

70-14,418

JERNIGAN, Mary Lois, 1921-
THE UTILITY OF PHONIC GENERALIZATIONS TO
SELECTED SCIENCE SERIES.

The University of Oklahoma, Ed.D., 1970
Education, psychology

University Microfilms, Inc., Ann Arbor, Michigan

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THE UNIVERSITY OF OKLAHOMA
GRADUATE COLLEGE

THE UTILITY OF PHONIC GENERALIZATIONS
TO SELECTED SCIENCE SERIES

A DISSERTATION
SUBMITTED TO THE GRADUATE COLLEGE
in partial fulfillment of the requirements for the
degree of
DOCTOR OF EDUCATION

BY
MARY LOIS JERNIGAN

1969

THE UTILITY OF PHONIC GENERALIZATIONS
TO SELECTED SCIENCE SERIES

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ACKNOWLEDGMENT

Deepest appreciation is expressed to Dr. Robert Curry, my chairman, for his assistance in directing, editing, and evaluating the manuscript for this study. I wish to express my gratitude to Dr. Gene Shepherd, Dr. Mary Clare Petty, and Dr. Albert Smouse for being members of my Advisory Committee and offering their aid and assistance. A special thanks to my beloved husband, Arthur O. Jernigan, Jr., because without his patience and understanding this study could not have been possible. Finally, I wish to thank my family, Mary, James, John, Cal, and Linda, for their faith and encouragement which made a dream come true.

Dedicated to my granddaughter Kimberly Lyn

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THE UTILITY OF PHONIC GENERALIZATIONS
TO SELECTED SCIENCE SERIES

CHAPTER I

THE STUDY

Introduction and Background

The first Harvard Report on reading examined the collegiate preparation of prospective teachers of reading. One of the most common deficiencies noted in student teachers was found to be a lack of understanding of phonetic principles.¹ Therefore, it was recommended: "that college instructors take greater responsibility in making certain that their students have mastered the principles of phonetic and structural analysis."²

The second Harvard Report, The First R, created more interest toward the teaching of phonics and structural analysis skills at the elementary school level. The authors of this study recommended "that continued emphasis be placed on helping children develop proficiency in word recognition through

¹Mary C. Austin and others, The Torch Lighters (Cambridge, Mass.: Harvard University Press, 1961), p. 82.

²Ibid., p. 146.

the use of meaning clues, visual analysis of word forms, sounding approaches, and the dictionary."³

Since that time, limited studies have reported findings that have analyzed the extent to which specific phonic and structural analysis generalizations are applicable in the materials used to teach students.

Word analysis skills are usually considered to be two different but related skills: phonics and structural analysis. According to Curry and Rigby "they are related because in many reading situations it becomes necessary to divide the word into its structural elements before the phonics principles can be applied."⁴ "Independence in reading does not seem possible without phonetic and structural analysis skills. The ultimate goal is self-direction in the learning process."⁵

The question concerning phonics has been one of great debate. Smith stated that most teachers begin to teach phonics functionally as needed and this phonics teaching may continue even into high school.⁶ Hildreth advises that "phonics is

³Mary C. Austin and Coleman Morrison, The First R: The Harvard Report on Reading in Elementary Schools (New York: Macmillan Co., 1963), p. 221.

⁴Robert L. Curry and Toby W. Rigby, Reading Independence Through Word Analysis (New York: Charles E. Merrill Pub., 1969), p. 5.

⁵Emerald V. Dechant, Improving the Teaching of Reading (Englewood Cliffs, N.J.: Prentice-Hall, 1964), p. 194.

⁶Nila Banton Smith, "Phonics and Word Method: Origin and Development," Education Digest (Oct., 1958), 40.

essentially a system of generalizing about the sounds contained in different words, a process requiring the recognition of familiar elements in new settings."⁷ A child's ability to recite phonic generalizations is no assurance that he has the ability to apply these generalizations in reading situations.⁸ The generalization is something that must come from the learner as the result of experiences (guided, self-directed, and vicarious) he has had with words.⁹ "Before the child can generalize about sounds in words, he needs to know a number of words which illustrate the generalization."¹⁰

Until the forties, the concept of teaching reading in the content fields had not been formulated. Since that time, there have been few comparative studies to relate the superiority of reading in a subject area to reading in a developmental program. The paucity of studies was particularly evident in the science content area. Studies which have been reported were more concerned with reading in the total school program.¹¹

⁷Gertrude Hildreth, "New Methods for Old in Teaching Phonics," Elementary School Journal, LVII, 436.

⁸Arthur W. Heilman, Phonics in Proper Perspective (Columbus, Ohio: Charles E. Merrill Books, Inc., 1964), p. 23.

⁹Emery P. Bliesmer, "Sequence of Reading Skills in Reading: Is There Really One?" Current Issues in Reading (Newark: International Reading Association, 1969), p. 125.

¹⁰Hildreth, op. cit., 436.

¹¹Leonard Courtney, "Are We Really Improving Reading in the Content Fields?" Current Issues in Reading (Newark: International Reading Association, 1969), p. 18.

Rammal reported a study in which the Flesch readability formula was applied to analyze the reading level of science textbooks. The results of this study indicated that a great variation of readability existed between textbooks designed for the same field of science.¹²

Courtney reported a study by Cooper in which he found science-reading ability to be equally related to general vocabulary, English vocabulary, social studies vocabulary, and science vocabulary with correlation coefficients ranging from .66 to .85. Conclusions reached were that reading ability appears largely to be an expression of a student's total intellectual ability.¹³

Need for the Study

The studies which have examined the utility of the forty-five phonic generalizations taught in four basal reader programs, showed that fewer than one-half of the generalizations have a utility value high enough to recommend that they be taught. Additional studies need to be conducted investigating the utility of these generalizations, especially as applied to the vocabularies of the different content fields.

The renewed interest in science and the emphasis on reading to learn makes the reading of science even more important.

¹²Joseph A. Rammel, "An Objective Study for the Bases of Selecting an Eighth Grade General Science Text Book," Science Education, XLVII, April, 1963, 259.

¹³Courtney, op. cit., p. 27.

Statement of the Problem

This study was to determine the utility of specific phonic generalizations to vocabularies in science textbooks. The sub-problems were: (1) What is the percentage of utility of each phonic generalization to the vocabulary taken from science textbooks in grades one through six? (2) Which of the forty-five phonic generalizations are required to identify words designated as science words? and (3) Are there differences in the utility of the generalizations to science series and reading series.

Basic Assumptions

The basic assumptions of the study were as follows:

1. That the forty-five phonic generalizations identified by Clymer in his study were representative of the phonic generalizations that may be required in reading the elementary science series.¹⁴
2. That the Clymer and Bailey studies of phonic generalizations utilized in selected reading programs offer a suitable basis for comparison of phonic generalizations applicable to elementary school science series.¹⁵

¹⁴Theodore Clymer, "The Utility of Phonic Generalizations in the Primary Grades," Reading Teacher, XVI (January, 1963), 252-258.

¹⁵Ibid.; Mildred Hart Bailey, "The Utility of Phonic Generalizations in Grades One Through Six," The Reading Teacher, XX (February, 1967), 413-418.

3. That adequate "selection criteria" can be established for selecting representative science textbooks for analysis in the study.

Definition of Terms

The following operational definitions were relevant to this study:

Utility: Utility refers to the extent that use of phonic generalizations results in correct pronunciation of unrecognized words.

Phonic generalizations: Phonic generalizations refer to the application of phonetic elements, word structure, and syllabication principles to determine the sound associated with letters and combination of letters.

Science words: Science words are key concept words that have the same meaning to every other scientist.

Delimitations of the Study

The delimitations of the study were:

1. The study was limited to an analysis of three elementary science series.

2. The study was limited to the utilization of Clymer's forty-five phonic generalizations.¹⁶

3. The study was limited by the exclusion of abbreviations, contractions, foreign words, proper adjectives, and proper words.

¹⁶Clymer, op. cit.

4. The study was limited to Webster's New Collegiate Dictionary, 1961 edition, as the authority for establishing pronunciation, accentuation, and syllabic-division for all words.¹⁷

Materials Used in the Study

Necessary to this investigation were the Clymer Study,¹⁸ the Bailey Study,¹⁹ Webster's New Collegiate Dictionary,²⁰ and the science textbooks, grades one through six, of the following series:

Paul F. Brandwein, and others. Concepts in Science. Chicago: Harcourt, Brace, and World Inc., 1966.

John G. Navarra, Joseph Zafforoni, and others. Today's Basic Science Series. Evanston, Ill.: Harper, Row, and Co., 1967.

H. Schneider and others. Heath Science Series. Boston: D. C. Heath and Co., 1965.

Review of Related Literature

There has been a revival of interest in the use of phonics in the reading program. Most educators agree that phonics generalizations should be taught, but they are unable to identify those generalizations which are of most value.

¹⁷ Webster's New Collegiate Dictionary (Springfield, Mass.: G. and C. Merriam Company, Publishers, 1961).

¹⁸ Clymer, op. cit.

¹⁹ Bailey, op. cit.

²⁰ Webster's New Collegiate Dictionary, op. cit.

Cordts investigated the vocabularies of forty-two primary readers. A total of 2,716 words were analyzed according to their phonetic elements. The words were classified as phonetic, phonic, or as being irregular. A phonetic word was one in which each letter represented a particular sound assigned to that letter. Of 1,600 one-syllable words, 224 phonetic words were found. The words were classified as being phonic by their vowel placement. There were 1,066 phonic words which were subdivided into three groups. Group one, words in which a single vowel had the sound assigned to it, contained 297 words. Group two, words in which there were combinations of vowels which had the sound assigned to them, contained 284 words. Group three, words to which no vowel letter to vowel sounds were made, contained 485 words. The final category of irregular words were those words which did not meet the criterion for classification as a phonetic or phonic word. There were 294 words in this classification. Of the 1,600 one-syllable words which were classified, there were only 805 words, or about one-half of the words, which could be taught according to phonic principles.²¹

In 1929 Horn used Cordts earlier study as a basis for the investigation of the different sound-letter association for the letter "a" alone. Horn found forty-seven different

²¹Anna D. Cordts, "An Analysis and Classification of the Sounds of English Words in a Primary Reading Vocabulary," (unpublished Ph.D. dissertation, State University of Iowa, 1925.

sound-letter associations for the letter "a" in words occurring in First, Second, and Third grade readers.²²

In 1952 Oaks summarized results from studies which reported on the use of the vowel in primary vocabularies. A great diversity of uses of vowels was found which indicated the need for an increased awareness, on the part of the teacher, of the wide range of sounds which primary children were expected to hear and associate with printed symbols.²³

Ten years later, Burrows and Lourie tested the validity of the "two-vowel-together rule." A list of 1,728 words, which contained adjacent vowels, was taken from the Rinsland list. There were 668 words, of the 1,728 word list, which followed the two-vowel rule.²⁴

In 1963 Clymer selected forty-five specific phonic generalizations, which were found in four basal reading series, and investigated their utility. A list was made of the words introduced in the four basic series from which the generalizations were drawn, plus the words from the Gates Reading Vocabulary for the Primary Grades. The present investigation

²²Earnest Horn, "The Child's Early Experience with the Letter 'a,'" Journal of Educational Psychology, XX (1929), 161-168.

²³Ruth E. Oaks, "A Study of the Vowel Situation in a Primary Vocabulary," Education, LXXII, (May, 1952), 604-617.

²⁴Alvina Treut Burrows and Zyra Lourie, "When 'Two Vowels Go Walking,'" The Reading Teacher, (November, 1963), 79-82.

utilized the following contributions from the Clymer study:²⁵

1. The forty-five phonic generalizations which are recorded in Appendix A of this study.

2. The criteria for degree of utility of each generalization.²⁶

Bailey replicated Clymer's study to determine the utility of the selected phonic generalizations as applied to words taken from basal readers for grades one through six. This study reported that there were only six generalizations applicable to large numbers of words which had few exceptions. Eight generalizations were found to possess a low percentage of utility and these eight should be reconsidered by persons concerned with reading instruction.²⁷

In 1969 Davis²⁸ replicated Clymer's study to determine the applicability of phonic generalizations to selected spelling programs. Selection was made of six spelling series, levels two through six. A list of 5,000 spelling words was compiled, against which the phonic generalizations were tested for their applicability. This study reported twenty-six generalizations met the criteria of applicability.

²⁵Clymer, op. cit.

²⁶Ibid.

²⁷Bailey, op. cit.

²⁸Lillie Smith Davis, "The Applicability of Phonic Generalizations to Selected Spelling Programs," (unpublished Ed.D. dissertation, University of Oklahoma, 1969.)

Emans replicated Clymer's study to apply the forty-five phonic generalizations to a random sample of 10 per cent of the words (1,944 words) beyond the primary level (grade four in The Teacher's Word Book of 30,000 Words by Thorndike and Lorge).²⁹ The important findings revealed that some generalizations were more useful above the primary grades than in the primary grades. Emans reported thirteen generalizations which were found to be useful in both the primary and above the primary levels.³⁰

Burmeister compared seven recent studies which scientifically investigated the value of many commonly found phonic, structural analysis, and accent generalizations. She concluded that certain generalizations, commonly taught, appear to have limited usefulness. For generalizations to be especially useful and clear it is important to differentiate between single and double vowels. When two vowels are together, they usually compose a phoneme.³¹

Summary

The revival of interest in the utility of phonic generalizations has been directed toward the basal reading program

²⁹E. L. Thorndike and I. Lorge, The Teacher's Word Book of 30,000 Words (New York: Teachers College, 1944).

³⁰Robert Emans, "The Usefulness of Phonic Generalization Above the Primary Grades," The Reading Teacher, (February, 1967), 419-425.

³¹Lou E. Burmeister, "The Usefulness of Phonic Generalizations," The Reading Teacher, XXI, (January, 1968), 349-356.

in the elementary school. Because reading in the basal reader is only one phase of the total reading program, the skills developed here must be transferable to other areas, namely the content field.

The results of studies with vocabularies found in the basal reading series indicate a need for further investigations. The question posed is, What is the utility of these specific forty-five phonic generalizations when applied to the vocabulary found in science textbooks in grades one through six?

CHAPTER II

PROCEDURES

This research extended the Clymer³² and Bailey³³ studies of the utility of forty-five phonic generalizations in reading programs to science programs. The list of generalizations and procedures developed by Clymer³⁴ were utilized in this study.

Selection of Generalizations

The generalizations, procedures, and criteria utilized in the study were those used by Clymer in his study of the utility of phonic generalizations in the primary reading program. The generalizations were selected from the teachers' manuals and consisted of five general types: (1) vowels, (2) consonants, (3) endings, (4) syllabication, and (5) miscellaneous relationships. The list of generalizations is recorded in Appendix A.

³²Clymer, op. cit.

³³Bailey, op. cit.

³⁴Clymer, op. cit.

Selection of Textbooks

The science series to be analyzed were selected from those listed in Textbooks in Print.³⁵ The selection was made on the basis:

1. The series encompassed grades one through six.
2. The series were published since 1965.
3. The series were frequently used. Judgment was made after consulting with Dr. John Renner, who identified those selected as books most frequently used.

The textbooks selected were:

Paul F. Brandwein, and others. Concepts in Science.
Chicago: Harcourt, Brace, and World Inc., 1966.

John G. Navarra, Joseph Zafforoni, and others.
Today's Basic Science Series. Evanston, Ill.:
Harper, Row, and Co., 1967.

H. Schneider and others. Heath Science Series.
Boston: D. C. Heath and Co., 1965.

Compilation of Vocabulary

The words were identified in three science textbook series, grades one through six. All words were recorded but the present study was limited by the exclusion of abbreviations, contracted forms, place names, proper names, proper adjectives, and words written with the apostrophe. Words connected by a hyphen were treated as compound words.

³⁵Textbooks in Print (New York: R. R. Bowker Company, 1966, 1967).

One exception to the delimitations was the inclusion of proper names in the list of key science concept words.

Each word was written on a card and then arranged alphabetically. On each card the following information was noted: the series, and whether it was considered to have a special scientific meaning. From this information a list of vocabulary words was organized.

Compilation of Science Words

The authors indicated, in each book, the words they considered to have special scientific meaning. This information was noted on the individual vocabulary cards. From this information, a separate science word list was compiled.

Recording of Word Pronunciations

An individual composite word list was made for each series. A separate list was compiled of words considered to have special scientific meanings. Webster's New Collegiate Dictionary,³⁶ 1961 edition, was chosen as the dictionary of authority for the study in order to analyze words from an orthographic rather than an auditory standpoint. The phonetic respelling, accentuation, and syllabic division of each word was recorded.

³⁶Webster's New Collegiate Dictionary, op. cit.

Determination of Utility of the Phonic Generalizations

The utility of each generalization was determined by testing the generalization against the respelling, accentuation, and syllabic division for each word. The applications and exceptions were noted. A per cent of utility was computed for each generalization by dividing the number of words pronounced as the generalization claimed by the total number of words to which the generalization could be expected to apply.

Criteria for Degree of Utility

Clymer set two criteria to constitute a reasonable degree of application. The two criteria were:

1. The word list must contain a minimum of twenty words to which the generalization might apply.
2. The second criterion was a per cent of utility of at least seventy-five. The per cent of utility was determined by dividing the total number of words pronounced as the generalization claimed by the total number of words to which the generalization could be expected to apply.

Summary

A group of approximately 12,000 words were taken from science textbooks and arranged in a list. Phonetic respelling for each word was recorded. The forty-five phonic generalizations were applied to the words and a per cent of utility

was computed for each generalization. These incidents were reported in appropriate tables in Chapter III.

CHAPTER III

FINDINGS

Utility of Generalizations to Science Textbooks

A list of approximately 12,000 words was compiled from three science textbook series, grades one through six. Webster's New Collegiate Dictionary³⁷ was used as the authority for the phonetic respelling, accentuation, and syllabic division of each word. The generalizations (Appendix A) were tested against the respelling, accentuation, and syllabic division for each word. The applications and exceptions for each generalization were noted. Two criteria were set to constitute a reasonable degree of application. The two criteria were:

1. That there should be an incident count of at least 20 to which the generalization might apply.
2. A seventy-five per cent utility should be attained. The utility was determined by dividing the total number of words, pronounced as the generalization claimed, by the total number of words to which the generalization could be expected to apply. The data were recorded in Table 1.

³⁷Ibid.

An inspection of the data (Table 1) in accordance with the established criteria, indicated that twenty-eight generalizations (3, 4, 5, 8, 10, 11, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 35, 36, 38, 40, 41, 44, 45) were found useful.

Of these generalizations which met the criteria, six generalizations (20, 21, 26, 27, 38, 29) were concerned with pronunciation where two consonants were together. Nine generalizations (30, 31, 32, 35, 36, 38, 40, 41, 45) were found to be useful for pronunciation by the use of syllabic division and accent placement.

Nine generalizations (20, 24, 25, 26, 27, 29, 35, 36, 41) had a utility of 100 per cent established. Three of this group of generalizations (26, 27, 35) had an incident count below 50. Five generalizations (20, 25, 29, 36, 41) had an incident count between 80 and 375. Generalization 23 had an incident count of 844.

Seven generalizations (1, 2, 5, 28, 30, 38, 39) had a high incident count of 1,000 or greater. Four generalizations (5, 28, 30, 38) met the two criteria established for this study. Generalization 30 had the highest number of incidents (4,076) with a utility level of 77 per cent.

A report of the findings for each generalization is presented in the following sections.

1. Generalization one, which was concerned with the principle of two adjacent vowels, had an incident count of

TABLE 1

SUMMARY OF UTILITY OF GENERALIZATIONS TO SCIENCE TEXTBOOKS^a

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
1. When there are two vowels side by side, the long sound of the first one is heard and the second is usually silent.	3149	1078(bean)	2071(air)	34
2. When a vowel is in the middle of a one-syllable word, the vowel is short.	1288	827	461	64
middle letter	344	260(big)	84(spark)	76
one of the middle two letters in a word of four letters	482	295(bend)	187(calf)	61
one vowel <u>within</u> a word of more than four letters	462	272(string)	190(minds)	61

^aThis table presents the composite findings for each of the forty-five recommended phonic generalizations. The number order of the generalizations in this table is identical with that in the tables shown in the Clymer and Bailey studies.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
*3. If the only vowel is at the end of a word, the letter usually stands for a long sound.	27	22(so)	5(the)	81
*4. When there are two vowels, one of which is final <u>e</u> , the first vowel is long and the <u>e</u> is silent.	444	337(coke)	107(sense)	76
*5. The <u>r</u> gives the preceding vowel a sound that is neither long nor short.	3105	2769(charge)	336(sterilize)	89
6. The first vowel is usually long and the second silent in the digraphs <u>ai</u> , <u>ea</u> , <u>oa</u> , and <u>ui</u> .	998	634	364	64
ai	237	176(mail)	61(chair)	74
ea	581	334(leak)	247(break)	57
oa	120	107(coat)	13(broad)	89
ui	60	17(suit)	43(rebuilt)	28

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
7. In the phonogram <u>ie</u> , the <u>i</u> is silent and the <u>e</u> has a long sound.	230	47(brief)	183(tie)	20
*8. Words having double <u>e</u> usually have the long <u>e</u> sound.	298	279(beet)	19(beer)	94
9. When words end with silent <u>e</u> , the preceding <u>a</u> or <u>i</u> is long.	668	492(cake)	176(care)	74
*10. In <u>ay</u> the <u>y</u> is silent and gives <u>a</u> its long sound.	104	100(day)	4(kayak)	96
*11. When the letter <u>i</u> is followed by the letters <u>gh</u> , the <u>i</u> usually stands for its long sound and the <u>gh</u> is silent.	123	99(thigh)	24(eight)	81
12. When <u>a</u> follows <u>w</u> in a word, it usually has the sound <u>a</u> as in <u>was</u> .	190	41(swam)	149(warm)	22
13. When <u>e</u> is followed by <u>w</u> , the vowel sound is the same as represented by <u>oo</u> .	58	29(chew)	29(newer)	50

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
14. The two letters <u>ow</u> make the long <u>o</u> sound.	226	138(sow)	88(plow)	61
15. <u>W</u> is sometimes a vowel and follows the vowel digraph rule.	250	138(grower)	112(few)	55
*16. When <u>y</u> is the final letter in a word, it usually has a vowel sound.	735	668(briefly)	67(pay)	91
17. When <u>y</u> is used as a vowel in words, it sometimes has the sound of long <u>i</u> .	915	183(hybrid)	732(cloudy)	20
18. The letter <u>a</u> has the same sound (o) when followed by <u>l</u> , <u>w</u> , and <u>u</u> .	649	205(talk)	444(algae)	32
*19. When <u>a</u> is followed by <u>r</u> and final <u>e</u> , we expect to hear the sound heard in <u>care</u> .	22	20(hare)	2(are)	91
*20. When <u>c</u> and <u>h</u> are next to each other, they make only one sound.	351	351(ditches)	0	100

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
*21. <u>Ch</u> is usually pronounced as it is in <u>kitchen</u> , <u>catch</u> , and <u>chair</u> , not like <u>sh</u> .	357	351(cnurches)	6(machine)	98
*22. When <u>c</u> is followed by <u>e</u> or <u>i</u> , the sound of <u>s</u> is likely to be heard.	494	478(chance)	16(ocean)	97
*23. When the letter <u>c</u> is followed by <u>o</u> or <u>a</u> , the sound of <u>k</u> is likely to be heard.	844	844(cone)	0	100
*24. The letter <u>g</u> often has a sound similar to that of <u>j</u> in <u>jump</u> when it precedes the letter <u>i</u> or <u>e</u> .	353	307(ginger)	46(girder)	87
*25. When <u>ght</u> is seen in a word, <u>gh</u> is silent.	120	120(insight)	0	100
*26. When a word begins with <u>kn</u> , the <u>k</u> is silent.	27	27(know)	0	100
*27. When a word begins with <u>wr</u> , the <u>w</u> is silent.	28	28(wrist)	0	100

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
*28. When two of the same consonants are side by side only one is heard.	1571	1505(buffer)	66(suggested)	96
*29. When a word ends in <u>ck</u> , it has the same last sound as in <u>look</u> .	84	84(flock)	0	100
*30. In most two-syllable words, the first syllable is accented.	4076	3141(carbon)	935(depend)	77
*31. If <u>a</u> , <u>in</u> , <u>re</u> , <u>ex</u> , <u>de</u> , or <u>be</u> is the first syllable in a word, it is usually unaccented.	1054	861(acetic)	193(area)	82
*32. In most two-syllable words that end in a consonant followed by <u>y</u> , the first syllable is accented and the last is unaccented.	264	259(dimly)	5(supply)	98
33. One vowel letter in an accented syllable has its short sound.	5661	3570(akin)	2091(basin)	63

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
34. When <u>y</u> or <u>ey</u> is seen in the last syllable that is not accented, the long sound of <u>e</u> is heard.	558	0	558(baby)	0
*35. When <u>ture</u> is the final syllable in a word, it is unaccented.	38	38(culture)	0	100
*36. When <u>tion</u> is the final syllable in a word it is unaccented.	245	245(detection)	0	100
37. In many two- and three-syllable words, the final <u>e</u> lengthens the vowel in the last syllable.	733	454(before)	279(become)	62
*38. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.	2751	2085(cupful)	666(decrease)	76

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
39. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.	2173	1143(adult)	1030(navigate)	53
*40. If the last syllable of a word ends in <u>le</u> , the consonant preceding the <u>le</u> usually begins the last syllable.	212	158(crumble)	54(bottle)	75
*41. When the first vowel element in a word is followed by <u>th</u> , <u>ch</u> , or <u>sh</u> , these symbols are not broken when the word is divided into syllables and may go with either the first or second syllable.	284	284(rushes)	0	100
42. In a word of more than one syllable, the letter <u>v</u> usually goes with the preceding vowel to form a syllable.	406	249(deliver)	157(over)	61

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 1--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
43. When a word has only one vowel letter, the vowel sound is likely to be short.	1331	915(hunt)	416(kind)	69
*44. When there is one <u>e</u> in a word that ends in a consonant, the <u>e</u> usually has a short sound.	179	155(men)	24(blew)	87
*45. When the last syllable is the sound <u>r</u> , it is unaccented.	783	766(brother)	17(transfer)	98

*Generalizations marked with an asterisk were found "useful" according to the criteria.

