

WORD NETWORK SPANS IN THE OSPD

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A word network is a set of words of a given length in which any two words differing by only one letter in a single position (such as aunt and runt, or hire and hare) are connected by a line. Using these lines, one can trace out a path leading from any word in a network to any other word in the same network. The terminal words, together with the intermediate words in the path, form a word ladder, well-known since the days of Lewis Carroll (who invented the concept, calling the terminal words doublets and the intermediate words links). There are, of course, many possible word ladders joining any pair of words in a network, but for each pair a minimum-length ladder can be found. If one now considers all pairs of words in the network, one or more of these pairs will have a minimum-length ladder that is exceeded in length by no minimum-length ladder belonging to some other pair; that is, these pairs possess the maximum minimum-length word ladders taken over all word-pairs. The number of lines in this maximum path is called the span of the network.

Not all words of a specified length will lie in a single network. In general, there is a principal network containing a large fraction of the words, together with numerous smaller networks isolated from the principal one, down to networks consisting of single words (called isolanos by Dave Silverman). In general, as the number of letters increases, the fraction of words in the principal network decreases.

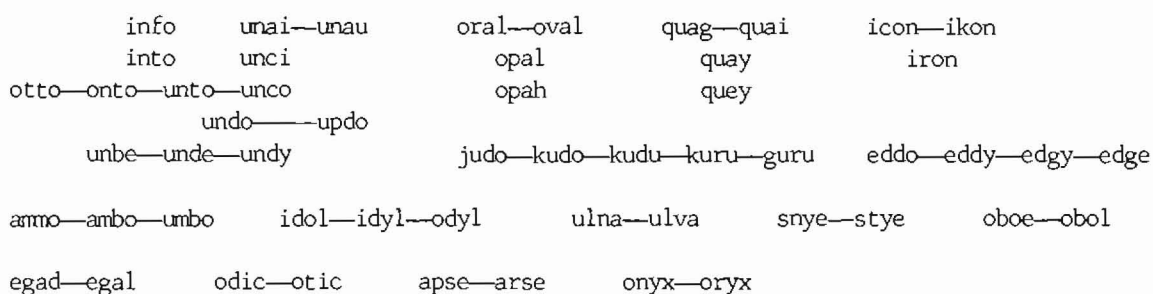
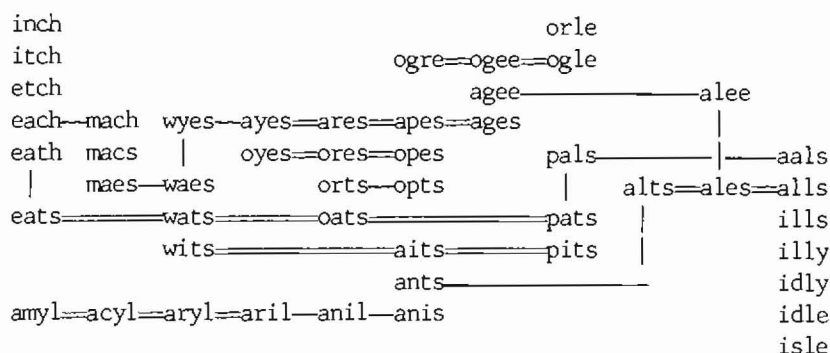
In the May and August 1973 issues of *Word Ways*, Ross Eckler exhibited word networks based on Webster's Pocket Dictionary. This article presents analogous results for words taken from the Official Scrabble Players Dictionary, for networks consisting of four-letter, five-letter, and six-letter words. Unfortunately, the corresponding results for seven-letter words could not be obtained because my computer did not have enough storage capacity to do the job.

There are 3670 four-letter words in the OSPD; 3550 of them (96.7 per cent) are in the principal network. (In contrast, only 89.5 per cent of the 1849 Pocket Dictionary boldface words are so connected.) On the next page is an abstract from the principal network showing four farthest-out words (peninsulas): inch, orle, amyl, isle. The span of the network is 14, from inch to any of the three other words. However, the distance from isle to amyl or orle to amyl is only 12, and orle to isle, 11.

