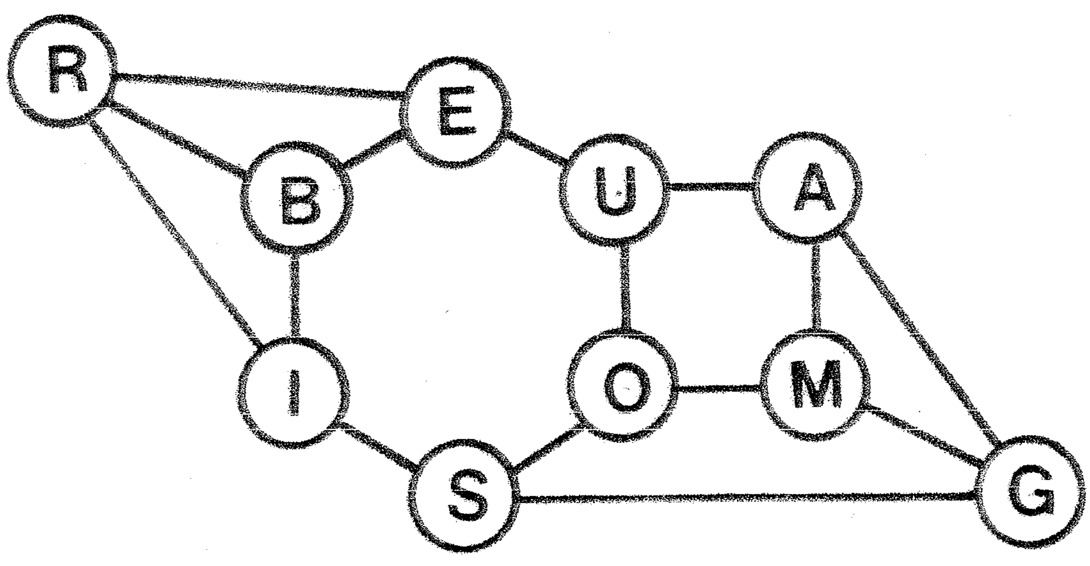
Presented by
Jeremiah Farrell
To Honor
Martin Gardner
At G4GX, Atlanta
March 28 – April 1, 2012

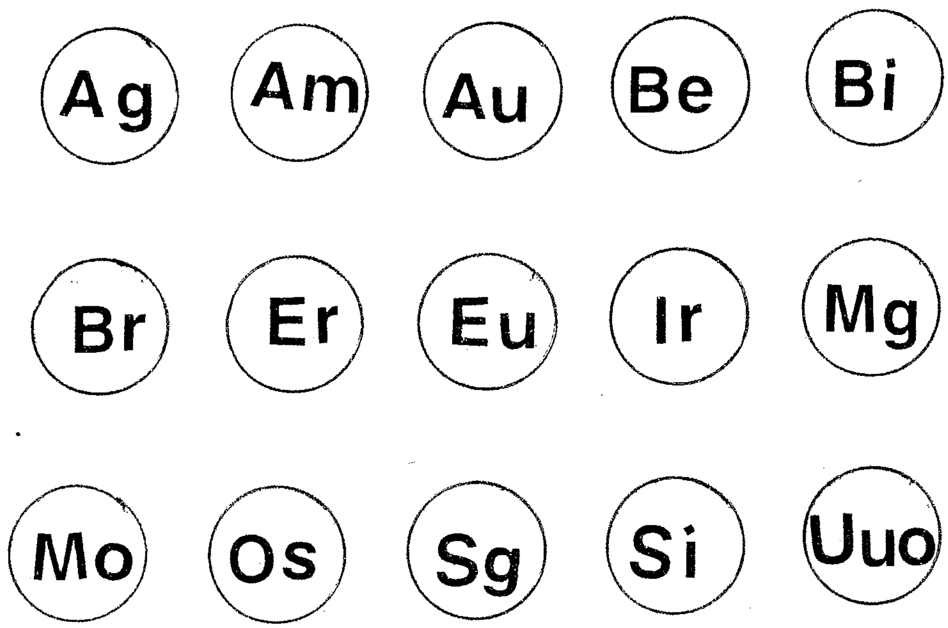
THE SEABORGIUM CHEMICAL TABLE

A Puzzle-Game
by Jeremiah Farrell

The diagram is an example of a connected, cubic graph with its ten nodes labelled with the letters of SEABORGIUM, chemical element 106. Connected means it is in one piece and cubic means that each node has exactly three edges on it.