3,149. There were 1,078 incidents conforming to this generalization and 2,071 exceptions. A utility of 34 per cent was established. The number of incidents found for generalization one was a composite of incidents which included those found for generalizations six and eight. The overall utility of 34 per cent for generalization one was primarily supported by the special application of generalizations six and eight. When the incidents, which were identified by the special application of the digraph rules for generalization six, were removed from those incidents conforming with generalization one, the utility dropped from 34 per cent to 21 per cent. Further, the removal of those incidents applicable to generalization eight lowered the utility from 21 per cent to 9 per cent.

2. Generalization two, which was concerned with the placement of one vowel within a one-syllable word, had an incident count of 1,288. There were 827 incidents conforming to this generalization and 461 exceptions. A utility of 64 per cent was established.

(a) A subdivision of generalization two, which was concerned with vowel placement as the middle letter, had an incident count of 344. There were 260 incidents conforming to this generalization and 84 exceptions. A utility of 76 per cent was established.

(b) A subdivision of generalization two, which was concerned with a vowel letter as one of the middle two letters in a word of four letters, had an incident count of 482. There were 295 incidents conforming to this generalization and 187 exceptions. A utility of 61 per cent was established.

(c) A subdivision of generalization two, concerned with one vowel within a word of more than four letters, had an incident count of 462. There were 272 incidents conforming with this generalization and 190 exceptions. A utility of 61 per cent was established.

3. Generalization three, which was concerned with one vowel placed at the end of a word, had an incident count of 27. There were 22 incidents conforming with this generalization and 5 exceptions. A utility of 81 per cent was established.

4. Generalization four, which was concerned with two vowels one of which was a final e, had an incident count of 444. There were 337 incidents conforming with this generalization and 107 exceptions. A utility of 76 per cent was established.

5. Generalization five, which was concerned with a single vowel followed by the letter r, had an incident count of 3,105. There were 2,769 incidents conforming with this

generalization and 336 exceptions. A utility level of 89 per cent was established.

6. Generalization six, which was concerned with digraphs (ai, ea, oa, ui) had an incident count of 998. There were 634 incidents conforming with this generalization and 364 exceptions. A utility of 64 per cent was established.

(a) The subdivision ai of generalization six had an incident count of 237. There were 176 incidents conforming with this generalization and 61 exceptions. A utility of 74 per cent was established.

(b) The subdivision ea of generalization six had an incident count of 581. There were 334 incidents conforming with this generalization and 247 exceptions. A utility of 57 per cent was established.

(c) The subdivision oa of generalization six had an incident count of 120. There were 107 incidents conforming with this generalization and 13 exceptions. A utility level of 89 per cent was established.

(d) The subdivision ui of generalization six had an incident count of 60. There were 17 incidents conforming with this generalization and 43 exceptions. A utility of 28 per cent was established.

7. Generalization seven, which was concerned with the phonogram ie, had an incident count of 230. There were 47 incidents conforming with this generalization and 183 exceptions. A utility of 20 per cent was established.

8. Generalization eight, which was concerned with words having the double e, had an incident count of 298. There were 279 incidents which conformed with this generalization and 19 exceptions. A utility of 94 per cent was established.

9. Generalization nine, which was concerned with words which end with a silent e and how this affects the preceding a or i, had an incident count of 668. There were 492 incidents conforming to this generalization and 176 exceptions. A utility of 74 per cent was established. The incident count applicable to generalization nine was included in the incident count for generalization four, when the only vowel preceding the silent e was an a or an i. The incident count applicable to generalization nine was also included in the incident count for generalization thirty-seven, when the word was of two or more syllables and the vowel preceding the silent e was an a or an i.

10. Generalization ten, which was concerned with the ay combination, had an incident count of 104. There were 100 incidents conforming with this generalization and 4 exceptions. A utility of 96 per cent was established.

11. Generalization eleven, which was concerned with the letter i followed by gh, had an incident count of 123. There were 99 incidents conforming with this generalization and 24 exceptions. A utility of 81 per cent was established.

12. Generalization twelve, which was concerned with the letter w followed by the letter a, had an incident count of 190. There were 41 incidents conforming with this generalization and 149 exceptions. A utility of 22 per cent was established.

13. Generalization thirteen, which was concerned with the letter e followed by w, had an incident count of 58. There were 29 incidents conforming with this generalization and 29 exceptions. A utility of 50 per cent was established.

14. Generalization fourteen, which was concerned with the letter o followed by the letter w, had an incident count of 226. There were 138 incidents conforming with this generalization and 88 exceptions. A utility of 61 per cent was established.

15. Generalization fifteen, which was concerned with the letter w used as a digraph, had an incident count of 248. There were 136 incidents conforming with this generalization and 112 exceptions. A utility of 55 per cent was established.

16. Generalization sixteen, which was concerned with the letter y as the final letter in a word, had an incident count of 735. There were 668 incidents conforming with this generalization and 67 exceptions. A utility of 91 per cent was established. This utility was established even though exceptions were automatically established when the letters ay (generalization ten) were the final letters in a word.

Additional exceptions were established when generalization seventeen was applicable and the final y had the long i sound.

17. Generalization seventeen, which was concerned with the use of y as a vowel, had an incident count of 915. There were 183 incidents conforming with this generalization and 732 exceptions. A utility of 20 per cent was established.

18. Generalization eighteen, which was concerned with the letter a in combination with letters l, w, or u had an incident count of 649. There were 205 incidents conforming with this generalization and 444 exceptions. A utility of 32 per cent was established.

19. Generalization nineteen, which was concerned with the letter a followed by the letter r and final e, had an incident count of 22. There were 20 incidents conforming with this generalization and 2 exceptions. A utility level of 91 per cent was established. This generalization acted to make automatic exceptions when the incidents fall within generalizations four, nine, and thirty-seven.

20. Generalization twenty, which was concerned with pronunciation of the letters c and h when used together, had an incident count of 351. There were 351 incidents conforming with this generalization and zero exceptions. A utility level of 100 per cent was established.

21. Generalization twenty-one, which was concerned with the pronunciation of the letters ch, had an incident count of 357. There were 351 incidents conforming with this

generalization and 6 exceptions. A utility level of 98 per cent was established.

22. Generalization twenty-two, which was concerned with the letter c followed by the letter e or i, had an incident count of 494. There were 478 incidents conforming with this generalization and 16 exceptions. A utility level of 97 per cent was established.

23. Generalization twenty-three, which was concerned with the letter c followed by the letter o or a, had an incident count of 844. There were 844 incidents conforming with this generalization and zero exceptions. A utility level of 100 per cent was established.

24. Generalization twenty-four, which was concerned with the sound of the letter g when followed by the letter i or e, had an incident count of 353. There were 307 incidents conforming with this generalization and 46 exceptions. A utility level of 87 per cent was established.

25. Generalization twenty-five, which was concerned with the letters ght combined, had an incident count of 120. There were 120 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

26. Generalization twenty-six, which was concerned with words which begin with the letters kn, had an incident count of 27. There were 27 incidents conforming with this generalization and zero exceptions. A utility level of 100 per cent was established.

27. Generalization twenty-seven, which was concerned with words which begin with the letters wr, had an incident count of 28. There were 28 incidents conforming with this generalization and zero exceptions. A utility level of 100 per cent was established.

28. Generalization twenty-eight, which was concerned with the combination of two like consonants, had an incident count of 1,571. There were 1,505 incidents conforming with this generalization and 66 exceptions. A utility of 96 per cent was established.

29. Generalization twenty-nine, which was concerned with the consonants ck at the end of a word, had an incident count of 84. There were 84 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

30. Generalization thirty, which was concerned with the placement of the accent in two-syllable words, had an incident count of 4,076. There were 3,141 incidents conforming with this generalization and 935 exceptions. A utility of 77 per cent was established.

31. Generalization thirty-one, which was concerned with the accent of the first syllable when the letters a, in, re, ex, de, or be were the first syllable. There was an incident count of 1,054. There were 861 incidents conforming with this generalization and 193 exceptions. A utility of 82 per cent was established.

32. Generalization thirty-two, which was concerned with two-syllable words which end with a consonant followed by y, had an incident count of 264. There were 259 incidents conforming with this generalization with 5 exceptions. A utility of 98 per cent was established.

33. Generalization thirty-three, which was concerned with the sound of one vowel letter in an accented syllable, had an incident count of 5,661. There were 3,570 incidents conforming with this generalization with 2,091 exceptions. A utility of 63 per cent was established.

34. Generalization thirty-four, which was concerned with the letters y or ey in the last syllable, had an incident count of 558. There were zero incidents conforming with this generalization and 558 exceptions. A utility of zero per cent was established.

35. Generalization thirty-five, which was concerned with the letters ture in the final syllable, had an incident count of 38. There were 38 incidents conforming with this generalization with zero exceptions. A utility of 100 per cent was established.

36. Generalization thirty-six, which was concerned with the letters tion in the final syllable, had an incident count of 245. There were 245 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

37. Generalization thirty-seven, which was concerned with the final e in two- and three-syllable words, had an incident count of 733. There were 454 incidents conforming with this generalization and 279 exceptions. A utility of 62 per cent was established.

38. Generalization thirty-eight, which was concerned with two consonants following the first vowel in a word, had an incident count of 2,751. There were 2,085 incidents conforming with this generalization and 666 exceptions. A utility of 76 per cent was established.

39. Generalization thirty-nine, which was concerned with a single consonant following the first vowel sound, had an incident count of 2,173. There were 1,143 incidents conforming with this generalization and 1,030 exceptions. A utility of 53 per cent was established.

40. Generalization forty, which was concerned with the last syllable of a word ending with the letters le, had an incident count of 212. There were 158 incidents conforming with this generalization and 54 exceptions. A utility of 75 per cent was established.

41. Generalization forty-one, which was concerned with the consonants th, ch, or sh following the first vowel sound, had an incident count of 284. There were 284 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

42. Generalization forty-two, which was concerned with words of more than one syllable and the letter v going with the preceding vowel, had an incident count of 406. There were 249 incidents conforming with this generalization and 157 exceptions. A utility of 61 per cent was established.

43. Generalization forty-three, which was concerned with words which had only one vowel, had an incident count of 1,331. There were 915 incidents conforming with this generalization and 416 exceptions. A utility of 69 per cent was established. The specialized application of this generalization, which was contained in generalization forty-four, was concerned with the sound of the letter e within a word.

44. Generalization forty-four, which was concerned with words which contain one e and end with a consonant, had an incident count of 179. There were 155 incidents conforming with this generalization and 24 exceptions. A utility of 87 per cent was established.

45. Generalization forty-five, which was concerned with the last syllable when the sound is r, had an incident count of 783. There were 766 incidents conforming with this generalization and 17 exceptions. A utility of 98 per cent was established.

Summary

An analysis of the data indicated that twenty-eight generalizations (3, 4, 5, 8, 10, 11, 16, 19, 20, 21, 22, 23,

24, 25, 26, 27, 28, 29, 30, 31, 32, 35, 36, 38, 40, 41, 44, 45) were found useful according to the criteria.

Six of these generalizations (20, 21, 26, 27, 28, 29) were concerned with pronunciation where two consonants were together. Nine generalizations (30, 31, 32, 35, 36, 38, 40, 41, 45) were found to be useful for pronunciation by the use of syllabic division and accent placement.

Nine generalizations (20, 24, 25, 26, 27, 29, 35, 36, 41) had a utility of 100 per cent. Three of this group of generalizations (26, 27, 35) had an incident count below 50. Five generalizations (20, 25, 29, 36, 41) had an incident count between 80 and 375.

Seven generalizations (1, 2, 5, 28, 30, 38, 39) had a high incident count of 1,000 or greater. Four generalizations (5, 28, 30, 38) met the two criteria established for this study.

Generalization thirty-four, which was concerned with the long e sound of y or ey in the last syllable of an unaccented word, established an incident count of zero. It was concluded that this generalization was a regional pronunciation and the dictionary authority did not support this pronunciation; therefore, it was of no usefulness according to the criteria.

Generalizations Applied to Words
Designated As Science Words

A list of 1,500 words, designated by the authors as science words, was compiled. The phonetic respelling, accentuation, and syllabic division of each word was recorded. The forty-five phonic generalizations (Appendix A) were applied to the words and a per cent of utility was computed for each generalization.

An inspection of the data (Table 2), in accordance with the established criteria, indicated that thirteen generalizations (3, 10, 11, 12, 13, 14, 19, 25, 26, 27, 29, 32, 35) did not meet the criterion of twenty words to which the generalization might apply. The subdivisions of generalization six (ai, oa, ui) also did not meet the criterion of twenty words to which the generalization might apply.

There were seventeen generalizations (4, 5, 8, 16, 20, 21, 22, 23, 24, 28, 30, 31, 36, 38, 40, 41, 45) which met both criteria of at least twenty words to which the generalization might apply and a utility of at least seventy-five per cent.

Seven generalizations (30, 31, 36, 38, 40, 41, 45) were found to be useful for pronunciation by the use of syllabic division and accent placement. Three generalizations (20, 21, 28) were concerned with pronunciation where two consonants were together.

TABLE 2

SUMMARY OF UTILITY OF GENERALIZATIONS TO SCIENCE WORDS^b

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
1. When there are two vowels side by side, the long sound of the first one is heard and the second is usually silent.	433	80	353	18
2. When a vowel is in the middle of a one-syllable word, the vowel is short.	179	109	70	61
middle letter	52	38	14	73
one of the middle two letters in a word of four letters	75	44	31	59
one vowel <u>within</u> a word of more than four letters	52	27	25	52

^bThis table presents the composite findings for each of the forty-five recommended phonic generalizations. The number order of the generalizations in this table is identical with that in the tables shown in the Clymer and Bailey studies.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
3. If the only vowel letter is at the end of a word, the letter usually stands for a long sound.	0	0	0	0
*4. When there are two vowels, one of which is final <u>e</u> , the first vowel is long and the <u>e</u> is silent.	61	55	6	90
*5. The <u>r</u> gives the preceding vowel a sound that is neither long nor short.	438	377	61	86
6. The first vowel is usually long and the second silent in the digraphs <u>ai</u> , <u>ea</u> , <u>oa</u> , and <u>ui</u> .	85	47	38	55
ai	19	14	5	74
ea	51	25	26	49
oa	8	8	0	100
ui	7	0	7	0

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
7. In the phonogram <u>ie</u> , the <u>i</u> is silent and the <u>e</u> has a long sound.	23	8	15	35
*8. Words having double <u>e</u> usually have the long <u>e</u> sound.	32	30	2	94
9. When words end with silent <u>e</u> , the preceding <u>a</u> or <u>i</u> is long.	105	72	33	69
10. In <u>ay</u> the <u>y</u> is silent and gives <u>a</u> its long sound.	10	10	0	100
11. When the letter <u>i</u> is followed by the letters <u>gh</u> , the <u>i</u> usually stands for its long sound and the <u>gh</u> is silent.	9	7	2	78
12. When <u>a</u> follows <u>w</u> in a word, it usually has the sound <u>a</u> as in <u>was</u> .	19	1	18	5
13. When <u>e</u> is followed by <u>w</u> , the vowel sound is the same as represented by <u>oo</u> .	4	3	1	75

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
14. The two letters <u>ow</u> make the long <u>o</u> sound.	19	15	4	79
15. <u>W</u> is sometimes a vowel and follows the vowel digraph rule.	23	16	7	70
*16. When <u>y</u> is the final letter in a word, it usually has a vowel sound.	67	63	4	93
17. When <u>y</u> is used as a vowel in words, it sometimes has the sound of long <u>i</u> .	141	50	91	35
18. The letter <u>a</u> has the same sound (o) when followed by <u>l</u> , <u>w</u> , and <u>u</u> .	102	26	76	25
19. When <u>a</u> is followed by <u>r</u> and final <u>e</u> , we expect to hear the sound heard in <u>care</u> .	2	2	0	100
*20. When <u>c</u> and <u>h</u> are next to each other, they make only one sound.	52	52	0	100

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
*21. <u>Ch</u> is usually pronounced as it is in <u>kitchen</u> , <u>catch</u> , and <u>chair</u> , not like <u>sh</u> .	52	49	3	94
*22. When <u>c</u> is followed by <u>e</u> or <u>i</u> , the sound of <u>s</u> is likely to be heard.	77	73	4	95
*23. When the letter <u>c</u> is followed by <u>o</u> or <u>a</u> , the sound of <u>k</u> is likely to be heard.	117	117	0	100
*24. The letter <u>g</u> often has a sound similar to that of <u>j</u> in <u>jump</u> when it precedes the letter <u>i</u> or <u>e</u> .	63	61	4	94
25. When <u>ght</u> is seen in a word, <u>gh</u> is silent.	8	8	0	100
26. When a word begins with <u>kn</u> , the <u>k</u> is silent.	3	3	0	100
27. When a word begins with <u>wr</u> , the <u>w</u> is silent.	4	4	0	100

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
*28. When two of the same consonants are side by side only one is heard.	176	171	5	97
29. When a word ends in <u>ck</u> , it has the same last sound as in <u>look</u> .	3	3	0	100
*30. In most two-syllable words, the first syllable is accented.	458	398	60	87
*31. If <u>a</u> , <u>in</u> , <u>re</u> , <u>ex</u> , <u>de</u> , or <u>be</u> is the first syllable in a word, it is usually unaccented.	88	67	21	76
32. In most two-syllable words that end in a consonant followed by <u>y</u> , the first syllable is accented and the last is unaccented.	15	15	0	100
33. One vowel letter in an accented syllable has its short sound.	824	515	309	63

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
34. When <u>y</u> or <u>ey</u> is seen in the last syllable that is not accented, the long sound of <u>e</u> is heard.	35	0	35	0
35. When <u>ture</u> is the final syllable in a word, it is unaccented.	5	5	0	100
*36. When <u>tion</u> is the final syllable in a word it is unaccented.	47	47	0	100
37. In many two- and three-syllable words, the final <u>e</u> lengthens the vowel in the last syllable.	139	83	56	60
*38. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.	348	268	80	77

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*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. or Words Conforming	Number of Exceptions	Per Cent of Utility
39. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.	400	224	176	56
*40. If the last syllable of a word ends in <u>le</u> , the consonant preceding the <u>le</u> usually begins the last syllable.	29	22	7	76
*41. When the first vowel element in a word is followed by <u>th</u> , <u>ch</u> , or <u>sh</u> , these symbols are not broken when the word is divided into syllables and may go with either the first or second syllable.	36	36	0	100
42. In a word of more than one syllable, the letter <u>v</u> usually goes with the preceding vowel to form a syllable.	65	30	35	46

*Generalizations marked with an asterisk were found "useful" according to the criteria.

TABLE 2--Continued

*Generalization	Total No. of Words	No. of Words Conforming	Number of Exceptions	Per Cent of Utility
43. When a word has only one vowel letter, the vowel sound is likely to be short.	178	113	65	63
44. When there is one <u>e</u> in a word that ends in a consonant, the <u>e</u> usually has a short sound.	29	21	8	72
*45. When the last syllable is the sound <u>r</u> , it is unaccented.	108	105	3	97

*Generalizations marked with an asterisk were found "useful" according to the criteria.

Four generalizations (20, 23, 36, 41) had a utility of 100 per cent. Two of this group (36, 41) had an incident count below 50. Generalization twenty had an incident count of 52 and generalization 23 had an incident count of 117.

A report of the findings for each generalization is presented in the following sections.

1. Generalization one, which was concerned with the principle of two adjacent vowels, had an incident count of 433. There were 30 incidents conforming with this generalization and 352 exceptions. A utility of 18 per cent was established. The overall utility of 18 per cent for generalization one was primarily supported by the application of generalizations six and eight. When the incidents which were identified by the special application of the digraph rules for generalization six, were removed from those incidents conforming with generalization one, the utility dropped from 18 per cent to 9 per cent. Further, the removal of those incidents applicable to generalization eight lowered the utility from 9 per cent to one per cent.

2. Generalization two, which was concerned with the placement of one vowel within a one-syllable word, had an incident count of 179. There were 109 incidents conforming with this generalization and 70 exceptions. A utility of 61 per cent was established.

(a) A subdivision of generalization two, which was concerned with vowel placement as the middle

letter, had an incident count of 52. There were 38 incidents conforming with this generalization and 14 exceptions. A utility of 73 per cent was established.

(b) A subdivision of generalization two, which was concerned with a vowel letter as one of the middle two letters in a word of four letters, had an incident count of 75. There were 44 incidents conforming with this generalization and 31 exceptions. A utility of 59 per cent was established.

(c) A subdivision of generalization two, which was concerned with one vowel within a word of more than four letters, had an incident count of 52. There were 27 incidents conforming with this generalization and 25 exceptions. A utility of 52 per cent was established.

3. Generalization three, which was concerned with one vowel placed at the end of a word, had zero incidents with zero exceptions.

4. Generalization four, which was concerned with two vowels one of which was a final e, had an incident count of 61. There were 55 incidents conforming with this generalization and 6 exceptions. A utility of 90 per cent was established.

5. Generalization five, which was concerned with a single vowel followed by the letter r, had an incident count of 438. There were 377 incidents conforming with this

generalization and 61 exceptions. A utility of 86 per cent was established.

6. Generalization six, which was concerned with digraphs (ai, ea, oa, ui), had an incident count of 85. There were 47 incidents conforming with this generalization and 38 exceptions. A utility of 55 per cent was established.

(a) The subdivision ai of generalization six had an incident count of 19. There were 14 incidents conforming with this generalization and 5 exceptions. A utility of 74 per cent was established.

(b) The subdivision ea of generalization six had an incident count of 51. There were 25 incidents which conformed with this generalization and 26 exceptions. A utility of 49 per cent was established.

(c) The subdivision oa of generalization six had an incident count of 8. There were 8 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

(d) The subdivision ui of generalization six had an incident count of 7. There were zero incidents conforming with this generalization and 7 exceptions. A utility of zero was established.

7. Generalization seven, which was concerned with the phonogram ie, had an incident count of 23. There were 8 incidents conforming with this generalization and 15 exceptions. A utility of 35 per cent was established.

8. Generalization eight, which was concerned with words having the double e, had an incident count of 32. There were 30 incidents conforming with this generalization and 2 exceptions. A utility of 94 per cent was established.

9. Generalization nine, which was concerned with words which end with a silent e and how this affects the preceding a or i, had an incident count of 105. There were 72 incidents conforming with this generalization and 33 exceptions. A utility of 69 per cent was established.

10. Generalization ten, which was concerned with the ay combination, had an incident count of 10. There were 10 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

11. Generalization eleven, which was concerned with the letter i followed by gh, had an incident count of 9. There were 7 incidents conforming with this generalization and 2 exceptions. A utility of 78 per cent was established.

12. Generalization twelve, which was concerned with the letter w followed by the letter a, had an incident count of 19. There was 1 incident conforming with this generalization and 18 exceptions. A utility of 5 per cent was established.

13. Generalization thirteen, which was concerned with the letter e followed by w, had an incident count of 4. There were 3 incidents conforming with this generalization and 1 exception. A utility of 75 per cent was established.

14. Generalization fourteen, which was concerned with the letter o followed by the letter w, had an incident count of 19. There were 15 incidents conforming with this generalization and 4 exceptions. A utility of 79 per cent was established.

15. Generalization fifteen, which was concerned with the letter w used as a digraph, had an incident count of 23. There were 16 incidents conforming with this generalization and 7 exceptions. A utility of 70 per cent was established.

16. Generalization sixteen, which was concerned with the letter y as the final letter in a word, had an incident count of 67. There were 63 incidents conforming with this generalization and 4 exceptions. A utility of 93 per cent was established. This utility was established even though exceptions were automatically established when the letters ay (generalization ten) were the final letters in the word. Additional exceptions were established when generalization seventeen was applicable and the final y had the long i sound.

17. Generalization seventeen, which was concerned with the use of y as a vowel, had an incident count of 141. There were 50 incidents conforming with this generalization and 91 exceptions. A utility of 35 per cent was established.

18. Generalization eighteen, which was concerned with the letter a in combination with the letter l, w, or u, had an incident count of 102. There were 26 incidents conforming with this generalization and 76 exceptions. A utility of 25 per cent was established.

19. Generalization nineteen, which was concerned with the letter a followed by the letter r and final e, had an incident count of 2. There were 2 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

20. Generalization twenty, which was concerned with the pronunciation of the letters c and h when used together, had an incident count of 52. There were 52 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

21. Generalization twenty-one, which was concerned with the pronunciation of the letters ch, had an incident count of 52. There were 49 incidents conforming with this generalization and 3 exceptions. A utility of 94 per cent was established.

22. Generalization twenty-two, which was concerned with the letter c followed by the letter e or i, had an incident count of 77. There were 73 incidents conforming with this generalization and 4 exceptions. A utility of 95 per cent was established.

23. Generalization twenty-three, which was concerned with the letter c followed by the letter o or a, had an incident count of 117. There were 117 incidents conforming with this generalization with zero exceptions. A utility of 100 per cent was established.

24. Generalization twenty-four, which was concerned with the sound of g when followed by the letter i or e, had an incident count of 63. There were 61 incidents conforming with this generalization and 4 exceptions. A utility of 94 per cent was established.

25. Generalization twenty-five, which was concerned with the letters ght combination, had an incident count of 8. There were 8 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

26. Generalization twenty-six, which was concerned with words which begin with the letters kn, had an incident count of 3. There were 3 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

27. Generalization twenty-seven, which was concerned with words which begin with the letters wr, had an incident count of 4. There were 4 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

28. Generalization twenty-eight, which was concerned with the combination of two like consonants, had an incident count of 176. There were 171 incidents conforming with this generalization and 5 exceptions. A utility of 97 per cent was established.

29. Generalization twenty-nine, which was concerned with the consonants ck at the end of a word, had an incident count of 3. There were 3 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

30. Generalization thirty, which was concerned with the placement of the accent in two-syllable words, had an incident count of 458. There were 398 incidents conforming with this generalization and 60 exceptions. A utility of 87 per cent was established.

31. Generalization thirty-one, which was concerned with the accent of the first syllable when the letter a, in, re, ex, de, or be were the first syllable, had an incident count of 88. There were 67 incidents conforming with this generalization and 21 exceptions. A utility of 76 per cent was established.

32. Generalization thirty-two, which was concerned with two-syllable words that end with a consonant followed by y, had an incident count of 15. There were 15 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

33. Generalization thirty-three, which was concerned with the sound of one vowel letter in an accented syllable, had an incident count of 824. There were 515 incidents conforming with this generalization and 309 exceptions. A utility of 63 per cent was established.

34. Generalization thirty-four, which was concerned with the letters y or ey in the last syllable, had an incident count of 35. There were zero incidents conforming with this generalization and 35 exceptions. A utility of zero was established.

