PERMED ENDS

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The readers of Word Ways will be familiar with words whose first few letters are repeated, in the same order, at the end of the word. John Ferguson of Maryland called these Heads 'n Tails (Feb 1970, p 48). Examples of the genre include ICELANDIC, TORMENTOR, OUTSHOUTS and UNDERGROUNDER. By way of contrast, the first few letters might be repeated at the end of the word in reverse order, as in DETONATED and SELAGINELLALLES (dfpf). The current investigation explores a third way in which the letters at the beginning of a word are repeated at the end of the word, namely in any permutation other than the same, or reverse, order. SIKORSKI and AESTIVATES are examples.

Permutations
Listed below are examples of words whose first 3, 4 and 5 letters are repeated as the last 3, 4 and 5 letters of the words. If these letters are represented by numbers, then an initial 3-letter group 123 offers the 4 permutations 132, 213, 231 and 312 as possible endings (= 6 permutations less 123 and 321). Similarly, an initial 4-letter group 1234 offers 22 possible endings (24 less 1234 and 4321), whilst a 5-letter group 12345 offers 118 possible endings (120 less 12345 and 54321). For each permutation, one example is given for as many different letter groups as possible, irrespective of word length. So how many different letter groups are there in total? Consider a 3-letter group beginning with the letter A. The second letter can be anyone of 5 and the third letter anyone of 24. Thus there are 25 x 24 = 600 different 3-letter groups beginning with A, excluding those with repeated letters which I do not include. Implicitly, there must be 600 x 26 (letters of the alphabet) = 15,600 such 3-letter groups in total. Split-word transposals, such as HORSESHOER (cham), in which the letters of the first half of the word are repeated in the second half, are not allowed; there must be at least one letter separating the two groups of letters. Thus HORSESHOERS is allowed. Tautonyms, such as HUSH-HUSH, are not included. All the examples are solid or hyphenated words; phrases are not included. The words are listed in alphabetical order. Unreferenced words can be found in the OED Second Edition as head words, variant forms and text words including citations. Non-OED references are listed at the end.

Three-letter Permutations
123—132
ACROSARC (web2), ASHERAHS, BARABRA, BELIEVABLE, BRAKEBAR, CATALECTA (web2), CLASSICAL, CLORAMFENICOL (sted), CREAMACER, DREADER, GAMMANUSIGMA (ww90175), HUTUKHTU (web2), HIJORTSHOJ (tig), IANTHINA, IDENTIFIED, IGNORING, INOCULATION,
KHANKAH (web2), KNIPPERKIN, KNOCK-ON, KREEKER, LEILLELIE, LEVER-VALVE, NECROMANCE, NYCRROMANCY (biw), OLIVE-OIL, PREPPER, PSEUDOSCOPIES, REBARBE, REGORGE, RESURSE, SIKORSKI, STERN-SET, TEISTIE, TREATER, TROUMPETOR, TRUDITUR, TYRANTRY, UERDURE

123---213
ADELEIDAE (web2), ATLANTAL, BIAJAIBA (pul), CATARACT, CIATICA, CYATYCA, DIAPSIDA, DIETHYLTOLUAMIDE (sted), DISCOIDS, DYSCOMFYDS, ENDEIGNED, ENSHRINES, FATHERCRAFT (web2), FIELD-WIFE, GAS-BAGS, GREEN-CHARGE, INCUDO-TYMPANIC, INSIGNIS, INTERKNIT, MASTOGRAMS (dor), MESEEMS, MISAIMS, MUSEUMS, NASORAEANS (cham), NATURANT, NUSAUNS, PIEWIPE, PISTOL-WHIPS, PUSH-UPS, RAIYATWARI (cham), RESCUERS, RETROVERT, ROMANIFORM (web2), RUSH-HOURS, SSETTEST, SIMPLISM, SITARIST, STANITS, TAENIATE, TIEENNANITE, TOSSPOTS, TRIMURTI, WOLF-GROWL