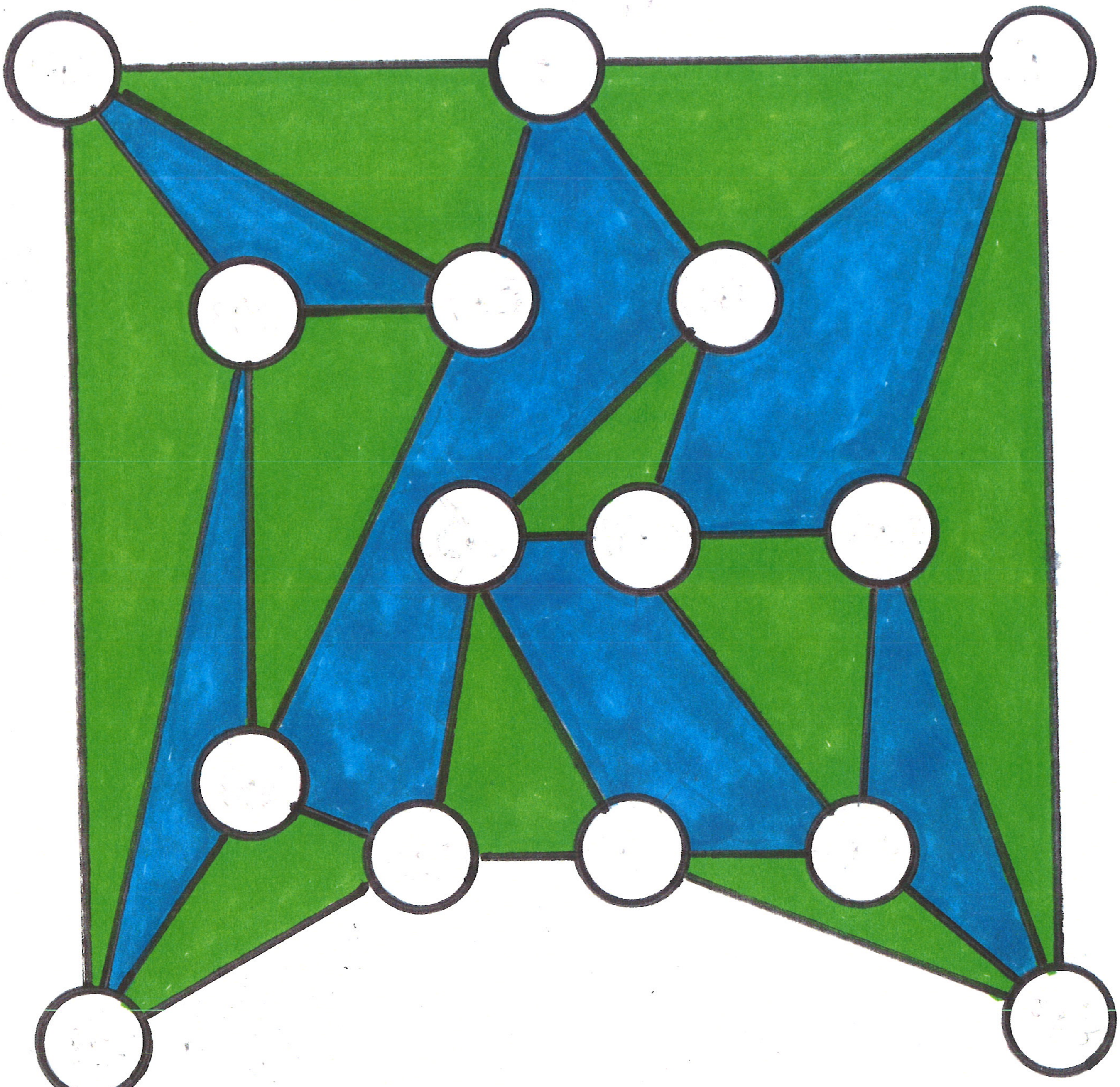
For our purposes we use instead a new graph constructed from this cubic known to graph theorists (see references B and H) as a line graph. This line graph has 15 nodes and 30 edges. The new nodes represent the 15 edges of the old cubic graph and are labelled, using the letters of the 10 nodes of the cubic an edge connects. I.e., we obtain these nodes.



