

ANA-GRAM-MAR CHAINS

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Words that break into two or more component words are the gist of many puzzles. Often the components conjure up an image unrelated to the compound: compare FAT ALLY to FATALLY, SAGA CITY to SAGACITY, CONDO NATION to CONDONATION, IMP LORE to IMPLORE, or BADGE RING to BADGERING. Such compound words are called **charades**. One **Word Ways** article on charades is Ralph Beaman's February 1975 "Big Amy on Wee Knights", the title of which includes two charade words. A puzzle in the August 1990 **Word Ways**, "Musical Wordboxes", required the reader to form 50 interlocked charades from components which could each form at least two charades.

Curiously, many charade components can be either the head or tail of a compound. For example, TEN is the head of TENOR, TENANT, TENON or TENSING, and the tail of BATTEN, HASTEN, HEARTEN, MARTEN or MOLTEN, to name just a few possibilities. This phenomenon has given rise to a puzzle type called **Ana-gram-mar**.

Ana-gram-mar's rules are simple. An **ana-gram-mar chain** consists of three common English words, such as ANA, GRAM and MAR, such that (1) the lengths of the first and last words are equal; (2) the middle word is no shorter than the end words; and (3) the join of the first two words is a word itself, and so is the join of the last two words.

An ana-gram-mar puzzle provides the end words of the chain and asks for the appropriate middle word: for example, fill in the missing word AS-(5 letters)-GO, answered by UNDER, making ASUNDER and UNDERGO. Laxer versions of the puzzle do not require the component elements to be words: for example, fill in the missing word in LAT-(5 letters)-ITY, answered by HERED, making LATHERED and HEREDITY.

There are thousands of possible ana-gram-mar chains, even restricting oneself to common English words. Most, however, are dull. In a November 1969 **Word Ways** article, "Foster Compounds", R. Robinson Rowe divided compound words into three etymological categories, which he called **children**, **stepchildren** and **foster children**. **Children** are words like OVERTAKE, which is etymologically related to both its components OVER and TAKE. **Stepchildren** are compounds like WARSHIPS, which is related to WARS but not to HIPS. **Foster children** are compounds relating to neither component, like BRANDISH from BRAN and DISH. Most ana-gram-mar chains consist entirely of the uninteresting children or stepchildren compounds.

Four types of ana-gram-mar chains are of interest, however:

- (1) chains where the first word is also the last word
- (2) chains where the first and last words themselves form a word
- (3) chains where all the compounds are foster children
- (4) chains where the middle word is relatively long

Puzzles embodying each type are given below.

Exercise 1: Fill in the missing word in each chain below, so that the first and missing word form a common English word, and so do the missing word and final word. The number in parentheses is the length of the missing word.

- (1) AD-(3)-AD, EL-(3)-EL, EN-(4)-EN, MAN-(5)-MAN, OVER-(4)-OVER,
PIN-(4)-PIN, WORK-(5)-WORK
- (2) FORE-(4)-SKIN, LA-(3)-ME, MASS-(4)-AGES, REV-(3)-ERE, RE-(4)-EL,
UNDER-(7)-LINES, UP-(5)-ON
- (3) CAD-(5)-ION, EAR-(4)-LED, EPIC-(5)-TAIN, HEAR-(4)-IONS,
LA-(4)-EL, PUN-(4)-EEL, REP-(5)-ATE, YEA-(3)-LED
- (4) ADO-(6)-ALE, AFTER-(7)-FULLY, CON-(7)-ANT, GIRL-(7)-HIPS,
HEAD-(7)-BACK, STAG-(6)-ALLY

The concept of ana-gram-mar chains can be easily generalized to allow more than one middle component. HAS-TEN-DON-ATE is a four-part chain with successive compounds HASTEN, TENDON and DONATE. The rules for extended ana-gram-mar chains are: (1) the lengths of the first and last words are equal; (2) the lengths of the component words never decrease from the first word to the center of the chain; and (3) the join of each successive pair of words is a word. To avoid endless loops, add (4) no component word may be repeated in the chain (except the first word may be the last).

As with three-link ana-gram-mar chains, most of the thousands of four-link chains are uninteresting aggregations of children and stepchildren. Some four-linkers fall into the four interesting types defined earlier; some of the best are given below as puzzles.

Exercise 2: Fill in the missing words in each chain below, so that each successive pair of words form a common English word. Numbers in parentheses are the lengths of the missing words.