123---231
AEROCAMERA (web2), AMINOACIDEMIA (web2), CARBON-ARC, CHIROGRAPHOSPHIC, DAIERYMAID, DANCE-BAND, DARTBOARD, DEADHEAD, DELAFIELD, DIABOLIAD, DIRT-BIRD, DRAGOGRAD (tig), DREAD-DESIRED, EAGLE-PLUMAGE, EARTHENWARE, ECHELICHE, ENCUMBRANCE, ENGRANGE, ENSCONSE, ENTENTE, ENZENZE (bt), EQUIVOQUE, FEATHERLEAF (web2), GANTANG (web2), GENSENG (web2), GUNNUNG (web2), HACKNEY-COACH, HATHATH (web2), HIGHTLEIGH (Devon), HOCHPOCH, HYPOGYPH, KUCKUCK (cham), LEAF-MEAL, MESODESM, MISANTHROPISM, MORIFORM, NIAGARIAN, NOUMERACIION, PARACARP, PHILOSOPHYSHIP, PLATE-LAP, PRAISE-TRAP, PRE-PREP, RAIL-CHAIR, READY-TO-WEAR, SACROILIACS (web2), SAGBAGS, SAMSAMS, SAHIBAHS, SALICIONALS, SCHOLARCHS, SEMSEMS, SENTENS, SERVERS, SHANACHAS (web2), SHEATHES, SILKTAILS, SIMSIMS (web2), SKATIKAS (web2), SLEPLES, SONATIONS (web2), SOKOUS (cham), SOWLOWS (daw), SPECTROSCOPES, SPHYGMOGRAFI (web2), STELATES, STICTIS, STOMATOS (cham), STULTUS (cham), SUBSHRUBS, SUPERGROUPS, TANTEQUANT, TENEMENT, TESTIEST (web2), THOROUGH-SHOT, TORCHWORT, TRADE-RAT, VLAISLAV (tig), VLAISLYSW (Gomulka)

123---312
ANIDIAN (web2), ALCHEMICAL, ALTAR-FRONTAL, ASITIAS (web2), CENTENCE, CHOLEDOCH, DECIDE, DERWARDE, EAST-SEA, EDIFIED, ELIMIEL (cad), ENTERPARTEN, ESTIMATES, HERBURHE, HYPERTROPHY, ICHTHIC (cham), ICOSANOIC (sted), INSEISIN, INTESTIN, ISTMITIS, KASALIYSKA (tig), KAZATZKA (cham), KOSCIUSKO (tig), LEAF-SSCALE, LEDGER-HANDLE, LYSIGENOUSLY, MYOTOMY, OSTINATOS, OUGADOGOU (web3), OWL-SWALLOW, PEARSHAPE, PERLETHORPE (Nottinghamshire), PHARMACOGRAPH (sted), PHOTOTROPH, REAWARE (web2), REINSPIRE, REOPHORE, REULURE, SCILFISC, SCYTTYSC, SENTENSE, SHABASH, SHESHBESH, SHIPPISH, SMITHISM, STANDFAST, STERNEST, STIGMATIST, STOCK-FROST, TEAMMATE, TEINEITE, TENENTE, TERRE-VERTE, THERTTIE, THORN-MOTH, THREEPENNYWORTH, THULUTH (web2)

Four-letter Permutations
Examples were found for each of the 22 possible permutations.

1234---1243
DISEMBODIES, INDETERMINED, NIETZSCHEANITE, SIGNALISING, STREP-TASTER

1234---1324
BRIDEWELL-BIRD, INOSCULATIONS, NECROMANCER, SENSLESNES

1234---1342
ANTI-LATIN (web2), DREAD-DEAR, RECHERCHE
AESTIVATES, INSORPTIONS (sted), INTERSILENT, NESCENCES (web2), PAN-EUROPEAN, PREINSPIRE (web2), RESIDENTIARIES, TONIFICATION
ASELLARIALES (opc), GYNOMEROGONY (sted), MENISPERMINE, METASTIGMATE (web2)
ANTENNATE (web2), AURE-QUARE, AWRTHWART, CATERACTE, INSTITUTIONIST, NIERSTEINER
MENAGE-MAN, NOSE-BONES, PRELATE-PURPLE, RUDE-FEATURED
ENTRECOVNTER, GIN-SLINGS, MARSHAL-AT-ARMS
CUBI-CUBIC, EPISCOPISE, ERITHRlTE, HEAT-DEATH, HINC-PINCH, HOTCHPOTCH, KANIKANIK, RIVER-DRIVER, SANDILANDS (Lincolnshire), SENTIMENTS, SINGLINGS, SLAP-SLAPS (web2), STEREOMETERS, TRANSMIGRANT
ENSCONCES, INSTANTIS (cham), RHEOPHORE
DIESELISED, SIGNET-RINGS, STREETERS
ICOSANOICS (sted), INTESTINE, PERSTIRPES, PORTER-POT, READY-PREPARED, TEAR-WATER, TENDER-SLANTED
ENDASPIDEAN, IDLE-BELLIED, INCOURCION, INTONATION
NORETHINDRONE, RED-SANDERS, VITELLIRUPTIVE (sted)
DOLIOLOID, FIRE-BRIEF, KRASNOYARSK (tig), SCIATICAS, SNIGGERINGS
ANTICHRISTIAN, DEHYDRORETINALDEHYDE (sted), ESOPHAGOSCOPIES (sted), INTERTEIN, PHRASEOGRAPH
DEINCLINED, DIPHOSPHID (pul), NORTHALLERTON (North Yorkshire), NOTIFICATION, REALITY-REVEALER, RENT-HUNTER, SERICTERIES, SKINNYMALINKS, STRATOCRATS
BLEACHABLE (web2), CALISTHENICAL, DESUETUDES (web2), FENOPROFEN (sted), ICE-PRECIPICE, MESOSOMES, MICROOTHERMIC (web2), OVER-DROVE
DREAM-READER, GRENZGANGER (cham), TRANSPLANTAR, TREACLE-WATER
ANTI-PURITAN, HYPOTROPHY, ICHTHYORNITHIC, ICTEROGENETIC, MYOTENOTOMY (web2), PHARMACOGRAPH (sted), STIRPICULTURIST
Five-letter Permutations

