

WORD LADDERS OF TODAY

LEONARD J. GORDON
Redlands, California

In an earlier article, I showed how many of the classic word ladders proposed by Lewis Carroll could be shortened with the aid of the computer. In this article, I use the computer to construct many new word ladders having various characteristics.

Minimum-length Word Ladders

Minimum-length, or ideal, word ladders change N letters in only N steps. Many minimum-length ladders can be constructed out of 4-letter words. With 5-letter words, one can find a ladder between almost any word-pair; some are minimum-length, but usually more than 5 steps are needed. With 6-letter words, a ladder between a pair of words chosen at random is usually impossible, but there are plenty of good pairs to be found. The computer can find minimum-length ladders between 6-letter words, but it is often difficult to find ones with meaningful relationships between the end words.

FOOT-fort-ford-fard-YARD	YARD-yare-mare-male-MILE	FOOT-moot-molt-mole-MILE
FOOL-mool-moll-mull-MULE	MULE-mure-mere-here-HERD	HEAD-heed-hoed-koes-TOES
HOGS-hags-lags-lars-LARD	BLUE-blae-brae-bray-GRAY	BLUE-glue-gee-gley-GREY
HERE-hern-tern-teen-THEN	COLD-hold-held-head-HEAT	BEER-peer-pees-pies-PISS
HAIR-hail-bail-ball-BALD	HARD-hart-hast-east-EASY	SWAN-swag-snag-sang-SONG

TIGER-timer-tamer-tames-lames-LAMBS	SHEEP-sheet-sleet-slept-slipt-CLIPT
LAMBS-lames-lanes-banes-bones-BONED	MUSTY-mussy-mossy-mousy-mouse-HOUSE
BONNY-boney-bones-tones-tines-TIMES	MACHO-machs-macks-packs-pucks-PUNKS
FUNNY-bunny-bunns-bunds-binds-BIRDS	BILLY-bills-bolls-bolts-boats-GOATS
BOOKS-gooks-goods-goats-grads-GRADE	FUNKY-funks-dunks-dunes-dynes-DYKES
KINKY-linky-liny-liner-liver-LOVER	HELLO-hells-wells-welds-wolds-WORDS

MISSUS-misses-masses-massed-masted-wasted-WANTED
 CURIOS-curies-carries-cartes-carted-wanted-WANTED
 WHACKY-whacks-shacks-stacks-stalks-stales-STYLE
 BRAZEN-brazes-crazes-crozes-crores-chores-CHORUS
 PASTAS-pastes-paster-poster-potter-pother-MOTHER
 CODGER-conger-conner-tonner-tonnes-tennes-TENNIS
 BLOODY-bloods-broods-broads-breads-dreads-DREAMS
 BLONDE-blonds-blinds-blinks-clinks-clicks-CHICKS
 ROCKET-rocker-hocker-honker-hanker-hanger-HANGAR
 SNORTS-shorts-shirts-shists-whists-whisks-WHISKY
 CHARAS-chares-chores-chokes-choked-cooked-HOOKED
 STONED-stored-stores-stares-shares-chares-CHARAS

In the fourth 6-letter example, chorus could be replaced with the more apt whores, but the ladder is no longer ideal.

Joining Transposals By Word Ladders

In the following, the end words are transposals of each other; in all but the last, every letter must be changed. Note that several of the end words are reversals of each other. I have not seen any other examples of these kinds of ladders.

RAJA-raga-rags-rigs-rims-aims-aims-alas-alar-AJAR

CHEAT-cleat-bleat-blest-blast-beast-least-leash-leach-TEACH

ESTER-eater-tater-tates-tares-tarns-terns-terne-TERSE

LARGE-marge-merge-verge-venge-venae-venal-renal-REGAL

TRIPS-tripe-trine-thine-shine-spine-spire-SPIRT

STOUT-shout-shott-shots-soots-toots-TOUTS

PORTS-pouts-pours-sours-spurs-spurt-SPORT

KNAPS-snaps-swaps-swans-spans-SPANK

REPINS-rewins-rewing-sewing-sering-serins-series-serves-selves-solves-soaves-staves
-stapes-stipes-snipes-SNIPER

RECAPS-remaps-remans-remand-remend-resend-reseed-rested-tested-teated-seated-seared
-spared-spaced-SPACER

REPAID-repand-remand-remend-resent-reseed-rested-rester-raster-rasper-rapper-dapper
-draper-DIAPER

Assorted Word Ladders

Here are a few ODDS and ENDS, including a selection of 7-letter word ladders. A few of these were suggested by the books mentioned in the previous article. **Purple-yellow** is a good sequel to **black-white**. I like **bandit-gallows** because it takes 13 steps. I do not know of any 7-letter ladders besides those given here. I did not try to find 8-letter ones.

