A SURVEY OF DIRECTED WORD CHAINS

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The idea of making chains by overlapping words is due to H. E. Dudeney, and is probably a follow-on of Lewis Carroll's word ladders. Dudeney used words of uniform length and constant overlap. Christopher McManus introduced Word Ways readers in November 1990 to Ana-Gram-Mar (AGM) chains, ones in which the word length may vary, but there is always single overlap (each letter appears in exactly two words): house-man-slaughter-house, gossypol-yester-morning-tide-water. In the May 1991 Word Ways, Ross Eckler called the Dudeney chains directed word chains and introduced notation for word length and degree of overlap. However, it is misleading to restrict the term directed word chains to only those having words of fixed length; AGM chains are directed as well. It is more useful to regard AGM chains as a special case of directed word chains. In three articles beginning in August 1991, I explored AGM chains. I call word parts frags; sometimes frags are words, sometimes not. Most of my work has been with (8,4) chains, such as tops-oils-kins-folk. In this article I consider directed word chains with words of uniform length (some are AGMs).

My database is mostly Websterian. My lists are about one-and-one-half times as long as the Official Scrabble Players Dictionary (my initial source), but short of Web 2 and Web 3. All words are lower case. A nice feature of these chains is that although many include words that are not common today, their meaning is apparent. My lists are restricted to lower case words as a consequence of my start with the OSPD.

Chains were devised by hand, but with the mule work done by computer. I used BASIC programs to create special lists and the standard WORDPERFECT search program to develop chains. A word processor in conjunction with BASIC is a most powerful tool.

Nine-Letter Ana-Gram-Mar Chains

There are different ways to chain words containing an odd number of letters. In the following chains of nine-letter words, frag lengths alternate 4-5-4-5-. My first step in boiling 26,300 nine-letter words down to a useful set was to collect and sort four- and five-letter beginning and ending frags. There were 7400 (4100) different four-letter beginnings (endings), and 13800 (9300) different five-letter beginnings (endings). Later steps selected words in which the left frag of length n was found in the list of right frags of length n, and the right frag of length 9-n was found in the list of left frags of length 9-n. The process was repeated several times to condense the resultant to core words. Two classes of words resulted, splitting 5-4 and 4-5; a few words appeared in both classes.

In the following headings, rain starts, both paths between
here-under-drug
start-ling-video-disc-over
steadishes-room-stone-week
rains-torm-end
loud-mouth-pain
lady-birds-eye
fire-break
wise-crack
hand-shake
test-cross-over
green-head
grass-fire
flash-back
dream-tide

Nine-Letter W (M,n) Chains

(M,n) chains are analogous to the previous set of words so that the following chain is made good when m is odd and overlap. Eckler in the May 1991 set of words made good analogues to the previous set. The following chain is made good in the following way.

railroads train
roadstead steady
steady stay

Eight-Letter W (M,n) Chains

With (m,n) letter second in the following:
In the following chains, note the separate usage of head and heads, rain and rains, etc. Note the use of overtrain and downstart, both divided two ways. No effort was made to find minimum paths between end words.

video-disc-overt-rain-water-work-horse-back-cross-over-train-sick-rooms-tead-lishes
room-stead-fast-backs-trap-light-ship-board-room (a ring)
head-stone-wall-paper-back-stage-hand
rains-torm-enter-mete-yards-tick-birds
loud-mouth-part-ridge-bone-heads

Nine-Letter Words, One-Letter Overlap

(M,n) chains use words of length m, each of which overlaps the previous by n letters. In the simple case, m and n are chosen so that the third word begins at the end of the first. However, when m is odd and n = (m+1)/2, there is one-letter secondary overlap. Eckler exhibits a network of interlocking (3,2) chains in the May 1991 Word Ways. Here, I construct (9,5) chains. The set of words useful for this kind of chain (obtained by procedures analogous to the ones described previously) is almost as large as the previous one, but the words are not as well-connected. The following are the longest chains I can make. This type of chain is more appropriate for short words, but nine-letter words make good puzzles.

railroads trichomes thousands eleganter
roadstead homestall sandsoaps anterooms
steadying stallions soapstone roomstead
dyingness lionships stoneface steadiest
shipshape diestrous
shapeless
trousered

Eight-Letter Words, Secondary Overlap

With (m,n) chains, if m is even and n = 1+(m/2), we have two-letter secondary overlap. There is not much in the way of length in the following (8,5) chains, but these also make good puzzles.
displace subhuman madwoman citharas confines
placement humanest womanize harasses finespun
cement anestric aniseed assessor espundia
entering stricter seedsman essorant undialed
chasable eringoes icterode
sublease erodents accoutre madoquas
leaseman profiles outreach aquassas
semantic filespec reaching assassin
anticked especial chingmas assinego

Seven-Letter Words, Secondary Overlap
Here is an introduction to the (7,4) chain. Now the game gets interesting!
rusalka isotach
alkalis unscrew tachist
alismas crewels histrio
smasher welsher
fiurama sheriffs Ryzen
marabou riffles sing
aboulis flesher singing
ulicons sheroor bundist gingham
constat roocher disturb gelidy
descent statant thereto turbeth
centric tantric retours bethumb carcass
tricorn tricars ourself humbugs cassava
connett carsick selfish bugshas savanna
netting sicking fishing shastra annatta
tingled kinging hinging strains attains
pledged gingly ainsell
galoot sellout
looting louting tinging

Six-Letter Words, Secondary Overlap
Here are (6,4) chains. Six seems to be the best length for this. These are well-enough connected to allow branching, but I have not found closed loops or enough joins to identify a core (it’s close). Analysis of a slightly-larger database should prove useful.

niacin batata brenne
acinar tatami incubi ennewe
inarch tamise cubist newest
archil misere bistro westar
replan chilli serene stroke plays
planch illite renest rokete areste
anchor litera nester ketene esteem
choral teraph steric tenere teemer
orally raphae ericas nerels emerod
allyic phaeric icams reises erodes

Chaining Words of Mixed Length
Neither eight- nor nine-letter words produced long chains with secondary overlap, so here are chains using eight- and nine-letter

Puzzle 1
Fill the blank ping words (any length - 2)
1. cock-
2. brain-
3. ship-
4. trans-
5. paper-
6. ball-

Puzzle 2
Provide extension of the longer the word is answered by mon-
-ble
-whel
-do
-from
-de
-mad
-te

Answers can be any length.
words together. My rule is that every word must overlap the previous one by five letters. In the future, I will show what including ten-letter words allows.

puzzle 1

Fill the blank with one word so as to make two more overlapping words (i.e., a four-link AGM chain). The filler may be of any length – the longer, the better.

1. cock- -fatter 7. ship- -worm
2. brain- -power 8. show- -pieces
3. ship- -craft 9. cross- -talk
4. trans- -dress 10. sheep- -breeder
5. papers- -eller 11. corn- -picker
6. ball- -head 12. hand- -spring

Puzzle 2

Provide extensions in both directions from the following so as to produce two overlapping words. The longer the overlap, and the longer the words, the better. For example, -ignoratio- is answered by monsignor and rationale, which overlap at R; -hat-check- is answered by nuthatch and checkout, which overlap at CH. These are neither AGM chains nor directed word chains, but a more general case.

Answers can be found in Answers and Solutions at the end of this issue.