE ACT-1.1A OR PROCESS-.14A OF ADMINISTERING
ADMINISTRATION-.3A = THE BODY-.5A OF PERSONS DIRECTING THE GOVERNMENT OF A COUNTRY
ADMINISTRATION-.4A = THE TERM-1.2A OF OFFICE OF AN ADMINISTRATIVE OFFICER OR BODY
ADMINISTRATOR-.0A = ONE-2.2A THAT ADMINISTERS ; ESP
ADMINISTRATOR-.0B = ONE-2.2A WHO SETTLES AN INTESTATE ESTATE
ADMIRAL-.0A = A COMMISSIONED OFFICER-.3A IN THE NAVY RANKING NEXT BELOW A FLEET ADMIRAL
ADMIRALTY-.0A = THE BRITISH GOVERNMENT DEPARTMENT-.2A

HAVING AUTHORITY OVER NAVAL AFFAIRS
ADMISSION-.1A = THE GRANTING-\IV1.3A% OF AN ARGUMENT
ADMISSION-.2A = THE ACKNOWLEDGMENT-\RV.1A% OF A FACT
ADMISSION-.3A = THE ACT-1.1A OF ADMITTING
ADMISSION-.4A = THE PRIVILEGE-.0A OF BEING ADMITTED
ADMISSION-.5A = A FEE-.3A PAID FOR ADMISSION
ADMITTANCE-.0A = PERMISSION-.0A TO ENTER
ADMIXTURE-.2A = SOMETHING-.0A% ADDED IN MIXING
ADO-.1A = BUSTLING EXCITEMENT-.0A
ADOBE-.1A = SUN-DRIED BRICK-1.0A ; ALSO
ADOBE-.1B = CLAY-.2A FOR MAKING SUCH BRICKS
ADOBE-.2A = A STRUCTURE-.2A MADE OF ADOBE BRICKS
ADOLESCENCE-.0A = THE PROCESS-1.3A OR PERIOD-1.6A OF GROWTH BETWEEN CHILDHOOD AND MATURITY
ADULATION-.0A = EXCESSIVE OR SERVILE PRAISE-\RV.1A%
ADULT-2.0A = ONE-2.2A THAT IS ADULT ; ESP
ADULT-2.0B = A HUMAN BEING-.3B AFTER AN AGE (AS 21) SPECIFIED BY LAW
ADULTERANT-.0A = SOMETHING-.0A% USED TO ADULTERATE ANOTHER THING
ADULTERY-.0A = SEXUAL UNFAITHFULNESS-\RA.1A% OF A MARRIED PERSON
ADULTHOOD-.0A = THE STATE-1.1A OR TIME-1.1A OF BEING AN ADULT
ADVANCE-2.1A = A FORWARD MOVEMENT-.1A
ADVANCE-2.3A = A RISE-2.4A ESP. IN PRICE OR VALUE
ADVANTAGE-.1A = SUPERIORITY-\RA1.2A% OF POSITION
ADVANTAGE-.3A = THE FIRST POINT-1.10A WON IN TENNIS AFTER DEUCE
ADVENT-.1A = A PENITENTIAL SEASON-1.2A BEGINNING FOUR SUNDAYS BEFORE CHRISTMAS
ADVENT-.2A = ARRIVAL ; ESP , CAP
ADVENT-.2B = THE COMING-\IV.2A% OF CHRIST
ADVENTURE-1.1A = A RISKY UNDERTAKING-.3A
ADVENTURE-1.2A = A REMARKABLE AND EXCITING EXPERIENCE-.2B
ADVENTURE-1.3A = A BUSINESS VENTURE-2.1B
ADVENTURER-.1A = A PERSON-.1A WHO ENGAGES IN NEW AND RISKY UNDERTAKINGS
ADVENTURER-.2A = A PERSON-.1A WHO FOLLOWS A MILITARY CAREER FOR ADVENTURE OR PROFIT
ADVENTURER-.3A = A PERSON-.1A WHO TRIES TO ADVANCE HIS FORTUNES BY QUESTIONABLE MEANS
ADVERB-.0A = A WORD-1.2A THAT TYPICALLY SERVES AS A MODIFIER OF A VERB , AN ADJECTIVE , OR ANOTHER ADVERB
ADVERSITY-.0A = HARD TIMES-1.6A
ADVERTISEMENT-.1A = THE ACT-1.1A OF ADVERTISING
ADVERTISEMENT-.2A = A PUBLIC NOTICE-1.4A INTENDED TO ADVERTISE SOMETHING
ADVERTISING-.0A = THE BUSINESS-.2A OF PREPARING ADVERTISEMENTS

ADVICE-.1A = RECOMMENDATION-.1A WITH REGARD TO A COURSE OF ACTION
ADVISEMENT-.0A = CAREFUL CONSIDERATION-.4A
ADVOCATE-.1A = ONE-2.2A WHO PLEADS ANOTHER'S CAUSE
ADVOCATE-.2A = ONE-2.2A WHO ARGUES OR PLEADS FOR A CAUSE OR PROPOSAL
ADZ-.0A = A CUTTING TOOL-1.1A THAT HAS A CURVED BLADE SET AT RIGHT ANGLES TO THE HANDLE AND IS USEDIN SHAPING WOOD
AEOLIAN-HARP-.0A = A BOX-2.1A HAVING STRETCHED STRINGS THAT PRODUCE VARYING MUSICAL SOUNDS WHEN THE WIND BLOWS ON THEM
AEON-.0A = AN INDEFINITELY LONG TIME-1.5A
AERIAL-2.0A = A RADIO OR TELEVISION ANTENNA-.2A
AERIALIST-.0A = A PERFORMER-\RV.5A% OF FEATS ABOVE THE GROUND ESP. ON A FLYING TRAPEZE
AERIE-.0A = A HIGHLY PLACED NEST-1.1A (AS OF AN EAGLE)
AERONAUT-.0A = ONE-2.2A WHO OPERATES OR TRAVELS IN AN AIRSHIP OR BALLOON
AERONAUTICS-.0A = A SCIENCE-.1A% DEALING WITH THE OPERATION OF AIRCRAFT-.0A% OR WITH THEIR DESIGN AND MANUFACTURE
AEROSOL-.0A = A SUSPENSION-.2B OF FINE SOLID OR LIQUID PARTICLES IN A GAS ; ESP
AEROSOL-.0B = A SUBSTANCE-.2A (AS AN INSECTICIDE , MEDICINE , OR COSMETIC) IN A LIQUID SPRAYED FROM THE VALVE OF A SPECIAL CONTAINER
AEROSPACE-.0A = THE EARTH'S ATMOSPHERE-.1A AND THE SPACE-1.3A/& BEYOND
AESTHETE-.0A = A PERSON-.1A HAVING OR AFFECTING SENSITIVITY TO BEAUTY ESP. IN ART
AESTHETICS-.0A = A BRANCH-1.3A OF PHILOSOPHY DEALING WITH BEAUTY AND THE BEAUTIFUL
AFFAIR-.1A = SOMETHING-.0A% THAT RELATES TO OR INVOLVES ONE
AFFAIR-.2A = A ROMANTIC OR SEXUAL ATTACHMENT-.2A OF LIMITED DURATION
AFFECTATION-.0A = AN ATTITUDE-.2A OR MODE-.2A OF BEHAVIOR-.0A/+ ASSUMED BY A PERSON IN AN EFFORT TO IMPRESS OTHERS
AFFECTION-1.0A = TENDER ATTACHMENT-.2A
AFFIDAVIT-.0A = A SWORN STATEMENT-.1A IN WRITING
AFFILIATE-2.0A = AN AFFILIATED PERSON-.1A OR ORGANIZATION-.2A
AFFINITY-.2A = ATTRACTIVE FORCE-1.6A
AFFIRMATIVE-2.1A = AN EXPRESSION-.1A OF AFFIRMATION OR ASSENT
AFFIRMATIVE-2.2A = THE SIDE-.6A THAT UPHOLDS THE PROPOSITION STATED IN A DEBATE

