MORE CONFIGURATION PUZZLE-GAMES

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In their article "Numerical Patterns and Geometrical Configurations" on pages 82-92 of Mathematics Magazine 57 (1984), Harold Dorwart and Warren Page note that the venerable David Hilbert once remarked "...there was a time when the study of configurations was considered the most important branch of all geometry." "Today," added Dorwart and Page, "...most students have limited knowledge about configurations—except perhaps the Pappus (9,3), the Desargue (10,3), and the Petersen graph (the logo on the cover of the Journal of Graph Theory)."

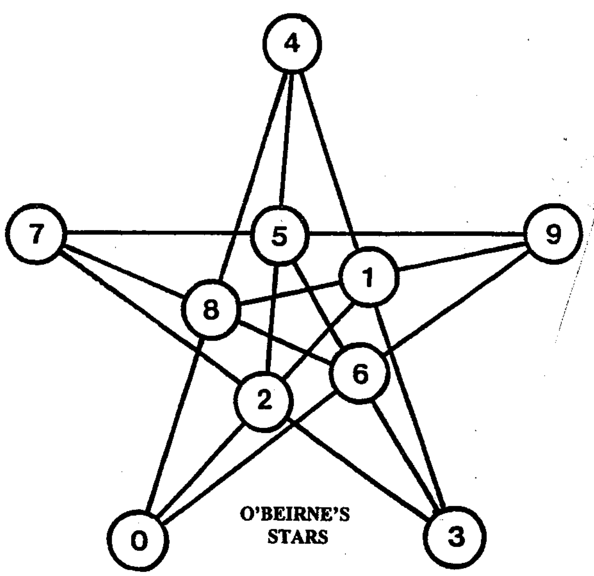
Recently, however, there has been a noticeable revival of interest in configurations, due mostly to the extensive research by Germany's Harald Gropp. This topic is summarized in his article "Configurations" in *The CRC Handbook of Combinatorial Designs* (CRC Press, Boca Raton, 1996). Our own contribution to the theory has been to treat points as letters and lines as words and to use configurations to play two-person games (see "Games on Word Configurations" in the November 1994 Word Ways).

By a word configuration of class (n,r) we mean a collection of distinct letters and a collection of distinct words formed from them subject to the following requirements:

R1 Any two letters are in at most one word and any two words have at most one letter in common
R2 Each word has r letters and each letter is in r words
R3 There are the same number, n, of words as there are letters

Another puzzle, based on a diagram used by the Glasgow puzzlist and mathematician Thomas H. O'Beirne, is shown at the left below (see page 109 in O'Beirne's *Puzzles & Paradoxes*, Oxford, 1965). One is to take the ten words from the solution set and arrange these words on the graph so that abutting words have a letter in common. Amazingly, once any given word is initially placed on any node, there will be exactly two solutions to the puzzle, one with lines with a common letter and one with common letters on a triangle.

O'BEIRNE'S STARS	ALE I	LIT E	LOU C	ROT R	TAU D	CUR O	RED T	COD U	AID A	ICE L
O'BEIRNE'S TRIANGLES	ALE I	AID A	RED T	COD U	ICE L	CUR O	LOU C	ROT R	LIT E	TAU D