Each label is the symbol of a chemical element (Uuo is element 118, Ununpentium). On the next page is a representation of the line graph where the edges connect nodes with a common letter.

The Puzzle: Place the 15 nodes on the line graph so that each node connects to another with a common letter.

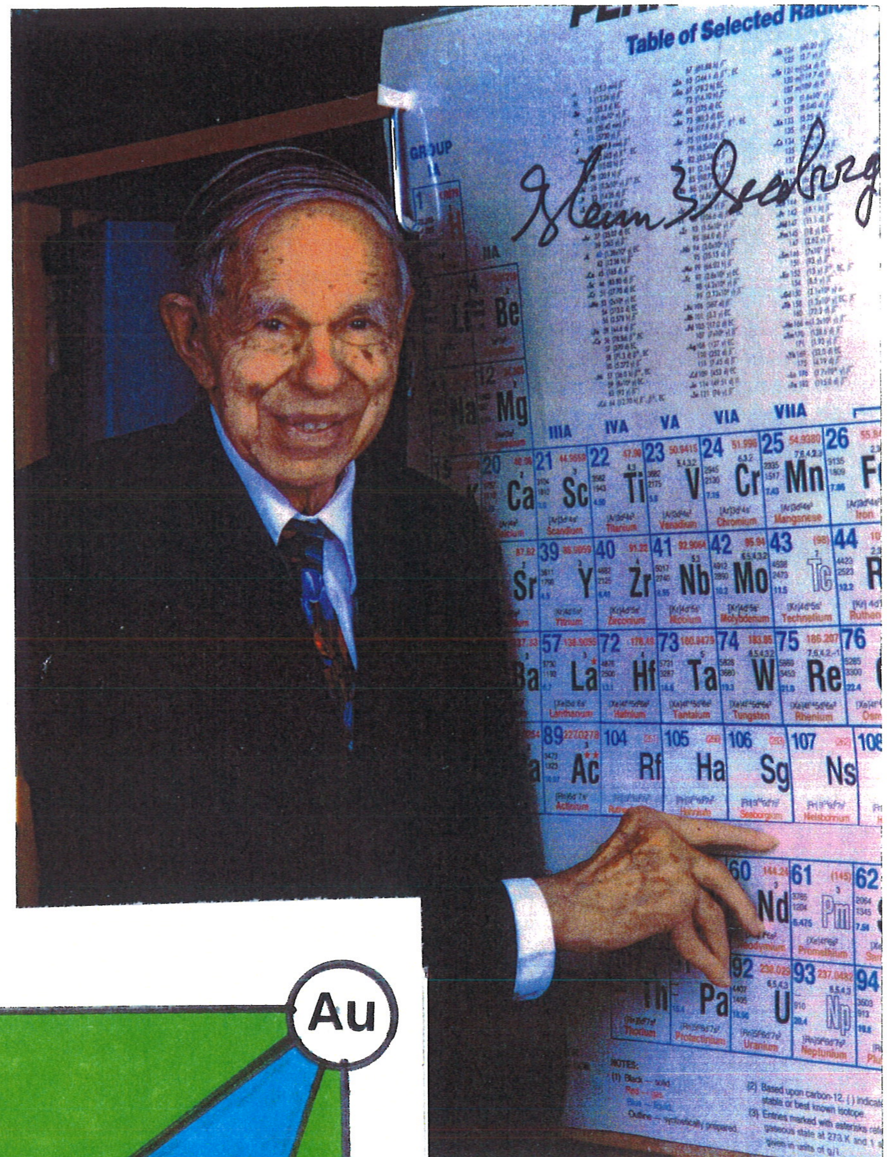
The Game: The players (two or three) select five tokens each and alternately place them on the graph so that abutting tokens have a common letter. Last player to be able to move wins. For two players, the extra five tokens are face-down in a kitty and may be drawn by a player when needed.