AFFIX-2.0A = ONE OR MORE SOUNDS-2.1A/! OR LETTERS ATTACHED TO THE BEGINNING OR END OF A WORD AND SERVINGTO PRODUCE A DERIVATIVE WORD OR AN INFLECTIONAL FORM

AFFLATUS-.0A = DIVINE INSPIRATION-.3A

AFFLUENCE-.0A = ABUNDANT SUPPLY-2.1A ; ALSO

AFFLUENCE-.0B = WEALTH-.1A , RICHES

AFGHAN-.0A = A BLANKET-.1A OR SHAWL-.0A OF COLORED WOOL KNITTED OR CROCHETED IN SECTIONS

AFRICAN-.1A = A NATIVE-.0B OR INHABITANT-.0A OF AFRICA

AFRIKAANS-.0A = A LANGUAGE-.1A DEVELOPED FROM 17TH CENTURY DUTCH THAT IS ONE OF THE OFFICIAL LANGUAGES OF THE REPUBLIC OF SOUTH AFRICA

AFTERBIRTH-.0A = STRUCTURES-.2B AND MEMBRANES-.0A/& EXPELLED FROM THE UTERUS AFTER THE BIRTH OF YOUNG

AFTERCARE-.0A = THE CARE-1.3A , NURSING , OR TREATMENT-.0A OF A CONVALESCENT PATIENT

AFTERDECK-.0A = THE REAR HALF-1.1A OF THE DECK OF A SHIP

AFTEREFFECT-.1A = AN EFFECT-1.1A THAT FOLLOWS ITS CAUSE AFTER SOME TIME HAS PASSED

AFTEREFFECT-.2A = A SECONDARY EFFECT-1.1A COMING ON AFTER THE FIRST OR IMMEDIATE EFFECT HAS SUBSIDED A MEDICINE WITH NO NOTICEABLE [S

AFTERGLOW-.0A = A GLOW-.1A REMAINING (AS IN THE SKY AFTER SUNSET) WHERE A LIGHT HAS DISAPPEARED

AFTERLIFE-.0A = AN EXISTENCE-.1A AFTER DEATH

AFTERMATH-.1A = A SECOND-GROWTH CROP-1.3A ESP. OF HAY

AFTERNOON-.0A = THE TIME-1.1A BETWEEN NOON AND EVENING

AFTERTASTE-.0A = A SENSATION-.1A (AS OF FLAVOR-1.1A/+) CONTINUING AFTER THE STIMULUS CAUSING IT HAS ENDED

AFTERTHOUGHT-.0A = A LATER THOUGHT-2.5A ; ALSO

AFTERTHOUGHT-.0B = SOMETHING-.0A% THOUGHT OF LATER

AGAPE-2.0A = SELF-GIVING LOYAL CONCERN-2.1A THAT FREELY ACCEPTS ANOTHER AND SEEKS HIS GOOD

AGATE-.1A = A STRIPED OR CLOUDED QUARTZ-.0A

AGATE-.2A = A CHILD'S MARBLE-.3A OF AGATE OR OF GLASS RESEMBLING AGATE

AGAVE-.0A = ANY OF SEVERAL SPINY-LEAVED PLANTS-2.1A/! RELATED TO THE AMARYLLIS

AGE-1.1A = THE LENGTH-.2A OF TIME-1.1A/+ DURING

APPENDIX E: SAMPLE OF NEW SEMANTIC DICTIONARY OF VERBS

ABANDON-1.0A = TO GIVE-1.17A\-UP UP
ABASH-.0A = TO DESTROY-.1B THE COMPOSURE OF
ABATE-.2A = TO DECREASE-1.0A IN AMOUNT , NUMBER , OR DEGREE
ABBREVIATE-.0B = TO REDUCE-.1A TO AN ABBREVIATION
ABDICATE-.0A = TO GIVE-1.17A\-UP UP (AS A THRONE) FORMALLY
ABDUCT-.0A = TO TAKE-1.1A\-AWAY AWAY (A PERSON) BY FORCE
ABJURE-.1A = TO RENOUNCE-.1A SOLEMNLY
ABJURE-.2A = TO ABSTAIN-.0A FROM
ABLATE-.0A = TO REMOVE-1.4A OR BECOME REMOVED BY CUTTING , EROSION , MELTING , OR VAPORIZATION
ABOLISH-.0A = TO DO-AWAY-WITH-R.1AV
ABOUND-.1A = TO BE-.1B PLENTIFUL
ABOUND-.2A = TO BE-.4A FULLY SUPPLIED
ABRADE-.0A = TO WEAR-1.3A\-AWAY AWAY BY RUBBING
ABRIDGE-.0A = TO LESSEN-.0A IN LENGTH OR EXTENT
ABSCOND-.0A = TO DEPART-.1A SECRETLY AND HIDE-1.2A/& ONESELF
ABSENT-2.0A = TO KEEP-1.12A (ONESELF) AWAY
ABSOLVE-.1A = TO SET-1.4A FREE FROM AN OBLIGATION OR THE CONSEQUENCES OF GUILT
ABSORB-.2A = TO SUCK-1.3A UP OR TAKE-1.15A\-IN IN IN THE MANNER OF A SPONGE
ABSORB-.3A = TO ENGAGE-.2A (ONE'S ATTENTION)
ABSORB-.4A = TO RECEIVE-.2A WITHOUT RECOIL OR ECHO
ABSTAIN-.0A = TO RESTRAIN-.2A ONESELF
ABSTAIN-.0B = LEAVE-1.6B OFF
ABSTRACT-3.2A = TO MAKE-1.2B AN ABSTRACT OF
ABSTRACT-3.3A = TO DRAW-1.4A AWAY THE ATTENTION OF
ABUSE-1.3A = TO BLAME-1.1A OR SCOLD-2.0A RUDELY
ABUT-.0A = TO TOUCH-1.2A ALONG A BORDER
ABUT-.0B = BORDER-2.2A ON
ACCEDE-.1A = TO ADHERE-.1A TO AN AGREEMENT
ACCEDE-.2A = TO EXPRESS-3.1A APPROVAL
ACCEDE-.3A = TO ENTER-.7A UPON AN OFFICE
ACCELERATE-.1A = TO BRING-.3A ABOUT EARLIER
ACCELERATE-.2A = TO SPEED-.3A UP
ACCEPT-.1A = TO RECEIVE-.1A OR TAKE-1.7A WILLINGLY
ACCEPT-.2A = TO AGREE-.1A TO
ACCEPT-.3A = TO ACKNOWLEDGE-.4A AS BINDING AND PROMISE-2.1A/& TO PAY
ACCLAIM-.2A = TO WELCOME-1.2A OR PROCLAIM-.0B WITH APPLAUSE
ACCLIMATE-.0A = TO ACCUSTOM-.0A TO A NEW CLIMATE OR NEW CONDITIONS
ACCOMMODATE-.1A = TO MAKE-1.1A FIT OR SUITABLE
ACCOMMODATE-.3A = TO PROVIDE-.3A WITH SOMETHING NEEDED
ACCOMMODATE-.4A = TO HOLD-1.8A WITHOUT CROWDING
ACCOMPANY-.1A = TO GO-1.1A OR OCCUR-.2A ALONG WITH
ACCOMPANY-.2A = TO PLAY-2.7B AN ACCOMPANIMENT FOR