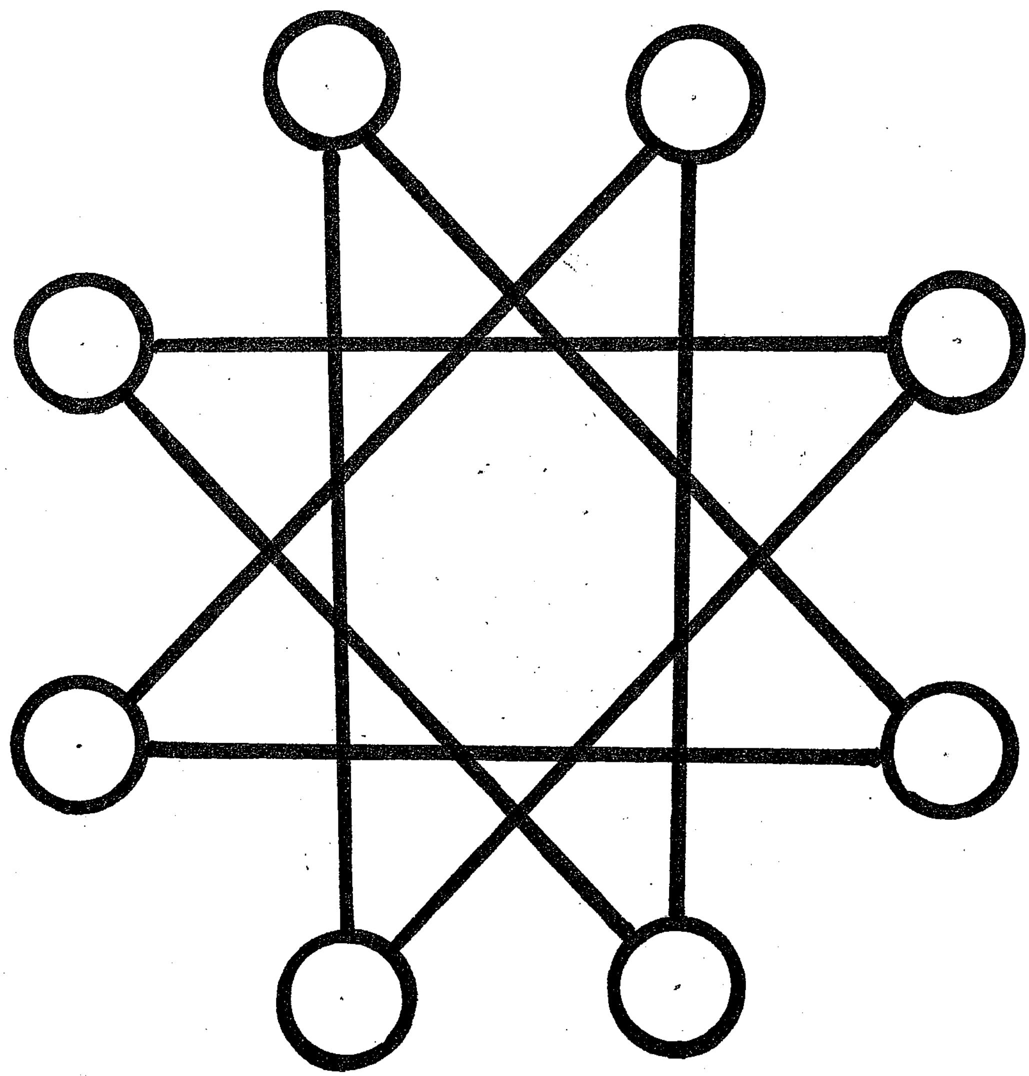


O'BEIRNE'S STARS

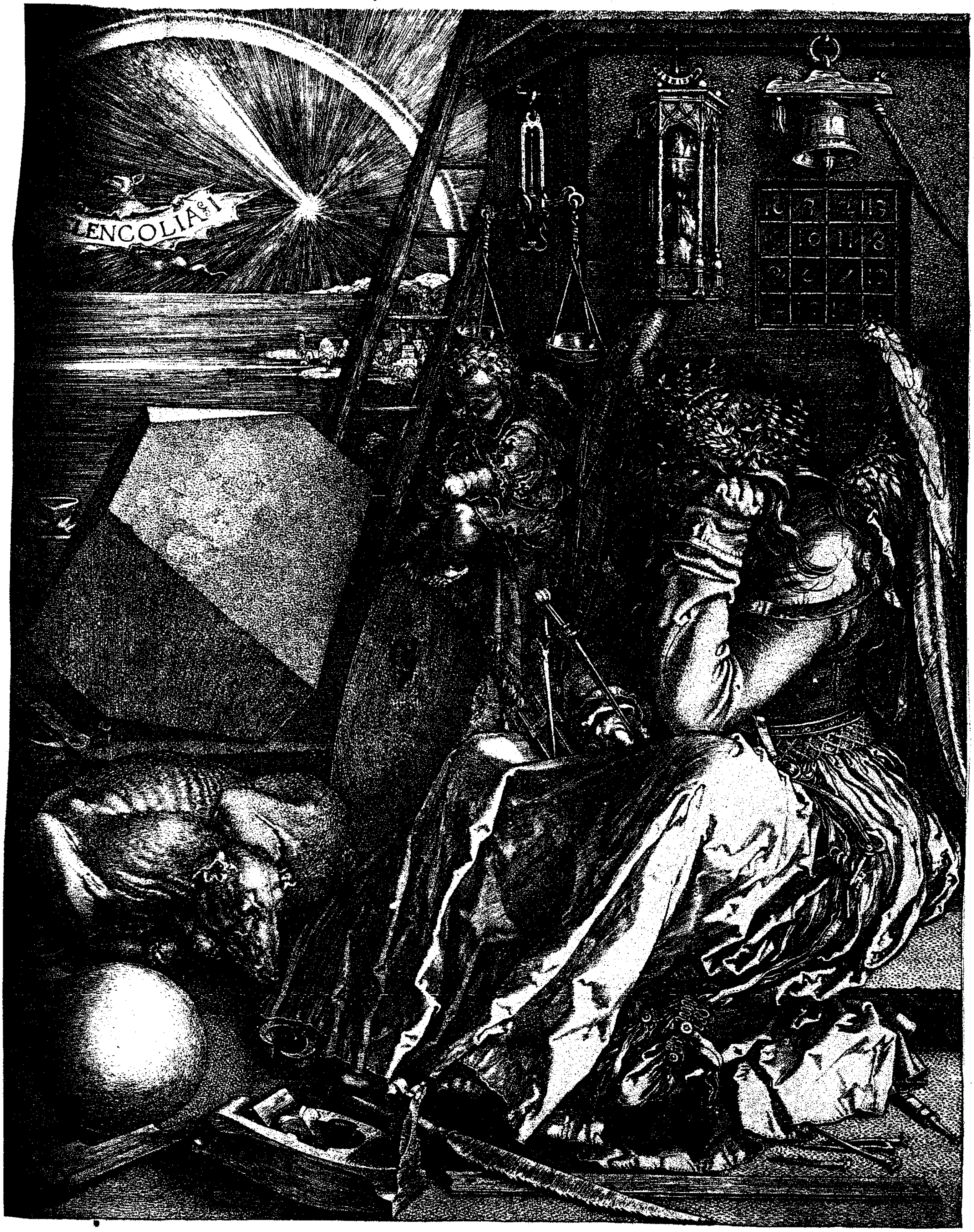
The solutions using the letters in the word ELUCIDATOR are listed in 0 to 9 order on the right of the diagram.

For the BUTLER BULLDOG game on the back cover First can win in four moves by initially taking one of the odes ROB, TED or LUG. If Second takes another of these three, First wins by taking the last one and then plays rationally. If instead Second starts with any other node First forces Second to waste a move by making Second play a node to which Second has no common letter. First then can win in four moves by playing rationally.

For the eight nodes of this star place the words from ASTEROID on the diagram so that connected nodes have a letter in common: AID, OAR, SAT, DOT, TIE, SIR, RED, EOS.

