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.

<table>
<thead>
<tr>
<th>Word Length</th>
<th>Average percent neighbours for each position</th>
<th>Percent onalosis</th>
<th>Percent isolanos</th>
<th>Max n'hours</th>
<th>Percent hets</th>
<th>Avg n'hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>778 350 571 608 - - - - -</td>
<td>71</td>
<td>0.5</td>
<td>63</td>
<td>76</td>
<td>23.0</td>
</tr>
<tr>
<td>5</td>
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<td>28</td>
<td>1.7</td>
<td>55</td>
<td>61</td>
<td>12.7</td>
</tr>
<tr>
<td>6</td>
<td>157 70 96 92 70 85 - - - - -</td>
<td>3</td>
<td>8.6</td>
<td>44</td>
<td>45</td>
<td>5.7</td>
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<tr>
<td>7</td>
<td>66 28 35 36 24 21 38 - - - -</td>
<td>0.04</td>
<td>25</td>
<td>31</td>
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<td>8</td>
<td>25 12 15 13 13 9 10 22 - - - -</td>
<td>0</td>
<td>43</td>
<td>20</td>
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<td>9</td>
<td>15 8 9 9 8 9 6 7 16 -</td>
<td>0</td>
<td>52</td>
<td>14</td>
<td>12</td>
<td>0.9</td>
</tr>
<tr>
<td>10</td>
<td>7 6 4 4 5 4 5 3 5 13 - -</td>
<td>0</td>
<td>66</td>
<td>15</td>
<td>7</td>
<td>0.6</td>
</tr>
</tbody>
</table>

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

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The following are the nearest words of that length to an onalosi:
Length 8: CRAMPERS, MISTREST, STANNERS [7 letters changeable]
Length 9: DISTRAINS, ENCRESSED, ENCRESES, MESSELINE, SWINGLING [7 changeable]
Length 10: DESCONFITS, DISCONFIDS, DYSCOMFYTS (7 changeable, see OED discomfit followed by variants of discomfit, DELECTABLE, DISCASTING, v

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

Length 9:
BATTERING (14): 1 HATTERING MATTERING PATTERING TATTERING YATTERING, 2 BETTERING BITTERING BUTTERING, 3 BANTERING BARTERING,
4 BATHERING, 5 BATTELING BATTENING
REVELLING (14): 1 BEVELLING DEVELLING LEVELLING NEVELLING, 2 RAVELLING RIVELLING ROVELLING, 3 REVELLING REPELLING REPSELLING RESELLING RETELLING,
5 REVEALING REVEILING

SLATTERED (14): 1 BLATTERED CLATTERED FLATTERED, 2 SCATTERED SHATTERED SKATTERED SMATTERED SNATTERED SPATTERED SWATTERED, 3 SLITTERED SLOTTER SLOTTERTED, 5 SLATHERED followed by DISPORTED (13), BATTEREST, ENCRESES, PATTEREST (all 12)

Length 8:
SLATTERS (20): 1 BLATTERS CLATTERS FLATTERS PLATTERS, 2 SCATTERS SHATTERS SKATTERS SMATTERS SPATTERS SWATTERS, 3 SLITTERS SLOTTERS,
4 SLAHTERS SLAHTERS SLAUTERS 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 YEALING YEALING ZEALING, 2 SCALING SHALING SPALING STALING SWALING, 3 SELING SEILING SEILING SELING SETLING, 4 SEEKinG SEAMING SEANIN SEARING SEASING SEATING SEAWING, 7 SEALINE SEALINK followed by: BARLING, CARLING, W ARLING (all 29), BETTERS, SEARING (both 28)

Length 6:
COLLER (44): 1 BOLLER DOLLER FOLLER GOLLER HOLLER KOLLER LOLLER MOLLER POLLER ROLLER SOLVER TOLLER VOLVER WOLLER, 2 CALLER CELLER CILLER CULLER,
3 COALER COBLER COIIER COOLER COULER COULER COYLER, 4 COLDER COLEER COlli 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 SPALE STALE STALE SWALE, 3 SECLE SEDLE SEELE SEILE SELLE SEMLE SETLE SEYLE, 4 SEACE SEAGE SEAKE SEAME SEANE SEARE SEASE SEATE SEAVE SEAVE 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 UEARE YEARE YEARE ZEARE, 2 SCARE SHARE SKARE SLARE SMEARE SNARE SOARE SPARE SSARE STARE SUARE SWARE, 3 SECRE SEERE SEGRE SEIRE SELRE SERRE SEURE SEVRE SEWRE SEYRE, 4 SEACE SEAGEE SEAKE SEAME SEANE SEASE SEATE SEAVE 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 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 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, SEIF, SEIT, SEYE, SOON, SOOT. 15 ninefold, 41 eightfold, 140 sevenfold, 379 sixfold, 1286 fivefold, 1715 fourfold, 2267 triples, and 3210 doubles.