ACCOMPLISH-.0A = TO BRING-.3A TO COMPLETION
ACCOST-.0A = TO APPROACH-.1A/& AND SPEAK-.2A/& TO
ACCOUNT-2.2A = TO GIVE-1.9A AN EXPLANATION
ACCOUTER-.0A = TO EQUIP-.0A ESP. FOR MILITARY SERVICE
ACCREDIT-.1A = TO AUTHORIZE-.2A OFFICIALLY
ACCRUE-.1A = TO COME-.5A BY WAY OF INCREASE
ACCRUE-.2A = TO BE-.4A ADDED BY REGULAR GROWTH OVER A PERIOD OF TIME
ACCUMULATE-.0A = TO HEAP-2.1A OR PILE-3.2A UP
ACCUSE-.0A = TO CHARGE-1.5A WITH AN OFFENSE
ACE-2.0A = TO SCORE-2.4A AN ACE AGAINST (AS OPPONENT)
ACHE-.1A = TO SUFFER-.1A A USU. DULL PERSISTENT PAIN
ACHIEVE-.0A = TO GAIN-2.3A BY WORK OR EFFORT
ACKNOWLEDGE-.1A = TO ADMIT-.3A AS TRUE
ACKNOWLEDGE-.2A = TO ADMIT-.3A THE AUTHORITY OF
ACKNOWLEDGE-.3A = TO EXPRESS-3.1A THANKS FOR ; ALSO
ACKNOWLEDGE-.3B = TO REPORT-2.1B RECEIPT OF
ACKNOWLEDGE-.4A = TO RECOGNIZE-.3A AS VALID
ACQUAINT-.2A = TO MAKE-1.1A FAMILIAR
ACQUAINT-.2B = CAUSE-2.0A TO KNOW-.2A/C
ACQUIESCE-.0A = TO ACCEPT-.2A A PLAN OR STATEMENT WITHOUT OPEN OPPOSITION
ACQUIRE-.0A = TO COME-.3A INTO POSSESSION OF
ACQUIT-.1A = TO PRONOUNCE-.1A NOT GUILTY
ACQUIT-.2A = TO CONDUCT-2.4A (ONESELF) USU. SATISFACTORILY
ACTIVATE-.1A = TO SPUR-2.2A INTO ACTION ; ALSO
ACTIVATE-.1B = TO MAKE-1.1A ACTIVE , REACTIVE , OR RADIOACTIVE
ACTIVATE-.2A = TO AERATE-.2A (SEWAGE) TO FAVOR-2.7A/+ THE GROWTH OF ORGANISMS THAT CAUSE DECOMPOSITION
ACTIVATE-.3A = TO SET-1.4A UP (A MILITARY UNIT) FORMALLY
ACTUATE-.2A = TO INCITE-.0A TO ACTION
ADAPT-.0A = TO MAKE-1.1A SUITABLE OR FIT (AS FOR A NEW USE OR FOR DIFFERENT CONDITIONS)
ADD-.1A = TO JOIN-.1A TO SOMETHING ELSE SO AS TO INCREASE-1.3A/+ IN NUMBER OR AMOUNT
ADD-.2A = TO COMBINE-1.0A (NUMBERS) INTO ONE SUM
ADDICT-1.0A = TO DEVOTE-.2A OR SURRENDER-1.1A (ONESELF) TO SOMETHING HABITUALLY OR EXCESSIVELY
ADDLE-.1A = TO THROW-1.5A INTO CONFUSION
ADDRESS-1.1A = TO DIRECT-1.3A THE ATTENTION OF (ONESELF)
ADDRESS-1.2A = TO DIRECT-1.1C ONE'S REMARKS TO
ADDRESS-1.2B = DELIVER-.4A AN ADDRESS TO
ADDRESS-1.3A = TO MARK-2.2A DIRECTIONS FOR DELIVERY ON

ADDUCE-.0A = TO BRING-.3A FORWARD AS AN ARGUMENT , REASON , OR PROOF
ADHERE-.1A = TO GIVE-1.9A SUPPORT
ADHERE-.1B = MAINTAIN-.2A LOYALTY
ADHERE-.2A = TO STICK-2.4A FAST
ADJOIN-.0A = TO BE-.4A SITUATED NEXT TO
ADJOURN-.1A = TO SUSPEND-.2A INDEFINITELY OR UNTIL A STATED TIME
ADJOURN-.2A = TO TRANSFER-1.1A A SESSION TO ANOTHER PLACE
ADJUDGE-.2A = TO HOLD-1.9B OR PRONOUNCE-.1A TO BE-.1B/+
ADJUDGE-.3A = TO AWARD-1.1A BY JUDICIAL DECISION
ADJUDICATE-.0A = TO SETTLE-1.13A JUDICIALLY
ADJURE-.0A = TO COMMAND-1.1A SOLEMNLY
ADJURE-.0B = ENTREAT-.0A EARNESTLY
ADJUST-.1A = TO BRING-.2A TO AGREEMENT
ADJUST-.2A = TO CAUSE-2.0A TO CONFORM-.1A/C
ADMINISTER-.2A = TO METE-1.2A OUT
ADMINISTER-.3A = TO GIVE-1.2A USU. RITUALLY OR REMEDIALLY
ADMINISTER-.4A = TO PERFORM-.4A THE OFFICE OF ADMINISTRATOR
ADMIRE-.0A = TO REGARD-2.3A WITH HIGH ESTEEM
ADMIT-.1A = TO ALLOW-.4A TO ENTER-.1A/+
ADMIT-.3A = TO RECOGNIZE-.3A AS GENUINE OR VALID
ADMONISH-.0A = TO WARN-.1A GENTLY
ADMONISH-.0B = REPROVE-.1A WITH A WARNING
ADOPT-.1A = TO TAKE-1.6A (A CHILD OF OTHER PARENTS) AS ONE'S OWN CHILD
ADOPT-.2A = TO TAKE-1.9A\-UP/& UP AND PRACTICE-1.3A/& AS ONE'S OWN
ADOPT-.3A = TO ACCEPT-.2A/& FORMALLY AND PUT INTO EFFECT
ADORE-.2A = TO REGARD-2.3A WITH REVERENT ADMIRATION
ADORE-.3A = TO BE-.1B EXTREMELY FOND OF
ADORN-.0A = TO DECORATE-.1A WITH ORNAMENTS
ADSORB-.0A = TO TAKE-1.15A\-UP UP (AS MOLECULES OF GASES) AND HOLD-1.8A/& ON THE SURFACE OF A SOLID OR LIQUID
ADULTERATE-.0A = TO MAKE-1.1A IMPURE BY MIXING IN A FOREIGN OR INFERIOR SUBSTANCE
ADUMBRATE-.1A = TO FORESHADOW-.0A VAGUELY
ADUMBRATE-.2A = TO SUGGEST-.2A OR DISCLOSE-.0A PARTIALLY
ADVANCE-1.1A = TO BRING-.1A OR MOVE-1.1B FORWARD
ADVANCE-1.2A = TO ASSIST-1.0A THE PROGRESS OF
ADVANCE-1.3A = TO PROMOTE-.1A IN RANK
ADVANCE-1.4A = TO MAKE-1.1A EARLIER IN TIME
ADVANCE-1.6A = TO RAISE-1.9A IN RATE
ADVERTISE-.2A = TO CALL-1.4A PUBLIC ATTENTION TO ESP. IN ORDER TO AROUSE A DESIRE TO PURCHASE

