A 5-by-5 palindromic word square is one in which the first word is a reversal of the fifth word, the second is a reversal of the fourth, and the third is a palindrome. The most famous of these squares, the Latin one given at the right, SATOR can be translated "Arepo the begetter (or sower) holds the wheels with care." It has been found on ancient walls and on amulets for safe childbirth; there is an extensive literature discussing its religious or mystical significance (see, for example, pp. 207-210 of Dmitri Borgmann's Language on Vacation (Scribner's, 1965)).

When I first came upon this celebrated square, I was instantly impelled to set my indefatigable machine seeking comparable incantations in English. Imagine my thrill when the square at the right issued almost immediately, using only words from Webster's Collegiate Dictionary: "Household gods anoint, witness unctuous Elena". Mystic connections between the two squares loom on every side: LA-RES, the household protectors, with childbirth; ELENA with OPERA (Verdian); the supporting cross that REFERS us to the commanding TENET -- believe! What more Latinate square could one encounter? What stronger bonds could link a Roman charm to an English whimsy?

Wondering what other mysteries were locked in the Collegiate, I instructed my servant to try derivatives of three- and four-letter words as well as straight five-letter words:

\[
\begin{align*}
\text{CARES} & & \text{HALES} & & \text{SATES} & & \text{LATES} \\
\text{ANELE} & & \text{ANELE} & & \text{ANELE} & & \text{ANELE} \\
\text{REFER} & & \text{LEVEL} & & \text{TENET} & & \text{TENET} \\
\text{ELENA} & & \text{ELENA} & & \text{ELENA} & & \text{ELENA} \\
\text{SERAC} & & \text{SELAH} & & \text{SETAS} & & \text{SETAL}
\end{align*}
\]

The first two squares are surely legitimate, but purists may feel squeamish about SETAS (properly setae) in the third square and LATES (endowed with a nominal meaning, as in "the early out-bloom the lates") in the fourth. Two additional squares can be generated by replacing TENET with TEBET.

The following square, which I am sure all cultured Yalies will
endorse, seems to say something about a lady judge anointing the winners of a race on a flat track in New Haven, or perhaps it is a command to pass the word to barmaid Elena to flatten a well-oiled reveler at Morey's. (If you're really generous about derived words, try YALED - secured with a strong lock - in place of YALER.)

Let us all anele Elena, whose opera Arepo's rival!

The first three word squares cited above exhaust the legitimate possibilities of Webster's Collegiate, and even they get the crucial ELENA from an appendix. If one throws in words from the Second Unabridged as well (more accurately, that subset of the Unabridged on a computer tape prepared by the Air Force more than a decade ago), one finds over 350 palindromic squares, mostly dull checkerboards of vowels and consonants. But one square stands out. Not only does it break the vowel-consonant checkerboard, but it also holds the logologist's favorite SNARK, snared so tightly that no change is possible without destroying the entire fabric of the square.

Aside from the SNARK square, the best of the Unabridged offerings are these. The first one is also an isolate; no simple change turns it into any other square:

```
GNATS
NONET
ANANA
TENON
STANG
ASSAM
SHAMA
SAGAS
AMAHS
MASSA
ASSAM
SNOGA
SOLO
AGONS
MASSA
DARTS
APART
RADAR
TRAPA
STRA
```

The more typical palindromic square is one in which all the words (not just the third one) are palindromic. Five squares (of which the two at right are representative) use three different letters to form each square.

```
GNATS
NONET
ANANA
TENON
STANG
ASSAM
SHAMA
SAGAS
AMAHS
MASSA
ASSAM
SNOGA
SOLO
AGONS
MASSA
DARTS
APART
RADAR
TRAPA
STRA
```

Palindromic squares can read differently across and down. Though the Romans probably wouldn't find them as perfectly mystical as the SATOR square, these interlocking patterns of two different palindromes are much less common than those with row-column symmetry, and so they ought to be more highly prized.

