CONSTRAINED PYRAMIDS

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Word pyramids, in which a letter is added at each step and the letters rearranged, will be familiar to the readers of Word Ways. The aim has been to construct a pyramid with as long a base word as possible, ideally with all words from a single dictionary. Ross Eckler constructed an excellent pyramid, without any plurals, with the 17-letter base word ANTICEREMONIALIST (Word Ways 79146), only slightly marred by the inclusion of the non-dictionary RECLAMATIONIST which seems a perfectly good inferred word. Two pyramids of Kyle Corbin’s appeared in WW88075, both with a 17-letter base word, one pyramid with three plurals and the other with five plurals. In WW2003021, Darryl Francis offered the first pyramid with an 18-letter base word - PRESENTATIONALISMS. This pyramid included five plurals, two of which were straight pluralisations of the adjacent word.

The pyramids offered here are not aimed at having the longest base word. They are special, however, in that each of them abides by one or more of a range of constraints. Most of the words used below are taken from the Oxford English Dictionary, Second Edition. The sources of non-OED words are given at the end.

Let us begin with a pyramid which describes itself.

\[
\begin{align*}
A & \\
RA & \\
AIR & \\
RAID & \\
DIARY & \\
MYRIAD & \\
PYRAMID & \\
\end{align*}
\]

In these pyramids, each word starts with the same letter, and each word ends with the same letter.

\[
\begin{align*}
AN & \quad PE \\
AIN & \quad PIE \\
AIRN & \quad PINE \\
AREIN & \quad PINTE \\
AROEIN & \quad PANTIE \\
AILERON & \quad PINEATE \\
ACROLEIN & \quad PATERINE \\
ALECTRION & \quad PIGNERATE \\
ALECTORIAN & \quad PREGRANITE \\
ALTERCATION & \quad PREFERMNATE \\
ALTERICATION & \quad PREIMPREGNATE
\end{align*}
\]
In the first of these two pyramids, each word both starts and finishes with the same letter, E. In the second pyramid, the second and penultimate letters are all Es. The letter E does not appear elsewhere in these pyramids.

E
EE
ETE
EATE
ENATE
ETIANE
ELATINE
ELOINATE
ELOIGNATE
ELONGATIVE
RED
REED
DETER
TEARED
SEDATER
REPAIRED
DEPURATES
DEPAIRED

The alternating letters A and N form the sides of the first pyramid. All the words in the second pyramid begin with A and end with AL.

AN
NEA
AEON
NEOSA
ARESON
NERVOSA
AVERSION
AAL
ANAL
ANEAL
ANTEAL
AMENTAL
AMENTIAL
ALIMENTAL

So far, we have concentrated on the first and last letters, the second and penultimate letters, and the first, penultimate and last letters. Now we turn our attention to the central letters of the words. As these central letters have to be arranged in a vertical line, each step of the pyramid adds two letters rather than the more normal one letter. The words of the first five pyramids below have one of the five major vowels as their central letter. The vowel in question does not occur elsewhere in the pyramid. The words of the sixth pyramid make a central AEIOU vertical line.

A
EAT
INATE
STEARIN
ESTUARINE
NEUTRALISED
UNSTEWARDLIKE

E
NEC
OCEAN
CAMERON
COSTERMAN
MISCREATION
COMMISERATING

I
TIE
ATIRE
RACIEST
SANCTIONEER
NONRESISTANCE

O
NOD
DRONE
MINORED
RANDOMISE
SEMIDORMANT
INTERMODALISM

U
CUE
SAUCE
ACTUOSE
CONSULATE
INOSCULATED
DENTOSURGICAL

A
SEA
ANISE
ESTONIA
ISOBUTANE
The central letters of the words in these four pyramids are 5-letter sequences of alphabetically-consecutive letters.

CAN CUBAN BOUCANE BOUNDANCE COUNTERBAND
TER REFIT FRI GATE FARTHINGE
ALI SIMLA CLANISM CALSOMINE
IRE ROSIE INSTORE ENTRUSION
SOLEMNACIE INTRAVENOUS

The words of these two pyramids have constraints on their first, last and central letters.

POE PROLE PAROLEE PETROLATE PARASOLETTE
TIE TRIPE TRAIPSE TAPPISTRE TRAPPISTINE

A variation on single pyramids is to split a word into a number of letter groups and then make a pyramid from each group. In each of these two examples, the letter groups are the same length, seven letters and six letters respectively.

A A A I O
AN TA AT DI NO
ANT EAT TEA DIE DON
TINA RATE KATE ICED NODE
SAINT TREAD INSTAR REDATE
PETROLATE TETRAK. AIDECA. HEDRON
PARASOLETTE TETRAK. AIDECA. HEDRON

Note that the tips of these five pyramids consist of the five vowels in reverse alphabetical order.

U O I E A
TU DO HI HE LA
RUT ADO HIC HEP AIL
ULTR. ADOL. ICHO. CEPH. ALIC

These two sets of pyramids are constructed from the same base word split into groups of four, six and eight letters, and eight, six and four letters respectively.
Other base words can also be split in more than one way. This is demonstrated well by the 18-letter base word OVERDISCOURAGEMENT. In these first two examples it is split into groups having an equal number of letters.

\[
\begin{align*}
&I \quad A \\
&DI \quad AT \\
&DIE \quad RAT \\
&DIRE \quad TEAR \\
&DRIVE \quad GREAT \\
&CERVID \quad GARNET \\
&SCRIVED \quad REAGENT \\
&DISCOVER \quad TENURAGE \\
\end{align*}
\]

OVERDISCOURAGEMENT

Alternatively, OVERDISCOURAGEMENT can be split into three and four pyramids, each larger than its predecessor.

\[
\begin{align*}
&A \\
&AN \\
&I \quad NAG \\
&IS \quad ANGE \\
&OSIC \quad RANGE \\
&OR \quad DISC \quad ENRAGE \\
&ROE \quad SODIC \quad RENTAGE \\
\end{align*}
\]

OVERDISCOURAGEMENT

In the first example below, the groups have progressively fewer letters; in the second, the two outer groups have an equal number of letters so making a symmetrical set of pyramids.

\[
\begin{align*}
&O \\
&DO \\
&DOE \\
&DOVE \\
&VIDEO \\
&VOICED \\
&DIVORCE \\
\end{align*}
\]

\[
\begin{align*}
&A \\
&AS \\
&E \\
&ER \\
&RUE \\
&UREA \\
&AUGER \\
\end{align*}
\]

\[
\begin{align*}
&DO \\
&DOE \\
&DOVE \\
&VIDEO \\
&VOICED \\
&DIVORCE \\
\end{align*}
\]

\[
\begin{align*}
&\text{SAC} \\
&\text{SICA} \\
&\text{E} \\
&\text{EM} \\
&\text{MET} \\
&\text{TEME} \\
\end{align*}
\]

OVERDISCOURAGEMENT

OVERDISCOURAGEMENT

We have constructed pyramids which abide by a range of constraints. Readers might like to build their own pyramids using these, and perhaps other, constraints.

Sources of non-OED words

ALECTRION (Tertiary Faunas, Vol.1 by A. Morley Davies, George Allen & Unwin 1971)
COSTERMAN (Roget’s Thesaurus)
AROEIN (Chambers English Dictionary)
DENTOSURGICAL, ECHINOSPHERITIDAE, IRIDATE, OVERDISCOURAGEMENT,
PREGRANITE, SEMIDORMANT, TETRAKAIDECAHEDRON (Webster’s Second Edition)
AMENTIAL, PETROLATE (Stedman’s Medical Dictionary)