ADVISE-.1A = TO GIVE-1.9A ADVICE TO
AERATE-.1A = TO SUPPLY-1.3A (BLOOD) WITH OXYGEN BY RESPIRATION
AERATE-.2A = TO SUPPLY-1.3A OR IMPREGNATE-.2A WITH AIR
AERATE-.3A = TO COMBINE-1.0B OR CHARGE-1.1B WITH GAS
AESTIVATE-.0A = TO PASS-1.4B THE SUMMER IN A STATE OF TORPOR
AFFECT-1.1A = TO BE-.1B FOND OF USING OR WEARING
AFFECT-2.0A = TO PRODUCE-1.4B AN EFFECT ON
AFFILIATE-1.0A = TO ASSOCIATE-1.1A AS A MEMBER OR BRANCH
AFFIRM-.2A = TO ASSERT-.1A POSITIVELY
AFFLICT-.0B = TROUBLE-1.2A GRIEVOUSLY
AFFORD-.1A = TO MANAGE-.4B TO BEAR-2.5A/+ OR BEAR THE COST OF WITHOUT SERIOUS HARM OR LOSS
AGE-2.1A = TO GROW-.1A OLD OR CAUSE-2.0A TO GROW OLD
AGE-2.2A = TO BECOME OR CAUSE-2.0A TO BECOME MATURE OR MELLOW
AGGLOMERATE-.0A = TO GATHER-1.1A INTO A MASS
AGGLUTINATE-.0A = TO CAUSE-2.0A TO ADHERE-.2A/C
AGGLUTINATE-.0B = GATHER-1.1A INTO A GROUP OR MASS
AGGRANDIZE-.0A = TO MAKE-1.1A GREAT OR GREATER
AGGRAVATE-.1A = TO MAKE-1.1A MORE SEVERE
AGGREGATE-2.0A = TO COLLECT-2.1A INTO ONE MASS
AGGRIEVE-.1A = TO CAUSE-2.0A GRIEF TO
AGGRIEVE-.2A = TO INFLICT-.0A INJURY ON
AGITATE-.1A = TO MOVE-1.3A WITH AN IRREGULAR RAPID MOTION
AGITATE-.2A = TO STIR-1.4A UP
AGITATE-.3A = TO DISCUSS-.2A EARNESTLY
AGITATE-.4A = TO ATTEMPT-.0A TO AROUSE-.2A/+ PUBLIC FEELING
AGONIZE-.0A = TO SUFFER-.1A OR CAUSE-2.0A TO SUFFER AGONY
AGREE-.2A = TO SETTLE-1.13A BY COMMON CONSENT
AGREE-.3A = TO EXPRESS-3.1A AGREEMENT OR APPROVAL
AGREE-.4A = TO BE-.1B IN HARMONY
AGREE-.5A = TO BE-.1B SIMILAR
AGREE-.6A = TO BE-.1B FITTING OR HEALTHFUL
AID-1.0A = TO PROVIDE-.3A WITH WHAT IS USEFUL IN ACHIEVING AN END
AIL-.1A = TO BE-.1A THE MATTER WITH
AIL-.2A = TO BE-.1B UNWELL
AIM-1.1A = TO POINT-2.6A (A WEAPON) TOWARD SOME OBJECT
AIM-1.2A = TO DIRECT-1.3A ONE'S EFFORTS
AIM-1.3A = TO DIRECT-1.3A TO OR TOWARD A SPECIFIED OBJECT OR GOAL
AIR-2.1A = TO EXPOSE-1.2A TO THE AIR
AIR-2.2A = TO EXPOSE-1.4A TO PUBLIC VIEW

ALARM-2.1A = TO WARN-.1A OF DANGER
ALARM-2.2A = TO AROUSE-.2A TO A SENSE OF DANGER
ALIBI-2.1A = TO OFFER-1.2A AN EXCUSE
ALIBI-2.2A = TO MAKE-1.2B AN EXCUSE FOR
ALIENATE-.1A = TO TRANSFER-1.2A (PROPERTY) TO ANOTHER
ALIENATE-.2A = TO MAKE-1.1A HOSTILE WHERE PREVIOUSLY FRIENDSHIP HAD EXISTED
ALIGHT-1.1A = TO GET-1.5A DOWN (AS FROM A VEHICLE)
ALIGHT-1.2A = TO COME-.3A TO REST FROM THE AIR
ALIGN-.1A = TO BRING-.2A INTO LINE
ALIGN-.2A = TO ARRAY-1.1A ON THE SIDE OF OR AGAINST A CAUSE
ALKALINIZE-.0A = TO MAKE-1.1A ALKALINE
ALLAY-.1A = TO REDUCE-.1A IN SEVERITY
ALLEGE-.1A = TO STATE-2.1A AS A FACT WITHOUT PROOF
ALLEGE-.2A = TO BRING-.3A FORWARD AS A REASON OR EXCUSE
ALLEVIATE-.0A = TO MAKE-1.1A EASIER TO BE ENDURED
ALLITERATE-.1A = TO FORM-2.1B AN ALLITERATION
ALLITERATE-.2A = TO ARRANGE-.1A SO AS TO MAKE ALLITERATION
ALLOT-.0A = TO DISTRIBUTE-.1B AS A SHARE OR PORTION
ALLOW .5A = TO MAKE-1.1A\-ALLOWANCE
ALLOW-.1A = TO ASSIGN-.1A AS A SHARE
ALLOW-.2A = TO RECKON-.2A AS A DEDUCTION
ALLUDE-.0A = TO REFER-.6B INDIRECTLY OR BY SUGGESTION
ALLURE-.0A = TO ENTICE-.0A BY CHARM OR ATTRACTION
ALLY-1.0A = TO UNITE-.2A IN ALLIANCE
ALPHABETIZE-.0A = TO ARRANGE-.1A IN ALPHABETIC ORDER
ALTER-.0A = TO MAKE-1.1A OR BECOME DIFFERENT
ALTERNATE-2.0A = TO OCCUR-.2A OR CAUSE-2.0A TO OCCUR BY TURNS
AMALGAMATE-.0A = TO UNITE-.1A INTO ONE BODY OR ORGANIZATION
AMASS-.0A = TO HEAP-2.1A UP
AMAZE-.0A = TO OVERWHELM-.3A WITH WONDER
AMBLE-1.0A = TO GO-1.1B AT AN AMBLE
AMELIORATE-.0A = TO MAKE-1.1A OR GROW-.9A BETTER
AMEND-.1A = TO CHANGE-1.1A FOR THE BETTER
AMEND-.2A = TO ALTER-.0A FORMALLY IN PHRASEOLOGY
AMERCE-.1A = TO PENALIZE-.0A BY A FINE DETERMINED BY THE COURT
AMORTIZE-.0A = TO EXTINGUISH-.0B (AS A MORTGAGE) USU. BY PAYMENT ON THE PRINCIPAL AT THE TIME OF EACH PERIODIC INTEREST PAYMENT
AMOUNT-1.1A = TO REACH-1.4A AS A TOTAL
AMOUNT-1.2A = TO BE-.1B*TO EQUIVALENT
AMPLIFY-.1A = TO EXPAND-.3A BY EXTENDED TREATMENT
AMPLIFY-.2A = TO INCREASE-1.3A (VOLTAGE , CURRENT ,