35. Generalization thirty-five, which was concerned with the letters ture in the final syllable, had an incident count of 5. There were 5 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

36. Generalization thirty-six, which was concerned with the letters tion in the final syllable, had an incident count of 47. There were 47 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

37. Generalization thirty-seven, which was concerned with the final e in two- and three-syllable words, had an incident count of 139. There were 83 incidents conforming with this generalization and 56 exceptions. A utility of 60 per cent was established.

38. Generalization thirty-eight, which was concerned with two consonants following the first vowel in a word, had an incident count of 348. There were 268 incidents conforming with this generalization and 80 exceptions. A utility of 77 per cent was established.

39. Generalization thirty-nine, which was concerned with a single consonant following the first vowel sound, had an incident count of 400. There were 224 incidents which conformed with this generalization and 176 exceptions. A utility of 56 per cent was established.

40. Generalization forty, which was concerned with the last syllable of a word ending with the letters le, had an incident count of 29. There were 22 incidents conforming with this generalization and 7 exceptions. A utility of 76 per cent was established.

41. Generalization forty-one, which was concerned with consonants th, ch, or sh following the first vowel sound, had an incident count of 36. There were 36 incidents conforming with this generalization and zero exceptions. A utility of 100 per cent was established.

42. Generalization forty-two, which was concerned with words of more than one syllable and the letter v going with the preceding vowel, had an incident count of 65. There were 30 incidents conforming with this generalization and 35 exceptions. A utility of 46 per cent was established.

43. Generalization forty-three, which was concerned with words which had only one vowel, had an incident count of 178. There were 113 incidents conforming with this generalization and 65 exceptions. A utility of 63 per cent was established.

44. Generalization forty-four, which was concerned with words that contain one vowel, an e, and end with a consonant, had an incident count of 29. There were 21 incidents conforming with this generalization and 8 exceptions. A utility of 72 per cent was established.

45. Generalization forty-five, which was concerned with the last syllable when the sound is r, had an incident count of 108. There were 105 incidents conforming with this generalization and 3 exceptions. A utility of 97 per cent was established.

Summary

A list of 1,500 words, designated to be science words, was compiled and phonetic respelling, accentuation, and syllabic division for each word was recorded. The forty-five generalizations (Appendix A) were applied to each word and the data revealed that there were thirteen generalizations which did not meet the twenty word criterion. There were seventeen generalizations which were found useful according to the criteria. Seven of these generalizations (30, 31, 36, 38, 40, 41, 45) were found to be useful for pronunciation by the use of syllabic division and accent placement. Five generalizations (20, 21, 22, 23, 28) were concerned with pronunciation where two consonants were together. The four generalizations (4, 5, 8, 16) were concerned with the silent e at the end of a word, two e's used together, the letter r

and the preceding vowel, and the y as a final letter. Three generalizations (22, 23, 24) were concerned with the letters c or g when followed by e, i, a, or o.

Comparison of Utility of Phonic Generalizations
to Science and Reading Programs

This research extended the Clymer³⁸ and Bailey³⁹ studies of the utility of forty-five phonic generalizations (Appendix A) in reading programs to science programs. The list of generalizations and procedures developed by Clymer were utilized in the study.

The Clymer study was concerned with approximately two thousand six hundred words. The Bailey study was concerned with approximately five thousand seven hundred and seventy-three words. The science study was concerned with approximately twelve thousand words. The data from the Clymer, Bailey, and the science studies⁴⁰ were presented in Table 3. An analysis of this data indicated that eighteen generalizations (5, 8, 10, 16, 20, 21, 22, 23, 25, 28, 29, 30, 31, 32, 40, 41, 44, 45) were useful, according to the criteria established, and common to all three studies. Further analysis indicated twenty-four useful generalizations (3, 5, 8, 10, 16, 19, 20, 21, 22, 23, 24, 25, 28, 29, 30, 31, 32, 35, 36,

³⁸Clymer, op. cit.

³⁹Bailey, op. cit.

⁴⁰Throughout the remainder of this report, the science study refers to the problem pursued in this study.

TABLE 3

COMPARISON OF UTILITY OF PHONIC GENERALIZATIONS
TO SCIENCE AND READING PROGRAMS^C

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
1. When there are two vowels side by side, the long sound of the first one is heard and the second is usually silent.	45	34	34
2. When a vowel is in the middle of a one-syllable word, the vowel is short.	62	71	64
middle letter	(69)	(78)	(76)
one of the middle two letters in a word of four letters	(59)	(68)	(61)

^CThis table presents the composite findings for each of the forty-five recommended phonic generalizations. The number order of the generalizations in this table is identical with that in the tables shown in the Clymer and Bailey studies.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
one vowel <u>within</u> a word of more than <u>four</u> letters	(46)	(62)	(61)
3. If the only vowel letter is at the end of a word, the letter usually stands for a long sound.	74	*76	*81
4. When there are two vowels, one of which is final <u>e</u> , the first vowel is long and the <u>e</u> is silent.	63	57	*76
5. The <u>r</u> gives the preceding vowel a sound that is neither long nor short.	*78	*86	*89

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
6. The first vowel is usually long and the second silent in the digraphs <u>ai</u> , <u>ea</u> , <u>oa</u> , and <u>ui</u> .	66	60	64
ai	(64)	(72)	(74)
ea	(66)	(55)	(57)
oa	*(97)	*(95)	*(89)
ui	(6)	(10)	(28)
7. In the phonogram <u>ie</u> , the <u>i</u> is silent and the <u>e</u> has a long sound.	17	31	20

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
8. Words having double <u>e</u> usually have the long <u>e</u> sound.	*98	*87	*94
9. When words end with silent <u>e</u> , the preceding <u>a</u> or <u>i</u> is long.	60	50	74
10. In <u>ay</u> the <u>y</u> is silent and gives <u>a</u> its long sound.	*78	*88	*96
11. When the letter <u>i</u> is followed by the letters <u>gh</u> , the <u>i</u> usually stands for its long sound and the <u>gh</u> is silent.	71	71	*81
12. When <u>a</u> follows <u>w</u> in a word, it usually has the sound of <u>a</u> as in <u>was</u> .	32	22	22

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
13. When <u>e</u> is followed by <u>w</u> , the vowel sound is the same as represented by <u>oo</u> .	35	40	50
14. The two letters <u>ow</u> make the long <u>o</u> sound.	59	55	61
15. <u>W</u> is sometimes a vowel and follows the vowel digraph rule.	40	33	55
16. When <u>y</u> is the final letter in a word, it usually has a vowel sound.	*84	*89	*91
17. When <u>y</u> is used as a vowel in words, it sometimes has the sound of long <u>i</u> .	15	11	20

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*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
18. The letter <u>a</u> has the same sound (o) when followed by <u>l</u> , <u>w</u> , and <u>u</u> .	48	34	32
19. When <u>a</u> is followed by <u>r</u> and final <u>e</u> , we expect to hear the sound heard in <u>care</u> .	90	*96	*91
20. When <u>c</u> and <u>h</u> are next to each other, they make only one sound.	*100	*100	*100
21. <u>Ch</u> is usually pronounced as <u>it</u> is in <u>kitchen</u> , <u>catch</u> , and <u>chair</u> , not like <u>sh</u> .	*95	*87	*98
22. When <u>c</u> is followed by <u>e</u> or <u>i</u> , the sound <u>s</u> is likely to be heard.	*96	*92	*97
23. When the letter <u>c</u> is followed by <u>o</u> or <u>a</u> , the sound of <u>k</u> is likely to be heard.	*100	*100	*100

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
24. The letter <u>g</u> often has a sound similar to that of <u>j</u> in <u>jump</u> when it precedes the letters <u>i</u> or <u>e</u> .	64	*78	*87
25. When <u>ght</u> is seen in a word, <u>gh</u> is silent.	*100	*100	*100
26. When a word begins <u>kn</u> , the <u>k</u> is silent.	100	100	*100
27. When a word begins with <u>wr</u> , the <u>w</u> is silent.	100	100	*100
28. When two of the same consonants are side by side, only one is heard.	*99	*98	*96
29. When a word ends in <u>ck</u> , it has the same last sound as in <u>look</u> .	*100	*100	*100

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
30. In most two-syllable words, the first syllable is accented.	*85	*81	*77
31. If <u>a</u> , <u>in</u> , <u>re</u> , <u>de</u> , <u>ex</u> , or <u>be</u> is the first syllable in a word, it is usually unaccented.	*87	*84	*82
32. In most two-syllable words that end in a consonant followed by <u>y</u> , the first syllable is accented and the last is unaccented.	*96	*97	*98
33. One vowel letter in an accented syllable has its short sound.	61	65	63
34. When <u>y</u> or <u>ey</u> is seen in the last syllable that is not accented, the long sound of <u>e</u> is heard.	0
35. When <u>ture</u> is the final syllable in a word, it is unaccented.	100	*95	*100

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
36. When <u>tion</u> is the final syllable in a word, it is unaccented.	100	*100	*100
37. In many two- and three-syllable words, the final <u>e</u> lengthens the vowel in the last syllable.	46	46	62
38. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.	72	*78	*76
39. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.	44	50	53

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
40. If the last syllable of a word ends in <u>le</u> , the consonant preceding the <u>le</u> usually begins the last syllable.	*97	*93	*75
41. When the first vowel element in a word is followed by <u>th</u> , <u>ch</u> , or <u>sh</u> , these symbols are not broken when the word is divided into syllables and may go with either the first or second syllable.	*100	*100	*100
42. In a word of more than one syllable, the letter <u>v</u> usually goes with the preceding vowel to form a syllable.	73	65	61
43. When a word has only one vowel letter, the vowel sound is likely to be short.	57	69	69

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

TABLE 3--Continued

Generalization	Utility		
	Per Cent of Utility		
	Primary Readers (Clymer)	Primary and Intermediate Readers (Bailey)	Elementary School Science Textbooks
44. When there is one <u>e</u> in a word that ends in a consonant, the <u>e</u> usually has a short sound.	*76	*92	*87
45. When the last syllable is the sound <u>r</u> , it is unaccented.	*95	*79	*98

*Per Cent of Utility marked with an asterisk was found "useful" according to the criteria.

38, 40, 41, 44, 45) common to the Bailey and the science studies.

A report of the specific findings for each generalization is presented in the following section.

1. Generalization one, which was concerned with the principle of two adjacent vowels, established a utility of 45 per cent (Clymer), 34 per cent (Bailey), and 34 per cent (science study).

2. Generalization two, which was concerned with the placement of one vowel within a one-syllable word, established a utility of 62 per cent (Clymer), 71 per cent (Bailey) and 64 per cent (science study).

(a) A subdivision of generalization two, which was concerned with vowel placement as the middle letter, established a utility of 69 per cent (Clymer), 78 per cent (Bailey), and 76 per cent (science study).

(b) A subdivision of generalization two, which was concerned with a vowel letter as one of the middle two letters in a word of four letters, established a utility of 59 per cent (Clymer), 68 per cent (Bailey), and 61 per cent (science study).

(c) A subdivision of generalization two, which was concerned with one vowel within a word of more than four letters, established a utility of 46 per cent (Clymer), 62 per cent (Bailey), and 61 per cent (science study).

3. Generalization three, which was concerned with one vowel placed at the end of a word, established a utility of 74 per cent (Clymer), 76 per cent (Bailey), and 81 per cent (science study).

4. Generalization four, which was concerned with two vowels one of which was a final e, established a utility of 63 per cent (Clymer), 57 per cent (Bailey), and 76 per cent (science study).

5. Generalization five, which was concerned with a single vowel followed by the letter r, established a utility of 78 per cent (Clymer), 86 per cent (Bailey), and 89 per cent (science study).

6. Generalization six, which was concerned with digraphs (ai, ea, oa, ui), established a utility of 66 per cent (Clymer), 60 per cent (Bailey), and 64 per cent (science study).

(a) The subdivision ai of generalization six established a utility of 64 per cent (Clymer), 72 per cent (Bailey), and 74 per cent (science study).

(b) The subdivision ea of generalization six established a utility of 66 per cent (Clymer), 55 per cent (Bailey), and 57 per cent (science study).

(c) The subdivision oa of generalization six established a utility of 97 per cent (Clymer), 95 per cent (Bailey), and 89 per cent (science study).

(d) The subdivision ui of generalization six established a utility of 6 per cent (Clymer), 10 per cent (Bailey), and 28 per cent (science study).

7. Generalization seven, which was concerned with the phonogram ie, established a utility of 17 per cent (Clymer), 31 per cent (Bailey), and 20 per cent (science study).

8. Generalization eight, which was concerned with words having the double e, established a utility of 98 per cent (Clymer), 87 per cent (Bailey), and 94 per cent (science study).

9. Generalization nine, which was concerned with words which end with a silent e and how this affects the preceding a or i, established a utility of 60 per cent (Clymer), 50 per cent (Bailey), and 74 per cent (science study).

10. Generalization ten, which was concerned with the ay combination, established a utility of 78 per cent (Clymer), 88 per cent (Bailey), and 96 per cent (science study).

11. Generalization eleven, which was concerned with the letter i followed by gh, established a utility of 71 per cent (Clymer), 71 per cent (Bailey), and 81 per cent (science study).

12. Generalization twelve, which was concerned with the letter w followed by the letter a, established a utility of 32 per cent (Clymer), 22 per cent (Bailey), and 22 per cent (science study).

13. Generalization thirteen, which was concerned with the letter e followed by w, established a utility of 35 per cent (Clymer), 40 per cent (Bailey), and 50 per cent (science study).

14. Generalization fourteen, which was concerned with the letter o followed by the letter w, established a utility of 59 per cent (Clymer), 55 per cent (Bailey), and 61 per cent (science study).

15. Generalization fifteen, which was concerned with the letter w used as a digraph, established a utility of 40 per cent (Clymer), 33 per cent (Bailey), and 55 per cent (science study).

16. Generalization sixteen, which was concerned with the letter y as the final letter in a word, established a utility of 84 per cent (Clymer), 89 per cent (Bailey), and 91 per cent (science study).

17. Generalization seventeen, which was concerned with the use of y as a vowel, established a utility of 15 per cent (Clymer), 11 per cent (Bailey), and 20 per cent (science study).

18. Generalization eighteen, which was concerned with the letter a in combination with letters l, w, or u, established a utility of 48 per cent (Clymer), 34 per cent (Bailey), and 32 per cent (science study).

19. Generalization nineteen, which was concerned with the letter a followed by the letter r and final e, established

a utility of 90 per cent (Clymer), 96 per cent (Bailey), and 91 per cent (science study).

20. Generalization twenty, which was concerned with pronunciation of the letters c and h when used together, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

21. Generalization twenty-one, which was concerned with the pronunciation of the letters ch, established a utility of 95 per cent (Clymer), 87 per cent (Bailey), and 98 per cent (science study).

22. Generalization twenty-two, which was concerned with the letter c followed by the letter e or i, established a utility of 96 per cent (Clymer), 92 per cent (Bailey), and 97 per cent (science study).

23. Generalization twenty-three, which was concerned with the letter c followed by the letter o or a, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

24. Generalization twenty-four, which was concerned with sound of the letter g when followed by the letter i or e, established a utility of 64 per cent (Clymer), 78 per cent (Bailey), and 87 per cent (science study).

25. Generalization twenty-five, which was concerned with the letters ght combined, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

26. Generalization twenty-six, which was concerned with words which begin with the letters kn, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

27. Generalization twenty-seven, which was concerned with words which begin with the letters wr, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

28. Generalization twenty-eight, which was concerned with the combination of two like consonants, established a utility of 99 per cent (Clymer), 98 per cent (Bailey), and 96 per cent (science study).

29. Generalization twenty-nine, which was concerned with the consonants ck at the end of a word, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

30. Generalization thirty, which was concerned with the placement of the accent in two-syllable words, established a utility of 85 per cent (Clymer), 81 per cent (Bailey), and 77 per cent (science study).

31. Generalization thirty-one, which was concerned with the accent of the first syllable when the letters a, in, re, ex, de, or be were the first syllable, established a utility of 87 per cent (Clymer), 84 per cent (Bailey), and 82 per cent (science study).

32. Generalization thirty-two, which was concerned with two-syllable words which end with a consonant followed by y, established a utility of 96 per cent (Clymer), 97 per cent (Bailey), and 98 per cent (science study).

33. Generalization thirty-three, which was concerned with the sound of one vowel letter in an accented syllable, established a utility of 61 per cent (Clymer), 65 per cent (Bailey), and 63 per cent (science study).

34. Generalization thirty-four, which was concerned with the letters y or ey in the last syllable, established a utility of zero per cent in each of the Clymer, Bailey, and science studies.

35. Generalization thirty-five, which was concerned with the letters ture in the final syllable, established a utility of 100 per cent (Clymer), 95 per cent (Bailey), and 100 per cent (science study).

36. Generalization thirty-six, which was concerned with the letters tion in the final syllable, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

37. Generalization thirty-seven, which was concerned with the final e in two- and three-syllable words, established a utility of 46 per cent (Clymer), 46 per cent (Bailey), and 62 per cent (science study).

38. Generalization thirty-eight, which was concerned with two consonants following the first vowel in a word,

established a utility of 72 per cent (Clymer), 78 per cent (Bailey), and 76 per cent (science study).

39. Generalization thirty-nine, which was concerned with a single consonant following the first vowel sound, established a utility of 44 per cent (Clymer), 50 per cent (Bailey), and 53 per cent (science study).

40. Generalization forty, which was concerned with the last syllable of a word ending with the letters le, established a utility of 97 per cent (Clymer), 93 per cent (Bailey), and 75 per cent (science study).

41. Generalization forty-one, which was concerned with the consonants th, ch, or sh following the first vowel sound, established a utility of 100 per cent in each of the Clymer, Bailey, and science studies.

42. Generalization forty-two, which was concerned with words of more than one syllable and the letter v going with the preceding vowel, established a utility of 73 per cent (Clymer), 65 per cent (Bailey), and 61 per cent (science study).

43. Generalization forty-three, which was concerned with words which had only one vowel, established a utility of 57 per cent (Clymer), 69 per cent (Bailey), and 69 per cent (science study).

44. Generalization forty-four, which was concerned with words which contain one e and end with a consonant,

established a utility of 76 per cent (Clymer), 92 per cent (Bailey), and 87 per cent (science study).

45. Generalization forty-five, which was concerned with the last syllable when the sound is r, established a utility of 95 per cent (Clymer), 70 per cent (Bailey), and 98 per cent (science study).

Summary

This research extended the Clymer and Bailey research studies of the utility of forty-five phonic generalizations in reading programs to science programs. The list of generalizations (Appendix A) and procedures developed by Clymer were utilized in this study.

The data from the Clymer, Bailey, and the science studies were presented in Table 3. An analysis of these data indicated that eighteen generalizations (5, 8, 10, 16, 20, 21, 22, 23, 25, 28, 29, 30, 31, 32, 40, 41, 44, 45) were useful, according to the established criteria, and common to all three studies. Further analysis indicated twenty-four useful generalizations (3, 5, 8, 10, 16, 19, 20, 21, 22, 23, 24, 25, 28, 29, 30, 31, 32, 35, 36, 38, 40, 41, 44, 45) common to the Bailey and the science studies. There were four additional generalizations (4, 11, 26, 27) found useful only in the science study. Of the twenty-four generalizations that were considered useful in both the Bailey and science studies, there were eight generalizations (3, 19, 24,

26, 27, 35, 36, 38) which did not meet the criteria of usefulness in the Clymer study. It appeared that the low incident count in the Clymer study was the primary cause of the non utility of these generalizations.

Conclusions implied a positive relationship between the number of words in the study and the number of generalizations which were considered useful. The greater the number of words in each study the greater the number of generalizations which met the established criteria.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Studies of the utility of forty-five phonic generalizations to reading programs were extended to vocabularies in science textbooks and to words designated to have special science meaning. In addition, a comparison was conducted of the utility of the specific phonic generalizations to reading and science vocabularies.

A list of words was compiled from three science textbook series grades one through six. The generalizations and procedures developed by Clymer were utilized and controls were determined as listed in Chapter II. The utility of the generalizations was tested against the phonetic respelling, accentuation, and syllabic division of each word, according to Webster's New Collegiate Dictionary, 1961 edition. A percent of utility was determined for each generalization by dividing the number of words or incidents investigated for the utility of the generalization.

An analysis of the data (Table 1) indicated twenty-eight generalizations were considered useful according to the established criteria. There were a total of 38,456 incidents

to which the forty-five generalizations were applied. Forty-nine per cent of this number of incidents were encompassed within the incidents concerning the twenty-eight useful generalizations. Ten generalizations, five of which were considered useful, were concerned with sixty per cent of the total number of incidents. The five useful generalizations (5, 28, 30, 31, 38) made up thirty-three per cent of the total incident count. Only generalization five was concerned with the use of vowels.

Within the twenty-eight generalizations considered useful in the science study, there were eleven generalizations which were concerned with vowels. Their incident count concerned one out of three incidents, of the total number of incidents, with which the twenty-eight useful generalizations were concerned, but only one out of six incidents of the total number of incidents. Six, of the twenty-eight generalizations, had a low incident count below one hundred, and twenty generalizations had an incident count below five hundred. The greatest consistency appeared within those incidents concerned with the sounds of consonants. Seventeen generalizations, of the nineteen consonant generalizations, met the criterion of usefulness. The remaining two generalizations established a utility greater than fifty per cent but less than seventy-five per cent.

The authors indicated, in each book, the words they considered to have special scientific meaning. The same

generalizations and procedures developed by Clymer were utilized for this list of words.

Thirteen generalizations did not meet the criterion of twenty words to which the generalization might apply. Seventeen generalizations were considered useful. Four generalizations, of this group of seventeen, were concerned with the use of vowels. Twelve generalizations established a utility of one hundred per cent, yet their incident count ranged from two to one hundred and seventeen incidents.

A comparison of the per cent of utility of specific generalizations to reading programs and science programs was made. The Clymer and Bailey studies were extended and the procedures and generalizations developed by Clymer were utilized in this study. There were eighteen generalizations common and useful to each study. There were twenty-four generalizations common and useful in the Bailey and science studies. Four generalizations were found useful in only the science study. The range of differences in percentage points of the utility of the forty-five generalizations was from zero to twenty-four points between the Bailey and the science studies. The differences in percentage points of the utility of the generalizations between the Clymer and the science studies ranged from one to twenty-two points. Eight generalizations, found useful in the Bailey and the science studies did not meet the criterion of incident count in the Clymer study. Three generalizations, concerned with silent

consonants, had a low incident count in each study and one hundred per cent utility.

Conclusions

On the basis of the findings of this investigation of the utility of the forty-five phonic generalizations, the following conclusions were reached:

1. The number of generalizations found to be useful in the reading studies and the science study suggested that reading word lists had been utilized as a word source; therefore, the indications were that skills taught in the reading program would also be useful in the content field.

2. Six generalizations (3, 9, 26, 27, 29, 35) had an incident count ranging between twenty-two and eighty-four. The teaching of these generalizations would be of questionable value in a phonics program.

3. Five generalizations (5, 28, 30, 31, 38) were concerned with high incident count ranging between one thousand and four thousand incidents. The high incident count and the high per cent of utility established indicated these generalizations to be of value.

4. Letters designated to be silent consonants indicated a stability of use; therefore, their inclusion in a phonics program should be considered.

5. The six generalizations, considered useful, concerned with pronunciation when two consonants were together

indicated a reliability that would make the knowledge of these generalizations valuable.

6. Indications were that the consonants c and g plus the vowels following them were consistently high in the sounds they represent and would be considered stable and of valuable use.

7. The wording of many of the generalizations, especially those pertaining to the sound of the letter y, were stated in a manner which made the acceptance of one generalization an automatic rejection of another. The reliability of the studies possibly would be improved if these generalizations were worded in a way to act independently from each other.

8. Since only forty-nine per cent of the total incidents fell within those generalizations which were considered useful, the indications were that only those generalizations with a high number of incidents plus a high per cent of utility should be included within a phonics program. Specifically generalizations 5, 28, 30, 31, and 38.

9. A consistency of usefulness was established by those generalizations concerned with the sound of consonants, syllabic division, and accent placement when twenty of the generalizations were considered useful in this study. Conclusions were that consistency of sounds were more reliable when they were concerned with consonants.

10. Conclusions were that there was an implied positive relationship between the number of words in a study and the number of generalizations which were considered useful.

11. Indications were that the utility of the generalizations remained equally constant for those words in the science study and those words designated to be science words.

12. Conclusions are that as the generalizations are presently worded only those generalizations concerned with large numbers of incidents, high per cent of utility, and concerned with the sound of consonants indicated enough utilitarian value and stability to be of value.

Recommendations

The conclusions reflected in this study indicated that there are many exceptions to the generalizations being taught to students.

This study did not answer the question as to which generalization should be taught. There may be other unstudied generalizations which possibly could be more helpful than those used in this study. Upon the basis that skills developed for reading may be utilized in the content fields, the following recommendations are made:

1. Future studies should be conducted to determine the optimum level of utility to be used as a criterion. The established level of seventy-five per cent utility may be

either too high or too low. The optimum level might be closer to fifty per cent.

2. Studies should be conducted to determine the most helpful generalizations to be taught. Because only forty-five generalizations were used for this study, a re-evaluation of generalizations might possibly indicate other generalizations of more value.

3. Research should be undertaken to determine if alternate generalizations should be taught when the first one fails. This method might enable the student to have a fifty per cent chance of being corrent.

4. Research should investigate the possibility that some generalizations may be applied in conjunction with other generalizations rather than in isolation. Specifically, generalizations such as number one and number thirty-six. The io combination in tion never has the double sound or long i sound.

5. Future studies should be concerned with the elimination of many of the generalizations whose usefulness is very doubtful. Specifically, generalizations 12, 17, 18, and 34 need to be restated, combined with other generalizations, or eliminated.

6. Studies should be conducted to determine if the wording of the generalizations correspond with the maturity level and understanding of children.

7. Investigations should be made to consider the possibility of other criteria for determining utility. An investigation could be made into the possibility of using the total number of words in which a generalization functions as the utility criterion rather than the total number of incidents.

