QUEEN’S-MOVE GRAPHING REVISITED

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The February 1996 Word Ways introduced the concept of a queen's-move-graphable word: place the different letters of a word on a chessboard (extended beyond 8x8, if needed) so as to allow a chess queen to move horizontally, vertically or diagonally to spell out the word in question. Words that cannot be queen-graphed—and there are only a handful, even in the second or third editions of the unabridged Merriam-Webster—have graphs that can be reduced by elimination of superfluous nodes (letters) and links (queen's-moves between letters) to one or another of a small set of minimal non-queen graphs. A minimal non-queen graph is one which, if any single further link or node (with associated links) is removed, then becomes queen-graphable.

Most non-queen-graphable words have graphs that reduce to one of two minimal non-queen graphs, diagrammed below. In the first, all letter-pairs but one (AE) are linked; in the second, a sixth letter joins two letters that are non-adjacent. (The integers characterize the number of links joining each letter; in the second, for example, A,C and E have four links apiece.)

\[
\begin{align*}
A & \quad A++F \\
B & \quad B+C with BD joined \\
C & \quad C+D with FE joined \\
D & \quad E \quad (44433) \\
& \quad E \quad (444332)
\end{align*}
\]

Words reducible to the first graph include insciences INSEC, intensities INTES, intratitarian INTRA, consciencewise ISCEN, stoutiloquious UTOIL, untrinitarian INTRA, consubstantiationist INSTA, duodenoenterostomies OENTS, unsubduedness DESUN; words reducible to the second graph include (2-linked letter in lower case) spectrohelioscopic ePIOSC, pseudoprosperous uORPSE, antispectroscopic ePIOSC, antiecclesiastical LAISEC, protransubstantiation nORTIA, duodenopancreatectomy oNACET, intraorganization rOINTA, tracheochromaticerythroblast aRHOEC, pleurolophocerous lUERCO, gastroenterostomies nESORT, transubstantiationist oNSTAI.

There are a handful of Websterian words that reduce to more complex minimal non-queen graphs. Unconsciousness and unprosperousness both reduce to the identical graphs below (all queen's moves but CO (or EO) are present)

\[
\begin{align*}
S & \quad + + + E \\
N & \quad + + + P \\
U & \quad with NE joined \\
C & \quad with SP joined \\
O & \quad (5433333) \\
I & \quad O + R \quad (5433333)
\end{align*}
\]

The words tacita haematospectroscopy, which are believed

\[
\begin{align*}
C & \quad NV \\
T & \quad A++ \\
I & \quad R \\
(VER, CN non-
R & \quad T+E+I \\
+ & \quad + + \\
S & \quad N+G \\
U & \quad (TS, EC non-
\end{align*}
\]

Leonard Gordon in the form of a word graph, do we find another minimal non-queen graph?

It is obvious that letters adjacent to disease, supradecystostomy and untrinitarian Websterian words are more stringent.

The author in terms of likely words reduces to different bigram program for testing, more stringent

\[
\begin{align*}
S & \quad + + + E \\
N & \quad + + + P \\
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\end{align*}
\]
The words tactinvariant, sacramentarianism, counterinsurgencies and haematospectrophotometer reduce to the following non-queen graphs which are believed to be minimal.

<table>
<thead>
<tr>
<th>C N V</th>
<th>T A with NI joined</th>
<th>T N S M</th>
<th>I A with TA joined</th>
</tr>
</thead>
<tbody>
<tr>
<td>I R</td>
<td>(6444222)</td>
<td>R C</td>
<td>(74333222)</td>
</tr>
<tr>
<td></td>
<td>(VR, CN not linked)</td>
<td></td>
<td>(MC, SN not linked)</td>
</tr>
</tbody>
</table>

Leonard Gordon notes that tactinvariant can be attractively S-graphed in the form of a 3-lobed pinwheel or windmill. It is curious how many of the words in this article have religious connotations. Can any reader find another minimal non-queen graph to which a word graph reduces? Or a word graph which reduces to two different minimal non-queen graphs?

It is obvious that any word that has a letter with nine or more other letters adjacent to it is not queen-graphable. Besides the 45-letter lung disease, supradiaphragmatically, epididymodeferentectomies, duodenocholecystostomy and choledochoenterstomy appear to be the only such Websterian words.

The author is much indebted to Leonard Gordon for providing a list of likely words to test for non-queen-graphability (at least five more different bigrams than different letters), and to Dan Tilque for writing a program for testing any word for queen-graphability (as well as the more stringent king-graphability).