

WORD NEIGHBOURS AND ONALOSIS

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This article is a partial update of my "Statistics of Word Neighbours" in the November 1997 Word Ways, and provides the facts lying behind the findings in the recent series (August 2000 through May 2001) of articles on word ladders. Two words are neighbours if they differ in a single letter. In this article, each such word is credited as having a neighbour, i.e. the link between them is counted twice (please refer to the earlier article for prior work and more information). The following table updates various parts of the article.

Word Length	Average percent neighbours for each position										Percent onalosis	Percent isolanos	Max n'bours	Percent hets	Avg n'bours
	1	2	3	4	5	6	7	8	9	10					
4	778	350	571	608	-	-	-	-	-	-	71	0.5	63	76	23.0
5	384	165	271	245	207	-	-	-	-	-	28	1.7	55	61	12.7
6	157	70	96	92	70	85	-	-	-	-	3	8.6	44	45	5.7
7	66	28	35	36	24	21	38	-	-	-	0.04	25	31	32	2.5
8	25	12	15	13	13	9	10	22	-	-	0	43	20	20	1.2
9	15	8	9	9	8	9	6	7	16	-	0	52	14	12	0.9
10	7	6	4	4	5	4	5	3	5	13	0	66	15	7	0.6

Thus, for words of length five, there are on average 3.84 words differing only in the first letter, 1.65 in the second letter, and so on. Over a quarter are onalosis (when every letter can be changed to make another word) and only 1.7 per cent are isolanos (no letters changed will make another word). At least one five-letter word has 55 neighbours, 61 per cent have all their letters different, and each word has nearly 13 neighbours on average. The very sharp drop in neighbourliness, and in heterograms, explains why ladders with given characteristics are impossible to find as the word length increases; alternatively, why short and wholly perfect ladders are ten-a-penny.

The following list of onalosis of length 7 replaces nine found earlier. I have now identified over 2500 of length 6.

BLUNDER	BORDELL	BRANDER	BRECHEN	CARNALL	CASTELL
CENTARE	CHAPPER	CHESTON	COLLICE	COMENTE	CONDITE
CORRAGE	COSTERS	CRISTEN	DELATER	DESPEND	ENCRESS
FORTHER	FRITTER	GRANTER	HALLAND	HARRIER	MARLINE
MARRINE	MILLINE	PARTANE	PASTERS	PINNATE	POLITES
SCALLED	SERENES	SHALDEN	SHANKER	SHILLET	SHIRLEY
SLUGGED	SOUTHER	SWELLED	TAINTER	TERRANE	THESTER
TRISTLE	UNTIMES	WINDLES			

The following are the nearest words of that length to an onalosi:

Length 8: CRAMPERS, MISTREST, STANNERS [7 letters changeable]

Length 9: DISTRAINS, ENCRESSED, ENCRESESSES, MESSELINE, SWINGLING [7 changeable]

Length 10: DESCONFITS, DISCONFIDS, DYSCUMFYTS (7 changeable, see OED discomfit followed by variants of discomfit, DELECTABLE, DISCASTING, v

variants of DYSSEISINS

(OED under mort d'ancestor), and variants of ENCRESSING (OED under increase) [6 changeable]

The words with most neighbours, showing the neighbours by position (number of neighbours brackets) are:

Length 10:

SLATTERING (15): 1 BLATTERING CLATTERING FLATTERING GLATTERING, 2 SCATTERING SHATTERING, SKATTERING SMATTERING SNATTERING SPATTERING SWATTERING, 3 SLITTERING SLOTTERING SLUTTERING, 5 SLATHERING (as before) is followed by **DISSEASING, HILLINGTON, KILLINGTON, LIDDINGTON, WILLINGTON (all 1**

Length 9:

BATTERING (14): 1 HATTERING MATTERING NATTERING PATTERING TATTERING YATTERING, 2 BETTERING BITTERING BUTTERING, 3 BANTERING BARTERING, 4 BATHERING, 6 BATTELING BATTENING
REVELLING (14): 1 BEVELLING DEVELLING LEVELLING NEVELLING, 2 RAVELLING RIVELLING ROVELLING, 3 REBELLING REFELLING REPELLING RESELLING RETELLING, 5 REVEALING REVEILING

SLATTERED (14): 1 BLATTERED CLATTERED FLATTERED, 2 SCATTERED SHATTERED SKATTERED SMATTERED SNATTERED SPATTERED SWATTERED, 3 SLITTERED SLOTTERED SLUTTERED, 5 SLATHERED

followed by **DISPORTED (13), BATTEREST, ENCRESESSES, PATEREST (all 12)**

Length 8:

SLATTERS (20): 1 BLATTERS CLATTERS FLATTERS PLATTERS, 2 SCATTERS SHATTERS SKATTERS SMATTERS SNATTERS SPATTERS SWATTERS, 3 SLITTERS SLOTTERS, 4 SLAHTERS SLAITERS SLAUTERS SLAWTERS, 5 SLATHERS, 8 SLATTERN SLATTERY (as before) is followed by: **SHARLING (19), STARLING (18), NOTATION (16), BATTERED, PARTENER, SHEELING, SHIRLING, SWELLING (all 15)**

Length 7:

SEALING (31): 1 BEALING DEALING FEALING GEALING HEALING MEALING NEALING PEALING TEALING VEALING WEALING YEALING ZEALING, 2 SCALING SHALING SPALING STALING SWALING, 3 SEELING SEILING SELLING SETLING, 4 SEAKING SEAMING SEANING SEARING SEASING SEATING SEAWING, 7 SEALINE SEALINK

followed by: **BARLING, CARLING, WARLING (all 29), BETTERS, SEARING (both 28)**

Length 6:

COLLER (44): 1 BOLLER DOLLER FOLLER GOLLER HOLLER KOLLER LOLLER MOLLER POLLER ROLLER SOLLER TOLLER VOLLER WOLLER, 2 CALLER CELLER CILLER CULLER, 3 COALER COBLER COILER COOLER COULER COWLER COYLER, 4 COLDER COLEER COLKER COLKER COLTER COLVER COLWER COLYER, 5 COLLAR COLLOR COLLYR, 6 COLLED COLLEE COLLEM COLLEN COLLEP COLLES COLLET COLLEY

followed by: **COSTER (37), BETTER, LETTER, RESTER, SELLER (all 35)**

Length 5:

SEALE (55): 1 BEALE CEALE DEALE FEALE GEALE HEALE KEALE LEALE MEALE NEALE
PEALE REALE TEALE UEALE VEALE WEALE YEALE ZEALE, 2 SAALE SCALE SHALE SKALE
SMALE SNALE SOALE SPALE STALE SWALE, 3 SECLE SEDLE SEELE SEILE SELLE SEMLE
SETLE SEYLE, 4 SEACE SEAGE SEAKE SEAME SEANE SEARE SEASE SEATE SEAVE SEAXE
SEAZE, 5 SEALD SEALF SEALH SEALL SEALM SEALS SEALT SEALY

SEARE (55): 1 BEARE CEARE DEARE FEARE GEARE HEARE IEARE JEARE KEARE LEARE
MEARE NEARE PEARE REARE TEARE VEARE WEARE YEARE ZEARE, 2 SCARE SHARE
SKARE SLARE SMARE SNARE SOARE SPARE SSARE STARE SUARE SWARE, 3 SECRE SEERE
SEGRE SEIRE SELRE SEORE SERRE SEURE SEVRE SEWRE SEYRE, 4 SEACE SEAGE SEAKE
SEALE SEAME SEANE SEASE SEATE SEAVE SEAXE SEAZE, 5 SEARS SEARY

followed by: **HALLE, SEATE (both 54), SEERE, SEETE, SEITE (all 53), SERES (52), SOURE (51)**

Length 4:

SAIE (63): 1 AALE BALE CALE DALE EALE FALE GALE HALE JALE KALE LALE MALE NALE
PALE RALE TALE VALE WALE YALE, 2 SCLE SELE SILE SMLE SOLE SULE SYLE, 3 SAAE
SABE SACE SADE SAFE SAGE SAHE SAIE SAKE SAME SANE SAPE SARE SASE SATE SAUE
SAVE SAWE SAXE SAYE, 4 SALA SALB SALD SALF SALH SALI SALK SALL SALM SALO SALP
SALS SALT SALU SALY SALZ

followed by: **HARE, HOLE, SALE, SARE, SERE (all 62), MARE, SEAT, SEET (all 61)**

The following are the numbers of multiple onalosis:

Length 7: none

Length 6: fourfold: SHEARE. triple: BORDEN, BURGES, CHILLE, COLLER, HARDEN, LANGER,
RESINE, SENDEN, SERENE, SHARES, SOLERE, WALKIN plus 158 doubles.

Length 5: sevenfold: SOULE. sixfold: MALES, MILLE, SAULE, SEALE, SHARE, SHERE. 51 fivefold
examples, 267 fourfold, 933 triples, and 3024 doubles.

Length 4: 14-fold: SEET. 12-fold: ARES, SAIE, SEAT, SEIE, SOUT. 10-fold: SAAR, SAER, SAIR,
SAIT, SAUR, SAYE, SEAR, SEER, SEIR, SEIT, SEYE, SOON, SOOT. 15 ninefold, 41 eightfold, 140
sevenfold, 379 sixfold, 1286 fivefold, 1715 fourfold, 2267 triples, and 3210 doubles.