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APPENDIX A

PHONIC GENERALIZATIONS

1. When there are two vowels side by side, the long sound of the first one is heard and the second is usually short.

2. When a vowel is in the middle of a one-syllable word, the vowel is short.

middle letter

one of the middle two letters
in a word of four letters

one vowel within a word of
more than four letters

3. If the only vowel letter is at the end of a word, the letter usually stands for a long sound.

4. When there are two vowels, one of which is final e, the first vowel is long and the e is silent.

5. The r gives the preceding vowel a sound that is neither long nor short.

6. The first vowel is usually long and the second silent in the digraphs ai, ea, oa, and ui.

ai

ea

oa

ui

7. In the phonogram ie, the i is silent and the e has a long sound.
8. Words having double e usually have the long e sound.
9. When words end with silent e, the preceding a or i is long.
10. In ay the y is silent and gives a its long sound.
11. When the letter i is followed by the letters gh, the i usually stands for its long sound and the gh is silent.
12. When a follows w in a word, the a usually has the sound of a as in was.
13. When e is followed by w, the vowel sound is the same as represented by oo.
14. The two letters ow make the long o sound.
15. w is sometimes a vowel and follows the vowel digraph rule.
16. When y is the final letter in a word, it usually has a vowel sound.
17. When y is used as a vowel in words, it sometimes has the sound of long i.
18. The letter a has the same sound (o) when followed by l, w, and u.
19. When a is followed by r and final e, we expect to hear the sound heard in care.
20. When c and h are next to each other, they make only one sound.

21. Ch is usually pronounced as it is in kitchen, catch, and chair, not like sh.

22. When c is followed by e or i, the sound of s is likely to be heard.

23. When the letter c is followed by o or a, the sound of k is likely to be heard.

24. The letter g often has a sound similar to that of j in jump when it precedes the letter i or e.

25. When ght is seen in a word, gh is silent.

26. When a word begins kn, the k is silent.

27. When a word begins with wr, the w is silent.

28. When two of the same consonants are side by side, only one is heard.

29. When a word ends in ck, it has the same last sound as in look.

30. In most two-syllable words, the first syllable is accented.

31. If a, in, re, ex, de, or be is the first syllable in a word, it is usually unaccented.

32. In most two-syllable words that end in a consonant followed by y, the first syllable is accented and the last is unaccented.

33. One vowel letter in an accented syllable has its short sound.

34. When y or ey is seen in the last syllable that is not accented, the long sound of e is heard.

35. When ture is the final syllable in a word, it is unaccented.

36. When tion is the final syllable in a word, it is unaccented.

37. In many two- and three-syllable words, the final e lengthens the vowel in the last syllable.

38. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.

39. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.

40. If the last syllable of a word ends in le, the consonant preceding the le usually begins the last syllable.

41. When the first vowel element in a word is followed by th, ch, or sh, these symbols are not broken when the word is divided into syllables and may go with either the first or second syllable.

42. In a word of more than one syllable, the letter y usually goes with the preceding vowel to form a syllable.

43. When a word has only one vowel letter, the vowel sound is likely to be short.

44. When there is one e in a word that ends in a consonant, the e usually has a short sound.

45. When the last syllable is the sound r, it is unaccented.

APPENDIX B

RUNNING WORD COUNT

*Series 1		*Series 2		*Series 3	
Grade 1	3,092	Grade 1	2,407	Grade 1	1,809
Grade 2	11,531	Grade 2	9,034	Grade 2	6,289
Grade 3	29,416	Grade 3	21,500	Grade 3	36,653
Grade 4	46,254	Grade 4	37,386	Grade 4	61,590
Grade 5	66,958	Grade 5	61,850	Grade 5	80,737
Grade 6	72,362	Grade 6	78,415	Grade 6	106,445

*Series 1 D. C. Heath

*Series 2 Harper Row and Co.

*Series 3 Harcourt, Brace and World

APPENDIX C

*a	*abundant	acetic
abbreviation	abundantly	aches
abdomen	accelerates	achieve
abdominal	accelerator	achieved
abilities	accept	achieving
*ability	*accepted	achievement
ablaze	accessible	achievements
*able	accident	*acid
*abroad	accidental	acidic
aborigines	accidentally	*acids
*about	*accidents	acorn
*above	accomplish	*acorns
aboveground	accomplished	acquaintance
abruptly	accomplishments	acquainted
absence	*according	acquire
absolute	*account	acquired
absolutely	accounted	acquires
*absorb	accounts	acquiring
*absorbed	accumulates	acre
absorbent	accuracy	acres
absorbing	*accurate	acrobats
*absorbs	*accurately	*across
absorption	*accustomed	*act
*abundance	acetate	acted

*Words found in all three series.

acting	*adds	*adventure
*action	adenosine	adventurous
actions	adequate	advertise
*active	adhesive	advertised
actively	adjoining	advice
*activities	*adjust	advised
*activity	*adjustable	aerate
actors	adjusting	aeration
*acts	adjustments	aerator
*actual	*admiral	aerial
*actually	admit	*affect
*adapt	admits	*affected
adaptation	admitted	affecting
adaptations	adobe	*affects
*adapted	adopt	affliction
adapts	adopted	afloat
*add	*adult	afire
*added	adulthood	afraid
addict	*adults	*after
addicted	*advance	afternoon
addictions	*advanced	aftershave
*adding	advancements	afterwards
*addition	*advances	*again
*additional	advancing	*against
address	*advantage	agate
addressed	advantages	*age

agencies	*aircraft	alga
agency	air-filled	*algae
agents	airfoil	*alike
*ages	airless	alimentary
aging	airline	*alive
agitated	airliner	alkali
*ago	airliners	alkalies
agonic	*airplane	alkaline
*agree	*airplanes	*all
*agreed	airport	allantois
agreement	airscrew	alley
agrees	airship	alligator
agricultural	airstream	*alligators
agriculture	airtight	*allow
ah	akin	allowance
*ahead	*alarm	allowances
*aid	alas	*allowed
aids	alchemist	allowing
ailerons	alchemists	*allows
ailments	alchemy	alloy
*aim	*alcohol	alloys
aimed	alcoholic	almanac
aims	alcoholism	almanacs
*air	ale	*almost
airborne	*alert	alnico
air-breathing	alfalfa	aloft

*alone	am	amusement
*along	amateur	amusing
alongside	amazed	*an
aloud	amazement	analysis
alpha	*amazing	analyze
*alphabet	amber	analyzed
alphabetical	ameba	analyzes
*already	amethyst	analyzing
*also	amino	anatomy
alter	*ammonia	*ancestors
altered	ammonium	anchor
alternate	amnion	*ancient
alternating	amoeba	ancients
alters	amoebas	*and
*although	*among	anemia
altimeter	*amount	anemic
altimeters	*amounts	anemometer
altitude	ampere	*anemone
altitudes	amperes	anemones
alto	*amphibian	aneroid
altocumulus	*amphibians	anesthetic
*altogether	amplified	anesthetized
altostratus	amplifier	angels
*alum	amplifies	angiosperm
*aluminum	amplify	angiosperms
*always	amplitude	*angle

angled	anther	appeal
angles	anthill	appealing
*animal	anthracite	*appear
animalcules	antibiotic	*appearance
*animals	antibiotics	appearances
*ankle	antibodies	*appeared
ankles	antibody	appearing
announce	anticyclone	*appears
announced	antiseptic	appetite
announcer	antiseptics	appetites
announcement	*ants	*apple
announcing	anvil	apples
annual	anxious	*appliances
annuals	*any	application
*another	anybody	applications
*answer	*anyone	*applied
answered	*anything	applies
answering	anyway	*apply
*answers	*anywhere	applying
ant	aorta	appointment
antarctic	*apart	appreciate
anteater	apartment	apprentice
antelope	aperture	approach
*antenna	apparatus	approached
antennae	*apparent	*approaches
antennas	apparently	approaching

appropriate	*area	arrive
appropriated	*areas	arrived
appropriation	arena	*arrives
approximate	argon	arriving
*approximately	argued	*arrow
approximation	argument	arrowhead
approximations	arguments	arrowheads
apricot	arisen	*arrows
apt	arises	arsenic
aqua-lung	arising	art
*aquarium	*arithmetic	*arteries
aquariums	*arm	artery
aquatic	armature	artesian
aqueducts	armed	arthropod
aqueous	armor	arthropods
arable	armored	articles
arachnids	*arms	*artificial
arc	arose	artificially
arch	*around	artist
archaeopteryx	aroused	artists
arches	*arrange	*as
arching	*arranged	asbestos
architects	*arrangement	ascent
arcs	*arrangements	ascorbic
arctic	array	*ash
*are	*arrival	*ashes

ashy	*assortment	atmospheric
*aside	assume	*atom
*ask	assumed	*atomic
*asked	assumes	*atoms
asker	assuming	*attach
*asking	assure	*attached
*asks	asteroid	attaches
*asleep	asteroids	attachments
asparagus	asters	*attack
aspect	astigmatism	attacked
aspects	astonished	attacking
aspergillus	astonishing	attacks
asphalt	astounded	attain
*assemble	*astronaut	attained
assembled	astronauts	attaining
assigned	*astronomer	attempt
assignment	astronomers	attempted
assist	astronomical	attempting
assistant	*astronomy	attempts
assistants	*at	attended
associate	*ate	*attention
associated	athlete	attitude
associates	athletic	*attract
association	atlas	*attracted
associations	*atmosphere	attracting
associative	atmospheres	*attraction

attractive	avenue	*baby
attracts	avenues	bacilli
audio-frequency	*average	*back
auditorium	avoid	backbone
auditory	await	backbones
auks	awaiting	backed
auricle	*awake	*background
aurora	awaken	backs
auroras	awakened	*backward
australis	awakening	backwards
author	awakens	backyard
authorities	aware	bacon
authors	awarded	*bacteria
auto	*away	bacterial
automated	awe	bacteriologist
*automatic	awhile	bacterium
automatically	awkward	*bad
*automobile	awnings	badgers
*automobiles	ax	badly
autonomic	axe	*bag
autonomous	axes	bags
autumn	*axis	bake
auxin	*axle	*baked
auxins	axon	baker
avocados	*babies	bakeries
available	baboons	bakers

bakery	*bar	*base
*baking	barbecues	*baseball
*balance	bards	baseballs
*balanced	*bare	baseboard
balances	barefoot	*based
balancing	*barely	*bases
*ball	barge	*basic
*balloon	barium	basin
ballooning	*bark	basins
*balloons	barley	*basis
ballpoint	barn	*basket
*balls	barnacles	basketball
ball-shaped	barns	basketballs
balsa	barograph	basketful
*banana	barometer	baskets
bananas	barometric	bass
*band	barrage	*bat
bandage	barred	batch
banded	*barrel	bath
*bands	barrels	bathe
*bang	barren	*bathing
banging	barrier	*bathroom
banish	barring	bathtub
bank	*bars	bathy
banking	basalt	*bathyscaph
*banks	basalts	bathysphere

bathyspheres	beaming	*become
bats	beams	*becomes
batted	*bean	*becoming
batter	*beans	*bed
battered	*bear	bedding
batteries	bearers	bedrock
battering	bearing	bedroom
batters	bearings	beds
*battery	*bears	*bee
*battle	beast	*beef
battles	*beat	beehive
bauxite	beaten	beehives
bay	beater	beekeeper
bays	beaters	beekeepers
*be	*beating	*been
*beach	beatings	beer
beaches	*beats	*bees
bead	*beautiful	beeswax
beadlike	beautifully	beet
beads	*beauty	*beetle
beady	beaver	beetles
beak	*beavers	*beets
beaker	becalmed	*before
beakers	*became	*began
beaks	*because	begets
*beam	beckons	*begin

beginner	belonging	beware
beginners	*belongs	*beyond
*beginning	*below	bicarbonate
beginnings	belt	*biceps
*begins	*belts	bicuspid
begonia	*bend	*bicycle
begonias	*bending	bicycles
*begun	*bends	bidding
*behave	*beneath	biennial
behaved	beneficial	biennials
behaves	*benefit	*big
behaving	benefits	*bigger
*behavior	*bent	*biggest
*behind	beriberi	bile
*being	berries	bill
*beings	beryllium	billed
belch	beside	*billion
belches	*besides	*billions
*belief	*best	billionth
*believe	beta	billionths
*believed	*better	billowing
believes	bettered	billowy
*bell	betterment	bills
bells	*between	binary
*belong	betweens	*bind
belonged	beverages	*binding

*binds	*bitten	*blast
binoculars	bitter	blasted
bio-electricity	bitterly	blasting
biography	bituminous	blastodisc
biological	bivalve	blasts
*biologist	bivalves	blazes
*biologists	*black	blazing
biology	blackberries	bleach
birch	blackberry	bleached
*bird	blackbird	bleaching
birdbath	blackbirds	bleak
bird-feeding	blackboards	bleed
*birds	blackened	bleeding
*birth	blackens	blend
birthday	blackness	blended
birthdays	blacks	blender
birthplace	*blade	blending
birthplaces	bladed	blends
biscuit	*blades	*blew
biscuits	bladder	blight
bison	blame	blimplike
*bit	*blank	*blind
*bite	*blanket	blindfold
*bites	blankets	blindfolding
biting	blares	blindness
*bits	blaring	blinds

*blink	blouse	*boats
blinked	*blow	boat-shaped
blinker	*blowing	bob
blinking	*blown	bobbed
blip	*blows	bobbing
blips	blubber	bobcats
blisters	*blue	bobs
*block	blueberries	*bodied
blocked	blue-green	*bodies
blocking	blue-greens	*body
*blocks	blue-jay	body-building
*blood	blues	bogs
*blooded	blue-white	*boil
bloodedness	bluish	*boiled
bloodstream	blunt	boiler
*bloom	blurred	boilers
bloomed	blush	*boiling
blooms	*board	*boils
blossom	boards	bold
blossoming	boast	boll
*blossoms	boasted	bolt
blot	boaster	bolts
blotted	boasts	bomb
*blotter	*boat	bombard
blotters	boating	bombarded
*blotting	boatman	bombarding

bombardment	boring	boundry
bombs	*born	bow
*bond	boron	bowed
bonded	borrow	*bowl
*bonds	borrowed	bowlegs
*bone	botanical	bowline
boned	*botanist	bowling
*bones	*botanists	bowls
bony	*both	bows
*book	bother	bowstring
bookbinder	bothered	*box
*books	*bottle	*boxes
boom	bottled	boxlike
booming	*bottles	*boy
booms	bottling	*boys
booth	*bottom	bracelet
boots	bottoms	bracket
borax	bought	brads
border	bouillon	*brain
borders	*boulders	brains
*bore	*bounce	brake
borealis	*bounced	braking
bored	*bounces	*branch
borer	*bouncing	*branches
borers	bound	brand
boric	boundaries	brands

*brass	bred	*briskly
brasses	breed	bristly
brassy	breeder	*brittle
brave	breeders	*broad
*bread	*breeding	*broadcast
breads	breeds	broadcasting
breadth	*breeze	broadcasts
*break	breezes	broader
breaker	*brick	broil
breakers	*bricks	broke
*breakfast	*bridge	*broken
*breaking	*bridges	bromide
*breaks	*brief	bronchial
breakthrough	*briefly	*bronze
breakwater	*bright	bronzes
breakup	*brighter	brook
breastbone	brightest	brooks
*breath	*brightly	broom
*breathe	brightness	broomstick
breathed	*brilliant	broth
breather	brilliantly	brother
breathers	brim	*brothers
breathes	*bring	*brought
*breathing	*bringing	*brown
breathtaking	*brings	brownstone
breaths	briquettes	browse

bruise	*builder	bumping
bruised	*builders	*bumps
*bruises	*building	bumpy
*brush	*buildings	*bunch
brushed	*builds	bunches
brushes	*built	bundle
brushing	*bulb	*bundles
bryophytes	bulbs	bunkhouse
*bubble	bulge	buoy
bubbled	bulged	buoyancy
*bubbles	*bulges	buoys
bubbling	bulging	bur
bubbly	bulky	burden
bucket	bull	burdock
bucketful	bulldog	bureau
buckets	bulldozer	burial
buckle	bulldozers	buried
bud	bullet	burlap
budding	*bulletin	burlike
budge	bullets	*burn
*buds	bullfrog	burnable
buffaloes	bumblebee	*burned
buffer	bumblebees	*burner
*bug	*bump	*burning
*bugs	bumped	*burns
*build	bumpier	burnt

*burrow	*by	*calcium
burrows	bye	calculate
*burst	buzz	calculated
*bursts	buzzed	calculating
bury	buzzers	*calculations
*bus	buzzes	calculus
*buses	buzzing	*calendar
bush	cab	calendars
*bushes	cabbage	calf
busily	cabbages	calibrate
*business	cabin	calibrated
businesses	cabinet	calibrating
businessmen	cabins	*call
*busy	cable	*called
*but	cablegrams	calling
butcher	*cables	*calls
*butter	*cactus	*calm
buttercup	cactuses	calmly
butterfat	cadmium	calms
*butterflies	cafeteria	caloric
*butterfly	*cage	calorie
buttermilk	cages	calories
*button	*cake	calorimeter
buttons	cakelike	calves
buy	cakes	calyx
buys	calcite	cambrium

*came	*candy	captive
camel	cane	capture
camels	canning	*captured
*camera	cannon	captures
*cameras	*cannot	*car
camp	canoe	carat
camper	*cans	carats
campers	cantaloupe	carbohydrate
campfire	cantaloupes	*carbohydrates
campfires	canteen	*carbon
camphor	cantilever	carbonate
camping	canvas	carbonized
campus	canyon	*carburetor
camshaft	canyons	*card
*can	*cap	*cardboard
canal	capable	cardinal
canals	capacity	cards
canaries	capes	*care
canary	*capillaries	cared
cancel	capillary	*careful
cancels	capital	*carefully
cancer	capped	careless
cancers	*caps	carelessness
*candle	capsule	cares
candlelight	captain	cargo
*candles	captains	caribou

caring	carved	cauliflower
carnations	carves	*cause
*carnivorous	*case	*caused
carpenter	*cases	*causes
carpenters	*cast	*causing
*carpet	castle-like	*caution
carpets	*casting	cautious
carrageen	castings	cautiously
carriage	*casts	cava
*carried	casual	*cave
carrier	*cat	caveman
carriers	catalogs	cavemen
*carries	catamaran	*caves
*carrot	catapult	cavities
*carrots	*catch	cavity
*carry	*catches	cease
*carrying	catching	ceases
*cars	category	cecropia
cart	*caterpillar	*ceiling
cartilage	*caterpillars	*celery
*carton	catkins	celestial
cartons	cats	*cell
cartridge	cattail	cellar
cartridges	cattails	cellars
carts	*cattle	*celled
carve	*caught	*cellophane

*cells	*chains	*characteristics
*cellulose	chair	*charcoal
*cement	*chairs	*charge
*cemented	*chalk	*charged
cent	*chalkboard	charges
*center	challenge	charging
centers	challenges	charm
centigrade	challenging	charms
centipedes	*chamber	charred
central	chambered	*chart
centrifugal	*champion	charted
cents	chance	charting
*centuries	chances	charts
*century	*change	chase
cephalopods	*changed	chased
ceramic	changer	chases
*cereal	changers	chasing
*cereals	*changes	chat
*cerebellum	*changing	chatter
*cerebrum	channel	chattered
cerium	channels	cheap
*certain	chap	cheaper
*certainly	chapped	*check
certification	chapter	checked
cesium	chapters	checkers
*chain	characteristic	checking

checks	*chickens	chitin
checkups	chicks	chloride
cheek	*chief	chlorinated
cheeks	chiefly	chlorination
cheerful	*child	*chlorine
*cheese	*children	chloro
cheesecloth	chill	*chlorophyll
cheeses	*chilled	chloroplasts
*chemical	chilling	chocolate
*chemically	chills	choice
*chemicals	chime	choices
*chemist	*chimney	cholera
*chemistry	chimneys	cholesterol
*chemists	chimpanzee	cholla
cherish	chimpanzees	*choose
cherries	chin	chop
cherry	china	chopped
*chest	chinook	chopping
chestnuts	chip	chosen
*chew	chipmunks	chores
chewed	chipped	chromatography
*chewing	chipping	chromium
chews	chips	chromosome
chick	chirp	chromosomes
*chicken	chirps	*chrysalis
chickenpox	chisel	chrysanthemum

chrysanthemums	circuses	classification
chunk	cirrocumulus	classifications
chunks	cirrostratus	*classified
churches	cirrus	classifies
churn	*cities	*classify
churning	citizen	classifying
chute	citizens	classmate
cigar	citrus	*classmates
cigarette	*city	*classroom
cilia	civil	classrooms
*cinders	civilization	clatter
*circle	civilizations	clattering
circled	civilized	claw
*circles	clam	*claws
circling	clamlike	*clay
*circuit	clamp	claybank
circuits	*clams	clayey
*circular	clamshells	clays
circulated	*clap	*clean
*circulates	clapper	cleancut
circulating	clarified	cleaned
*circulation	clarinet	cleaner
*circulatory	*class	cleaners
circumference	classed	*cleaning
circumstances	classes	cleanliness
circus	classic	cleanup

*clear	clinical	*clothing
clearance	*clip	cloths
clearer	clipping	*cloud
clearing	clippings	cloudbursts
*clearly	*clips	clouded
clematis	cloaks	cloudless
clench	*clock	cloudlike
clever	clocks	*clouds
*click	clockwise	*cloudy
clicked	clogged	clover
clickety-clack	*close	clown
*clicking	*closed	club
clicks	*closely	clubs
*cliff	closeness	clue
*cliffs	*closer	*clues
*climate	*closes	clump
*climates	closest	clumped
climatologist	closet	clumps
climb	closing	clumsy
climbed	clot	*cluster
climber	*cloth	clustered
*climbing	clothe	clusters
climbs	clothed	clustering
*cling	*clothes	clutch
clinging	clothesline	clutches
clings	clothespin	clutter

coach	cocoons	*collecting
*coal	*cod	*collection
coals	*code	collections
*coarse	codling	collectively
*coast	cod-liver	collector
coastal	coelacanth	*collects
coasting	*coffee	*college
coastline	*coil	*collide
coastlines	*coiled	collided
*coasts	*coils	collides
*coat	*coin	colliding
*coated	coins	collision
*coating	coke	collisions
*coats	*cold	cologne
cob	cold-blooded	colonial
*cobalt	*colder	*colonies
cocci	*coldest	colonists
coccus	*colds	*colony
coccyx	coleus	*color
cochlea	collapse	coloration
cockroach	collapsed	*colored
cockroaches	collapses	coloreds
cocoa	collapsible	*colorful
coconut	collars	*coloring
coconuts	*collect	*colorless
*cocoon	*collected	*colors

colt	comma	compares
columbine	*command	comparing
*column	commander	comparison
columns	commanding	comparisons
*comb	commendation	compartment
combat	*commercial	compartments
combatting	commercially	*compass
combed	comminuted	compasses
*combination	committee	compelled
*combinations	committees	competition
*combine	committing	compile
*combined	*common	compiled
*combines	*commonly	*complete
combing	*communicate	*completed
*combining	communicating	completes
combs	communication	*completely
combustible	communications	completing
combustion	communities	*complex
*come	*community	complicate
*comes	compact	*complicated
*comet	companies	compose
comets	companion	*composed
comfort	*company	composer
*comfortable	comparatively	*composition
comfortably	*compare	*compound
*coming	*compared	*compounds

compress	concluding	cone-shaped
*compressed	conclusion	conferences
*compresses	conclusions	confidence
*compression	conclusive	confined
*compressor	conclusively	confirm
computations	*concrete	confirmed
compute	condensation	conflict
computed	*condense	confronting
computers	*condensed	confuse
computes	*condenses	confused
computing	condensing	confusing
concave	*condition	confusion
conceived	conditioned	congealed
concentrate	conditioner	conglomerate
*concentrated	conditioners	conical
concentrates	conditioning	conifers
concentration	*conditions	*connect
concept	conduct	*connected
concepts	conducted	*connecting
concern	conducting	connection
concerned	conduction	connections
concerning	*conductor	connective
concerns	conductors	*connects
concerts	conducts	conquer
*conclude	*cone	conquered
*concluded	*cones	conquering

conquest	consulting	*continued
conscious	consults	*continues
conservation	consume	continuing
conservationist	consumed	*continuous
conserve	consumer	continuously
conserving	consuming	contour
*consider	*contact	contours
considerable	contacting	*contract
considerably	contacts	*contracting
consideration	contagious	*contraction
considered	*contain	contractor
consist	contained	*contracts
consisted	*container	contrary
consisting	containers	contrast
consists	*containing	contribute
*constant	*contains	contributed
*constantly	contaminated	contributes
constellarium	content	contribution
constellation	contents	*contributions
constellations	contest	*control
construct	contests	controllable
constructed	*continent	*controlled
*construction	continental	*controlling
constructional	*continents	*controls
constructive	continually	control-tower
consult	*continue	controversy

convection	*cooler	cores
convenience	coolest	*cork
*convenient	*cooling	*corks
converge	coolness	corkscrew
converging	*cools	*corn
conversation	co-operate	cornea
conversion	cooperate	corneas
*convert	co-operates	*corner
*converted	cooperation	*corners
converter	cooperating	cornfield
converting	cooperative	cornflakes
converts	coordinating	cornmeal
*convex	coordination	cornstalk
convince	cope	corolla
*cook	copecod	corpuscles
*cooked	copies	*correct
cooker	co-pilot	correcting
cookers	*copper	correctly
cookie	*copy	corresponds
cookies	coquina	corridors
*cooking	coral	corrode
cooks	corals	corrosion
cooky	*cord	corrugated
*cool	*cords	cosmetics
coolant	*core	cosmic
*cooled	corer	cosmonauts

cost	*country	crackle
costly	countryside	crackles
costs	*counts	crackling
costsaver	*course	crackly
cottage	courses	*cracks
cottages	cousins	cradle
*cotton	*cover	craft
cottonseed	coverage	crafts
cottony	coverall	craftwork
cotyledon	*covered	cram
cotyledons	*covering	cramps
cough	coverings	crane
*coughing	*covers	cranes
coughs	*cow	crank
*could	cowbirds	cranked
*count	cowpox	cranks
countdown	cowries	crankshaft
counted	*cows	crash
*counter	coyotes	crashes
counterbalance	*crab	crashing
counterclockwise	*crabs	crate
counters	*crack	*crater
counterweight	*cracked	*craters
*counting	cracker	*crawl
countless	crackers	crawled
*countries	*cracking	crawling