ODDS-adds-ands-ENDS

WOOL-wood-word-worn-warn-YARN

TOWN-tows-tots-pots-pits-pity-CITY

BEAU-bead-lead-load-lord-lore-LOVE

PAPER-taper-taped-TYPED

CARDS-carls-calls-cells-dells-deals-DEALT

GAMBA-gambs-games-gales-galls-calls-cells-CELLO

BREAD-break-bleak-bleat-blest-blast-boast-TOAST

CARVE-carse-corse-horse-house-rouse-roust-ROAST

CHEEK-check-chick-chink-chins-coins-coils-cowls-JOWLS

SKIRT-skint-skins-sains-wains-waits-wants-PANTS

WHALE-while-whine-chine-chins-coins-conns-cones-BONES

TOXIC-toric-boric-baric-basic-basis-basts-baste-WASTE

LAGER-layer-sayer-shyer-shoer-shoes-shots-shoot-shout-STOUT

PUSSY-pursy-purse-puree-purer-puler-paler-taler-tiler-TIGER

GUTSY-gutty-cutty-cutty-cuter-citer-titer-timer-timed-TIMID

SEVEN-semen-semes-sexes-sixes-sines-sinhs-sighs-sight-EIGHT

DRUNK-drank-brank-brans-brats-boats-borts-bores-sores-sorer-SOBER

BANJO-banco-bunco-bunko-bunks-punks-pinks-pinas-pimas-simas-simar-SITAR

THREE-threw-shrew-shred-sired-tired-tires-tiles-tilts-silts-silty-SIXTY

ANGEL-anger-agger-egger-eager-eater-dater-dates-dames-demes-demos-DEMON

BLIND-blink-clink-clonk-clons-cions-lions-lirms-links-sinks-sinhs-sighs-SIGHT

DISHES-dished-dashed-WASHED

FALLEN-faller-feller-heller-healer-heaver-leaver-LEAVES
 ROCKIE-bookie-bootie-bootee-booted-hooted-hoofed-COOFED
 GUNMEN-gunnen-gunner-rummer-ruiner-ruined-rained-railed-JAILED
 PAUPER-pauser-pauses-passes-pisses-wisses-wishes-wiches-RICHES
 BROKEN-broker-booker-boozer-bonzer-bonder-bender-mender-MENDED
 GRAVID-graved-craved-craver-crater-coater-cotter-potter-pother-MOTHER
 WINTER-winier-wirier-airier-aerier-aeries-series-serins-sering-SPRING
 PAPERS-capers-copers-cooers-cooees-cooeed-cooled-coaled-goaled-goaded-GRADED
 TARTAN-tartar-tarter-barter-batter-better-beater-beaver-braver-brazer-BLAZER
 YUPPIE-yippie-yippee-yipped-lipped-lisped-wisped-wished-wishes-wiches-RICHES
 TARZAN-tartan-tartar-tarter-barter-barker-burker-burger-burgee-burgle-bungle-JUNGLE
 SPRING-sering-serins-series-serves-selves-helves-helved-helmed-hemmed-hemmer-hummer
 -SUMMER
 VALISE-valine-maline-marine-murine-purine-purins-burins-buries-buried-burked-barked
 -parked-PACKED
 PURPLE-purply-purely-surely-sorely-sorels-morels-motels-botels-betels-bevels-levels
 -levees-levies-bevies-belies-belles-belled-balled
 -ballet-ballot-ballon-billon-billow-bellow-YELLOW
 DROPPED-cropped-clopped-clapped-clasped-classed-CLASSES
 CRITTUR-critter-fritter-flitter-flutter-fluster-flusher-FLUSHED
 DOOLIES-doilies-dailies-bailies-bailees-bailers-baiters-gaiters-gainers-garners-garnets
 -gurnets-GURNEYS
 CHEATER-cheated-chested-crested-crusted-crushed-crashed-crashes-brashes-braches-beaches
 -teaches-TEACHER
 BANDITS-bandies-pandies-panties-parties-parries-perries-ferries-ferlies-fellies-felloes
 -fellows-fallows-GALLOWS
 PICKING-pecking-perking-jerking-jerkins-jerkies-jerkier-perkier-peakier-beakier-brakier
 -brasier-brasher-brashes-braches-beaches-PEACHES
 WOUNDED-bounded-bounder-blunder-blunter-bluster-blaster-plaster-platter-platier-peatier
 -peakier-perkier-jerkier-jerkies-jerries-ferries
 -ferlies-fellies-dellies-dollies-doolies-DOOLEES
 TRIOLET-triplet-tripled-tripped-tripper-gripper-griper-grazier-brazier-brakier
 -beakier-peakier-peatier-pettier-nettier-nettler-nettles-settles-settees
 -setters-petters-putters-punters-punners-runners-runnels-ronnels-RONDELS

