POWERFUL WORDS

SUSAN THORPE
Great Missenden, Buckinghamshire, England
(thorpeds@hotmail.com)

There are two types of what I call **powerful words**:

* whole words whose letter totals (assigning a=1, b=2... z=26) are a square, a cube etc.
* words which break into a series of letter groups each of whose total is a square, cube etc.

Let us begin by taking a look at the first of these types of powerful word. Unreferenced words are in the OED, Second Edition. Sources of non-OED words are given at the end.

WHOLE WORDS - SQUARES, CUBES ETC.

A. SQUARE WORDS

The following square words have values ranging from 1^2 to 18^2: A(1), BAA (4), EBB (9), DEAF (16), ACCEDED (25), CASCADE (36), BAZAAR (49), COMEDIAN (64), AMPHIBOLE (81), REVERSAL (100), GRAMMATIST (121), ASSORTMENT (144), CHRONOLOGICALLY (169), PRONUNCIATION (196), OVERSTUDIOUSLY (225 web2), IMMUNOSUPPRESSION (256), INSTITUTIONALISATIONS cham (289) and PRESUPPOSITIONLESSNESS (324).

Changing one square word into another square word

1. any noun with a square total of 81, and which can be pluralised by adding the single letter S (19), produces a plural with the square total of 100. Thus SQUARE (81) + S (19) = SQUARES (100), and VERDICT (81) + S (19) = VERDICTS (100). The same square-to-square transformation is also demonstrated by certain verbs: WRIGGLE (81) + S (19) = WRIGGLES (100), whilst EXPLAIN (81) + S (19) = EXPLAINS (100).
2. adding a terminal AL to a noun with a letter total of 36 produces an adjective with a letter total of 49: FEUD (36) + AL (13) = FEUDAL (49).
3. a word with a square total of 36 can be transformed into a variant with a square total of 25 by replacing its terminal Y (25) with IE (14), an overall subtraction of 11: BADDY (36) and BADDIE (25) can both be found in Chambers Dictionary.

Square Phrases

Can you find phrases made of square words?
So far, ALL (25) I (9) HAVE (36) found are these:
SQUARE FEET (81-36), ABBA'S ALBUM (25-49), GARDEN FETE (49-36), and BIN LID (25-25). PETER CUSHING (64-81) was the squarest of all the British actors, in the nicest possible way of course. He appeared in 166 cinema and TV films, beginning with *Chump At Oxford* in 1939, and ending with *Biggles* in 1986. His starring roles included Sherlock Holmes and Dr Who.

Square Ladders
The words of these two ladders equate to 3^2, 4^2, 5^2, 6^2, 7^2 and 4^2, 5^2, 6^2, 7^2, 8^2 respectively.

BAEA dfpf (9) - BALA (16) - KALA (25) - KALL (36) - XALL or KALY (49)
FADE (16) - FAME (25) - FAXE (36) - SAXE (49) - SAXT (64)

A Square Pyramid
This square word pyramid adds a single letter at each step:

$1^2 = 1$	A
$2^2 = 4$	CA
$3^2 = 9$	ACE
$4^2 = 16$	CAGE
$5^2 = 25$	CAIGE
$6^2 = 36$	GIACKE

B. CUBE WORDS

These cube words have values ranging from 1^3 to 7^3:
A(1), CAD (8), ABODE (27), CAPTAIN (64 - also = 8^2), SYNONYM (125),
SYSTEMATIZATION web2 (216), URETEROPYELONEPHROSTOMY sted (343)

Changing one cube word into another cube word

1. any noun with a cube total of 8 which can be pluralised by adding S (19) produces a plural with the cube total of 27: CAD (8) + S (19) = CADS (27).
2. some nouns/verbs with a cube total of 27 and which end in E can accept RS at the end to change into a plural noun with a cube total of 64: CARE (27) + RS (37) = CARERS (64).
3. some nouns with a cube total of 27 can be turned into adverbs by adding the letters LY (37): BASE (27) + LY (37) = BASELY (64).

Cube Phrases
PUZZLE'S SOLUTION (125-125), UNEXPLAINED MYSTERY (125-125),
BY EXAMINATION (27-125), HALF DOZEN (27-64), PETER PIPER (64-64),
PETROLEUM GAS (125-27), GAS FUMES (27-64), HAND CALCULATORS (27-125).
Can you find others?