*crawls	crew	crosspieces
crayfish	crews	cross-pollinate
*crayon	cribs	cross-pollination
*cream	cricket	crosswise
creams	crickets	crowbar
creamy	crime	crowd
crease	criminal	*crowded
*create	crimson	crown
*created	crippled	crucial
creates	crippling	*crude
creating	crisp	cruising
creative	*crisscross	*crumble
creativity	croak	crumbled
creature	croaks	*crumbles
*creatures	crockery	crumbling
creek	crocodile	crumbly
creep	*crocodiles	crumbs
creeping	crook	crumple
creeps	crooked	crumpled
crepe	*crop	crumples
crescent	cropping	crush
crest	*crops	crushed
crests	*cross	crusher
crevasse	crossed	*crust
crevasses	crosses	crustaceans
crevices	crossing	cryolite

*crystal	cured	customs
crystalline	cures	*cut
crystallizes	curing	*cutting
crystal-radio	curiosity	*cuttings
*crystals	*curious	cuttlefish
*cube	curium	cutout
*cubes	curl	*cuts
cubic	curled	*cycle
cubs	curly	cycles
cucumber	curls	cyclone
cucumbers	*current	cyclotron
cultivate	currently	*cylinder
*cuisine	*currents	*cylinders
cultures	curtain	cylindrical
cumbersome	curtains	*cytoplasm
cumuliform	*curvature	dab
cumulonimbus	*curve	daddy
cumulus	*curved	daffodiles
*cup	*curves	*daily
cupboard	*curving	dairy
*cupful	cushion	daisies
*cupfuls	cuspid	daisy
cuprite	custards	*dam
*cups	custodian	*damage
curdling	customarily	damaged
cure	customers	damages

*damp	dashing	debris
dampen	data	decade
*dams	*date	decapod
dance	dated	*decay
danced	dates	*decayed
*dandelion	dating	*decaying
dandelions	daughters	*decays
*danger	dawn	deceive
*dangerous	*day	deceiving
*dangers	daydream	*decide
dangles	*daylight	*decided
dared	*days	decides
dares	*daytime	deciding
*dark	day-to-day	deciduous
darken	dazzling	decision
darkened	*dead	deck
darker	*deadly	decks
darkest	deafness	declination
*darkness	*deal	decomposed
darning	dealer	decomposition
dart	dealing	decorates
darting	deals	decoration
darts	dealt	*decrease
*dash	dear	decreased
dashboard	*death	decreases
dashes	debate	deduced

deems	deflects	den
*deep	deformed	dendrites
deepen	degree	denotes
deepened	*degrees	dens
*deeper	dehydrated	dense
*deepest	delay	densely
deeply	deliberately	denser
deep-sea	delicate	densest
deepwater	delicately	densities
*deer	delicious	density
defect	delight	dent
defend	delighted	dental
defending	deliver	dented
defends	delivered	dentist
defense	delivering	denying
defenses	delivers	department
deficiency	delivery	departments
define	delta	departure
*defined	deltas	*depend
defining	demand	dependable
definite	demanded	depended
definitely	demon	dependence
definition	demonstrate	*ependent
definitions	demonstrated	*depending
deflated	demonstrates	*depends
deflected	*demonstration	depict

depicts	designers	detections
*deposit	designing	detective
deposited	designs	detectives
*deposits	desirable	detector
depressant	desire	detects
*depth	desired	detergent
*depths	desires	*determine
derived	*desk	*determined
dermis	dessert	determines
derrick	desserts	*determining
desalting	destination	detour
descend	*destroy	deuterium
descending	*destroyed	*develop
*describe	destroyer	*developed
*described	destroying	*developing
*describes	destroys	*development
*describing	destruction	developments
description	destructional	develops
descriptions	destructive	*device
*desert	detail	*devices
*deserts	detailed	devise
*design	*details	devised
designated	*detect	devising
designation	detected	devoted
*designed	*detecting	*dew
designer	detection	dewdrops

diagonally	dieting	dignity
*diagram	diets	*digs
*diagrams	*differ	dilates
*dial	*difference	*dilute
dialed	*differences	diluted
dials	*different	dilutes
*diameter	*differently	dim
diameters	differing	dime
diamond	differs	dimensional
diamonds	*difficult	dimly
diapause	difficulty	dimmer
diaphragm	diffuse	dimples
diary	*diffused	dine
diastase	diffuses	dining
diatomaceous	diffusing	*dinner
diatoms	diffusion	dinners
dicots	*dig	dinnertime
dicotyledons	*digest	*dinosaur
dictionary	*digested	*dinosaurs
*did	digester	diorama
*die	digesting	*dioxide
*died	*digestion	*dip
*dies	*digestive	*dipped
diesel	digests	dipper
diesel-engine	digger	diphtheria
*diet	*digging	dipping

dips	discharges	disinfection
*direct	disclosed	disk
directed	disconnect	disks
direct-focus	disconnected	dislike
*direction	discontinue	dislocation
*directions	discourage	dismayed
*directly	discouraged	dismissal
director	*discover	disorder
directs	*discovered	disorders
dirigible	discoverer	dispatches
*dirt	*discoveries	displaced
*dirty	discovers	displaces
disadvantages	*discovery	displacement
disagree	discredited	displacing
*disappear	discs	display
disappearance	*discuss	displays
*disappeared	discussed	disposal
disappearing	discussing	dispose
disappears	discussion	disposed
disastrous	*disease	disrupts
disc	diseased	dissect
discard	*diseases	dissecting
discarded	*dish	dissection
discards	*dishes	*dissolve
*discharge	dishful	*dissolved
discharged	dishwashers	dissolver

*dissolves	dive	doldrums
dissolving	diver	doll
*distance	diverge	*dollar
*distances	divers	dollars
*distant	dives	dolls
distillation	*divide	dolphin
distilled	*divided	dolphins
distinct	*divides	domain
distinctions	dividing	dome
distinctive	diving	domes
distinctly	divining	domestication
*distinguish	divisible	dominance
distinguishing	*division	*dominant
distorted	divisions	dominate
distortion	dizziness	dominated
distress	dizzy	dominates
distributed	*do	domino
distributes	dock	dominoes
distribution	docking	donated
districts	docks	*done
*disturb	*doctor	donkey
disturbance	*doctors	*door
disturbances	*does	doorbell
disturbed	*dog	doorbells
ditch	*dogs	*doorknob
*ditches	*doing	doorknobs

doors	dozers	dread
doorway	dozes	dreaded
dormant	draft	*dream
doses	drafts	*dreamed
*dot	*drag	dreamer
dot-dash	dragged	dreams
*dots	dragging	dreary
dotted	dragonflies	dredges
*double	*dragonfly	drench
doubled	drags	dress
doubling	drains	dressed
*doubt	drainage	dressing
*dough	drained	*drew
doughy	draining	*dried
doves	drainpipes	dried-out
dowel	drains	dried-up
*down	dramatic	drier
*downhill	drank	*dries
downstream	*draw	driest
downstroke	drawbacks	*drift
*downward	drawer	drifted
downwards	*drawing	*drifting
downwind	*drawings	drifts
downy	*drawn	*drill
*dozen	drawn-up	*drilled
*dozens	draws	driller

*drilling	dropsonde	ducks
*drills	drought	duckweeds
*drink	drown	ducts
*drinking	drowning	*due
drinks	drowns	*dug
drip	drowsy	*dull
dripping	drudgery	dulling
*drips	drugs	dump
*drive	*drugstore	dumped
*driven	drugstores	dumping
driver	druggist	dumps
drivers	*drum	dune
*drives	drumbeat	dunes
driving	drumhead	*duplicate
drizzle	drummer	duplicated
drones	drums	duplicates
droop	drunken	duplication
*drop	*dry	dupp
droplet	dryer	durable
*droplets	*drying	duration
*dropped	dryness	*during
*dropper	dub	dusk
dropperful	*duck	*dust
droppers	duckbill	dusted
dropping	duckbilled	*dusty
*drops	duckling	duties

duty	earnest	*easy
dwarfs	earning	*eat
dwelt	earphone	*eaten
dweller	earphones	eaters
dwellers	earpiece	*eating
dwelt	*ears	*eats
dwindled	*earth	eaves
*dye	earthlight	echidna
dyed	earthly	echinoderms
*dyes	earthmen	*echo
dying	earth-person	echoes
dynamite	*earthquake	eclipse
dynamo	earthquakes	eclipses
*each	*earthworm	ecliptic
eager	*earthworms	ecologist
eagerly	earthy	economical
eagle	earwig	*edge
eagles	ease	*edges
*ear	eases	editor
earache	*easier	*educated
*eardrum	easiest	education
eardrums	*easily	*eel
*earlier	*east	eelgrass
*earliest	easterlies	eels
*early	eastern	*effect
earn	eastward	*effective

effectively	electrically	eliminates
effects	electrician	ellipse
efficiency	*electricity	ellipses
efficient	electric-light	elliptical
effort	electric-power	elm
efforts	electrified	elodea
*egg	*electromagnet	*else
eggbeater	electromagnetic	elsewhere
*eggs	electromagnets	embedded
eggshaped	*electron	embryo
eggshell	electronic	embryonic
eggshells	electronics	embryos
*eight	*electrons	emeralds
*eighteen	electroplate	emergency
*eighth	electroscope	emerges
eighths	*element	emperor
eighty	*elements	employ
einsteinium	elephant	emptied
*either	*elephants	empties
elaborate	elevated	*empty
elastic	elevation	emptying
*elbow	*elevator	*enable
elder	elevators	enabled
elderly	*eleven	enables
*electric	eliminate	enact
*electrical	*eliminated	enamel

encampments	engaging	*entire
encased	*engine	*entirely
encircle	*engineer	*entitled
*enclosed	engineering	entrance
encloses	*engineers	entries
encounter	*engines	entry
encounters	engulfs	*envelope
*encyclopedia	*enjoy	environment
encyclopedias	enjoyed	environmental
*end	enjoys	environments
endanger	enlarge	enzyme
endeavor	*enlarged	enzymes
ended	enlarges	epidemic
*ending	*enormous	epidermis
endings	enormously	epiglottis
*endless	*enough	*equal
endlessly	enrich	equalized
endoskeleton	enriched	equalizes
*ends	enriching	*equally
endure	*enter	equals
*enemies	*entered	*equation
*enemy	*entering	equations
energies	enterprises	*equator
*energy	*enters	equatorial
engage	entertainment	equinox
engaged	entice	*equipment

*equipped	essays	eventually
equivalent	essential	*ever
era	essentially	evergreen
eras	establish	evergreens
erase	established	*every
*eraser	establishing	everybody
erasers	*estimate	*everyday
erect	estimated	everyone
erected	estivate	*everything
erode	estivation	*everywhere
*eroded	eternal	*evidence
eroding	ethyl	evidences
*erosion	eucalyptus	evolved
errands	*euglena	*exact
error	evaluated	*exactly
erupt	*evaporate	examination
erupted	evaporated	*examine
erupting	*evaporates	examined
eruption	*evaporating	examines
erupts	*evaporation	*examining
*escape	*even	*example
escaped	*evening	examples
*escapes	evenings	excapes
*escaping	*evenly	exceed
esophagus	*event	exceeds
*especially	*events	excel

*excellent	exerts	expedition
*except	*exhale	expeditions
exception	exhaled	expelled
exceptionally	exhaling	expells
exceptions	exhaust	*expensive
excess	exhausted	*experience
excessive	exhausts	experienced
*exchange	exhibit	experiences
exchanger	exhibits	*experiment
exchanges	exist	experimental
exchanging	existed	experimentation
excited	existence	*experimented
excites	existing	experimenting
*exciting	exists	*experiments
excrete	exoskeleton	*expert
excreted	exosphere	experts
excretes	*expand	*explain
excreting	*expanded	*explained
excretion	*expanding	explaining
excretory	*expands	*explains
excursion	expanse	*explanation
excuse	expanses	*explanations
*exercise	*expansion	explode
exercised	*expect	exploded
exert	*expected	explodes
exerted	expects	exploding

*exploration	externally	*eyes
*explorations	*extinct	eyesight
*explore	extinguisher	eyespots
*explored	extinguishers	fabrics
explorer	*extra	*face
*explorers	extract	*faced
*exploring	extracted	*faces
*explosion	extracting	facets
explosive	extraction	facial
expose	extraordinary	*facing
*exposed	extreme	facsimile
exposes	*extremely	*fact
*exposure	extremes	factor
express	extremities	*factories
expressed	extrusive	factors
expression	*eye	*factory
expressions	eyeball	*facts
extend	eyecup	fade
extended	eyedness	faded
extending	eyedropper	*fades
*extends	eyeglass	fail
extension	*eyeglasses	failed
extensions	eyelashes	fails
extensive	eyelid	failure
extensively	eyelids	failures
external	*eyepiece	*faint

fainter	*farmers	*father
*fair	farming	fathers
*fairly	farmland	fathom
falcons	*farmlands	fathoms
*fall	*farms	*fats
*fallen	far-off	fatten
*falling	far-reaching	fatter
*falls	farsighted	fatty
*false	farsightedness	*faucet
fame	*farther	faucets
*familiar	*farthest	*fault
*families	fascinating	faulted
*family	fashion	faulting
*famous	fashioned	faulty
*fan	*fast	faults
fancy	*fasten	favor
fanlike	*fastened	favorable
fanning	fastener	*favorite
fans	fasteners	feared
fan-shaped	fastening	fearful
fantastic	*faster	feasible
*far	*fastest	feast
*faraway	fast-moving	*feather
far-flung	fast-running	feathered
*farm	*fat	*feathers
*farmer	fatal	feathery

feature	fender	fiery
features	ferment	*fifteen
*fed	fermentation	fifteenth
federal	*fern	*fifth
feeble	*ferns	fifths
*feed	ferrum	*fiftieth
feedback	ferry	*fifty
*feeding	fertile	*fight
*feeds	fertilization	fighter
*feel	fertilized	fighting
feeler	*fertilizer	*figure
*feelers	*fertilizers	figured
feeling	*fever	*figures
feelings	*few	figuring
*feels	*fewer	filament
*feet	fewest	filaments
*feldspar	fiber	*file
*fell	fiberlike	*filings
fellow	*fibers	*fill
*felt	*fiction	*filled
*female	fiddler	filling
*females	*field	*fills
femur	*fields	*film
fence	fierce	filmstrip
fenced	fiercely	filoplumes
fences	fiercest	*filter

*filtered	finish	*fish
filtering	*finished	fishbowl
*filters	finishes	fished
filtration	finishing	*fishes
fin	*fins	fisherman
final	fir	*fishermen
*finally	*fire	fishing
finch	fireballs	fishlike
*find	firebox	*fission
finder	fired	fissionable
finders	fireflies	fissions
*finding	firefly	*fist
*findings	firehouse	*fit
*finds	fireman	fitful
*fine	firemen	fitness
finely	fireplace	*fits
fines	fireplaces	fitted
finest	*fires	fitting
*finger	fireworks	*five
*fingernail	*firm	fives
fingerprint	*firmly	fix
fingerprints	firmness	*fixed
*fingers	firs	fixes
fingertip	*first	fixing
fingertips	first-magnitude	fizzes
finger-width	first-quarter	fizzles

fizzing	*flat	fliers
flabby	flatlands	*flies
*flag	flats	*flight
*flagpole	flatten	flights
flagship	*flattened	flimsy
flagstones	flattening	flings
flags	flattens	flint
*flakes	flatter	flip
*flame	flatworm	flipper
flames	flavor	flipper-like
flaming	flavorful	flippers
flannel	flavoring	flipping
*flap	flavors	flips
flapping	flaws	flits
flaps	flax	flitting
flared	flea-like	*float
flares	fleas	floated
*flash	fleet	*floating
*flashed	fleets	*floats
*flashes	flesh	flock
flashing	fleshy	flocks
*flashlight	*flew	floes
flashlights	flexible	*flood
flashy	flick	flooded
flask	flickering	flooding
flasks	flier	floodlights

*floods	fluoride	follicles
floodwater	flushed	*follow
*floor	flute	*followed
*floors	flutter	follower
florist	flutters	*following
flotation	*fly	*follows
flounder	flyer	folly
*flour	*flying	*food
flourished	foam	foodmakers
*flow	foamed	foodmaking
*flowed	foams	*foods
*flower	foamy	fool
flowered	focal	fooled
*flowering	*focus	foolish
flowerpot	*focused	*foot
flowerpots	*focuses	*football
*flowers	focusing	footballs
*flowing	*fog	foothills
flown	foggy	footprint
*flows	*foil	footprints
flu	*fold	footsteps
*fluffy	folded	*for
*fluid	*folding	forbidding
fluids	*folds	*force
flung	foliated	*forced
fluorescent	folk	*forces

forcing	*form	*fossil
forearm	formal	*fossils
forecast	formaldehyde	fought
forecaster	*formation	foul
forecasting	formations	*found
forecasts	*formed	foundation
forefinger	*former	foundations
foregoing	*formerly	founder
foreign	*forming	fountain
foreman	*forms	*four
foresee	*formula	four-cycle
foreseeable	formulas	four-engine
foresight	formulate	four-fifths
*forest	formulating	four-legged
forested	formulation	fours
forester	*forth	four-stroke
*forests	forties	fourteen
foretell	fortified	*fourth
foretold	fortunate	fourths
*forever	*fortunately	fox
forged	fortunes	foxes
*forget	*forty	foxlike
forgets	forty-five	*fraction
forgot	forty-five-foot	fractions
forgotten	forty-two	fracture
fork	*forward	fragile

fragments	frictional	*fruits
fragrance	*friend	fry
*frame	friendly	frying
frames	*friends	*fuel
*framework	frighten	fueling
frankfurter	*frightened	*fuels
freckled	frightening	*fulcrum
*free	fringe	fulfilled
freed	fringed	*full
freedom	fringes	*fullgrown
freeing	fro	*fully
*freely	*frog	*fumes
freeway	*frogs	*fun
*freeze	*from	*function
*freezer	*fronds	functioning
*freezes	*front	functions
*freeing	frontier	fundamental
freight	fronts	*fungi
frequencies	*frost	*fungus
frequency	frosted	*funnel
frequent	frosting	funny
*frequently	frothed	fun
*fresh	froze	*fur
freshly	*frozen	furiously
freshwater	*fruit	furlike
*friction	fruit-juice	*furnace

furnaces	gale	gastropods
*furnish	gallium	gate
furnishes	*gallon	gates
furniture	gallons	*gather
furred	galvanized	gathered
furrows	*galvanometer	gatherer
furry	*game	gatherers
furs	games	*gathering
*further	gamma	gathers
furthermore	gap	gauge
*fuse	gaps	gauges
fused	garage	gauze
fuselage	garageman	*gave
*fuses	*garbage	gazed
fusion	*garden	gazing
*future	gardener	*gear
fuzz	gardeners	*gears
fuzziness	gardening	geese
fuzzy	gardens	gel
gabbro	garlic	gelatin
gain	garter	gelatinous
gained	*gas	gem
faining	gaseous	gems
gains	*gases	gene
galaxies	*gasoline	*general
*galaxy	gastric	generally

*generate	geophysicists	ginger
generated	geophysics	giraffe
generates	geotropism	giraffes
generating	*geranium	girder
*generation	geraniums	girders
generations	gerbils	*girl
*generator	germ	*girls
*generators	germinate	*give
generous	germinated	*given
genes	germination	*gives
genetic	germproof	*giving
genie	*germs	gizzard
genius	gestation	*glacier
gentle	*get	*glaciers
gentler	*gets	glaciologists
*gently	*getting	glad
genuine	ghost	glance
geo	ghostly	*gland
geodesic	*giant	*glands
geographic	giants	glare
geographical	gibbous	glares
geologic	gift	*glass
geological	gigantic	glass-bottomed
geologist	*gill	*glasses
geologists	*gills	glass-like
*geology	*gin	glassmaker

*glassy	glucose	gooey
glazed	glue	goose
gleam	glued	gopher
gleams	glycogen	gophers
glide	gnawing	gorges
glider	gneiss	gorilla
glides	gnomon	*got
gliding	*go	govern
glimpse	*goal	governing
glistening	goals	*government
glistens	goats	governments
glittering	gobble	grab
glob	gobbles	grabs
global	goblins	graceful
*globe	*goes	*grade
globes	*going	grader
globular	*gold	grades
glory	*golden	gradual
glossy	goldfinch	*gradually
glove	goldfish	*graduated
gloved	*golf	graft
gloves	*gone	grafted
glow	gong	*grafting
glowed	gongs	*grain
*glowing	*good	grained
*glows	goods	grainlike

*grains	grass-lined	greet
gram	grassy	greet
grams	grate	*grew
grand	grated	grill
grandparents	grater	grim
*granite	*gravel	grime
granites	*gravitation	*grind
*granted	*gravitational	grinder
granular	*gravity	*grinding
granules	*gray	grinds
grape	grayish	grip
*grapefruit	graze	gripping
grapefruits	grazed	grips
*grapes	grazing	gristle
*graph	grease	grit
graphite	*great	grizzly
graphs	greatcoats	groceries
grappling	*greater	grocery
grasp	*greatest	groin
grasped	greatly	groins
grasping	*green	*groove
*grass	greener	grooved
*grasses	greenhouse	grooves
*grasshopper	*greenish	groping
*grasshoppers	greens	grosbeak
grasslands	greenstick	grosbeaks

*ground	guarding	guppy
grounded	guards	gurgling
grounds	*guess	gushes
groundwater	*guessed	gushing
groundwork	guesses	gusty
*group	*guide	gutter
*grouped	guided	guy
*grouping	guides	gymnasium
groupings	guiding	gymnosperms
*groups	guinea	gypsum
*grow	guitar	gypsy
grower	gulfweed	gyrocompass
growers	gull	*habit
*growing	gullet	habitable
growl	*gullies	habitat
growling	gulls	habit-forming
*grown	gully	*habits
*grows	*gulp	hacksaw
*growth	gulps	*had
growths	gum	hafnium
*grownup	gumdrops	haft
grownups	*gums	hail
grub	gun	hailed
grunts	*gunpowder	hails
guard	guns	hailstone
guarded	*guppies	hailstones

*hair	*hand	happier
haircut	handed	*happy
haired	*handful	harbor
*hairlike	handicap	harbors
hairpin	*handkerchief	*hard
*hairs	handkerchiefs	hard-boiled
*hairy	*handle	*harden
*half	handlebar	*hardened
half-full	handles	hardening
half-inch	handling	*hardens
half-loop	handloom	*harder
half-moon	*hands	hardest
*halfway	handsaw	*hardly
halibut	handsome	hardness
halo	handwoven	hardtack
halted	handy	hardware
halves	*hang	hardwoods
ham	hanger	hare
*hammer	hanging	hares
hammered	*hangs	*harm
hammering	haphazard	harmed
hammers	*happen	*harmful
hammock	*happened	harming
hampers	*happening	*harmless
hamster	happenings	harmony
hamsters	*happens	harness

harnessed	hazardous	heaps
harp	hazards	*hear
harps	hazel	*heard
harvest	*he	*hearing
harvester	*head	*hears
harvesting	headaches	*heart
*has	headed	*heartbeat
hasten	heading	heartfelt
hat	headlands	hearth
*hatch	headlight	heartless
*hatched	headline	hearts
*hatches	headphone	*heat
hatchet	headpiece	*heated
*hatching	*headquarters	heater
hatchway	*heads	heaters
hath	heal	*heating
hats	healed	heatproof
haul	healing	*heats
hauled	heals	heave
hauling	*health	heaved
*have	healthful	heavenly
*having	healthier	heavens
hawk	*healthy	heaves
hawks	heap	*heavier
hay	heaped	*heaviest
hazard	heaping	heavily

heaving	*hemoglobin	*hidden
*heavy	hen	*hide
hedge	hence	hideaway
heel	hens	hides
*height	*her	*hiding
heights	herbivorous	*high
*held	herds	*higher
helicopter	herdsman	*highest
helicopters	*here	highly
heliometer	hereditary	high-pitched
*helium	heredity	highs
hello	hermit	highway
*helmet	hero	hike
*help	heroin	hikers
*helped	herring	*hill
helper	herself	*hills
helpers	heterosphere	*hillside
*helpful	hexagonal	hillsides
*helping	hi	hilltops
helpless	hibernate	hilly
helplessly	hibernates	*him
*helps	hibernating	*himself
helter	hibernation	hind
hemisphere	hibernator	*hinge
hemispheres	hibernators	hint
hemlocks	hickory	hinted

hints	*holes	hope
*hip	*hollow	hoped
hips	hollows	*hopes
*his	*home	hoping
historical	homeless	hopped
*history	homemade	horizon
*hit	*homes	horizontal
hitch	homework	hormone
*hits	homosphere	hormones
*hitting	*honey	horn
hive	honeybee	*hornblende
*hives	honeybees	horned
hobbies	honeycomb	hornets
*hobby	honeycombs	hornless
hog	honeylike	horns
hogs	honor	horrifying
*hoist	hood	*horse
hoisted	hoof	horseback
hoisting	hoofs	horse-chestnut
*hold	*hook	horsepower
*holder	hooked	horses
holdfasts	hooking	horseshoe
*holding	hooks	horsetails
*holds	hook-ups	*hose
*hole	hooves	hospital
holed	*hop	hospitals

host	*hum	hunts
*hot	*human	hurl
hotness	humans	hurled
*hotter	humorous	*hurls
*hottest	humid	*hurricane
*hour	humidity	*hurricanes
*hours	humming	hurried
*house	hummingbird	hurry
*household	hummingbirds	*hurt
households	humor	hurts
*houses	hump	huts
housing	hump-backed	hybrid
housewife	hums	hybridization
housewives	humus	hybrids
hover	*hundred	hydra
hovers	*hundreds	hydrant
*how	hundredth	hydrants
*however	*hung	hydras
howl	hunger	hydrate
howling	hungrier	hydraulic
howls	*hungry	hydro
huddle	*hunt	hydrocarbons
huddled	hunted	hydrochloric
*huge	*hunter	hydroelectric
hugs	*hunters	hydrofoil
hull	*hunting	*hydrogen

hydrogenated	ice-covered	illuminated
hydrogenation	icicle	*illustrate
hydrographer	icicles	illustrated
hydrographers	icy	illustrating
hydrometer	*idea	*illustration
hydrosphere	ideal	illustrations
hydroxide	ideally	*image
hygrometer	*ideas	*imaginary
hygrometers	identical	*imagination
hyperopia	identification	imaginative
hypochlorite	*identified	*imagine
hypodermic	*identify	imagined
hypotheses	identifying	imitate
*hypothesis	idle	imitation
hypothesized	*if	immediate
hypothesizes	*igneous	*immediately
I	ignorance	immovable
*ice	ignite	immune
iceberg	ignited	immunity
icebergs	igniter	imperfect
icebreaker	ignites	implies
icebreakers	ignition	importance
icecap	ill	*important
icecaps	illegal	*impossible
ice-choked	*illness	impractical
ice-cold	illuminate	impressions

imprint	incinerators	*indicate
imprints	incisors	*indicated
imprison	incline	indicates
improperly	inclined	indicating
*improve	inclosed	indication
improved	*include	indicator
improvement	included	indirect
improvements	includes	indirectly
improves	*including	indispensable
improving	incoming	indistinct
*impulse	incomplete	individual
*impluses	incompletely	individually
impure	inconvenient	individuals
impurities	*incorrect	indivisible
*in	*increase	*indoors
inability	*increased	induction
inaccurate	increases	industrial
*inactive	*increasing	*industry
in-between	increasingly	inertia
inbetween	incubation	inexhaustible
inborn	incubator	inexpensive
incandescent	*indeed	infancy
*inch	indefinitely	infant
*inches	independent	infantile
incident	independently	infected
incinerator	index	*infection

infections	inherit	*insects
infectious	inherited	*insert
inferior	inheriting	inserted
infinite	inherits	inserting
infinitely	initials	*inside
inflamed	inject	insight
inflammation	injected	insights
*inflated	injections	insoluble
inflates	injure	inspected
influence	injured	inspectors
influenced	injuries	install
influences	injury	installation
influenza	ink	*instance
*information	inked	instances
informed	inkling	instant
infra	inks	*instead
*infrared	inland	instinct
ingots	inlet	instincts
ingredient	inlets	instruct
ingredients	inner	*instrument
inhabit	innermost	*instruments
inhabiting	inorganic	insulate
*inhale	input	*insulated
inhaled	*insect	insulating
inhales	insecticide	*insulation
inhaling	insecticides	*insulator