The largest network other than the principal network contains

14 words; all other networks are much smaller. All are diagrammed below, including the 68 isolanos.

In these diagrams, note that one can take a single step between any two words connected by a string of equal-signs, such as *eats* and *pats*, or *amyl* and *aryl*.

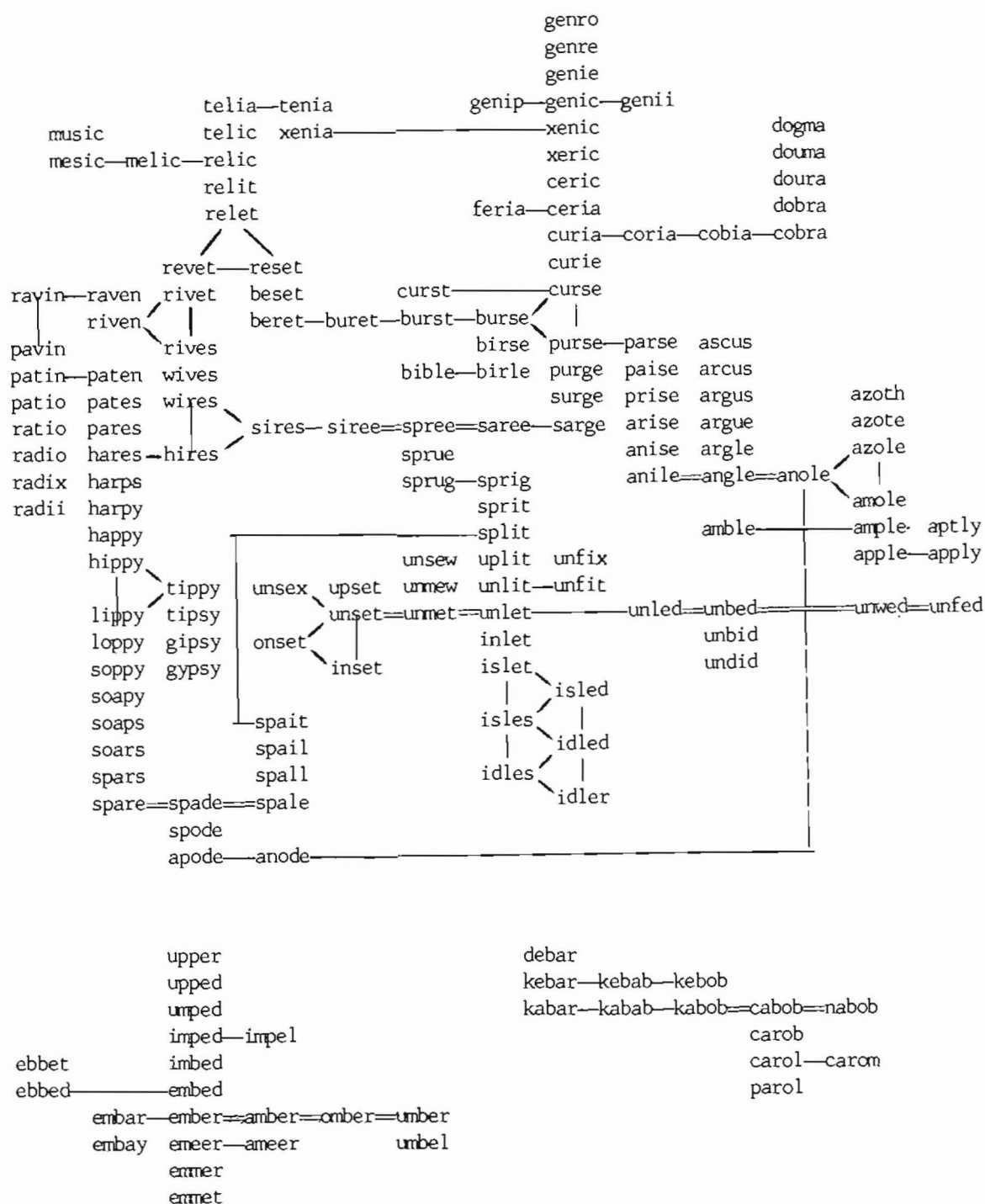


abri adze ahoy amok ankh aqua arak asci auld awol ciao dhak djin eaux ebbs
 ebon ecru elhi emyd envy epee epha espy etna etui evil exam expo huic hymn
 iffy iglu inam immy isms jagg jehu jeux juju kagu kiwi lynx meow odor ogam
 ohms once ordo orgy ossa ouzo ovum owse plie skua sybo tahr ughs upby upon
 urge uric void weka yegg zebu zoea zoic

Of the slightly more than 8200 five-letter words in the OSPD, about 6950 (84.8 per cent) are connected in a single network. (In contrast, about 57 per cent of the 2804 five-letter Pocket Dictionary boldface words are in the principal network.) Using a city map analogy, the network shown on the next page shows the shortest routes between suburbs, skirting or tunnelling the central city (which is too dense to diagram). This abstract of the full network includes those words which are farthest apart. The span of the network is 29, achieved with *genro* to *idler*. Other long ladders (26, 27, 28) have been included for two reasons: 1) they contain interesting terminal words, such as *gypsy* to *music*, and 2) they show how various long paths are inter-related. *Dogma* seems to be the word farthest out on a peninsula, but it is one step closer to the main body than *genro* is, through the connection at *curia*.

The approximately 1250 words not included in the principal network make up about 900 separate networks of their own, including

many isolanos. All networks with eight or more words are depicted below; the largest network has only 20 words.