A Cube Pyramid
A pyramid made from cube words which increases by a single letter each step can only grow in size as far as the 4^3 (64) level. This is because the next level, 125, minus 64 = 61 which is greater than the value of any single letter. We have to look for another type of cube pyramid in order to include the 125 level. This cube pyramid adds, progressively, 1 letter, 2 letters, 3 letters, 4 letters and 5 letters:

$1^3 = 1$	A
$2^3 = 8$	CAD
$3^3 = 27$	CABLED
$4^3 = 64$	ACCORDABLE
$5^3 = 125$	LABRADORESCENCE

C. HIGHER POWER WORDS

It should be noted that some higher powers equate to other, lower, powers. Words with these particular totals can be found above in *A. Square Words*.

$2^4 = 4^2 = 16$ $2^6 = 4^3 = 8^2 = 64$ $2^8 = 4^4 = 16^2 = 256$ $3^4 = 9^2 = 81$

These higher powers, on the other hand, do not equate to any lower powers:

$2^5 = 32$ = PIG $2^7 = 128$ = CLINTONISM $3^5 = 243$ = CRYPTOZYGOSITY

D. POWERFUL TRANSFORMATIONS

In *A. Square Words*, we saw how one square word can be changed into another square word by adding a single letter at the end (VERDICT to VERDICTS), and similarly for cube to cube words (CAD to CADS). The same principle can be applied to change a word of one power into a word of a different power.

Turning Square Words into Cube Words and Cube Words into Square Words

1. a square word totalling 9 may be turned into a cube word totalling 27 by adding the letter R:
   ACE (9) + R (18) = ACER (27)
2. a square word totalling 100 may be turned into a cube word totalling 125 by adding Y (itself a square): HOLOGRAPH (100) + Y (25) = HOLOGRAPHY (125)
3. a square word totalling 121 may be turned into a cube word totalling 125 by adding D (itself a square): PUNCTUATE (121) + D (4) = PUNCTUATED (125)
4. a cube word totalling 27 can be turned into a square word totalling 36 by adding I (itself a square): HAR (27) + I (9) = HARI (36)
5. a cube word totalling 125 can be turned into a square word totalling 144 by adding S:
   The noun ANOINTMENT (125) + S (19) = ANOINTMENTS (144)
   The verb DISACCOMMODATE (125) + S (19) = DISACCOMMODATES (144)

Turning Higher Power Words into Square Words and vice versa.

A higher power word is turned into a square word...

1. HEAR ($2^5 = 32$) + D (4) = HEARD ($6^2 = 36$)

...and a square word is turned into a higher power word:

2. BIN ($5^2 = 25$) + G (7) = BING ($2^5 = 32$)

LETTER GROUPS - SQUARES, CUBES ETC.

A. SPLITTING WORDS INTO LETTER GROUPS

Identical Powers and Identical Roots

Each of these words is split into 3 groups of letters. In those cases in which the 3 groups all have the same number of letters*, the word is a numerical tautonym.

CA.BB.AC* = $2^2 2^2 2^2$ - word is a palindrome

HA.ED.DE* = $3^2 3^2 3^2$

P.ANA.CHE = $4^2 4^2 4^2$

PI.NK.Y = $5^2 5^2 5^2$

SPA.NDR.ELS* = $6^2 6^2 6^2$
PRO.CHORDA.LLY sted = $7^2 7^2 7^2$
WATT.LED TRE.E-CROW phrase = $8^2 8^2 8^2$

Identical Powers and Progressive Roots
A.BB.ACE (1.4.9) = $1^2 2^2 3^2$
CA.I.CHE (4.9.16) = $2^2 3^2 4^2$
DE.NB.Y (9.16.25) = $3^2 4^2 5^2$
P.ALL.ISH (16.25.36) = $4^2 5^2 6^2$
HEL.IOL.ITHIC (25.36.49) = $5^2 6^2 7^2$
TE.TANA.LLY sted (25.36.49) = $5^2 6^2 7^2$ - word made of straight line letters
SHI.FTIN.GNESS (36.49.64) = $6^2 7^2 8^2$
PUL.MOCOR.ONARIES sted (49.64.81) = $7^2 8^2 9^2$
LEUKO.CYTOME.TRICALLY sted (64.81.100) = $8^2 9^2 10^2$