*insulators	internal-combustion	invasion
insurance	internally	invariably
intake	international	*invent
intelligent	interplanetary	*invented
intelligence	interpret	inventing
intelligently	interpretation	*invention
intend	interpreted	inventiveness
intended	interpreting	inventor
intense	interrupted	inventors
intensions	intersect	invents
intensity	interstellar	inverse
intercom	*interval	inversely
intercommunication	interview	invert
interdependence	*intestine	invertibrate
interdependent	intestines	*invertibrates
interest	intestional	inverted
*interested	*into	investigate
*interesting	intoxicated	investigated
interestingly	intricacy	investigates
interests	introduce	investigating
interfere	*introduced	investigation
interfered	introduces	investigations
interference	introduction	investigator
interferes	intrusive	*invisible
interior	invade	invitation
internal	invading	invite

inviting	isle	jaws
involuntary	isogonic	jay
involve	isolate	jello
*involved	isolated	*jelly
involving	*isotope	*jellyfish
inward	*isotopes	jellyfishes
*iodine	*it	jerk
iodized	item	jerky
ion	*items	*jet
ionosphere	*its	jet-propelled
ions	*itself	jet-propulsion
iris	ivory	jettisons
*iron	jab	*jets
ironwood	*jack	jewel
irregular	jacket	jewelers
irregularity	jack-in-the-pulpit	*jewelry
irregularly	jacks	jewelweed
irrigate	jagged	jiggle
irrigated	jaguar	jiggles
irrigating	jam	jiggling
irrigation	*jar	jingle
irritable	jarful	*job
irritate	jarred	*jobs
*is	jarring	*join
*island	*jars	joined
*islands	jaw	joining

*joins	junkyards	kickoff
*joing	*just	kicks
*jointed	justified	kidney
*joints	jutting	kidneys
jostle	*kangaroo	*kill
jot	kangaroos	*killed
journal	katydid	killer
journals	katydids	killers
*journey	kayak	*killing
*journeys	keen	*kills
joy	*keep	kiln
judgment	keeper	kilns
judgments	*keeping	*kind
jug	*keeps	kindling
*juice	*kelp	kinds
*juices	*kept	kinetic
juicy	kernal	king
jumble	kernel	*kingdom
*jump	kernels	kingdoms
jumped	*kerosene	kings
jumper	*kettle	kit
*jumping	*key	*kitchen
jumps	keyboard	kitchens
juncos	keys	kitchenware
jungle	*kick	kite
jungles	kicking	kites

kits	*knowledge	laden
*kitten	*known	ladybirds
kittens	*knows	ladybug
knapsack	knuckles	ladybugs
*knee	koala	lagoon
*kneecap	krill	lagoons
kneeling	krypton	*laid
knell	kudzy	*lake
*knew	*label	*lakes
*knife	labeled	lamb
knifeblade	*labels	*lamp
knives	labor	*lamps
knight	laboratories	lampshade
knighted	*laboratory	*land
*knitting	labored	landed
knives	laborer	landforms
*knob	laborers	*landing
*knobs	laborious	*lands
*knock	lack	landscape
knocked	*lacked	language
knock-knees	*lacking	languages
*knot	lacks	lantern
knots	lacquer	lanterns
knotted	lacy	lap
*know	ladder	lapel
*knowing	ladders	lapping

lapse	launcher	*leading
lard	launching	*leads
*large	laundromat	lead-weighted
largely	laundry	*leaf
*larger	*lava	leaf-bearing
*largest	lava-cinder	leafcutter
larkspur	*law	leafcutters
larva	*lawn	leaflet
*larvae	lawnmower	leaflike
larynx	*lawns	leaf-sized
laser	lawrencium	leaf-type
lashes	*laws	leafy
*last	lawyers	leak
*lasted	*lay	leaking
lasting	*layer	leaks
latch	*layered	leaky
*late	layering	lean
*later	*layers	leans
latest	laymen	leap
latitude	laying	leaped
latitudes	*lays	leaping
latter	lazy	leaps
laughed	*lead	*learn
laughter	lead-gray	*learned
launch	leaders	*learning
launched	leadership	*learns

leash	lemonade	levels
*least	lemons	*lever
leather	*length	leverage
leathery	lengthen	*levers
*leave	lengthening	liberates
*leaves	lengthens	librarian
*leaving	*lengths	libraries
lectured	lengthwise	*library
lecturing	*lens	lice
led	*lenses	licensed
lee	*less	*lichen
*left	lessened	*lichens
left-over	lessens	lick
leftover	lesser	*lid
leftovers	lesson	*lids
*leg	lessons	*lie
legend	*let	*lies
legends	*lets	*life
legged	*letter	lifelike
legless	lettering	*lifetime
*legs	*letters	*lift
legume	letting	*lifted
legumes	lettuce	*lifting
leisure	levees	lift-off
lemmings	*level	*lifts
lemon	leveled	

ligament	*likeness	liner
ligaments	*likenesses	*liners
*light	*likes	*lines
light-colored	lilac	*lining
*lighted	lilies	*link
lighten	*lily	*linked
lightening	lima	links
*lighter	limb	linoleum
lighter-than-air	limbs	lint
lighter-than-water	*lime	*lion
lightest	limes	lions
light-gathering	*limestone	*lip
lighthouses	limestones	*lips
lighting	*limewater	*liquid
*lightly	limey	liquid-fuel
lightness	limeys	liquid-propellant
*lightning	*limit	*liquids
lightproof	limitation	*list
*lights	limited	*listed
lightweight	limits	*listen
light-year	limp	listener
lignite	limpets	listening
*like	*line	listens
liked	*lined	listing
likelihood	linen	listless
*likely	line-of-sight	lists

*lit	lobsters	*long
liter	*local	*longer
literature	locale	*longest
lithium	locality	longing
lithosphere	*locate	longitude
litmus	*located	longitudes
*little	locates	longlegs
*live	locating	longshore
*lived	*location	*look
livelier	locations	*looked
*lively	lock	*looking
*liver	*locked	*looks
liverwort	locomotion	loom
liverworts	*locomotive	looms
*lives	locomotives	loop
*living	locust	looped
*lizard	locusts	loops
*lizards	lodes	*loose
*load	lodestone	loosely
*loaded	loft	*loosen
loading	*log	loosened
loads	logbook	*loosening
loaf	loggers	loosens
loam	logical	loran
lobster	*logs	*lose
lobsterlike	logy	*loses

*losing	lubricant	*lungs
*loss	lubricate	luno
*lost	lubricates	lunologist
*lot	lubricating	lunology
lotion	lubrication	lures
lots	luciferin	lurks
*loud	luck	lush
louder	luckily	luster
loudest	*lucky	luxurious
loudly	luggage	lying
loudness	lukewarm	lymph
loudspeaker	lumbar	macaroni
*love	lumber	*machine
lovely	lumbering	*machinery
*low	lumberjack	*machines
*lower	lumberman	mackerel
*lowered	lumberyard	*made
*lowering	luminescence	*magazine
lowers	luminesces	*magazines
*lowest	luminous	maggot
low-power	lump	maggots
low-pitched	*lumps	*magic
lows	lunar	*magma
lox	*lunch	magmas
lub	lung	magnesia
lubb	lungfish	*magnesium

*magnet	majestically	mangrove
*magnetic	major	mangroves
*magnetism	*make	manifold
magnetite	make-believe	manipulator
magnetize	maker	manipulators
magnetized	makers	mankind
magnetizes	*makes	manmade
magnetizing	make-up	manned
*magnets	*making	manner
magnification	malachite	mantis
magnificent	*malaria	*mantle
*magnified	*male	manual
magnifier	males	*manufacture
*magnifies	mallard	manufactured
magnify	mallards	manufacturer
*magnifying	mallet	manufacturers
magnitude	malt	manufactures
magnitudes	*mammal	manufacturing
mail	*mammals	manure
*main	*mammoth	*many
mainland	mammoths	*map
*mainly	*man	*maple
mains	manage	maples
maintain	managed	mapped
maintaining	maneuver	mapping
maintenance	manganese	*maps

*marble	*mass	meadow
*marbles	*masses	meadows
marching	massive	*meal
margarine	mast	meals
margin	masted	*mean
margins	master	*meaning
marigold	mastered	meaningful
marine	masters	meanings
maritime	mastery	*means
*mark	*match	meant
*marked	*matches	meantime
*marker	matchsticks	meanwhile
markers	mate	measles
*market	*material	*measure
markets	*materials	*measured
*marking	mathematical	measurement
markings	*mathematician	*measurements
*marks	*mathematics	*measures
*marrow	mating	*measuring
marshes	*matter	*meat
marshmallows	mature	meat-eaters
martial	maturity	meat-eating
*marvelous	*maximum	meats
mash	*may	mechanic
mask	maybe	*mechanical
masking	me	mechanism

*medical	mend	*metamorphic
*medicine	mended	metamorphosed
medicines	mental	metamorphosis
medieval	mention	meteor
*medium	mentioned	meteorite
*medulla	mentions	*meteorites
*meet	mercuric	*meteorologist
*meeting	*mercury	meteorologists
*meets	mercury-filled	*meteors
megaphone	mercy	meter
melon	*merely	methane
melons	meridian	*method
*melt	meridians	*methods
*melted	merry	metric
*melting	mesh	mi
*melts	mesquite	*mica
member	*message	*mice
*members	*messages	microbes
*membrane	met	microbiologist
*membranes	metabolism	micrometeors
memories	*metal	microorganism
memorize	metallic	microorganisms
memorizing	metallurgical	microphone
memory	metallurgists	microphotograph
*men	metallurgy	microprojector
menace	*metals	*microscope

*microscopes	*milky	mineralized
*microscopic	milky-way	mineralogists
mid-day	mill	*minerals
middens	milled	miners
*middle	milller	*mines
midnight	milliliters	miniature
midpoint	millimeter	mini-breaker
midrib	millimeters	mini-breakers
midsection	*million	minimum
midst	millionaire	mining
midsummer	*millions	minister
midwestern	millipede	mint
*might	millipedes	minus
mighty	mills	*minute
migrate	mimeograph	*minutes
migrates	mimic	miracle
migration	mimicry	*mirror
migratory	mimics	*mirrors
*mild	*mind	miss
*mile	mindful	missed
*miles	minds	misses
military	*mine	missile
*milk	*mined	missiles
milked	miner	*missing
milking	*mineral	mission
milkweed	mineralization	*mist

mistake	module	moments
mistakenly	*moist	monarch
mistakes	*moisten	monarchs
mistletoe	*moistened	monastery
mistook	moistens	*money
misty	moistness	monitor
mites	moisture	monk
mitt	molars	monkey
*mix	molasses	*monkeys
*mixed	*mold	monks
mixer	moldlike	monocots
mixers	*molds	monocotyledons
mixes	moldy	*month
*mixing	mole	monthly
*mixture	*molecular	*months
*mixtures	*molecule	monument
mockingbird	*molecules	mood
*model	moles	*moon
modeled	mollusca	moonless
*modeling	*mollusk	*moonlight
*models	*mollusks	moonlike
moderate	molt	moonlit
moderator	*molten	moon-person
*modern	molting	moon-quakes
modify	molts	*moons
modulated	*moment	moonship

moose	*motors	*movements
*more	mound	mover
moreover	mounds	*moves
*morning	*mount	movie
mornings	*mountain	movies
morphine	mountain-like	*moving
mortor	mountainous	mower
*mosquito	*mountains	mowers
*mosquitoes	mountainside	*much
*moss	mountainsides	mucilage
*mosses	mountaintop	mucous
*most	*mounted	mucus
*mostly	mounting	*mud
*moth	mourning	mud-colored
mothball	*mouse	*muddy
mothballs	mouselike	muffler
*mother	*mouth	mufflers
mothers	mouthful	muggy
mothflakes	mouthed	mulberry
*moths	mouthfuls	mule
*motion	mouthpiece	multicelled
motionless	*mouths	multicellular
*motions	movable	multiple
*motor	*move	*multiplied
motorboat	*moved	multiplies
motorcycle	*movement	*multiply

*multiplying	mutation	nasturtium
multistage	*my	nation
mumps	myopia	national
munching	mysteries	nations
murky	*mysterious	native
murmur	*mystery	*natural
*muscle	myth	*naturally
*muscles	*nail	*nature
muscovite	nailed	nauplius
*muscular	nailing	nautical
*museum	*nails	nautilus
museums	*name	naval
mushroom	*named	navel
*mushrooms	*names	navigate
mushy	naming	navigating
music	naked	navigation
musical	nap	navigator
musicians	napkin	navigators
musk	napkins	navy
muslin	narcissus	neap
mussel	narcotic	*near
mussels	narcotics	*nearby
*must	narrow	*nearer
mutant	narrowed	*nearest
mutants	narrower	nearing
mutated	narrows	*nearly

nears	*neither	newsmagazines
nearsighted	*neon	*newspaper
nearsightedness	neptunium	*newspapers
neatly	nerve	newsprint
necessarily	*nerves	newts
*necessary	*nervous	*next
necessity	*nest	niacin
*neck	nesting	nibble
necked	nests	nibbles
necklace	*net	nice
necks	nets	nicely
*nectar	*network	*nickel
*need	neuron	nickels
*needed	neurons	nickname
*needle	*neutral	nicknamed
needle-like	neutron	*night
*needles	*neutrons	*nights
*needs	*never	nighttime
*negative	nevertheless	nimbostratus
negatively	*new	nimbus
neglects	newborn	*nine
*neighbor	newer	nineteen
*neighborhood	newest	nineteenth
neighborhoods	newly	ninety
*neighboring	*news	nip
*neighbors	newscaster	nitrate

nitrates	nonstop	notes
*nitrogen	noodle	*nothing
nitroglycerine	noodles	*notice
*no	*noon	*noticed
nobody	noontime	noticing
nod	*nor	notify
node	*normal	nourish
nodules	*normally	nourished
noise	*north	nourishment
noises	northeast	nova
noisily	northeastern	novas
noisy	northeasterly	novelties
nomad	northerly	*now
nonconductors	*northern	nowadays
*none	northernmost	nowhere
nonexistent	northward	nozzle
nonexploding	*northwest	nozzles
nonfood	northwestern	*nuclear
nongreen	*nose	*nuclei
*nonliving	noses	*nucleus
nonluminous	nostrils	nuisance
nonmagnetized	*not	numb
nonmoving	*note	*number
nonpermeable	*notebook	*numbered
nonporous	notebooks	*numbers
nonscientists	noted	numeral

numerals	obelisks	obvious
*numerous	obey	obviously
*nurse	obeys	occasional
nurseries	*object	occasionally
nurses	*objective	occupants
*nut	objectives	occupation
nutcracker	*objects	*occupies
nutrient	obnoxious	occupy
nutrients	obscured	occupying
nutrition	observable	*occur
nutritionist	observation	occurred
nutritionists	*observations	occurrence
nutritive	observatories	occurring
*nuts	observatory	*occurs
nutty	*observe	*ocean
nylon	*observed	oceanographers
nymph	*observer	oceanography
nymphs	observers	*oceans
oak	observes	*o'clock
oaks	*observing	octagonal
oars	*obsidian	*octopus
oases	obstacles	*octopuses
oasis	*obtain	ocular
oat	*obtainable	odd
oatmeal	*obtained	oddity
oats	obtaining	oddly

*odor	olfactory	*openings
*odorless	*olive	*opens
odors	olives	*operate
*of	*on	operated
*off	*once	operates
offer	oncoming	*operating
offers	*one	operation
office	one-celled	operator
officer	one-fourth	operators
officers	one-half	ophthalmos
*offices	one-hole	ophthalmoscope
officials	one-piece	opinion
offs	ones	opium
offset	*onion	opossums
offspring	onionlike	opportunity
*often	onions	opposing
oh	*only	*opposite
*oil	*onto	opposition
oiled	onward	optic
oily	ooze	optical
oils	oozes	*or
*old	opaque	oral
olden	*open	*orange
*older	*opened	oranges
*oldest	opener	*orbit
oldtime	*opening	orbital

orbiting	ornithopters	outlet
*orbits	orphan	outlets
orchard	ostracodern	*outline
orchards	ostracoderns	outlined
orchids	ostrich	outlines
*order	*other	outnumber
orders	*others	outnumbered
orderly	*otherwise	out-of-doors
ordinances	otoscope	outpost
*ordinarily	ouch	output
*ordinary	ought	outrigger
*ore	ounce	outshines
ores	*ounces	*outside
*organ	*our	outskirts
organic	ours	outspread
*organism	*ourselves	outstretched
organisms	*out	outward
organizations	outcome	outwit
organized	outdoor	oval
*organs	*outdoors	oval-shaped
origin	*outer	ovaries
*original	outermost	*ovary
originally	outgrew	*oven
oriole	outgrow	*ovens
orioles	outgrows	*over
ornaments	outlast	overboard

overcast	ovipositor	packages
*overcome	ovule	*packed
overcoming	*ovules	packet
overfishing	owe	packets
*overflow	owl	packing
overflowing	owls	packs
overflows	*own	*pad
overgrazing	owned	*paddle
overgrown	owner	paddles
*overhead	ox	pads
overheated	oxcart	*page
overheating	oxidation	*pages
overlap	*oxide	paid
overlapping	oxides	*pail
overloaded	oxidize	pailful
overlying	oxidized	*pain
*overnight	oxidizer	*painful
overrun	oxidizers	painkillers
overripe	oxidizing	painlessly
overseas	*oxygen	pains
oversized	oyster	*paint
overspecialization	oysters	*painted
overstuffed	ozone	painting
overtakes	pacing	paints
overweight	pack	*pair
overwhelming	*package	paired

*pairs	parachute	partial
*pale	parachutes	partially
paleobiologist	parade	participating
paleontologists	*paraffin	*particle
paler	paragraph	*particles
*palm	paragraphs	*particular
palms	parallel	particularly
pamphlets	parallels	*partly
*pan	paralysis	partner
pancake	paralyzed	partners
pancreas	paramecia	partnership
pancreatic	paramecium	*parts
pane	parasite	partway
paned	parasites	*pass
panels	parcel	passage
panes	parched	passages
pangs	*parent	passageway
panning	*parents	*passed
*pans	paring	passenger
panther	*park	*passengers
panting	parking	*passes
*paper	parks	*passing
paperclip	parr	passports
papier-mache	parrot	*past
*papers	parrots	*paste
paperweight	*part	pasted

pasture	pay	pecking
pasturized	payload	pecks
pat	pays	peculiar
patch	*pea	pedal
*patches	*peace	pedals
patent	peaceful	pedigree
patented	peacefully	peek
*path	peach	peeked
pathogenic	peaches	peeks
paths	*peak	*peel
pathway	*peaks	peeled
pathways	peanut	peeled-off
patience	*peanuts	peeling
patient	*pear	peels
patiently	pearl	peer
patrolling	pearls	peering
patter	pearly	peg
pattering	pears	pegboard
*pattern	pear-shaped	pegmatite
*patterns	*peas	pegmatites
pause	peashooter	pelecypods
pauses	peat	pelicans
paved	pebble	pellagra
pavement	*pebbles	pelts
pavements	pebbly	*pen
paws	peck	*pencil

pencils	perceivable	peripheral
pendulum	percent	periscope
penetrate	percentage	periwinkle
penetrates	percentages	permanent
penetrating	perch	permanently
penetration	perched	permeable
penguin	perches	permission
*penguins	perching	*permit
penhole	perchlorate	*permits
*penicillin	percolator	peroxide
penicillium	perennials	perpendicular
penknife	perfect	perpetual
pennant	perfecting	perpetually
pennies	perfection	persisted
*penny	*perfectly	*person
penpoint	*perform	personal
penumbra	*performance	personally
*people	performed	*persons
peoples	*performs	*perspiration
pep	perfume	perspire
*pepper	perfumes	perspiring
peppered	*perhaps	persuaded
peppers	*period	persuades
peps	periodic	persuasion
pepsin	periods	pertinaciously
*per	periosteum	pest

*pests	*phosphorus	*picks
*pet	photo	picnic
petal	*photograph	*picture
*petals	photographed	*pictured
petiole	photographic	*pictures
petri	*photographs	picturing
petrified	photography	*pie
petrify	photon	*piece
petroleum	photons	pieced
*pets	*photosynthesis	*pieces
petunias	phrase	piecing
pharmacy	phrases	piedmont
phase	phylum	pier
phases	*physical	pierces
pheasant	physically	piers
phenomena	physician	piezoelectricity
phenomenon	*physicist	pig
philosophy	physicists	pigeon
phlox	physics	pigment
phone	phytoplankton	pigments
phones	piano	pigs
phonograph	piccolo	*pile
phonographs	*pick	piled
phosphates	*picked	*piles
phosphor	picking	*piling
phosphors	pickle	*pillars

pillow	pipeline	planarian
*pills	pipelines	*plane
*pilot	pipes	*planes
pilots	piping	*planet
*pin	*pistil	planetarium
*pinch	pistol	planetariums
pinched	*piston	planetesimal
pinches	pistons	planetesimals
pinching	pit	*planets
*pine	*pitch	plank
pinet	pitched	plankton
ping	pitcher	planned
pinfeathers	pitchers	*planning
pinhole	pitfalls	*plans
pinholes	pith	*plant
*pink	pits	plant-eaters
pinkish	*pivot	*planted
pinpoint	pivots	planter
*pins	*place	*planting
*pint	*placed	*plants
pinwheel	placers	plasma
pinwheels	*places	plast
pioneer	placing	*plaster
pioneers	*plain	*plastic
*pipe	*plains	plastics
piped	*plan	*plate

plateau	plots	*pockets
plateaus	plotting	pod
plated	plover	pods
*plates	*plow	*point
platforms	plowed	*pointed
plating	plowing	pointer
*platypus	plows	pointers
*play	*pluck	pointing
played	plucked	*points
player	plucking	*poison
playful	plucks	poisoned
*playground	*plug	poisoning
*playing	plugged	poisonous
*plays	plugs	poisons
*pleasant	plum	*poke
please	plumb	poked
pleased	plumcot	*polar
pleases	plums	polarity
pleasing	plunge	polarized
pleasure	plunger	*pole
*plentiful	plunk	*poles
*plenty	plural	*police
pliable	plus	policemen
pliers	plutonium	*polio
plodded	plywood	polish
plot	*pocket	*polished

polite	*pops	poster
polled	popular	posters
*pollen	*population	postman
pollinate	porcelain	*posts
pollinated	pore	*pot
pollinating	pores	*potassium
pollination	pork	*potato
polluted	*porous	*potatoes
polluting	porphyry	potential
pollution	porpoises	potholder
polyps	port	*pots
pomato	portable	potted
*pond	portion	potter
*ponds	portions	pottery
pondweeds	ports	pouch
pong	poses	pouched
*pool	*position	pouches
pools	positional	poultry
*poor	*positions	pounced
poorer	positive	*pound
poorest	positively	pounding
poorly	possibility	*pounds
*pop	*possible	*pour
popcorn	*possibly	*poured
popping	post	*pouring
*poppy	postcards	*pours

*powder	predictable	*presses
*powdered	*predicted	*pressing
powders	*prediction	*pressure
powdery	predictions	pressures
*power	predicts	pressurization
*powered	*prefer	pressurized
*powerful	preferably	pretend
powerhouse	*prehistoric	pretty
powerhouses	premixed	prevailing
*practical	preparation	*prevent
*practically	*prepare	prevented
*practice	prepared	*preventing
practiced	prepares	prevents
practices	preparing	previous
prairie	prescribed	previously
prairies	prescription	prey
praying	*presence	price
prawns	*present	prick
precaution	presented	prickles
precautions	presenting	pried
preceding	preservative	pries
*precious	preserve	primarily
precipitation	*preserved	primary
precise	*press	primates
precisely	pressboard	primitive
*predict	*pressed	principal

principally	*processed	prongs
principle	*processes	*proof
principles	processing	*prop
*print	*produce	propagating
*printed	*produced	propel
printer	*produces	propellant
printing	*producing	propellants
prints	product	propelled
*prism	production	*propeller
prisms	*products	*propellers
private	professional	propels
*prize	professor	*proper
prizes	profile	*properly
probable	program	*properties
*probably	*programs	*property
*probe	*progress	proportion
probes	progresses	proportions
probing	project	propose
*problem	projections	proposed
*problems	projector	propulsion
proceed	projectors	*protect
proceeded	projects	*protected
proceeds	prominent	*protecting
procedure	promise	protection
procedures	promote	*protective
*process	promotes	protects