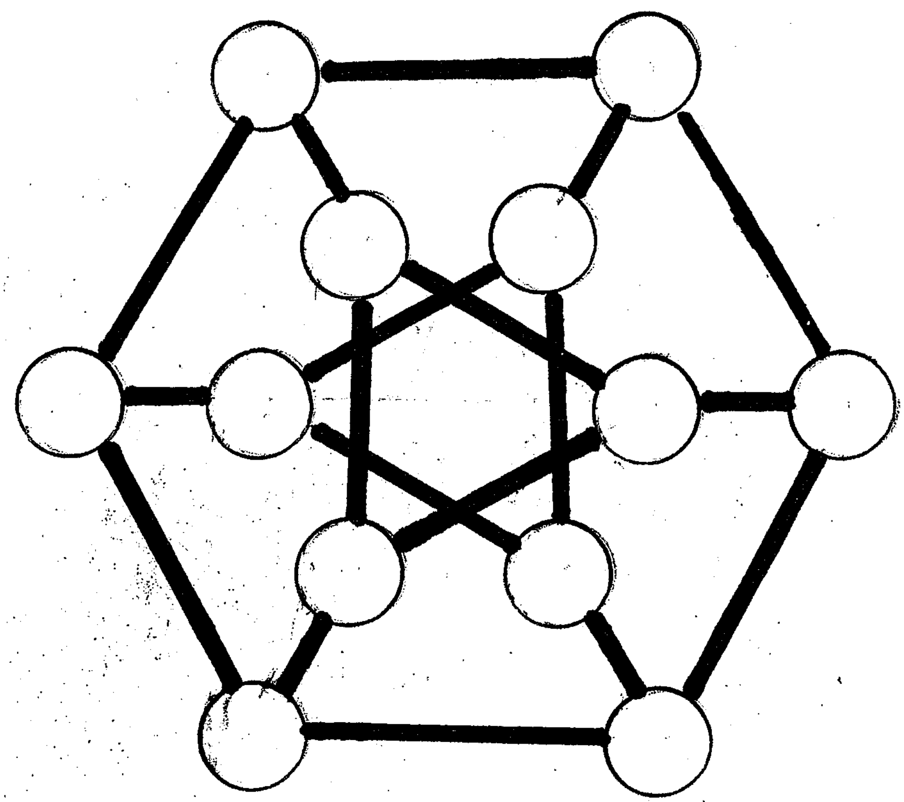


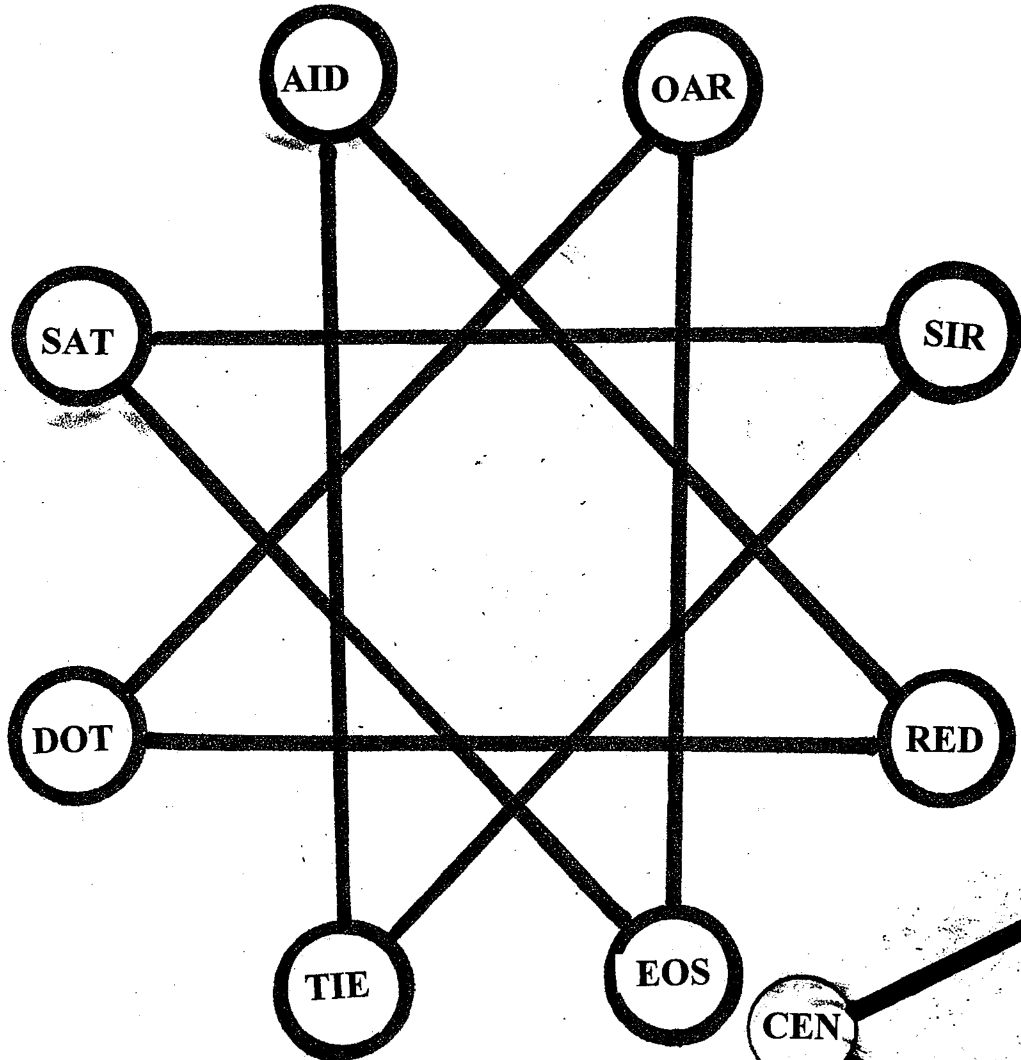
MELENCOLIA by Albrecht Dürer

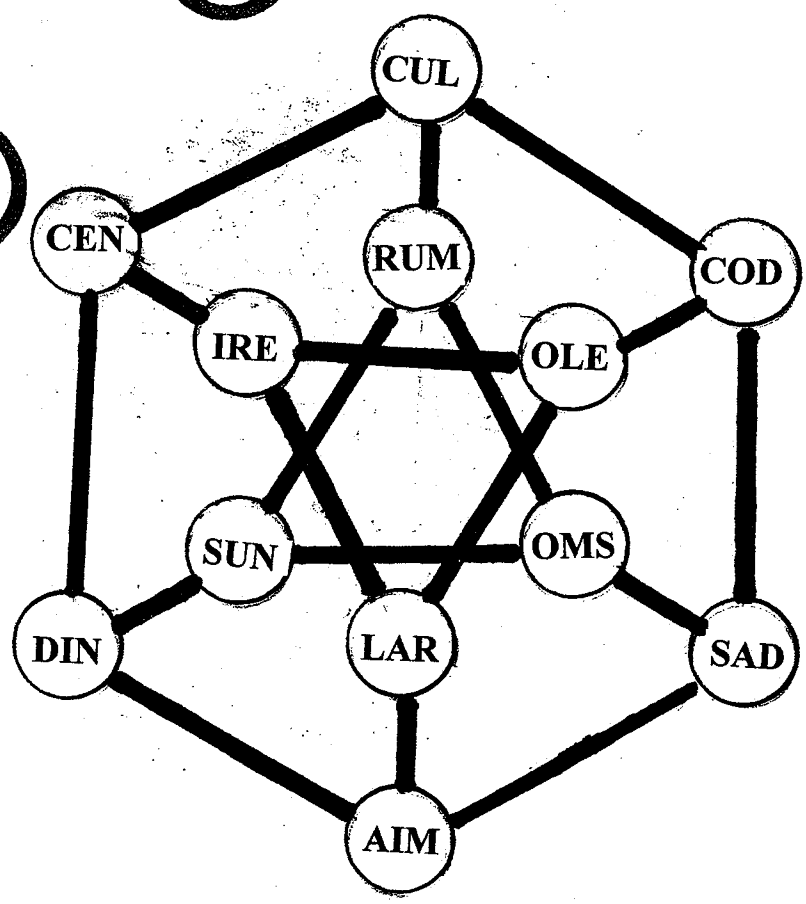


The following Diagram is a schematic of the solid in the picture that is resting on one of its triangular faces. Each of the different letters of DÜRER'S MELENCOLIA is used exactly three times in these 12 words: AIM, DIN, SAD, SUN, LAR (Household God), OLE, OMS (Hindu chants), IRE, CUL (Bottom, Fr.), COD, CEN (Century), RUM. Place these words on the nodes so that connected nodes have a letter in common.

Pleases note that two player games can be played on any completed puzzle. Players try to obtain three nodes with a common letter. All the games can be won by First. Details are left to the reader.







These games are examples of symmetric configurations and both are adaptations of some in the article "Configuration Games" by Jeremiah Farrell, Martin Gardner, and Thomas Rodgers in the 2005 book by AK Peters *Tribute to a Mathemagician*, edited by A. Cipa, E.D. Demaine, M.L. Demaine and T. Rodgers.