Identical Powers and Regressive Roots
HA.BB.A (9.4.1) = $3^2 2^2 1^2$
FEE.DE.D (16.9.4) = $4^2 3^2 2^2$
HEL.P.ED (25.16.9) = $5^2 4^2 3^2$
SLE.D-LI.KE (36.25.16) = $6^2 5^2 4^2$
PRO.SE-L.IKE (49.36.25) = $7^2 6^2 5^2$
STET.HOGRA.PHIC (64.49.36) = $8^2 7^2 6^2$
MYCETO.GENETICA.LLY sted (81.64.49) = $9^2 8^2 7^2$
PRIMARY. STRUC.TURE phrase (100.81.64) = $10^2 9^2 8^2$

Progressive Powers and Identical Roots
D.EC.IG.RAM (4.8.16.32) = $2^2 2^3 2^4 2^5$
HA.LO.GENOUS (9.27.81) = $3^2 3^3 3^4$

Progressive Powers and Progressive Roots
A.CA.CIAN web2 (1.4.27) = $1^1 2^2 3^3$
A.DD.RESSABLE (1.8.81 - note the digital palindrome) = $1^2 2^3 3^4$
A.P.PENDICOENTEROSTOMIES sted (1.16.243) = $1^3 2^4 3^5$

Progressive Powers and Regressive Roots
TEST.IMONIU.MS (64.81.32) = $4^3 3^4 2^5$
TE.TRAKAID.EKAHEDRON (25.64.81) = $5^2 4^3 3^4$

Regressive Powers and Identical Roots
DIS.CAL.CE.D (32.16.8.4) = $2^5 2^4 2^3 2^2$
YOUT.HEN.ED web2 (81.27.9) = $3^4 3^3 3^2$

Regressive Powers and Progressive Roots
DIS.COMPOS.TURE (32.81.64) = $2^5 3^4 4^3$
ARSENIO.SIDERI.TE (81.64.25) = $3^4 4^3 5^2$

Regressive Powers and Regressive Roots
LO.BB.A (27.4.1) = $3^3 2^2 1^1$
RISSOA.CE.A tf (81.8.1 - note the digital tautonym) = $3^4 2^3 1^2$

Identical Powers and Palindromic Roots
HA.NK.ED (9.25.9) = $3^2 5^2 3^2$
P.ASTI.CHE (16.49.16) = $4^2 7^2 4^2$
TE.NB.Y (25.16.25) = $5^2 4^2 5^2$
SHI.P.PABLE (36.16.36) = $6^2 4^2 6^2$
VIR.I.LISED cham (49.9.49) = $7^2 3^2 7^2$
This split-word transposal can be divided into four squares: SHI.P.P.ISH (36.16.16.36) = $6^2 4^2 4^2 6^2$

Identical Powers and Tautonymic Roots
D.I.BB.ED cham (4.9.4.9) = $2^2 3^2 2^2 3^2$
P.ED.DL.ED (16.9.16.9) = $4^2 3^2 4^2 3^2$
GR.I.DDEL.ED (25.9.25.9) = $5^2 3^2 5^2 3^2$

Identical Powers and Alphomic Words
Powerful alphomic words include...
A.BB.ET (1.4.25) = $1^2 2^2 5^2$
DE.RR.Y (9.36.25) = $3^2 6^2 5^2$
... and powerful reverse alphomic words include:
GED.D.A (16.4.1) = $4^2 2^2 1^2$
P.IG.GED (16.16.16) = $4^2 4^2 4^2$

Identical Powers and Symmetrical Words
The letters of this word exhibit horizontal symmetry. As a bonus, it divides into palindromic roots:
DE.CID.ED (9.16.9) = $3^2 4^2 3^2$
The letters of this word exhibit vertical symmetry:
HUT.I.A (49.9.1) = $7^2 3^2 1^2$

Identical Powers and Typewriter Words
Letters from the top row of the typewriter keyboard make PIRRITE which divides into five squares:
P.I.RR.I.TE (16.9.36.9.25) = $4^2 3^2 6^2 3^2 5^2$

Identical Powers and Total Breakdown
A few words are made of powerful individual letters:
These two examples are isomorphs:
D.A.D.D.A (4.1.4.4.1) = $2^2 1^2 2^2 2^2 1^2$ and P.I.P.P.I (16.9.16.16.9) = $4^2 3^2 4^2 4^2 3^2$
This is another alphomic word (see above):
D.I.P.P.Y (4.9.16.16.25) = $2^2 3^2 4^2 4^2 5^2$
The king of the total breakdowns is YPAID, composed of five numerically-consecutive squares:
Y.P.A.I.D (25.16.1.9.4) = $5^2 4^2 1^2 3^2 2^2$

A Square Word Square

This word square is made from letters/letter groups which equate to 1^2, 2^2, 3^2, 4^2, 5^2 and 6^2, six being the maximum possible different square letters/letter groups in a 3 x 3 non-double square.