*protein	*pry	*pulleys
*proteins	prying	*pulling
protist	pseudopod	*pulls
protists	pseudopods	pulmonary
protium	psychologists	*pulp
proton	psychology	*pulse
*protons	psychrometer	pulsing
protoplanet	ptarmigan	*pumice
protoplanets	pteridophyta	*pump
*protoplasm	pteridophytes	*pumped
protozoa	*public	*pumping
protozoan	publish	pumpkin
protozoans	published	pumpkins
protractor	publishes	*pumps
protrudes	pudding	*punch
protruding	puddingstone	puncture
*prove	puddle	punctured
proved	puddles	punishing
proven	puff	punishment
*provide	puffiness	*pupa
*provided	puffing	pupae
*provides	puffs	*pupil
providing	puffy	pupils
proving	*pull	puppies
prowl	*pulled	*puppy
pruned	*pulley	pups

purchase	*put	*quart
purchased	*puts	*quarter
*pure	*putting	*quarters
purely	putty	*quarts
purification	puzzle	*quartz
purified	puzzled	quartzite
purifier	puzzler	queen
purifies	*puzzles	queens
*purify	puzzling	*question
purifying	pyramid	questioned
*purple	pyramids	*questions
purplish	pyrex	*quick
*purpose	pyrosoma	quicker
*purposes	pyrosomas	*quickly
purr	quadrant	quicksand
purring	quadrillion	*quiet
purse	quake	*quietly
pursued	qualitative	quiets
pus	qualities	quill
*push	quality	quills
pushbuttons	quantitative	*quite
*pushed	*quantities	quitely
*pushes	*quantity	*rabbit
*pushing	quarantine	*rabbits
pushpins	quarries	rabies
pussy	quarry	raccoons

*race	*radium	*raising
raced	radius	raisins
racehorse	raft	ram
racer	rages	ramjet
races	ragged	*ramp
racing	rags	ramps
rack	rail	rams
racket	railing	*ran
*radar	*railroad	ranch
radiant	railroads	rancher
radiated	rails	ranchers
radiates	*rain	ranches
radiation	*rainbow	random
radiations	raincoat	*range
*radiator	*raindrop	ranged
radiators	*raindrops	*ranges
*radio	rained	ranging
*radioactive	*rainfall	rapid
radioactivity	rainfalls	*rapidly
radioed	raining	rapids
radioisotope	*rains	rapping
radiometer	rainwater	raps
radios	rainy	rare
radiosonde	*raise	rarely
*radish	*raised	raspberries
radishes	*raises	raspberry

*rat	reactors	rebuilding
*rate	*reacts	rebuilds
rates	*read	rebuilt
*rather	*readily	*recall
rating	*reading	*receive
ratio	*readings	*received
rats	reads	*receiver
rattle	*ready	receivers
rattles	*real	*receives
rattlesnake	realistic	*receiving
rattlesnakes	reality	recent
ravens	realize	*recently
ravines	realizes	reception
*raw	realized	recessive
ray	*really	recessiveness
*rayon	reappear	recharged
*rays	*rear	recheck
*razor	rearrange	rechecked
*reach	rearranged	rechecks
*reached	rearranging	reciprocates
*reaches	*reason	reciprocating
*reaching	*reasonable	reckoning
react	*reasoned	reclaim
*reaction	reasoning	recognition
reactions	*reasons	*recognize
*reactor	rebounds	recognized

recognizes	red-winged	reforestation
recognizing	reed	refract
*recommend	reeds	refracted
recommends	reef	refracting
reconstruct	reefs	refraction
reconstructed	reel	refractor
reconstruction	reentry	refracts
*record	refer	*refrigerator
record-breaking	*reference	refrigerators
*recorded	references	refuges
*recorder	referred	refuse
recorders	refers	refused
*recording	refill	refute
*records	refined	regarded
recover	refinement	regenerative
rectangular	refineries	*region
*red	refining	*regions
redder	*reflect	registered
*reddish	*reflected	registers
redevelopment	*reflecting	regrets
reds	*reflection	*regular
*reduce	reflector	regularity
*reduced	reflectors	*regularly
*reduces	*reflects	regulate
reducing	reflex	regulated
reduction	reflexes	regulates

regulating	*releases	renewed
regulators	releasing	repair
reheat	reliable	repaired
reindeer	relief	repairman
rejected	relieved	repairs
rejoin	rely	*repeat
*relate	*remain	*repeated
*related	*remained	repeatedly
relates	remainder	repeating
relating	remaining	repeats
relation	*remains	*repel
relationship	remarkable	*repelled
*relationships	remarkably	repelling
relative	*remember	replace
relatively	remembered	*replaced
relatives	remembers	replacements
relax	*remind	replaces
relaxed	reminders	replies
relaxes	reminds	reply
relaxing	remote	*report
*relay	removal	reported
relayed	*remove	reporting
relaying	*removed	*reports
*relays	removes	represent
*release	*removing	representative
*released	rendezvous	*represented

*represents	*reservoir	*rest
*reproduce	*reservoirs	restaurant
*reproduced	residue	rested
reproduces	resift	resting
reproducing	resin	restless
reproduction	*resist	restore
reproductive	*resistance	restored
*reptile	resistant	restores
*reptiles	resists	restoring
*repulsion	resounds	*rests
reputation	resource	restudy
request	resources	*result
requested	respect	resulted
requests	respectable	resulting
require	respects	*results
required	respiration	retain
requirements	respiratory	retained
*requires	*respond	retains
requiring	responded	retards
*research	responding	*retina
researchers	responds	retinas
reseeding	response	retold
resemble	responses	*return
*resembles	responsibility	returned
resembling	*responsible	*returning
*reserve	responsive	*returns

reveal	riboflavin	*ring
revealing	ribs	ringed
reveals	*rice	*ringing
*reverse	*rich	*rings
reversed	richer	rinse
reversing	riches	rinsed
*review	richest	*ripe
revise	ricketts	ripened
revised	*rid	ripening
revisions	riddle	ripens
*revolution	*ride	ripped
revolve	riders	ripple
revolved	rides	rippled
*revolves	ridge	ripples
*revolving	ridges	rippling
reward	ridiculous	*rise
rewarding	riding	risen
rewards	rifle	*rises
rhizopus	*right	*rising
rhubarb	right-sight-up	risk
rhythm	rigid	risky
rhythmic	rigidly	rival
rib	rill	*river
ribbon	rills	riverbanks
ribbon-like	*rim	riverbed
ribbons	rim	*rivers

*road	*rod	ropes
road-building	rode	ropy
*roads	rod-like	*rose
roadside	*rods	rose-breasted
roadway	rod-shaped	roses
roadways	role	*rot
roam	*roll	*rotate
*roamed	*rolled	rotated
*roar	*roller	*rotates
roaring	rollers	*rotating
roars	*rolling	*rotation
roast	*rolls	rotational
roasters	*roof	rotor
roasting	roofer	rots
robbery	rooftops	rotted
robin	*room	rotten
robins	roomful	*rotting
*rock	*rooms	*rough
rocker	roomy	rougher
*rocket	roosters	roughly
rocket-launched	*root	roughness
rocketry	rootlet	*round
*rockets	rootlets	*rounded
*rocks	rootlike	rounding
rockweeds	*roots	roundness
*rocky	*rope	roundworms

*route	*rumbles	sack
routes	*run	sacks
*row	runaway	sacs
*rowboat	rung	sad
*rows	runner	sadness
*rub	runners	*safe
*rubbed	*running	safeguards
*rubber	runoff	*safely
rubberized	*runs	safer
rubberlike	runway	*safety
rubbery	runways	saguaro
*rubbing	rural	*said
rubbish	rush	sail
rubidium	rushed	sailboat
rubies	*rushes	sailboats
rubs	rushing	sailed
rudder	rust	sailing
*rug	rusted	sailor
rugged	*rusting	*sailors
ruined	rustle	sails
*rule	rusts	salad
ruled	*rusty	salads
*ruler	ruts	salamander
rulers	sabertooth	salamanders
rules	sables	sale
rumble	*sac	*saliva

*salivary	*sandy	sausage
*salmon	sanitary	savannas
*salt	sanitation	*save
saltier	*sank	saved
saltiness	sap	saves
salt peter	sapphires	*saving
*salts	sardine	savings
salt-water	sardines	savor
*salty	sassafras	*saw
salvaged	sat	sawdust
*same	*satellite	sawing
*sample	*satellites	saws
samplers	satin	*say
*samples	satisfaction	*saying
sampling	satisfactorily	sayings
sanctuaries	satisfactory	says
sanctuary	*satisfied	*scale
*sand	satisfies	scaled
sandblaster	satisfy	*scales
sandbugs	satisfying	scallops
*sandpaper	saturate	scaly
sandpipers	saturated	scamper
sands	saturation	scampering
*sandstone	saucepan	scan
*sandwich	saucer	scaphe
sandwiched	saucers	*scarce

scarcely	*scoop	scrapings
scarf	scooped	scraps
scarlet	scoopful	*scratch
scarps	scooping	scratched
*scatter	scoops	scratches
*scattered	scope	*scratching
scattering	scorch	screamed
scatters	scorching	screechy
*scene	score	*screen
scenery	scores	screening
scenes	scoria	screens
scent	scorpions	*screw
schedule	scotties	screwed
scheme	scour	screwdriver
schists	*scouring	*screws
*school	scout	screwtop
schooling	scouts	scrub
*schools	scraggly	scrubby
schoolyard	scrambled	scuba
*science	scrap	scuds
*scientific	scrapbook	scuffed
*scientist	*scrape	sculptor
*scientists	*scraped	sculptors
scion	scraper	scum
*scissors	scrapes	scurry
sclera	scraping	scurrying

scurby	seated	seed-bearing
*sea	seawalls	seeded
seabottom	seawater	seeding
seacoast	*seaweed	seedless
seacoasts	seaweeds	seedlessness
*seal	*second	seedling
*sealed	secondary	*seedlings
sealing	second-magnitude	seedmaking
*seals	*seconds	*seeds
*search	secret	*seeing
searched	secrete	*seek
searches	secreted	seeking
*searching	secretes	seeks
searchlight	secretions	*seem
searchlights	secrets	*seemed
searing	*section	seeming
*seas	*sections	*seems
seashell	secure	*seen
seashells	*securely	seep
*seashore	securing	seeped
seaside	*sediment	seeping
season	*sedimentary	*seeps
seasonal	sedimentation	*sees
seasonally	sediments	*seesaw
*seasons	*see	segment
seat	*seed	segmented

segments	sensation	servant
seismograph	*sense	servants
seismographic	sensed	*serve
seismographs	senseless	served
seismologist	*senses	serves
seismologists	sensible	service
seldom	sensing	services
select	*sensitive	servings
selected	*sensory	*set
selective	*sent	*sets
selects	sentence	*setting
selenium	sentences	*settle
self-contained	sepals	*settled
self-control	*separate	settlers
sell	*separated	*settles
sellers	separately	settling
semaphore	*separates	*seven
semaphores	*separating	seventh
semicircular	separation	sevenths
semiliquid	septum	seventieth
semitransparent	sequence	seventy
*send	*sequoia	*several
sender	*series	severe
senders	*serious	severely
*sending	seriously	sew
*sends	serum	*sewage

sewing	shaping	*sheets
sextant	*share	*shelf
shad	shared	*shell
*shade	sharing	shellac
shaded	shark	*shelled
*shades	sharks	*shellfish
shading	*sharp	*shells
*shadow	sharpen	*shelter
*shadows	sharpened	sheltered
*shady	sharpener	shelters
*shaft	sharper	shelves
shafts	sharply	shepherds
*shake	sharpness	shield
shaken	shattered	shielded
shaker	shattering	shielding
shakes	shavings	shieldings
shaking	*she	shields
shaky	shears	*shift
*shale	sheath	shifted
shales	shed	*shifting
shall	shedding	shifts
*shallow	sheds	shimmering
shampoos	*sheep	shinbone
*shape	sheer	*shine
*shaped	*sheet	*shines
*shapes	sheeting	shingles

shinier	*shore	shovelfuls
*shining	shoreline	shovels
*shiny	shorelines	shoving
*ship	*shores	*show
shipped	*short	*showed
shipping	*shortage	*shower
*ships	shortages	showers
shirt	shortcake	showing
shirts	shorten	*shown
shoals	shortened	*shows
*shock	shortening	shrank
shocked	*shortens	shredded
shocks	*shorter	shreds
*shoe	*shortest	shrews
shoelace	shorthorned	shrieks
shoelaces	shortness	shrill
*shoes	short-wave	shriller
shone	shot	shrimp
*shoot	shots	shrimplike
shooter	*should	*shrimps
shooters	*shoulder	*shrink
*shooting	shoulders	*shrinking
*shoots	shout	shrinks
*shop	shouted	shrivels
shopping	shouts	shrub
shops	shovel	shrubbery

*shrubs	*signal	silt
shrunk	signaling	*silver
shuffle	signalman	silverware
shuffling	*signals	silvery
shunted	signed	*similar
*shut	significance	similarities
shuts	significant	similarity
*shutter	significantly	*simple
shutters	signifies	*simpler
shy	signs	*simplest
*sick	*silence	simplicity
sicken	silent	*simplified
sickness	silently	simply
*side	silhouette	simultaneously
sided	silica	*since
*sides	silicates	sincerely
*sidewalk	silicon	*sing
*sidewalks	silicone	singer
*sideways	silicones	singing
sift	*silk	*single
sifting	silklike	single-celled
*sight	silkworm	singled
sighted	*silkworms	single-stage
sighting	*silky	singly
sights	sill	sings
*sign	*silly	*sink

sinkful	*sizes	skunks
*sinks	*skate	*sky
*sip	skater	skyline
siphon	skaters	skyrocket
sips	skates	skyscraper
siren	skeletal	skyscrapers
sirupy	*skeleton	skyward
sister	*skeletons	skywatch
sisters	skelter	slab
*sit	*sketch	slabs
site	sketches	slack
*sits	skidding	slacken
sitters	skies	slag
*sitting	skiing	slaked
situated	*skill	slams
situation	skilled	slant
situations	*skills	slanted
*six	skim	slanting
*sixteen	skimmed	slants
sixteenth	*skin	slap
sixth	skin-diving	slaps
sixth-magnitude	skinlike	slat
sixty	skinned	*slate
sixty-seven	*skins	slats
*size	skip	sled
sized	*skull	*sleep

sleepers	*slippery	*small
sleeping	slipping	small-craft
sleeps	*slips	*smaller
sleepy	*slit	*smallest
*sleet	*slits	smallpox
sleets	sliver	smash
slender	slivers	smashed
*slice	*slope	smashes
sliced	*slopes	smashing
*slices	*sloping	smear
slick	slot	smear
slid	sloth	*smell
*slide	slots	smelled
*slides	*slow	smelling
*sliding	*slowed	*smells
slight	*slower	smog
slightest	slowest	smoke
*slightly	slowing	smokes
slim	*slowly	smokestack
*slime	slow-paced	smoking
slimmer	slows	smoky
slimy	sluggish	smolder
sling	slugs	smoldered
*slip	sly	smolt
*slipped	smack	smolts
slipper	smacking	*smooth

smoothed	snip	soap
smoothest	snipping	soapy
smoothing	snorkel	soar
*smoothly	snout	soared
smoothness	snouts	soaring
smothered	*snow	*social
smudge	snowball	*socket
smudged	snowballs	sockets
snacks	snowberry	socks
*snail	snowbirds	sod
*snails	snow-covered	*soda
*snake	snowed	*sodium
*snakes	snowfall	*soft
snakeskin	*snowflakes	soft-bodied
snap	snowing	soften
snapdragon	snow-laden	softened
snapping	snowplow	softening
snaps	*snows	softens
snapshot	snowy	softer
snatch	snug	softest
sneak	snugly	softland
sneeze	*so	softly
sneezes	*soak	softness
*sneezing	*soaked	softwood
sniff	soaking	softwoods
sniffed	*soaks	*soil

soil-covered	*someone	*sound
soilmakers	somersault	sound-absorbing
*soils	*something	sounded
sol	sometime	*sunder
*solar	*sometimes	sounding
solar-system	*somewhat	soundings
*sold	*somewhere	soundproof
solder	son	*sounds
soldier	*sonar	soup
soldiers	*song	soups
*solid	songs	soupy
solidly	sonic	*sour
solid-propellant	*soon	*source
*solids	*sooner	*sources
solstice	soonest	*south
*solution	*soot	southeast
*solutions	sore	southeastern
*solve	sores	southern
*solved	sorrow	southward
solver	sorry	southwest
solves	*sort	southwestern
*solving	sorted	sow
*some	sorting	soya
somebody	sorts	soybean
*someday	sought	soybeans
somehow	soul	*space

spacecraft	*speak	spectra
spaced	speaker	spectroscope
spaceman	*speaking	spectroscopes
spacemen	speaks	*spectrum
*spaces	spear	spectrums
space-ship	spearheads	speculated
*spaceship	spears	speculating
*shaceships	*special	sped
spade	speciality	speech
spadefoot	specialization	*speed
spadeful	specializations	speeded
spading	specialize	speedier
span	specialized	speediest
spaniel	specializes	*speeding
spaniels	specially	speedometer
spans	species	*speeds
sparingly	specific	*speedy
*spark	specifically	spell
sparkle	specimen	spelled
sparkled	specimens	spelling
sparkling	*speck	*spend
sparks	speckled	spends
sparrow	*specks	*spent
sparrows	spectacle	sperm
spawn	spectacular	spermatophyta
spawning	spectators	spermatophytes

sphere	spirillum	spools
*spheres	spirogyra	*spoon
spherical	*spite	spoonful
sphygmomanometer	*splash	spoonfuls
spices	splashed	*spoons
*spider	splashes	*spore
*spiders	splint	*spores
spiderwebs	splinter	sport
spill	splinters	*spot
spilled	splintery	*spots
spilling	splints	spotted
spills	*split	spotting
*spin	*splits	*spout
spinach	*splitting	spouting
*spinal	spoil	sprained
spine	spoilage	spray
*spines	spoilage	*sprayed
*spinning	spoils	spraying
*spins	spoke	*spread
spiny	spokes	spread-apart
spiracles	*sponge	*spreading
*spiral	*sponges	*spreads
spiraled	spongin	sprig
spiraling	spongy	sprigs
spirals	spontaneously	*spring
spirilla	*spool	springs

springtime	squeaks	staging
springy	squeaky	stain
*sprinkle	*squeeze	stained
sprinkled	*squeezed	staining
sprinkler	squeezes	stainless
*sprinkling	squeezing	stains
*sprout	squid	stair
sprouted	squidlike	stairs
sprouting	*squids	stairway
sprouts	squint	stairways
spruce	*squirrel	stalactite
spruces	squirrels	stalactites
spun	squirt	stalagmite
spurt	squirted	stalagmites
spurted	squirting	stale
*spurts	squirts	*stalk
squad	stability	stalklike
squall	stable	stalks
*square	stack	stall
squared	stacked	*stamen
squarely	stacks	*stamens
squares	stadium	stamp
*squash	staff	stamped
squat	*stage	stamping
squats	*stages	*stand
*squeak	staghorn	standard

*standing	*starting	steak
standpoint	startling	stealing
standpoints	*starts	*steam
*stands	starvation	steamboat
stanzas	starve	steaming
staph	starves	steamship
staphylococcus	starving	steamy
staple	*state	*steel
stapler	stated	steelmaking
staples	*statement	steels
stapling	*statements	*steep
*star	*states	steeper
*starch	*static	steepness
starches	stating	*steer
*starchy	*station	steered
stare	stationary	*steering
stared	stationery	steers
*starfish	*stations	stegosaurus
stargazers	statue	*stem
starlight	statues	stemlike
starling	*stay	*stems
starry	*stayed	stentor
*stars	staying	*step
*start	*stays	step-by-step
*started	*steadily	stepped
starter	*steady	*steps

stereophonic	stimulus	stopwatch
sterilization	sting	*storage
*sterilize	stinger	*store
stethoscope	stingers	*stored
stewed	stinging	storehouse
*stick	stings	storeroom
sticker	*stir	*stores
stickers	stirred	*stories
*sticking	*stirring	*storing
stickleback	stirrup	*storm
sticklebacks	stirs	stormless
*sticks	stock	*storms
*sticky	*stomach	storm-warning
*stiff	stomachs	stormy
stiffen	stomata	*story
stiffened	*stone	storyteller
stiffening	stonelike	stout
stiffer	*stones	*stove
stiffness	stony	stoves
stigma	stood	*straight
*still	stoop	straighten
stimulant	*stop	straightened
stimulate	stopped	straightens
stimulated	*stopper	strain
stimulates	stopping	strainer
stimuli	*stops	strains

strand	*streets	*strong
strands	*strength	*stronger
*strange	strengthen	strongest
strange-looking	streptomycin	strongly
strangely	stress	strontium
stranger	*stretch	*struck
straps	*stretched	*structure
stratiform	*stretches	*structures
stratosphere	stretching	struggling
stratus	strict	strung
*straw	strictly	stub
strawberries	*strike	stubby
strawberry	*strikes	*struck
straws	*striking	studded
stray	*string	student
streak	stringed	*students
streaking	*strings	*studied
streaks	stringy	studies
*stream	*strip	studio
streamed	*striped	*study
streamers	stripes	*studying
streaming	stripped	stuff
streamlined	*strips	stuffed
streamlining	stroke	stuffs
*streams	stroked	stumbled
*street	*strokes	stumbles

stumbling	subtract	sugars
stumped	subtracting	suggest
stumps	subtracts	*suggested
stung	subtypes	suggestions
stunted	succeed	suggests
stupid	succeeded	*suit
sturgeon	succeeding	*suitable
style	*success	*suited
subatom	successes	*suits
subatomic	*successful	*sulfate
subdivision	*such	sulfide
subgroups	suck	sulfides
subject	sucked	*sulfur
subjects	suckers	sulfuric
sublevels	sucking	sulphate
sublime	sucks	sum
*submarine	sucrose	sumac
*submarines	suction	summarized
submerge	*sudden	summarizes
submit	*suddenly	summary
subpolar skin	suet	summed
subsoil	suffer	*summer
*substance	suffered	summers
*substances	suffering	summertime
substitute	sufficient	summing
substitutes	*sugar	summon

sums	superstitions	surprises
*sun	supervise	*surprising
sun-baked	supper	surprisingly
sunbather	*supplied	surround
sunbeams	supplier	surrounded
sunburn	*supplies	*surrounding
sunburned	*supply	*surroundings
sun-cooked	supplying	*surrounds
sundial	*support	survey
sundown	supported	surveying
sunflower	*supporting	surveys
sunk	supports	survival
*sunlight	*suppose	*survive
sunlit	supposed	survived
*sunny	supposedly	surviving
sunrise	*sure	susceptible
suns	sure-footed	suspect
sunset	*surely	suspected
*sunshine	*surface	suspend
sunspots	surfaces	suspended
suntan	surge	suspension
sun-up	surgeon	sustains
superconductivity	surges	swab
superior	surplus	*swallow
supermarket	surprise	swallowed
supernova	*surprised	swallowing

swallows	swell	*symbol
swam	swells	symbolize
swamp	swept	symbolizes
swampland	swerve	*symbols
swamplike	swift	symptoms
*swamps	*swiftly	synapse
swampy	*swim	synthesis
swan	*swimmer	synthetic
swarm	swimmers	syrup
swarmed	*swimming	syrups
swarming	*swims	*system
swat	*swing	*systems
swaying	*swinging	*table
sways	*swings	*tables
*sweat	swirl	*tablespoon
sweaters	*swirling	tablespoonfuls
sweating	swirls	tablet
*sweep	swish	tabletop
sweeping	*switch	tablets
sweeps	switchboard	tabs
*sweet	switchboards	tack
sweetened	switched	tacked
sweetens	*switches	tackle
sweeter	switching	tackled
sweetness	*swollen	*tacks
sweets	*swung	*tadpole

*tadpoles	tanks	tea
tagged	*tap	teach
tags	*tape	*teacher
*tail	tapering	*teachers
tailed	tapers	teaching
taillight	tapes	teacup
tails	taplike	teakettle
*take	tapped	team
*taken	tapping	teammates
*takes	tapwater	teams
*taking	tar	*tear
talc	target	tearing
*talk	tarnishes	*tears
*talked	*task	teaspoon
*talking	tasks	*teaspoonful
talks	*taste	*teaspoonfuls
*tall	tasted	technicians
*taller	tasteless	*technique
*tallest	tasters	techniques
tallness	tastes	technologists
tame	tasting	technology
*tan	tasty	teddy-bear
tangle	tat	teemed
tangled	taught	teeming
*tank	taut	teens
tankers	taxi	*teeth

telecast	tendons	*tested
telegrams	tends	tester
*telegraph	ten-footed	*testing
telegraphers	*tennis	*tests
telegraphic	tension	tetanus
*telephone	tentacle	*textbook
telephones	*tentacles	textile
*telescope	tentative	textiles
*telescopes	tenth	texture
teletype	tenths	textures
teletypewriter	tepid	thallaphyla
*television	term	thallophytes
*tell	*terminal	*than
*telling	*terminals	thanks
*tells	termite	*that
temperate	termites	thaw
*temperature	*terms	thaws
temperatures	tern	*the
temporarily	terns	*their
temporary	terraces	*them
*ten	terracing	*themselves
*tend	terrarium	*then
tended	terrible	theoretically
tender	*terrific	*theories
tending	terrifying	theorized
*tendon	*test	*theory

*there	*think	though
thereby	*things	*thought
*therefore	*think	*thoughts
thermal	thinker	thousand
thermocline	*thinking	*thousands
thermocouple	*thinks	thousandths
thermograph	thinly	*thread
*thermometer	*thinner	threaded
*thermometers	thinnest	*threadlike
thermostat	thinning	*threads
thermostats	thins	threat
*these	*third	threaten
*they	third-magnitude	threatened
thiamin	thirds	*three
*thick	thirst	three-foot
thickened	thirsty	three-fourths
thicken	thirtieth	threes
*thicker	thirty	three-year-old
thickest	*this	threshold
*thickness	thoracic	threw
thicknesses	thorax	thrive
thieves	thorium	thrives
thigh	thorns	thriving
thighbone	thorny	*throat
thimble-like	*thoroughly	throb
*thin	*those	throbbing