Pears Advanced Word-Puzzlers' Dictionary (Pelham Books, London, 1987; £15.95) is the first dictionary specifically designed for the logologist and word-gamesman. Each word listed and defined therein has been selected for a logological purpose: an odd meaning (as in Mrs. Byrne's Dictionary), a transposable set of letters, an unusual lexical property (see "A Trivia Challenge" elsewhere in this issue), or an odd letter-pattern (words containing a Q not followed by U). The two-letter word collection is outstanding, consisting of 247 entries including plurals such as KS or RS. One's only regret is that the dictionary does not give at least one source for each word listed.

The book also contains a list of transposable words of six through ten letters. This is the most complete list I have ever seen. To illustrate its scope, the table below lists the number of transposals of eleven different six-letter groups, as given in nine different anagram dictionaries. These letter groups consist of all those generating eight or more transposals in the Air Force List based on Webster's Second Edition, plus inferred forms of Webster's Collegiate words.

	<i>Pear</i>	<i>Cham</i>	<i>Long</i>	<i>Wett</i>	<i>Hunt</i>	<i>Edwa</i>	<i>Curl</i>	<i>Ball</i>	<i>Haer</i>
<i>ACENRT</i>	9	8	6	5	8	5	8	6	5
<i>ACEPRS</i>	12	4	6	4	9	2	9	7	5
<i>ACERST</i>	12	2	7	2	9	2	9	8	2
<i>AEERST</i>	13	5	3	1	11	3	8	6	3
<i>AEHPRS</i>	14	5	4	3	7	3	7	6	2
<i>AELRST</i>	36	5	9	4	10	2	10	7	3
<i>AEPRSS</i>	12	3	6	2	9	3	8	8	3
<i>EENRST</i>	14	1	4	3	8	1	8	5	1
<i>EINRST</i>	17	3	5	4	7	2	5	5	2
<i>ENORST</i>	11	3	4	1	8	2	7	5	3
<i>EOPRST</i>	18	3	4	2	9	2	6	6	2
	168	42	58	31	95	27	85	69	31

Pears also has 26 transposals of AEPRST and 25 of AENRST; also, the eight-letter group AEGINRST has an amazing 23. I unhesitatingly recommend this book for the shelf of any logologist or word-gamesman.

Pelham Books are part of the Penguin Group, so copies should be available in the United States by ordering through Viking-Penguin.