OR POWER) IN MAGNITUDE OR STRENGTH (AS BY THE USE OF A VACUUM TUBE)

AMPLIFY-.3A = TO MAKE-1.1A LOUDER

AMPUTATE-.0A = TO CUT-1.3A OFF

AMUSE-.0A = TO ENTERTAIN-.3A IN A LIGHT OR PLAYFUL MANNER

ANALYZE-.0A = TO MAKE-1.10A AN ANALYSIS OF

ANATHEMATIZE-.0A = TO PRONOUNCE-.1A AN ANATHEMA AGAINST

ANATOMIZE-.0A = TO DISSECT-.1A SO AS TO EXAMINE-.1A/+ THE STRUCTURE AND PARTS ; ALSO

ANCHOR-2.0A = TO HOLD-1.4A OR BECOME HELD IN PLACE BY OR AS IF BY AN ANCHOR

ANGER-2.0A = TO MAKE-1.1A ANGRY

ANGLE-2.0A = TO TURN-1.11A , MOVE-1.1A , OR DIRECT-1.2A AT AN ANGLE

ANGLE-3.0A = TO FISH-2.1A WITH A HOOK AND LINE

ANGLICIZE-.1A = TO MAKE-1.1A ENGLISH (AS IN HABITS , SPEECH , CHARACTER , OR OUTLOOK)

ANGLICIZE-.2A = TO BORROW-.2B (A FOREIGN WORD OR PHRASE) INTO ENGLISH WITHOUT CHANGING FORM OR SPELLING AND SOMETIMES WITHOUT CHANGING PRONUNCIATION