*through	tides	*tin
*throughout	tidewater	tin-can
*throw	*tie	tingling
throwing	*tied	tinier
*thrown	tiger	*tiniest
throws	tigers	tinkle
*thrust	*tight	tinsel
thrusters	*tighten	tinted
thrusts	tightened	*tiny
thud	*tightening	*tip
*thumb	tightens	*tipped
*thumbtack	tighter	*tips
*thumbtacks	*tightly	tiptoes
*thunder	*tile	*tire
thunderhead	tiles	*tired
*thunderstorm	till	tirelessly
thunderstorms	*tilt	tires
*thus	*tilted	tiresome
*thyroid	tilts	*tissue
thyroxin	timber	tissues
*tick	*time	title
ticket	timekeeper	titled
ticking	timer	titles
ticks	*times	*to
*tidal	timing	*toad
tide	timothy	toads

toast	*tons	tortoise
toasted	*too	tortoises
*toaster	*took	toss
toasters	*tool	tosses
toasts	*tools	*total
tobacco	*tooth	totaled
*today	toothbrushes	totally
*toe	toothed	*touch
*toes	*toothpaste	*touched
*together	*toothpick	*touches
toggle	*toothpicks	*touching
toilet	*top	*tough
told	topcoats	tougher
toll	topic	*toward
tollbooth	topics	towards
*tomato	topmost	towed
*tomatoes	topple	*towel
tombs	toppling	toweling
tomorrow	*tops	towels
ton	*topsoil	*tower
tone	tore	towered
toned	*torn	towering
tones	tornado	towers
tongs	tornadoes	*town
*tongue	torrential	*towns
*tonight	torrents	townspeople

toxic	*training	transmitting
*toy	*trains	transparent
toys	trait	transpire
*trace	traits	transplant
traced	transatlantic	transplanting
tracers	transcribe	transport
traces	*transfer	transportation
trachea	transferred	transports
tracing	*transferring	transuranic
*track	*transfers	trap
tracked	transformed	trapdoor
*tracking	transformer	*trapped
trackless	transformers	trapping
*tracks	transforming	*traps
tract	transforms	trash
traction	transistor	trashrack
tractor	transistors	*travel
trade	translate	*traveled
traders	translates	*traveler
traditionally	translucent	*travelers
traffic	transmission	*traveling
trail	transmit	*travels
trailing	transmits	*tray
trails	transmitted	trays
*train	*transmitter	treadmills
trained	transmitters	treasure

treasured	trickle	troposphere
*treasures	trickles	*trouble
*treated	trickling	troubled
treating	tricks	troubles
treatment	*tried	troublesome
treats	*tries	troughs
treaty	*trigger	trout
*tree	trigger-like	truck
treeless	trigonometry	truckloads
treelike	trillion	*trucks
*trees	trillions	*true
treetops	*trilobite	*truly
trembles	*trilobites	trumpet
*tremendous	trim	*trunk
tremendously	trimmed	trunks
trenches	trioxide	trust
tri	*trip	trusted
trial	triphosphate	truss
*trials	tripod	truth
*triangle	*trips	truthful
triangular	tritium	*try
*tribe	*tropical	*trying
tribes	tropics	trypsin
tricalcium	tropism	tsunami
triceps	tropisms	tsunamis
*trick	tropistic	*tub

tuba	tuning	twenties
*tube	*tunnel	twentieth
tube-like	tunnels	*twenty
*tuberculosis	*turbine	twenty-five
*tubes	*turbines	twenty-four
tubful	turbojet	twenty-one
*tubing	turboprop	twenty-two
tubular	turboprops	*twice
tuck	turkey	*twig
tucked	*turn	*twigs
tug	*turned	twilight
tugboat	*turning	twin
tugged	turnip	twine
tugging	turnips	twinkle
tugs	*turns	twinkling
tulip	turntable	twins
tumble	*turtle	*twist
tumbled	*turtles	twisted
tumbler	tusk	twister
tumblers	tusked	twisting
tuna	tusks	*twists
tundra	twang	twitch
*tune	tweezer	twitched
tuned	*tweezers	twitching
tunes	twelfth	*two
tungsten	*twelve	two-lens

two-man	unbelievably	undersea
twos	unbend	*underside
tying	unborn	undersides
*type	unbreakable	*understand
typed	*unchanged	*understanding
*types	unchanging	understands
typewriter	unchecked	*understood
typhoid	unclean	undersurface
typhoons	uncommon	undertake
typical	unconscious	undertaking
typing	uncontrolled	underwater
udder	uncover	underwear
ugly	*uncovered	undeveloped
ultra	uncovers	undigested
*ultraviolet	uncovering	undiscovered
umbra	uncurled	undisturbed
*umbrella	*under	undoubtedly
*unable	underbrush	undue
unaided	undergo	uneasily
unanswered	undergoes	unending
unattached	undergoing	unequal
unattractive	undergone	uneven
unbalanced	*underground	unevenly
unbearable	underlie	unexpected
unbearably	underlying	unexplained
unbelievable	*underneath	unexploded

unexplored	university	unstable
unfailing	*unknown	unsteady
unfastened	unlearned	unstreaked
unfavorable	unleash	unsuitable
unfinished	*unless	unswallowed
unfit	*unlike	unthinkable
unfold	unlikely	untie
unfolds	unlimited	untied
unfortunately	unmagnified	*until
unglazed	unmanned	untouched
unhatched	unmercifully	untrimmed
unheard	unmoving	untwist
unhesitatingly	unpleasant	unused
unhook	unprinted	*unusual
unidentified	unprotected	unusually
uniform	unreal	unwanted
unimportant	unrest	unwashed
uninformed	unripe	unwelcome
union	unroll	unwind
*unit	unruly	unwinding
unites	unsafe	unwisely
*units	unsalted	unwound
univalve	unscientific	unwrap
univalves	*unscrew	*up
*universal	unscrewed	updraft
*universe	unshaded	uphill

upkeep	user	vantage
*upon	*uses	*vapor
*upper	*using	vaporizes
upright	*usual	vaporization
uprooted	*usually	vapors
upset	utensils	variable
upsets	utilizes	variables
*upside	vacant	variation
upstairs	vaccinate	variations
*upstream	vaccinated	varied
*upward	vaccinates	varies
upwards	vaccination	varieties
*uranium	vaccine	*variety
urchins	*vacuum	*varnish
urge	*valley	*vary
urged	*valleys	vase
urgently	*valuable	vaseline
urea	*value	*vast
urine	valve	vats
*us	*valves	veers
usage	vane	vegetable
*use	vanes	*vegetables
*used	vanish	vegetation
*useful	vanished	vegetative
usefulness	vanishes	vehicle
useless	vanishing	

*vehicles	*vessels	villain
veil	vial	villi
veil-like	vials	*vine
*vein	*vibrate	*vinegar
*veins	vibrated	vines
velocities	*vibrates	viol
velocity	*vibrating	*violent
vena	*vibration	violently
venetian	*vibrations	*violet
vent	vibrator	violets
ventricle	vibrators	violin
venture	viceroys	violinist
ventured	victims	virus
venus	victories	*viruses
verbena	victory	viscous
verified	*view	visibility
verify	viewed	*visible
vermiculite	viewer	visibly
vertebra	viewers	vision
*vertebrae	viewing	*visit
*vertebrate	views	visited
*vertebrates	vigorous	visiting
vertical	vigorously	visitors
vertically	*village	visits
*very	villages	visual
vessel	villagers	visualized

vital	*wading	wandered
*vitamin	wads	wanderer
*vitamins	waffle	wandering
vitreous	waffles	*want
vivid	wafted	*wanted
vocabulary	waggle	*wants
vocal	*wagon	war
*voice	wagons	warbler
voices	waist	warblers
*volcanic	*wait	warhead
*volcano	waited	*warm
*volcanoes	waiting	warm-blooded
voles	waits	*warmed
*volt	wake	*warmer
voltage	wale	warmest
voltages	*walk	warming
volts	*walked	warmly
*volume	walkers	*warms
volumes	*walking	*warmth
voluntary	*walks	warn
vorticella	*wall	warned
*voyage	*walls	*warning
*voyages	walnut	warnings
vulcanite	walnuts	wars
*wad	walruses	*was
waddle	*wander	*wash

washable	waterlogged	*way
*washed	watermelon	*ways
washers	waterpower	wayward
*washes	*waterproof	*we
*washing	waters	*weak
washrooms	water-sampling	weaken
*waste	*watershed	*weakened
wastebasket	watersheds	weakening
wastebaskets	waterspout	weakens
wasted	watertight	weaker
wasteful	waterways	weakest
wasteland	waterwheel	weakness
*wastes	waterwheels	wealth
wasting	*watery	weapon
*watch	watt	*weapons
*watched	watts	*wear
watchers	wave	*wearing
*watches	wavelength	*wears
*watching	wavelengths	weasel
*water	waver	weasels
waterdriven	*waves	*weather
watered	*waving	*weathered
waterfall	wavy	*weathering
waterfalls	*wax	weatherman
water-filled	waxed	weave
*watering	waxy	weaver

weaves	weird	*wheat
weaving	welcome	*wheel
web	welfare	wheelbarrow
webbed	*well	wheelchair
webbing	well-being	*wheels
webfeet	well-defined	whelk
webs	welled	*when
*wedge	well-equipped	whenever
*wedges	welling	*where
*weed	*wells	*wherever
weeding	well-suited	*whether
weeds	*went	*which
*week	*were	whichever
weekly	*west	*while
*weeks	westerlies	whip
weeping	westerly	whiplike
weevil	western	whirl
*weigh	westward	*whirled
*weighed	*wet	*whirling
weighing	wetness	whirlpool
*weighs	wets	*whirls
*weight	*whale	whiskey
weighted	*whales	whisper
weightless	whaling	*whistle
weightlessness	*what	whistled
*weights	*whatever	whistles

whistling	*wider	windowpanes
*white	widespread	*windows
whiteness	widest	windowsill
whites	*width	*windpipe
whitish	widths	windproof
whittle	*wiggle	*winds
whizz	wiggling	windshield
whizzed	wiggles	windshields
whizzing	wiggly	windstorms
*who	wigwag	windswept
*whole	wild	windward
whole-grain	wildlife	*windy
wholes	wildly	wing
wholly	*will	winged
whom	willing	wingless
whose	willow	*wings
*why	willows	wingspread
*wick	wilt	winner
wicked	win	wins
*wide	*wind	*winter
widely	windbreaks	wintergreen
wide-mouth	winding	*winters
widemouthed	windlass	wintertime
widen	windmill	wipe
widened	windmills	*wire
widens	*window	wired

wireless	*wood	*worm
*wires	wooded	wormery
wiring	*wooden	wormlike
wisdom	woodland	*worms
wise	woodpecker	*worn
*wisely	*woods	*worry
*wish	woodshed	worse
wished	*woody	worst
wishes	*wool	*worth
witch	woolen	worthless
*with	wooly	*would
withdraw	*word	wound
withdrew	*words	woven
withers	wore	*wrap
*within	*work	*wrapped
*without	*worked	wrapper
withstand	*worker	wrappers
witnesses	workers	wrapping
wolves	workhorse	wrecked
woman	*working	wrenching
won	workings	wrens
*wonder	workmen	wrestle
*wondered	*works	wriggle
*wonderful	*world	*wriggler
*wondering	worlds	*wrigglers
wonders	world-wide	wriggling

wrinkle	yearly	yucca
wrinkled	*years	zags
wrinkles	*yeast	zebra
wrinkling	*yeasts	zebras
*wrist	yell	zenith
wrists	yelling	*zero
*write	*yellow	zeros
*writes	yellowish	zips
*writing	yellowish-brown	zigzag
writings	yellowish-white	zigzags
*written	yellows	zinc
*wrong	*yes	zinnia
*wrote	*yesterday	zinnias
xenon	*yet	zip
xylophone	*yield	zipper
yam	yielded	zipping
yams	yielding	zips
*yard	yields	zoe
yardarms	*yolk	zoic
yards	yolks	zone
*yardstick	*you	zones
yarn	*young	*zoo
yawning	*younger	zookeeper
yawns	youngest	zoologist
*year	*your	zoom
yearbook	yours	zooms
yearbooks	yourself	

APPENDIX D

abdomen	altimeter	Antares
absolute	alto	anteater
absorbs	aluminum	antenna
acetic	Amanitas	antennae
acid	ameba	antennas
acids	amethyst	anther
acorn	amethysts	anthill
acorns	amnion	anthracite
action	amount	antibiotic
active	ampere	antibiotics
activities	amphibian	antibodies
activity	amphibians	antiseptic
adaptations	amplifier	anvil
adapted	amplitude	aorta
adult	anarctic	applied
age	anemia	aquarium
agonic	anemometer	aquatic
air	anemones	aqueducts
airship	aneroid	aqueous
alchemist	angiosperm	arable
algae	angiosperms	arachnids
alimentary	angle	archaeopteryx
alkali	animals	Archeozoic
allantois	annual	Arctic
alnico	antarctic	armor
alternating	Antarctica	arteries

artery	Azonic	behavior
artesian	babies	bell
arthropod	bacilli	beriberi
arthropods	backbone	biceps
ascorbic	bacteria	biennial
associative	bacteriologist	Big
astigmatism	balance	billions
astronaut	balanced	biologist
astronauts	ball	biologists
astronomer	balloon	biology
atmosphere	bar	bird
atom	bare	bituminous
atomic	barograph	bivalve
atoms	barometer	bivalves
auditory	bases	bladder
auricle	bathyscaph	blade
aurora	battery	blastodisc
Australis	bauxite	bleed
automated	bays	block
automatic	beach	blood
autonomic	beaks	blooded
auxin	bean	bloom
auxins	bearings	blotting
axis	beaver	blubber
axle	beetle	blue
axon	beets	bodies

boil	butterfly	carton
boll	cactus	cases
bond	calcium	Cassiopeia
bone	calf	catapult
bones	calibrate	caterpillar
borealis	calibrating	cause
born	calyx	cave
botanist	cambium	Cecropia
botanists	camera	celery
bowline	canal	cell
Bracket	Cancer	cellophane
brain	candle	cells
brake	capillaries	cellulose
breathe	capillary	cement
brush	Capricorn	Cenozoic
Bryophyta	captures	centrifugal
bryophytes	carbohydrate	cephalopods
bud	carbohydrates	ceramic
buds	carbon	cereal
bugs	carbonate	cerebellum
bulb	carburetor	cerebrum
bulbs	cares	cerium
bulletin	caribou	chain
bumblebee	carnivorous	change
burn	carrageen	changes
bury	cartilage	chap

charcoal	classroom	condensation
checks	clay	condense
chemical	climate	conditioning
chemistry	cloud	conducted
chemists	clouds	conduction
chest	coal	conductor
chew	cocci	cone
chirps	coccyx	cones
chitin	cochlea	confirm
chlorophyll	cockroach	conifers
cholesterol	cocoon	connects
cholla	cold	conservation
chloroplasts	coleus	constellarium
chromatography	collections	constellation
chromosome	colony	contagious
chromosomes	colonies	contract
chrysalis	combines	contraction
cilia	combustion	contracts
circle	comet	convection
circuit	community	convex
circulates	compare	copepod
circulation	compass	copper
circulatory	compound	coral
circumference	compressor	cord
cirrus	concave	cords
classify	concrete	core

cork	cryolite	Decapod
cornea	crystal	decay
corolla	crystals	decaying
corpuscles	crystalline	deciduous
correct	cube	declination
corrode	cucumbers	deep
corrosion	cumuliform	degree
cotton	cupful	degrees
cotyledon	cuprite	dendrites
cover	cure	density
covering	current	dentist
cowbirds	currents	depth
crater	curves	dermis
craters	cuttings	desert
creek	cycle	deuterium
crest	cyclone	dew
crevasses	cyclotron	diameter
cribs	cylinder	diaphragm
cricket	cytoplasm	diastase
croaks	daily	diatoms
crocodiles	damage	dicotyledons
crop	damp	diffuse
cross	dampen	diffused
crowded	dams	diffuses
crust	dark	diffusion
crustaceans	data	digest

digestion	dress	electricity
digestive	drill	electromagnet
dilute	drop	electromagnetic
dim	drugs	electron
dinosaur	drugstore	electroscope
dinosaurs	drum	element
dioxide	dry	elephant
Dipper	dull	ellipse
dirigible	dusty	elliptical
discharged	dyes	elm
diseases	eardrum	embryo
displaces	earphone	end
displacement	Earth	endless
dissolve	earthquake	endoskeleton
dissolved	earthworm	energy
dissolves	earwig	engine
dissolving	echinoderms	environment
distillation	echo	enzyme
division	eclipse	epidermis
dock	ecliptic	epiglottis
dolphins	effect	equation
dominant	egg	equator
drag	einsteinium	equinox
dragonfly	elastic	erosion
drain	electric	escape
drawing	electrician	esophagus

estivate	facial	fingerprints
eucalyptus	factory	fish
euglena	farming	fishes
Eustachian	fat	fission
evaporate	fault	fizzes
evaporation	faulting	fizzles
evergreens	feathers	flashlight
examine	feeds	flattened
example	feldspar	flowering
excretion	female	fluffy
excretory	femur	fluid
exhale	ferment	focal
exhaling	fermentation	focus
exhaust	fern	focuses
exoskeleton	ferns	fog
exosphere	fertilization	foil
expand	fertilizer	fold
expands	fertilizers	folding
experiment	fever	folds
explore	fibers	follicles
exposure	field	food
extinct	filament	foot
extinguisher	filter	footprint
extremities	filtration	force
eye	fin	formaldehyde
eyelid	finder	formula

fossil	gastropods	gnomon
fossils	gauge	Gobi
frame	Geiger	goldfinch
freckled	gene	golf
freezes	generator	government
frequency	genes	grafting
friction	Geneticists	gram
fringed	geologist	granite
frogs	geophysics	graph
fronds	geotropism	grass
front	geranium	grasshoppers
fuel	germ	gravel
fulcrum	germinate	gravitation
full	germs	gravity
fungi	gestation	greenhouse
fungus	gibbous	ground
funnel	gill	group
fur	gills	growing
furnace	glacier	grown
fuse	gland	grownup
fusion	glands	growth
galaxy	glass	growths
Galileo	globe	grub
gallon	glow	guide
galvanometer	glucose	guppies
gas	glycogen	guppy

gymnosperms	Holocene	immune
hafnium	homosphere	inactive
hail	hook	inborn
hailstone	hormones	incandescent
hailstones	hornblende	inches
hairs	human	incisors
halfway	humerus	inclined
hammer	humidity	incomplete
hamster	humus	induction
harmful	hurricane	inertia
harvester	hybrid	infantile
hatch	hydrant	infrared
head	hydrochloric	inhale
heal	hydrogen	inhaling
hearing	hydrographer	ink
heart	hydrometer	inorganic
heat	hydrosphere	input
helicopter	hygrometer	insect
helium	hyperopia	insects
hemoglobin	hypothesis	instrument
Herefords	Ichthyosaur	instruments
heroin	identify	insulate
heterosphere	igneous	insulation
hibernate	illuminate	insulator
hibernation	image	interdependent
hollows	imagination	internal

intestine	kilns	lichens
invented	kindling	life
invertebrate	kinetic	lifeless
invertebrates	kingdom	lift
investigate	kingdoms	ligament
investigation	knitting	ligaments
involuntary	label	light
ion	laboratory	lightning
ionosphere	ladders	light-year
ions	large	lignite
iris	larva	Lima
iron	larvae	limb
irrigate	larynx	lime
irrigation	latitude	lines
isogonic	lava	liquid
isotope	law	listen
isotopes	lawrencium	lit
itself	layer	lithosphere
jagged	leafcutter	litmus
jaguar	leaves	Little
jars	legumes	liver
jet	length	living
joint	lens	lizards
joints	levees	load
Jupiter	lever	lobster
kidneys	lichen	longitude

looms	mammals	meteor
loran	mantis	meteorite
lotion	mantle	meteorites
lubb	many	meteorologist
lubb-dupp	map	meteors
lubrication	marble	meter
luciferin	margarine	method
lumber	marrow	mica
luminescence	Mars	microbiologist
luminous	mass	microorganism
lunar	materials	microorganisms
lungs	mating	microphone
lymph	matter	microscope
machine	measure	migration
machinery	measuring	Milky
machines	medieval	million
maggot	medulla	millions
magma	melt	millipede
magnet	membrane	mimicry
magnetic	mercuric	mimics
magnetism	Mercury	mineral
magnets	Mesozoic	mineralization
magnifying	metabolism	minerals
malaria	metal	mixture
male	metamorphic	mockingbird
mammal	metamorphosis	model

modeling	mouth	neutron
moist	mucus	neutrons
moisture	muffler	newspaper
Mojave	multistage	niacin
molars	muscle	night
mold	muscles	nimbus
molds	muscular	nitrates
molecular	museum	nitrogen
molecule	music	node
molecules	mutant	nodules
mollusk	mutation	nonconductor
mollusks	myopia	nonpermeable
molt	narcissus	North
molten	nauplius	nose
molts	nautilus	nostrils
Monarch	nectar	nova
monocotyledons	needles	nuclear
Moon	negative	nucleus
Morse	Neptune	number
mosquitoes	nerve	numbers
mosses	nerves	numeral
moth	nervous	nutrient
motion	nest	nutrients
motor	neuron	nylon
mountain	neurons	nymph
mountains	neutral	objective

observe	oval-shaped	penguins
observes	ovary	penicillin
obsidian	ovipositor	penumbra
oceanographers	ovules	periodic
oceanography	oxidation	pemeable
octagonal	oxide	peroxide
octopuses	oxygen	perspiration
ocular	oysters	persuasion
oil	pads	petals
olfactory	painful	petiole
opaque	paleontologists	petrify
ophthalmoscope	Paleozoic	petroleum
optic	pancreas	phenomena
optical	paper	phosphates
orbit	paralysis	phosphors
ores	paramecium	photon
organ	parasite	photosynthesis
organic	parasites	phylum
organism	parent	physical
organisms	parents	physician
orirole	Pasteur	physicist
Orion	pattern	physics
orphan	pebble	Phytoplankton
otoscope	peel	pigment
ounces	pelecypods	pigments
output	pellagra	pine

pint	polarity	principle
pipe	polarized	print
pipes	pole	prism
pistil	poles	problem
pitch	polio	Procyon
pitcher	polish	profile
planarian	polled	propellant
plane	pollen	propeller
planet	pollinate	property
planetarium	pollinated	protein
plankton	pollination	proteins
plant	polluted	Proterozoic
plants	pond	protist
plasma	poppy	protists
plaster	pore	protium
plastic	potential	proton
plateau	pound	protoplanets
platypus	powdered	protoplasm
Pleistocene	powerhouse	protozoa
pliers	prairie	protozoan
plug	prairies	protozoans
Pluto	praying	pseudopods
pod	precipitation	psychologists
point	presence	psychrometer
polar	pressure	ptarmigan
Polaris	prevailing	pteridophyta

pteridophytes	raft	reproduce
pulley	rain	reptile
pulse	rainbow	reptiles
pumice	ramp	research
pumpkin	range	reservoir
pumps	rate	reservoirs
punch	ratio	resin
pupa	raw	resistance
pupae	rayon	respiratory
pupil	rays	response
puppy	reaction	retina
pups	reactor	revolution
quarantine	recessive	revolves
quarries	record	riboflavin
quartz	red	ridges
radar	reeds	ripens
radiant	reef	robin
radiation	reel	rock
radiators	reference	rocket
radio	reflected	rocks
radioactive	reflecting	rocky
radioactivity	refracting	rod
radioisotope	refraction	rods
radiometer	refrigerators	rollers
radiosonde	refuges	root
radish	relative	roots

rot	science	senses
rotate	scientist	sensory
rotates	scion	sepals
rotation	sclera	serum
rough	scoria	sextant
rubber	screen	shadow
sacrum	screw	shady
safety	scum	shapes
saguaro	sea	shells
Sahara	seal	shines
saliva	seals	ship
salivary	search	short
salmon	season	shrimps
salt	seasons	sidewalk
samples	sediment	sight
sandstone	sedimentary	silica
sandy	sediments	silicones
sap	seed	silk
satellite	seedling	silt
saturated	seedlings	single
saturation	seeds	single-celled
Saturn	seeped	single-stage
savannas	segmented	sink
scale	seisonograph	siphon
scales	seismograph	sips
scallops	semicircular	Sirius

sizes	solar	sponge
skeletal	solid	spore
skeleton	solution	spores
skeletons	soot	spout
slaked	sound	sprout
slate	sounds	sprouted
sleet	space	spun
slime	spadefoot	squall
slots	sparrow	squids
small	spawn	stable
smell	specific	stage
smog	spectroscope	stalactite
snail	spectrum	stalagmite
snails	speed	stamen
snake	sperm	stamens
sniff	spermatophyta	staphylococcus
snorkel	spermatophytes	star
snowberry	sphere	stars
snowflakes	sphygmomanometer	static
soak	spin	steam
soapy	spinal	steel
social	spine	stems
socket	spiracles	stereophonic
soda	spirilla	stethoscope
sodium	spirillum	stigma
soil	split	stimulus

stirrup	suspension	terminals
stomach	swarm	termites
stomata	sweat	terrarium
stored	swim	test
strainer	switch	tests
strand	symbol	thallophyla
stratiform	synapse	thallophytes
stratosphere	system	theory
stratus	table	thermograph
streptomycin	tablespoonful	thermometer
strings	tackle	thermostat
structure	tadpoles	thiamin
style	Tahiti	thickness
submarine	tan	thoracic
substance	taste	thorax
substances	teaspoonful	thread
sugar	technology	thrust
Sun	teeth	thunder
sunbeams	telescope	thyroxin
sunlight	Telstar	tide
sunny	temperate	tilted
sunshine	temperature	time
supernova	tendon	tissue
superstitions	tension	toad
supporting	tentacle	tomato
surface	tentacles	topsoil

tornado	tusk	veins
touch	twig	velocity
tough	twigs	vena
trachea	typhoons	ventricle
trade	Tyrannosaurus	Venus
translucent	ultraviolet	vermiculite
transmitter	umbra	vertebra
transparent	unbalanced	vertebrae
triceps	uncover	vertebrate
trigonometry	univalve	vertebrates
trilobite	univalves	vessels
trilobites	universe	vibrate
tritium	uranium	vibrating
Tropic	Uranus	vibration
tropics	urine	villi
tropism	vacant	vinegar
tropisms	vaccinated	violet
troposphere	vaccine	virus
trunk	vacuum	viscous
tubes	valleys	vitamin
tubing	valve	vitamins
tungsten	valves	vitreous
tunnels	vane	vocal
turbine	vapor	volcano
turtle	variable	volt
turtles	vein	volume

voluntary	whales
wad	wheels
wall	whistle
warbler	white
warm	wind
warm-blooded	window
warmest	winds
water	wires
watermelon	wood
watershed	word
waterspout	work
watt	worms
wave	wiggler
wavelength	wrigglers
wavelengths	wrinkled
waves	wrist
wax	X-ray
weather	yeast
weathering	yeasts
weatherman	zero
weaving	zigzag
wedges	zoo
weevil	
weigh	
weight	
well	