All of the above are the shortest ladders (least links in Carroll's nomenclature) between the end words. When the computer found alternate paths of the same length, I usually chose links that had some association with the end words: cheek-chins-jowls is an example. For a final sample, chaos-order is a great word association, but the shortest ladder uses some uncommon words. Here it is, followed by longer ones using more familiar words.

CHAOS-chats-coats-colts-coles-codes-coder-cider-aider-adder-odder-ORDER
 CHAOS-chats-coats-boats-bolts-boles-bodes-bides-aides-aider-alder-older-ORDER
 CHAOS-chaps-chops-coops-corps-cores-codes-coder-cider-eider-elder-older-ORDER
 CHAOS-chats-chits-whits-waits-warts-wares-wades-wader-wider-eider-elder-older-ORDER

A Sequence Of Word Ladders

Lewis Carroll converted **wheat** to **bread**, and **flour** to **bread**. This suggested to me the problem of converting **wheat** to **flour** to **dough** to **bread**, a much more difficult problem, since **dough** and **toast** have a different vowel-consonant pattern than the three words Car-

roll considered. Here are two solutions to the problem; I suspect that improvements are possible.

WHEAT-cheat-cleat-bleat-bloat-float-flout-FLOUR-floor-flood-blood-blond-blend-bleed-blued-glued-glues-gluts-gouts-routs-route-rouge-rough-DOUGH-cough-couch-pouch-poach-peach-peace-place-plane-plans-plays-prays-preys-treys-trees-treed-breed-BREAD-tread-triad-tried-tries-trims-trams-teams-beams-beaus-beaut-beast-boast-TOAST

WHEAT-cheat-cleat-bleat-bloat-float-flout-FLOUR-flout-float-bloat-bleat-blest-blast-boast-roast-roust-rouse-rouge-rough-DOUGH-bough-brugh-brush-brash-brass-braes-brees-breed-BREAD-tread-treed-trees-tress-ress-crass-class-clast-coast-TOAST

Stepwords

In this section, we require that every other link be a transpositional. There are four variations, depending on how we define which type of link to use at each end; I illustrate the choices for isle-inch. If one exhibits transposals horizontally and letter-changes vertically, the reason behind the term stepword is evident. Unfortunately, too few words allow transposals for us to find many interesting ladders with transposals at both ends.

inch	inch-chin	inch	inch-chin
itch-chit	coin-cion	itch-chit	chis-ichs
chis-ichs	lion-lino	shit-hist	ices-sice
ices-sice	line-lien	list-lits	side-dies
side-dies	lied-idle	lies-isle	lies-isle
diel-idle	isle		
isle			

Here are some Carroll word ladders in stepword form.

grass	seven-neves	white-withe	shore-shoer
trass-tsars	never-nerve	lithe-thile	shier-hires
tears-stear	serve-sever	toile-teloi	vires-rives
shear-share	siver-viers	telos-toles	river
shore-heros	tiers-tries	tales-stale	
heron-honer	trigs-girts	stalk-talks	
goner-genro	girth-right	calks-slack	
genre-green	eight	black	

And here are a few of my own inventions.

chili	actor-taroc	stale-steal	cheat
chile-chiel	taros-ratos	stead-dates	cheap-peach
shiel-heils	rates-stare	dater-tread	teach
heals-hales	stage	bread	
work	hates-haste		
wort-trow	caste-cesta	golf	soup
trop-port	costa-tacos	wolf-fowl	scup-cups
part-rapt		foal-loaf	tups-puts
work	rape-reap	ball	leaf-feal
cork-rock	leap-pale	balm-lamb	meal-male
rack-cark	paly-play	lane-male	mage-game
care-race		mage-game	
rate-tear			
teal-late			