

# COMPOUND WORD SQUARES

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Readers of Harry Partridge's entertaining "Word-Crossed Characters" in this issue of Word Ways may not be aware that his 3-by-3 kanji crossword illustrates a new form of linguistic wordplay. It is best introduced by the English-language homologue given at the right. The three letters of each word at the left of the square grid are placed, in order, in the three boxes of the same row; similarly, the three letters of each word above the grid are placed, in order, in the three boxes of the same column. (To make this distribution more clear, the horizontal words are capitalized, and the vertical words are in lower case.) Each box contains two letters, one contributed by the corresponding letter of the word at the left of the row and the other by the corresponding letter of the word above the column. These two letters are transposed, if necessary, to form a word. In total, the six three-letter words outside the grid are a collective transposal of the nine two-letter words inside the grid.

	t	o	b
	o	w	i
	e	n	b
ATE	At	To	bE
SET	So	wE	iT
MAY	Me	An	bY

The 2-by-2 analogue of this structure is given at the right. For greatest elegance, I propose that all words, both inside and outside the grid, be distinct; in fact, they should be anagrammatically distinct as well (i.e., one should not find both NO and ON among the eight two-letter words).

	p	i
	i	f
AS	pA	iS
TO	iT	Of

It is possible to move into higher dimensions -- the 3-by-3-by-3 compound word cube has 27 three-letter words in it, each one constructed out of the proper letters from words assigned to the 27 face boxes.

DIE	TOO	LIE		THE	COT	GIN
TEA	GAY	SEA		AIM	PRY	RAT
SOB	MAN	ROE		PIN	NOT	WAR
				EGO	DAY	SPA
				DRY	DEW	PEN
				OAR	ASH	AGO

The corresponding interior words are

Top Layer	Middle Layer	Bottom Layer
LOT ICY AGE	THY WOO ION	RED HIT ONE
GAS APE RAP	RIG ERA AYE	MAT YES TAG
PER NOD SEW	DIM ADO PAN	SON OAT BAR

For example, the L in LOT comes from LIE, the O comes from EGO, and the T from THE. Note that all 54 words are anagrammatically distinct, as required.

The 2-by-2 and 3-by-3-by-3 grids were quite easy to construct, suggesting that larger ones are possible. Someone may wish to build a 4-by-4-by-4-by-4 grid with 256 face words of four letters anagrammed to 256 other interior words of four letters, keeping all 512 words anagrammatically distinct. If this is not a sufficient challenge, there's always the 5-by-5-by-5-by-5-by-5 grid with a total of 6250 words!

Harry Partridge suggests that this wordplay can be generalized to allow words on both sides of the square instead of only one; these can be called double compound word squares. In such squares, the interior words will have four letters instead of two; he presents the following 4-by-4 example in which four different typefaces have been used.

	head	rank	oven	aeon	
	↓	↓	↓	↓	
<i>stem</i> →	host	tory	sole	maps	← slot
<i>veil</i> →	evil	heal	vain	well	← wall
<i>pert</i> →	rapt	cane	pure	toes	← spat
<i>inch</i> →	edit	tank	corn	hymn	← mote
	↑	↑	↑	↑	
	<i>trio</i>	<i>achy</i>	<i>ruins</i>	<i>yelp</i>	

The arrows indicate the direction in which the letters of each word in the margin are written consecutively into each cell on a horizontal or vertical line with it. Note that the square is not quite perfect; EVIL and VEIL appear in two different places. This can be rectified by changing HEAD to LOAD, HOST to LOST and EVIL to VIOL.

Double compound word squares can be generalized to higher dimensions as well. A 6-by-6-by-6 double compound word cube, containing 216 six-letter words and faced by 216 six-letter words, ought to be possible to construct without duplication.