My helper was unable to find the ultimate word square of this type - one with all Webster's parts - a substitution word appearing at the end of the square and down somewhere in a complementary position. Squares may have boldface type in Section and Subsection times as large.
one with all ten words different. Two such squares, using words in Webster's Unabridged not on the Air Force computer tape, are given in Dmitri Borgmann's previously-mentioned book.

The full collection of palindromic word squares is presented in two parts -- a basic list of 36 squares, and a supplementary list of word substitutions that can be made to generate additional squares. A substitution marked (1), (2) or (3) means it must be made only when the word appears in first, second or third position among the five words of the square. Substitutions for the third word must be made across and down simultaneously; when a first (or second) word is changed, a complementary change has to be made in the fifth (or fourth) word. Squares marked with an asterisk are unsymmetrical. If all words in boldface type in Webster's Unabridged (including the Biographical Section and the Gazetteer) had been used, this list would be several times as long.

anasa, nolas, alala, salon, asana
anasa, nolas, arara, salon, asana*
anasa, nomos, alala, solon, asana
anasa, noras, arara, saron, asana
apart, paler, alala, relap, trapa
assam, shama, sagas, amahs, massa
assam, snoa, solos, agone, massa
assed, saute, sulus, etuas dessa
assed, slime, sids, emils, dessa
assed, spale, sagas, elaps, dessa
assed, spole, solos, elops, dessa
camus, amelu, mesem, ulema, sumac
daraf, alala, radar, alala, farad
darts, apart, radar, trapa, strad
demal, elena, mesem, anele, lamed
gnats, nonet, anana, tenon, stang
hakam, alala, kayak, alala, makah
hales, anele, levei, elena, selah
kayak, alala, yaray, alala, kayak
krans, renin, anana, niner, snark
lamas, alala, madam, alala, samal
lares, anele, refer, elena, seral
larum, amelu, refer, ulema, mural
nasus, amelu, refer, ulema, susan
rated, anele, tenet, elena, detar
samas, alala, radar, alala, samas*
sasas, alala, sagas, alala, sasas
sasas, alala, susus, alala, sasas*
sasas, alala, yaray, alala, sasas*
sasas, alula, sulus, alula, sasas
sasas, ululu, sasas, ululu, sasas*
sasas, ululu, sulus, ululu, sasas*
sayas, alala, yaray, alala, sayas
spart, paler, alala, relap, traps
susus, ululu, sulus, ululu, susus
yaray, alala, radar, alala, yaray

alala = acara, agama, amapa, anasa, ajaja, anana, arara (2)
kayak = kazak (3)
alala = alula (3)
tenet = tebet
sagas = sabas, samas, saras, sasas, sayas
solos = socos, sohos
sidis = sisis, sisis
level = lemmel
sulus = sukus, susus, sutus (3)
lamas = jamas, lamar, namas, namaz, samas
elena = enema
larum = larus, sarum
assam = ossal
darts = marts, parts, warts
rated = gater, satem
hales = paler
lares = bares, cares, wares, hared, tared
demal = reman, nemas
slime = slive, stime
refer = reder, reser, reter
seles = semes, seres
spole = slone
daraf = saras

A BOOK CURIOUSLY DONE

Ever wish you had a copy of Gadsby, the E-less novel, just as a curiosity? Alphabetical Africa (New Directions paperback, 1974), by Walter Abish (a pseudonym?), is an agreeable second-best. It starts out with a chapter (A) even more restricted than Gadsby, every word beginning with A:

Ages ago, Alex, Allen and Alva arrived at Antibes, and Alva allowing all, allowing anyone, against Alex's admonition, against Allen's angry assertion ...

In the next chapter, all words begin with A or B. By the 26th chapter, all words are usable. Then Abish works his way back up the alphabet, until in the 52nd and last chapter all words again begin with A. The writing is more telegraphic, less straightforward than that of Gadsby, even late in the alphabet, but rather more interesting. The book got generally favorable reviews, and I have seen some outright raves. I quit at K, though.

(P.M.C.)