12345---12453 MARKET-MAKER
12345---12534 HORSE-SHOERS
12345---12543 CHENILLE-MACHINE
12345---13542 EDrioasteroid (web2)
12345---15243 UNDERBURNED (web2)
12345---15342 ASCENDANCES
12345---15423 RHYPAROGRAPHY
12345---23145 INCESSANCIES (web2)
12345---23415 ISAT-CHLORISATIC, TRANSMIGRANTS
12345---23451 DUST-ENCRUSTED (sg), NATIONALISATION, RACKENSACKER (ws), SHEARING-SHEARS
12345---25341 LUNAR-DIURNAL, TRANSVERSANT
12345---31245 ETHICOAESTHETIC (web2)
12345---31452 ULTRASTRUCTURAL
12345---32415 GIRDER-BRIDGE
12345---34125 PHRASEOGRAPHS
12345---34512 AISTHANESTHAI (cham)
12345---34521 DENIZENIZED (web2)
12345---35124 INTERLACISTRINE
12345---41235 PHILADELPHIA
12345---41325 TRANSPLANTARS (note that TRANSPLANTAR fills the pattern 1234---4132)
12345---43125 PHARYNGOGRAPHY
12345---45123 MASTOCYTOMAS (sted)
12345---45213 NIGHT-FIGHTING
12345---51243 THREAD-FEATHER
12345---51324 NEGRO-MONGER

I have not searched for permutations of 6 or more letters. By chance, however, I came across EDrioasteroidea (web2) with the pattern 123456---354216, and GLACIOLOGICAL with the pattern 123456---615432. Will anyone take up the reins from here?

A related exercise springs to mind. The words SCinticisternoGRAPHICS (inferred from SCinticisternoGRAPHY in Stedman) and PROtocoproporphyria (sted) contain 3 different permutations of the letters C, I, S, and O, P, R respectively, reverse orders being allowed. Readers are invited to discover more such words. The letter groups may occur anywhere in the word.

References for non-OED words

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>biw</td>
<td>Book of Intriguing Words by Paul Hellweg, 1986</td>
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<tr>
<td>bt</td>
<td>Bloomsbury Thesaurus, 1993</td>
</tr>
<tr>
<td>cham</td>
<td>Chambers English Dictionary</td>
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<tr>
<td>dor</td>
<td>Dorland's Medical Dictionary</td>
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<tr>
<td>opc</td>
<td>Outline of Plant Classification by Sandra Holmes by J.C. Willis, 7th Edition CUP 1966</td>
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<tr>
<td>pul</td>
<td>The Complete Word Game Dictionary by Pulliam &amp; Carruth, Facts on File 1984</td>
</tr>
<tr>
<td>sg</td>
<td>from word list with Supergram program for Acorn computers</td>
</tr>
<tr>
<td>sted</td>
<td>Stedman's Medical Dictionary</td>
</tr>
<tr>
<td>web2/3</td>
<td>Webster's Second/Third Edition</td>
</tr>
<tr>
<td>tig</td>
<td>The Times Index Gazetteer of the World, 1965</td>
</tr>
<tr>
<td>ws</td>
<td>War Slang by Paul Dickson, 1994</td>
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