ANIMADVERT-.0A = TO REMARK-1.2A CRITICALLY

ANIMADVERT-.0B = EXPRESS-3.1A CENSURE

ANIMATE-2.1A = TO IMPART-.1A LIFE TO

ANIMATE-2.2A = TO GIVE-1.9A SPIRIT AND VIGOR TO

ANIMATE-2.3A = TO MAKE-1.11A APPEAR-.3A/C TO MOVE-1.3A/C

ANNEAL-.0A = TO SOFTEN-.0A AND TOUGHEN-.0A/& (AS GLASS OR STEEL) BY SUBJECTING TO HEAT AND THEN COOLING

ANNEX-1.1A = TO ATTACH-.3A AS AN ADDITION

ANNEX-1.2A = TO INCORPORATE-.1A (AS A TERRITORY) WITHIN A POLITICAL DOMAIN

ANNIHILATE-.0A = TO DESTROY-.1A COMPLETELY

ANNIHILATE-.0B = WIPE-1.3A\-OUT OUT

ANNOTATE-.0A = TO FURNISH-.1B WITH NOTES

ANNOUNCE-.1A = TO MAKE-1.1A\-KNOWN KNOWN PUBLICLY

ANNOUNCE-.2A = TO GIVE-1.9A NOTICE OF THE ARRIVAL OR PRESENCE OF

ANNOY-.0A = TO DISTURB-.3A OR IRRITATE-.1A ESP. BY REPEATED ACTS

ANNUL-.0A = TO MAKE-1.1A LEGALLY VOID

ANOINT-.1A = TO APPLY-.1B OIL TO ESP. AS A SACRED RITE

ANSWER-2.1A = TO SPEAK-.2A OR WRITE-.3A IN REPLY TO

ANSWER-2.2A = TO BE-.1B RESPONSIBLE

ANSWER-2.3A = TO BE-.1B ADEQUATE

ANTAGONIZE-.0A = TO PROVOKE-.2A THE HOSTILITY OF

ANTEDATE-.1A = TO DATE-3.2A (A PAPER) AS OF AN EARLIER DAY THAN THAT ON WHICH THE ACTUAL WRITING OR SIGNING IS DONE

ANTEDATE-.2A = TO PRECEDE-.0A IN TIME

ANTICIPATE-.1A = TO FORESEE-.0A/& AND PROVIDE-.3A/& FOR BEFOREHAND
ANTICIPATE-.2A = TO LOOK-1.2A FORWARD TO
AP-1.2A =TO UTTER-2.1A SHARP OR ANGRY WORDS
APOLOGIZE-.0A = TO MAKE-1.2B AN APOLOGY
APOLOGIZE-.0B = EXPRESS-3.1A REGRET
APOSTROPHIZE-.0A = TO ADDRESS-1.2A AS IF PRESENT OR AS IF CAPABLE OF UNDERSTANDING
APPALL-.0A = TO OVERCOME-.2A WITH HORROR
APPEAL-.1A = TO TAKE-1.18A STEPS TO HAVE (A CASE) REHEARD IN A HIGHER COURT
APPEAL-.2A = TO PLEAD-.4A FOR HELP , CORROBORATION , OR DECISION
APPEAL-.3A = TO AROUSE-.2A A SYMPATHETIC RESPONSE
APPEAR-.2A = TO COME-.1A FORMALLY BEFORE AN AUTHORITY
APPEAR-.5A = TO COME-.1A BEFORE THE PUBLIC
APPEASE-.1A = TO CAUSE-2.0A TO SUBSIDE-.4A/C
APPEASE-.2B = TO BUY-1.0C OFF BY CONCESSIONS
APPEND-.0A = TO ATTACH-.3A ESP. AS SOMETHING ADDITIONAL
APPERTAIN-.0A = TO BELONG-.3A AS A RIGHTFUL PART OR PRIVILEGE
APPLAUD-.0A = TO SHOW-1.1A APPROVAL ESP. BY CLAPPING
APPLY-.1A = TO PLACE-2.2A IN CONTACT
APPLY-.1B = PUT-.1A OR SPREAD-1.1A ON A SURFACE
APPLY-.2A = TO PUT-.10A/-TO-USE TO PRACTICAL USE
APPLY-.3A = TO EMPLOY-1.3A WITH CLOSE ATTENTION
APPLY-.4A = TO SUBMIT-.1A A REQUEST PERSONALLY OR BY LETTER
APPOINT-.1A = TO FIX-1.5A OR SET-1.3A OFFICIALLY
APPOINT-.2A = TO NAME-2.3A OFFICIALLY
APPOINT-.3A = TO FIT-3.8A OUT
APPORTION-.0A = TO DISTRIBUTE-.1B PROPORTIONATELY
APPRAISE-.0A = TO SET-1.7A A VALUE ON
APPRECIATE-.1A = TO VALUE-2.2A JUSTLY
APPRECIATE-.2A = TO BE-.1B AWARE OF
APPRECIATE-.3A = TO BE-.1B GRATEFUL FOR
APPRECIATE-.4A = TO INCREASE-1.1A IN VALUE
APPREHEND-.3A = TO LOOK-1.2A FORWARD TO WITH DREAD
APPRENTICE-2.0A = TO BIND-.2A OR SET-1.4A AT WORK AS AN APPRENTICE
APPROACH-.1A = TO MOVE-1.1A NEARER TO
APPROACH-.2A = TO TAKE-1.18A PRELIMINARY STEPS TOWARD
APPROPRIATE-1.1A = TO TAKE-1.1A POSSESSION OF
APPROPRIATE-1.2A = TO SET-1.2A APART FOR A PARTICULAR USE
APPROVE-.1A = TO HAVE-1.8A OR EXPRESS-3.1A A FAVORABLE OPINION OF
APPROVE-.2A = TO ACCEPT-.2A AS SATISFACTORY
APPROXIMATE-2.0A = TO COME-.1A NEAR
ARBITRATE-.3A = TO SUBMIT-.1A FOR DECISION TO AN ARBITRATOR
ARCH-2.1A = TO COVER-1.1A WITH AN ARCH

ARCH-2.2A = TO FORM-2.2A OR BEND-2.2B INTO AN ARCH

ARGUE-.1A = TO GIVE-1.9A REASONS FOR OR AGAINST SOMETHING

ARGUE-.4A = TO PERSUADE-.0A BY GIVING REASONS

ARISE-.1A = TO GET-1.5A UP

ARM-2.0A = TO FURNISH-.1B OR EQUIP-.0A WITH WEAPONS

AROUSE-.1A = TO AWAKEN-.0A FROM SLEEP

AROUSE-.2A = TO STIR-1.4A UP

AROUSE-.2B = ROUSE-.2A TO ACTION

ARRAIGN-.1A = TO CALL-1.4A BEFORE A COURT TO ANSWER TO AN INDICTMENT

ARRAIGN-.2A = TO ACCUSE-.0A OF WRONG OR IMPERFECTION

ARRANGE-.2A = TO COME-.7A TO AN AGREEMENT ABOUT

ARRANGE-.3A = TO ADAPT-.0A (A MUSICAL COMPOSITION) TO VOICES OR INSTRUMENTS OTHER THAN THOSE FOR WHICH IT WAS ORIG. WRITTEN