- (1) BACK-(4)-(4)-BACK, HAND-(4)-(4)-HAND, MAN-(4)-(4)-MAN,
OR-(3)-(3)-OR, RE-(3)-(3)-RE, UPS-(4)-(4)-UPS
- (2) DO-(4)-(4)-OR, FUR-(4)-(4)-LED, NO-(3)-(3)-ON, OFF-(4)-(4)-END,
REP-(3)-(3)-LAY, SLUM-(4)-(4)-PING, SO-(4)-(4)-ON,
WOOD-(4)-(4)-WIND
- (3) AT-(3)-(3)-GO, AW-(3)-(3)-AD, CAR-(3)-(3)-TIC, FAT-(3)-(3)-KEY,
RAG-(4)-(4)-STY, TAW-(3)-(3)-ORB
- (4) BLUE-(5)-(5)-CAPE, EYES-(5)-(5)-TONE, FLOOD-(5)-(5)-BOATS,
FLY-(5)-(5)-LAP, LIVE-(5)-(5)-TICK, THREE-(5)-(5)-HARPS,
WORK-(5)-(5)-LESS

Most chains longer than three or four links are also aggregations of children and stepchildren. Links such as BACK, DOWN, FOOT, HAND, HOLD, OUT, OVER and TURN are increasingly frequent. Some interesting multi-link chains are given below as puzzles.

Exercise 3: Fill in the missing words in each chain below, so that

each successive pair of words form a common English word. Numbers in parentheses are the lengths of the missing words. A list of choices is provided after the puzzle.

- (1) ANT-(4)-(4)-(4)-(4)-ANT, ARM-(4)-(4)-(4)-ARM,
EL-(3)-(4)-(4)-(3)-EL, CO-(3)-(4)-(4)-(3)-CO,
TURN-(4)-(4)-(4)-(4)-TURN, UPS-(3)-(4)-(3)-UPS
- (2) BE-(4)-(4)-(4)-EN, CUR-(4)-(4)-(4)-ATE, EM-(3)-(4)-(4)-(3)-US,
CAR-(3)-(3)-(3)-(3)-AGE, HE-(4)-(4)-(4)-(4)-AD,
IMP-(3)-(4)-(3)-END, ME-(4)-(4)-(4)-OW, MI-(4)-(6)-(4)-EN,
NOT-(3)-(3)-(3)-(3)-ATE
- (3) AM-(3)-(3)-(3)-ME, DIG-(3)-(4)-(3)-EON, HAM-(3)-(3)-(3)-HER,
IN-(3)-(3)-(3)-AS, KIT-(3)-(3)-(3)-PEN, TEE-(3)-(3)-(3)-ANT
- (4) BACK-(4)-(7)-(4)-POTS, BAD-(3)-(6)-(3)-MEN, CUR-(3)-(7)-(3)-PIE,
FARE-(4)-(6)-(4)-CARD, SEA-(4)-(6)-(4)-HOT, WHAT-(4)-(6)-(4)-ROOM

AIR ANT BALL BACK BAG BAR BED BOX CAR CRACKER CUR DOWN EAR END EVER
FALL FELLOWS FIN FIRE FLOWER GREENS HAND HANDLE HEAD HEM HER HILL
HIP HOLD HOT ICE JACK LAM LAND LEADER LESS LIFT MAN MARK MART MEN
NET OFF OUT OUTS OVER PACE PAN PANT PEE PER POTS RAIN RAM RED REIN
REST RING ROT SET SHOW SIDE SLIP SON SPRING SURE TAIL TEN THY TIME
TRY WALL WARD WELL WOOD WORK

Several questions suggest themselves, including (1) what is the longest possible extended chain? Remember that no chain can repeat an interior component. Any answer should be greater than 39, the length of LO-GO-RE-LAY-OFF-SET-TEE-PEE-PER-SON-ANT-HILL-SIDE-BACK-HAND-HOLD-OVER-NIGHT-CLOTHES-HORSE-SHOE-LACE-WING-SPAN-KING-SHIP-YARD-ARM-LET-UPS-HOT-BED-PAN-TRY-OUT-DO-ME-AN. The hardest condition is making the lengths of the components symmetric about the center. (2) What is the longest chain for which the first and last components form a word? The previous example is one such chain, forming LOAN. (3) What is the longest chain whose lengths strictly increase to the center word(s), and then strictly decrease? A first try yields S-HE-ART-WORK-HORSE-WOMAN-KIND-RED-IS-S, if single letters are considered words. (4) In the spirit of Lewis Carroll's Doublet word-ladders, what natural word associations can be joined by an extended ana-gram-mar chain? A few examples are LAND-MARK-DOWN-TURN-OVER-SEAS, HEAD-REST-RAIN-COAT-TAIL, REST-RING-WORM-WOOD-WORK, WORK-HORSE-PLAY, SHOE-LACE-WING-BACK-BONE-HEAD-WIND-SOCK and FOOT-HOLD-OVER-HAND.