A NOTE ON CATOPTRONS

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The suggestion that Palindromes may be enriched must be a traumatic statement to practitioners of that artful craft, so we will just say that possibly its image may be changed. We ourselves have labored at the making of Palindromes (often to bring forth a mouse) and are aware of the beauty and difficulty of them. We are not damning with faint praise.

A Palindrome reverses letter-order or word-order, but not the letters themselves. Letter-reflection, and the sentences that can result, presents a large, little-exploited field of recreational word-play. For this recreation we propose the word CATOPTRONICS; actual examples may then be called CATOPTRONS. Both terms are based on a Greek word for mirror.

For our purposes we divide Catoptrons into three categories: horizontal reflections, or H; vertical reflections, or V; and a combination of the two reflections, or HV. The H, V and HV refer to the direction of the line (or lines) across which a letter is reflected; these lines are shown dashed in the examples below. For instance, the letter B can be reflected horizontally without change:

\[
\begin{array}{c}
\text{B} \\
\text{H} \\
\text{B}
\end{array}
\]

The letter A reflects vertically into itself:

\[
\begin{array}{c}
\text{A} \\
\text{V} \\
\text{A}
\end{array}
\]

The letter Z can be reflected twice, HV, to give us back its original form. This double reflection is equivalent to rotating the letter around its center 180° in its plane:

\[
\text{Z}_{\text{HV}} = \text{Z}_{\text{180°}}
\]

Of course, there are more letters in each category with these potentials. The reader may easily discover them for himself.

In passing, we note that nomenclature seems far from stabilized
In this field. On pages 27-8 of Language on Vacation, Dmitri Borgmann calls the HV reflection a Vertical Palindrome, the V reflection a Mirror Palindrome (Type A), and the H reflection a Mirror Palindrome (Type B). On pages 345-6 of Bombaugh’s Oddities and Curiosities of Words and Literature, Martin Gardner recognizes all three Catoptron categories, but gives them no names. Charles Trigg has used the word Strobogrammatic to describe the HV reflection applied to numbers instead of letters.

The typewriter yields only a few exact mirror-images. Capital E reflects horizontally; capital A reflects vertically, as does Y. But capital M reflects horizontally to capital W, and lower-case b becomes d in V and p in H.

One finds rather scant pickings when he explores the catoptronic possibilities of the typewriter. Frankly, we would eliminate it in favor of longhand -- if we break with the tyranny of the machine and take certain liberties, we can enlarge the stockpile of usable letters and words, and generally have more fun. Too, there is an aesthetic pleasure to be derived from the use of pen or pencil which the machine does not give -- and one does not have to be a professional letterer, either, to obtain rewarding results. The only thing we need ask ourselves is, Are our compositions in longhand easily readable? If not, the liberties taken are not justified.

For reasons that will become clear, we suggest the following letters be done in longhand. Write a as ө, which reflects in HV as ө. We think ө is legible -- and e is a very useful letter to have on hand, with its high frequency occurrence! N is the same in HV; if written N it becomes N in V, and N in H. Another useful letter is added by this small liberty. T, if written т, is reflectable in all three categories; as T it is only usable in the V category. E, written ë, may be used in V reflections, as can Y for R. Readers may discover other letter-adaptations which will enlarge the catoptronic stockpile. One's conscience, or communication-sense, will test their validity.

We are composing, for instance, a vertically-reflected sentence, and need a B. B does not properly reflect vertically into itself. But if written as b, which reflects vertically as d, we will perhaps succeed in our effort. And we do believe that upper and lower case may be combined in Catoptronics: legibility is the only criterion.

A few words and sentences from the three categories of V, H and HV are presented below. They are printed in longhand and take the liberties spoken of above.
VERTICAL  This is the letter-ordering of the Palindrome, and there are a number of letters which reflect vertically. Individual words which fulfill catoptronic requirements are not too difficult to find:

```
  brow  word  told  biot
  pwp  pwp
```

However, sentences are harder to discover:

```
  YOUD  level  buoy
  rAqRaB  a  drapy
  ANIMAL  NO  bqpRqR  YAPPED  ON  LAMINA
  live  ON  time  RMIT  NO  EVIL
```

and we must not forget the well-known palindrome and catoptron

```
  TOO  HOT  TO  HOOT.
```

This is one of the few examples of Catoptrons obtainable on the typewriter alone; OHM, which reflects HV to WHO, is another.

HORIZONTAL  Using the longhand N and the + for T, many sentences present themselves in this category:

```
  HEXED  COOK  HID  IN  ICEBOX
  HEXED  COOK  HID  DICED  CHICKEN
  HIDBIT  IN  ICEBOX
  INHIBITED  HE  EXHIBITED  IONIC  CODEX  IN
  HIDDEN  NOOK  -  COOKBOOK  I  THINK
```

and that is quite enough of that cook, with his troubles! On other subjects, we may make:

```
  EXCITED  BEE  BI+  BE+B  ON  NECK
```

and

```
  +OKIO  CHICK  IN  OBI  =  NICE  (018-1133)
```

with its questionable overtones.
HORIZONTAL-VERTICAL To test the validity of the following, turn the magazine upside-down:

pe diq biq biqed
NOW NO sex at;te XEs ON MON
pie on snooofs; spoons NO eID

and

¡ole! ¡ole!

which is Spanish for Long Live Garlic.

If one should wish to explore the field further, and knows something of the Greek alphabet, one may come up with sentences like:

φειθ says she's thief.

which, translated, means Faith Says She's Thief. (But, knowing her, we don't believe it.)

Finally, sentences can be written vertically instead of horizontally, and then subjected to a V reflection or a H reflection. We give two examples, the left-hand one vertically reflected and the right-hand one horizontally reflected:
The reader who has gone along with us this far is now in a position to consider the truth or falsity of the following mathematical statements:

\[
\begin{align*}
9 + 9 &< 18 \\
88 - 66 &= 11 \\
0 &> \infty
\end{align*}
\]

I hope that you will have pleasure reflecting on my reflections about reflections, and that you will agree that they do change the image of the Palindrome. It is hoped that you will attempt the composition of Catoptrons in all three categories. The field has not been deeply explored, we think, and there is room for everyone.

QUERY

Can the readers of Word Ways find a word (or name) n letters long and ending with the nth letter of the alphabet, varying n from 1 to 26? The best results of Darryl Francis are given below; the only missing words are those ending in V, W, X and Z. Unasterisked words come from Webster’s Unabridged, and asterisked words from references such as Dorland’s Medical Dictionary and the Times Index-Gazetteer.


Similarly, can one find a word (or name) of n letters ending with the (27 - n)th letter of the alphabet?

*hemangioendothelioblastoma, -----, *methylene-citryl-salicylic, -----, isonicotinoylhydrazine, -----, slaughter-threatening, ballistocardiograph, labirinthbranchial, *Ancoquishachayoj, undersheriffwick, noninstrumental, libertarianism, vaccinization, whillaballoo, thunderclap, qaraqalpaq, godmother, slowness, content, bureau, sclav, slow, box, my, z.

This column, can match the below, can be done.

CAN YOU SCORE 88?

The best score of Rockquist of Rochester N.Y., that its Prep-Cal. came up with was "I" and "E" done with time with an undersonic double and triple.

Besides the word GO which is contained by play of words GO, WOB and related, a score of 88 is obtained by playing PUBA OBTENED. The word is constructed so that a slight possibility of a last 88 is that its edges lands on a blank and is an 88 point solution.

Josefa B. From using any score, if desired) is that if one is restored can be achieved. T is above this.