ARRAY-1.1A = TO ARRANGE-.1A IN ORDER

ARRAY-1.2A = TO DRESS-1.2C ESP. IN SPLENDID ATTIRE

ARREST-1.2A = TO TAKE-1.1A INTO LEGAL CUSTODY

ARRIVE-.1A = TO REACH-1.4A A DESTINATION

ARRIVE-.2A = TO BE-.1B NEAR OR AT HAND

ARRIVE-.3A = TO ATTAIN-.1A SUCCESS

ARROGATE-.0A = TO CLAIM-1.1A OR SEIZE-.1A WITHOUT JUSTIFICATION AS ONE'S RIGHT

ARTICULATE-2.1A = TO UTTER-2.1A DISTINCTLY

ARTICULATE-2.2A = TO UNITE-.1A BY JOINTS

ASCEND-.1A = TO MOVE-1.1A UPWARD

ASCEND-.2A = TO SUCCEED-.1A TO

ASCERTAIN-.0A = TO FIND-1.1A OUT

ASCERTAIN-.0B = LEARN-.2B BY INQUIRY

ASCRIBE-.0A = TO REFER-.1A TO A SUPPOSED CAUSE , SOURCE , OR AUTHOR

ASK-.1A = TO CALL-1.5A ON FOR AN ANSWER

ASK-.3A = TO MAKE-1.2B A REQUEST OF

ASK-.4A = TO MAKE-1.2B A REQUEST FOR

ASK-.5A = TO SET-1.7A AS A PRICE

ASPHALT-2.0A = TO COVER-1.1A OR IMPREGNATE-.2A WITH ASPHALT

ASPIRE-.1A = TO HAVE-1.8A A NOBLE DESIRE OR AMBITION

ASPIRE-.2A = TO RISE-1.7A ALOFT

ASSAIL-.0A = TO ATTACK-1.1B VIOLENTLY

ASSASSINATE-.0A = TO MURDER-2.1A BY SUDDEN OR SECRET ATTACK

ASSAY-1.2A = TO SUBJECT-3.3A (AS AN ORE OR DRUG) TO AN ASSAY

ASSAY-1.3A = TO MAKE-1.10A A CRITICAL ESTIMATE OF

ASSAY-1.4A = TO PROVE-.2A TO BE-.1B/+ OF A PARTICULAR NATURE BY MEANS OF AN ASSAY

ASSEMBLE-.1A = TO COLLECT-2.1B INTO ONE PLACE

ASSEMBLE-.2A = TO FIT-3.3A TOGETHER THE PARTS OF

ASSEMBLE-.3A = TO MEET-1.5B TOGETHER

ASSERT-.1A = TO STATE-2.1A POSITIVELY

ASSERT-.2A = TO MAINTAIN-.5A AGAINST OPPOSITION CLAIM 1.3B S MAINTAIN
ASSESS-.1A = TO FIX-1.5A THE RATE OR AMOUNT OF
ASSESS-.2A = TO IMPOSE-.1A (AS A TAX) AT A SPECIFIED RATE
ASSESS-.3A = TO EVALUATE-.0A FOR TAXATION
ASSEVERATE-.0A = TO ASSERT-.1A EARNESTLY
ASSIGN-.1A = TO TRANSFER-1.2A (PROPERTY) TO ANOTHER
ASSIGN-.2A = TO APPOINT-.2A TO A DUTY
ASSIMILATE-.1A = TO TAKE-1.15A\-UP UP AND ABSORB-.1A/& AS NOURISHMENT ; ALSO
ASSIMILATE-.1B = TO ABSORB-.1A INTO A CULTURAL TRADITION
ASSIMILATE-.3A = TO MAKE-1.1A OR BECOME SIMILAR
ASSOCIATE-1.1A = TO JOIN-.4A IN COMPANIONSHIP OR PARTNERSHIP
ASSOCIATE-1.2A = TO CONNECT-.1A IN THOUGHT
ASSORT-.1A = TO DISTRIBUTE-.3A INTO LIKE GROUPS
ASSUAGE-.1A = TO MAKE-1.1A (AS PAIN OR GRIEF) LESS
ASSUME-.1A = TO TAKE-1.9A\-UPON UPON ONESELF
ASSUME-.2A = TO PRETEND-.2A TO HAVE-1.1B/+
ASSUME-.3A = TO TAKE-1.7A AS GRANTED THOUGH NOT PROVED
ASSURE-.2A = TO GIVE-1.9A CONFIDENCE TO
ASSURE-.3A = TO STATE-2.1A CONFIDENTLY TO
ASSURE-.4A = TO MAKE-1.1A CERTAIN THE ATTAINMENT OF
ASTONISH-.0A = TO STRIKE-1.2A WITH SUDDEN WONDER
ASTOUND-.0A = TO FILL-1.5A WITH BEWILDERED WONDER
ATOMIZE-.0A = TO SUBJECT-3.3A TO ATOM BOMB ATTACK
ATONE-.1A = TO MAKE-1.1A AMENDS
ATROPHY-2.0A = TO CAUSE-2.0A OR UNDERGO-.2A ATROPHY
ATTACH-.1A = TO SEIZE-.1A LEGALLY IN ORDER TO FORCE-2.2A/+ PAYMENT OF A DEBT
ATTACH-.2A = TO BIND-.9A BY PERSONAL TIES
ATTACH-.4A = TO BE-.4A FASTENED OR CONNECTED
ATTACK-1.1A = TO SET-1.4A\-UPON UPON WITH FORCE OR WORDS
ATTACK-1.2A = TO SET-1.4A TO WORK-3.13A/! ON
ATTAIN-.2A = TO ARRIVE-.3A AT
ATTAINT-.0A = TO CONDEMN-.5A TO LOSS OF CIVIL RIGHTS
ATTEMPT-.0A = TO MAKE-1.10A AN EFFORT TOWARD
ATTEND-.1A = TO LOOK-1.5A AFTER
ATTEND-.2A = TO BE-.1B PRESENT WITH
ATTEND-.3A = TO BE-.1B PRESENT AT
ATTEND-.4A = TO PAY-1.5A ATTENTION
ATTEND-.5A = TO APPLY-.3A ONESELF
ATTEND-.6A = TO TAKE-1.9A CHARGE
ATTENUATE-.1A = TO MAKE-1.1A OR BECOME THIN
ATTEST-.1A = TO CERTIFY-.1A AS GENUINE BY SIGNING AS A WITNESS
ATTITUDINIZE-.0A = TO ASSUME-.1A AN AFFECTED MENTAL ATTITUDE
ATTRACT-.1A = TO DRAW-1.4A TO OR TOWARD ONESELF

ATTRACT-.1B = CAUSE-2.0A TO APPROACH-.1A/C
ATTRACT-.2A = TO DRAW-1.4A BY EMOTIONAL OR AESTHETIC APPEAL
ATTRIBUTE-2.1A = TO EXPLAIN-.2A AS TO CAUSE OR ORIGIN
ATTRIBUTE-2.2A = TO REGARD-2.6B AS A CHARACTERISTIC
ATTUNE-.0A = TO BRING-.2A INTO HARMONY
AUCTION-2.0A = TO SELL-.1A AT AUCTION
AUDIT-2.1A = TO MAKE-1.10A AN AUDIT OF
AUDIT-2.2A = TO ATTEND-.3A (A COURSE) WITHOUT EXPECTING FORMAL CREDIT
AUDITION-2.0A = TO GIVE-1.2A AN AUDITION TO
AUGUR-2.1A = TO FORETELL-.0A ESP. FROM OMENS
AUGUR-2.2A = TO GIVE-1.9A PROMISE OF
AUTHENTICATE-.0A = TO PROVE-.2A GENUINE
AUTHORIZE-.1A = TO GIVE-1.9A LEGAL POWER TO
AUTOGRAPH-2.0A = TO WRITE-.2A ONE'S SIGNATURE ON
AUTOMATE-.1A = TO OPERATE-.2A BY AUTOMATION
AUTOMATE-.2A = TO CONVERT-1.2A TO AUTOMATIC OPERATION
AUTOMATIZE-.0A = TO MAKE-1.1A AUTOMATIC
AVAIL-1.0A = TO BE-.1B OF USE OR ADVANTAGE
AVENGE-.0A = TO TAKE-1.18A VENGEANCE FOR
AVER-.0A = TO DECLARE-.2A POSITIVELY
AVERAGE-3.1A = TO BE-.2B AT OR COME-.7A TO AN AVERAGE
AVERAGE-3.2A = TO BE-.1B USUALLY
AVERAGE-3.3A = TO FIND-1.3A THE AVERAGE OF
AVERT-.1A = TO TURN-1.15A ASIDE OR AWAY
AVERT-.2A = TO WARD-2.0B OFF
AVERT-.2B = PREVENT-.1A THE OCCURRENCE OF
AVOID-.1A = TO KEEP-1.12A AWAY FROM
AVOID-.2A = TO PREVENT-.1A THE OCCURRENCE OF
AVOID-.3A = TO REFRAIN-1.0A\-FROM FROM
AVOUCH-.1A = TO DECLARE-.2A POSITIVELY
AVOW-.0A = TO DECLARE-.2B OPENLY
AWAIT-.0A = TO WAIT-1.1A\-FOR FOR
AWAKE-1.0A = TO BRING-.2A BACK TO CONSCIOUSNESS AFTER SLEEP
AWAKE-1.0B = WAKE-1.2A UP
AWARD-1.1A = TO GIVE-1.2A BY JUDICIAL DECISION
AWARD-1.2A = TO GIVE-1.2A IN RECOGNITION OF MERIT OR ACHIEVEMENT
AWE-2.0A = TO INSPIRE-.2B WITH AWE
BABBLE-.1A = TO UTTER-2.1A MEANINGLESS SOUNDS
BABBLE-.2A = TO TALK-1.1A FOOLISHLY OR EXCESSIVELY
BABY-2.0A = TO USE-2.2A WITH GREAT CARE OR CONSIDERATION
BABY-SIT-.0A = TO CARE-2.4A FOR CHILDREN USU. DURING A SHORT ABSENCE OF THE PARENTS
BACK-4.2A = TO GO-1.1B OR MAKE-1.11A GO BACKWARD OR IN REVERSE
BACK-4.3A = TO FURNISH-.1B WITH A BACK
BACK-4.3B = FORM-2.5B THE BACK OF

GLOSSARY OF SPECIAL TERMINOLOGY

AMBIGUITY: The condition in which one string of symbols has more than one meaning associated with it.

APPROPRIATENESS: The use of a linguistic unit in a way that a native speaker would not find exceptional.

ARC: A relation between two atoms, or an atom and an list in LISP, used esp. to refer to the immediate taxonomic link between two word-sense element nodes.

ATOM: Abbreviation for atomic symbol, in LISP, a symbol for which LISP has provided unique hash-coded internal storage and which may have arcs connecting it to other atoms.

BREADTH: The number of nodes descended from a single superordinate.

CLOSURE: A characteristic of sets and operations such that applying such an operation to a member of such a set results in a member of that set.