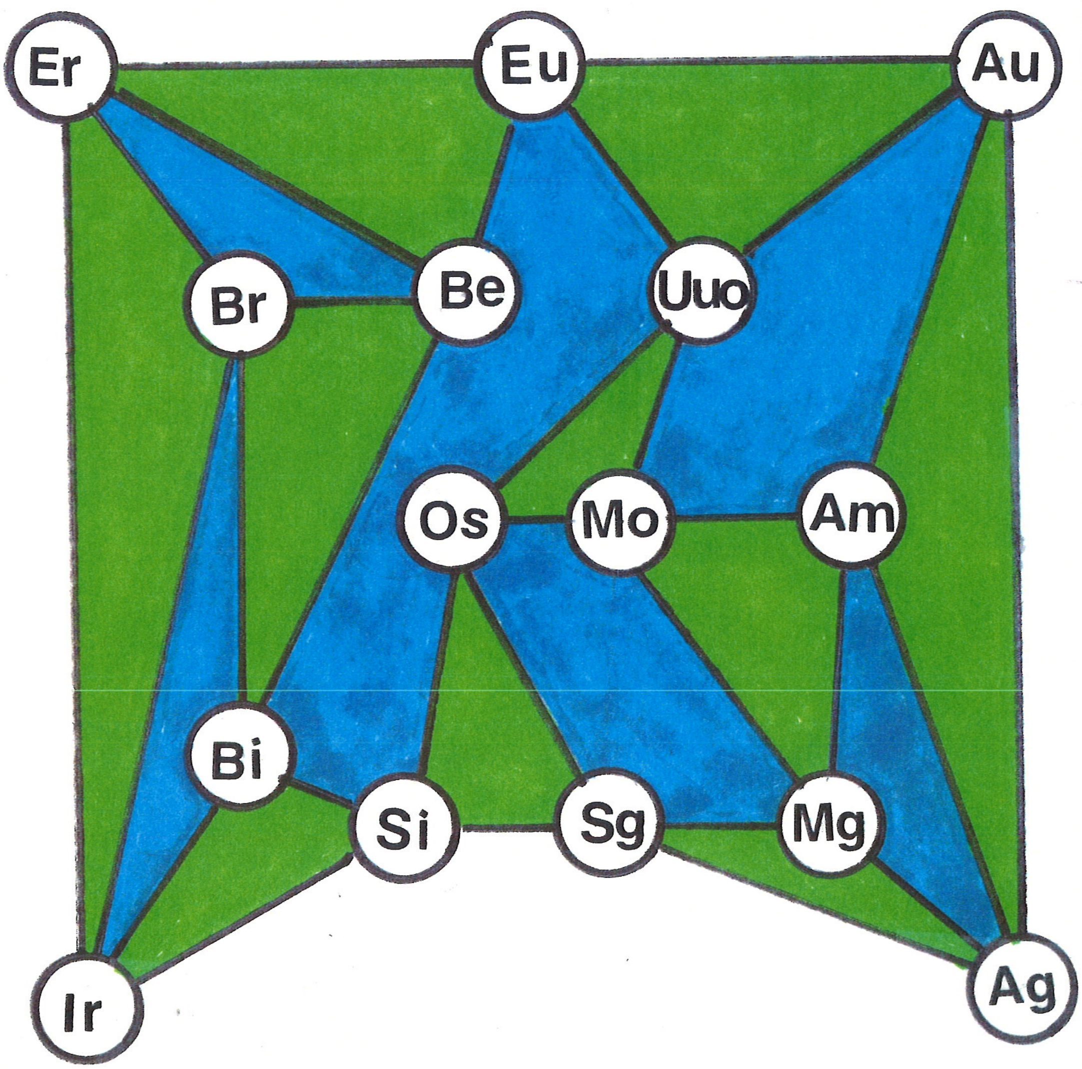


GLENN T. SEABORG
(1912-1999)
1951 Chemistry Nobelist

Dr. Seaborg worked on the Manhattan Project from 1942-1946, during which he was co-discoverer of plutonium and all further transuranium elements through element 102.