36	25	4	HIS	PI	D
25	16	1	PI	P	A
4	1	9	D	A	ED

B. SPLITTING THE ALPHABET

It is interesting to note that the first half of the alphabet splits into three powerful letter groups:

A	BCD	EFGHIJKLM
1^2	3^2	9^2

POWERFUL TRANSPOSAL EQUATIONS

Finally, we return to whole powerful words and use them to make powerful equations. The idea is to construct numerically powerful equations and then find **whole** words to equate to each of the equation's components. To make it more difficult, let us require that the letters which make the word(s) on one side of the equation be the same letters which make the word(s) on the other side of the equation. As there are many ways of splitting single squares, or single cubes etc., into series of squares and/or cubes etc., readers might like to try constructing what I call **powerful transposal equations** for themselves. Here are some examples:

$5^2 = 3^2 + 4^2$ HAIG = I + HAG

$9^2 = 7^2 + 2^5$ DELIBERATE = BELATED + IRE

$5^3 = 5^2 + 10^2$ DISTORTABLE = DRAB + TOILETS* (see *Meaningful Equations* below)

This equation is an all-cube affair:

$6^3 = 3^3 + 4^3 + 5^3$ INTERCOMMUNICATION = INCA + UNIT + METRONOMIC

Now we add a further constraint by requiring a specific type of letter or word form:

Geometrical Words

The word UNEVEN, with its letter ratio of 2.2.1.1., will make two triangles in which like letters occur on the same row (see *Geometrical Words Part 1* 97193). It so happens that both UNEVEN and the two 3-letter triangles it makes can be expressed as powers, thus enabling the construction of a powerful transposal equation. Note that the letters of the 2 triangles make the palindromic words NUN and EVE. Incidentally, UNEVEN is also a Balanced Word with an average letter value of 13.5, half way through the alphabet.

		U		V	
UNEVEN	=	N	N +	E	E
9^2	=	7^2	+	2^5	

Narrow Letters
This equation is made from narrow letters:
$10^2 = 6^2 + 8^2$ sources = roc (a bird) + uses

Straight Line Letters
$10^2 = 6^2 + 8^2$ ANIMATELY (web2) = LAMIA + TYNE

Piano Letters
These words are made from the letters a,b,c,d,e,f,g:
$5^2 = 3^2 + 4^2$ CABBAGED = DABB (web2 - a large spiny-tailed lizard) + CAGE
Note that in CAbbaGEd, CAGE reads forward and DABB reads backward.

Letters from First Half of Alphabet
$9^2 = 2^5 + 7^2$ HAMAMELIDACEAE (web2) = ACADEME+MAHEILA (a large river sailing-boat in Iraq)

Letters from Second Half of Alphabet
$10^2 = 6^2 + 8^2$ TOUSY (dishevelled) = OU (a honeycreeper bird) + STY

More Powerful Equations
So far, all the equations have featured a single square or cube equating to two or three other squares or cubes etc. It is also possible to make equations with more than one power on both sides.
$2^2 + 11^2 = 5^2 + 10^2$ CA (Scots: mountain-pass) + DECLARATIONS = LACED+ RAINCOATS
$4^2 + 13^2 = 8^2 + 11^2$ BEDE + INCONSIDERATION = REBAITED + NONDECISION (web2)

Meaningful Equations
The DRAB TOILETS equation (above*) holds a certain degree of meaning. Here are two more. Can you find others?
$13^2 = 12^2 + 5^2$ ELECTROSTATICS = STILETTOES + CRAC (an old form of 'crack')

I dedicate this last one to Al Gore:
$9^2 = 1^2 + 8^2 + 4^2$ HANDICAPPED = A + NIPPED + CHAD

SOURCES OF NON-OED WORDS

cham = Chambers English Dictionary
dfpf = A Dictionary of the Flowering Plants and Ferns by J.C. Willis, 1966
sted = Stedman's Medical Dictionary
tf = Tertiary Faunas vol 1 by A. Morley Davies, 1971
web2 = Websters Second Edition