COMPONENTIAL ANALYSIS: The discovery of a minimal set of defining criteria through examination of the members of a clustered group of lexemes.

COMPOSITE NODE: A node representing combination of the felicitous and !/-scored descendants of both singular and plural forms of a word-sense element. In intent a composite node represents the merger of all the taxonomic information present in the dictionary without regard to syntactic idiosyncrasies.

CONSTITUENT: A delimitable linguistic part of a sentence. The linguistic parts of a constituent (if any) are themselves constituents.

CONTRAST SET: The set of nodes immediately descended from a single superordinate.

COVERT TAXON: An unlabeled node on a taxonomic tree.

DIRECT CONTRAST: The relation obtaining between two members of a contrast set.

DISAMBIGUATOR: A person whose task it was to determine by context the particular sense with which a relevant word was used within a definition.

ETHNOSEMANTICS: The study of semantic structures using speakers' own classification as descriptive criteria.

FOCAL TERM: A constituent of a textual dictionary definition which is a candidate for inclusion in the tree structure, based on the syntax and semantics of its use in a sense-definition.

FOLK CATEGORY: Categories (see GENUS) commonly found to exist in human language taxonomic structures.

GENUS: A category in a taxonomy whose criterion for membership lies outside the taxonomic structure itself. Superordinate of SPECIES, descendant of LIFE FORM.

HASH-CODING: A computational storage technique whereby strings are mapped to numbers pseudo-randomly distributed within a fixed range of integers and then stored at memory locations given by those integers.

HOMOGRAPH: A string of written characters which is identical to another such string with a different meaning or usage.

HOMOGRAPH INTEGER: A number assigned to separate homographs of a word within the Merriam-Webster dictionaries. Homograph integers are assigned to different parts of speech and to words of the same part of speech which have distinctly different etymologies.

HOMONYMY: The condition of a string of symbols (as a word) having two or more different meanings with an identical representation, e.g., 'plant' representing vegetable and factory.

HYPONYM: Linguistic term for DESCENDANT.

IDIOM: A word or expression whose meaning in common usage differs from the literal meaning of its parts.

INCLUSION: The proper subset relation expressed from superset to subset.

INFIX RELATIONSHIP: A binary relationship which is positioned between its arguments, e.g., 1 + 2 is an infix usage of the binary + relationship. Contrasts with prefix notation, e.g. (+ 1 2)

INFLECTION: The process of using morphemes in order to express grammatical information about a word, where part of speech remains the same.

INTERMEDIATE CATEGORY: A category (see GENUS) whose taxa often have no labels and which falls in the hierarchy between LIFE FORM and GENUS.

ISA: The transitive, subset relation between a main entry and a constituent in its definition, short for "is a type of".

KERNEL: The linguistic constituent in a clause to which all other constituents are subordinate.

LEXEME: A word or phrase whose meaning cannot be determined by the meaning of its parts.

LIFE FORM: A category (see GENUS) descendant from UNIQUE BEGINNER and superordinate to GENUS.

MACLISP: a dialect of the LISP programming language developed at M.I.T. under Project MAC.

MINIMAL SPANNING FOREST: A set of graph theoretic trees which minimally contain all the nodes in a set of all possible trees which could be enumerated containing those nodes. The shortest enumeration of a set of graph theoretic trees forming a graph theoretic "forest".

MPD: Acronym for the Merriam-Webster Pocket Dictionary, 1964-1974 edition.

NODE: (1) A discrete, identifiable segregate, usually labeled, which is arrayed in a taxonomic tree by the subset relation.
(2) A LISP atom connected by ARC(s) to one or more other atoms.

PATH: A set of taxonomic links from one node upward to the unique beginner.

PHYLUM: A major category (see GENUS) used in Linnaean taxonomic biology.

POLYSEMY: The condition of a word or other meaningful unit which has multiple, but related, senses.

PRIMITIVE SET: An interconnected set of noun word-sense entries which form the top of a noun tree.

RECURSION: A programming technique whereby the value of an operation is self-defined in terms of a series of evaluations of one function, with a single simple returned value at the last opportunity, e.g., n = (n-1) + 1 is a recursive operation yielding the value of adding 1 to any integer.

ROOT: The node in a graph theoretic tree from which all the other nodes descend, equivalent to "unique beginner" in ethnotaxonomics.

SALIENCE: A condition of one property of an entity which makes that property intuitively more important than others.

SEMANTIC TRIPLE NOTATION: A notation in which two terms and the relationship between them are expressed as a triple, e.g., (HASPART HAMMER HANDLE) or (HAMMER HASPART HANDLE).

SENSE-DEFINITION: The definition associated with a word-sense element, esp. as used in an ordinary dictionary.

SENSE-INTEGER: The designation of numbered subdivisions within the MPD definition of a particular main entry.

SENSE-MEANING: The meaning (i.e., definitional text) associated with a given sense-definition of a lexeme.

SENSE-NUMBER: A combination of homograph integer (if any), decimal point, sense integer, and subsense letter, used to uniquely identify individual meanings of words.

SIBLINGS: Fellow members of a contrast set. Also called "sisters".

SLASH-SCORE: The score assigned to a semantically important word whose use in a definition was not as a syntactic kernel and was noted by placing a slash (/) before the sense-number.

SPECIES: A category (see GENUS) descendant from GENUS and superordinate of VARIETY, esp. any category nearly or very nearly the most specific within a taxonomy.

SUBSENSE: A part of a sense definition divided from other parts by a boldface colon in the Merriam-Webster Pocket Dictionary.

SUPERORDINATE: The node in a taxonomic tree from which another node is descended.

SYNONYMY: The condition of a meaning which is equally associated with more than one symbol string.

TANGLED HIERARCHY: A transitive, acyclic, tree-like graph-theoretic structure which allows multiple upward links. A partially complete semi-lattice.

TAXON: A set which is a node of a taxonomic tree. Plural: TAXA.

TAXONOMIC LINK: The ISA or proper subset relation as manifest between a node and its immediate superordinate.

TAXONOMY: A set of sets ordered by the proper subset relation, whose members are labeled by lexemes. Loosely used to refer to a TANGLED HIERARCHY.

TERMINAL: A taxonomic node which has no descendants.

TOK: Abbreviation for TOKEN

TOKEN: A relationship between a node representing a concept and a node representing a usage of that concept in a semantic network. Earliest use in [QUILLIAN-68].

TRACE: An ordered set of nodes from a graph theoretic tree-structure which only contains the nodes which would be traversed between the root and some other node in the tree. For tangled hierarchies, a trace only contains one of the possible upward paths from any node.

UNIQUE BEGINNER: The only node in a taxonomic tree which is not a descendant of another; i.e., the top of the tree. Also a category (see GENUS).

USAGE NOTE: A sense-definition which refers not to a meaning but to a grammatical function. A usage note is often given in place of any other definition for certain function words such as 'a', 'the', 'be', and 'have'.

VARIETY: A category (see GENUS) descendant from SPECIES; it has no categories subordinate to it.

WORD-SENSE ELEMENT: A lexical unit which stands for a string of symbols, the main entry, sense, and subsense it represents.