The radioactive element 106, Seaborgium, is named after him.





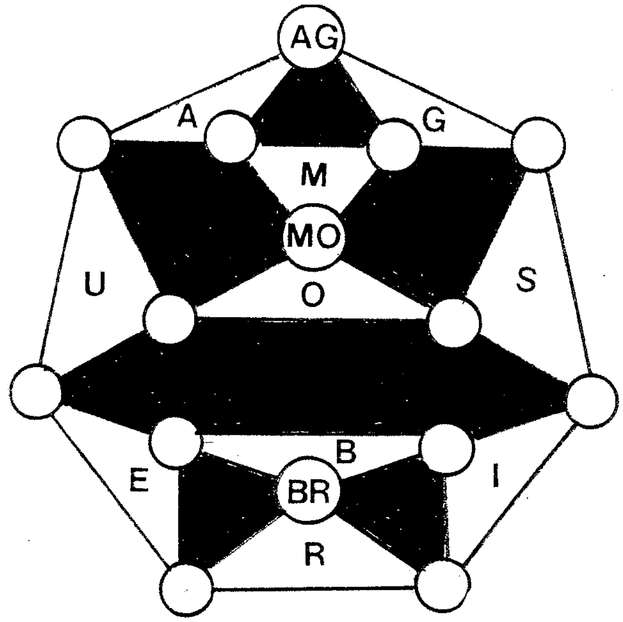
A solution to the Seaborgium Chemical Table.

All entries are chemical symbols using the ten letters of Seaborgium (Sg).

Another solution appears later in this paper.

SEABORGIUM has a second solution that can be discovered if we redraw the original line graph thusly

Notice the line of symmetry AG-MO-BR that could be a reflective axis to obtain the new solution Sg interchanged with Au, etc.



This illustrates the wide variety of playing bounds possible with these graphs. And this is not all! According to Wolfram Math World (http://mathworld.wolfram.com/regular graph.html) there are 19 nonisomorphic cubic 10s. This means that in addition to our SEABORGIUM cubic there are 18 more cubics that can yield 18 other line graphs on none of which our tokens can be successfully placed.

For example, another of the 18 is the cubic we label NIGHTMARES. It is drawn on the interior of its line graph at the end of this article. The line graph nodes are all main entries in The Chambers Dictonary, 11th ed. On the cubic notice that the outer 5 nodes are in order, NIGHT and the inner 5 are MARES. Perhaps knowing this can help in playing the game NIGHTMARES.

Wolfram claims nonisomorphic cubics to be: 85 on 12 nodes, 509 on 14 nodes, and 4060 on 16 nodes. Examples of each of these three follow: NOTARY PUBLIC, RHAPSODY IN BLUE, and OSCAR THUMPBINDLE. THUMPBINDLE is a regular comtributor to *Word Ways: The Journal of Recreational Linguistics*. For possible game playing note the outer and inner cycles are respectively NOTARY-PUBLIC, EUPHONY-RIBALDS, and BRUNCHES-DIPLOMAT.

The reader should also be aware that most non-cubic graphs have line graphs and are therefore suitable for puzzles and games.

As a final activity, we offer the following word puzzle. Place the letters of MOUSTERIAN (of an early Palaeolithic culture) on the NIGHTMARES cubic so that on the line graph, each triangle contains one of the ten letters and each of the dark 4-gons anagrams into a word as well as the two 5-gons (inner and outer). Each of the 15 nodes should be dictionary entries as well. A hint to our answer appears below.

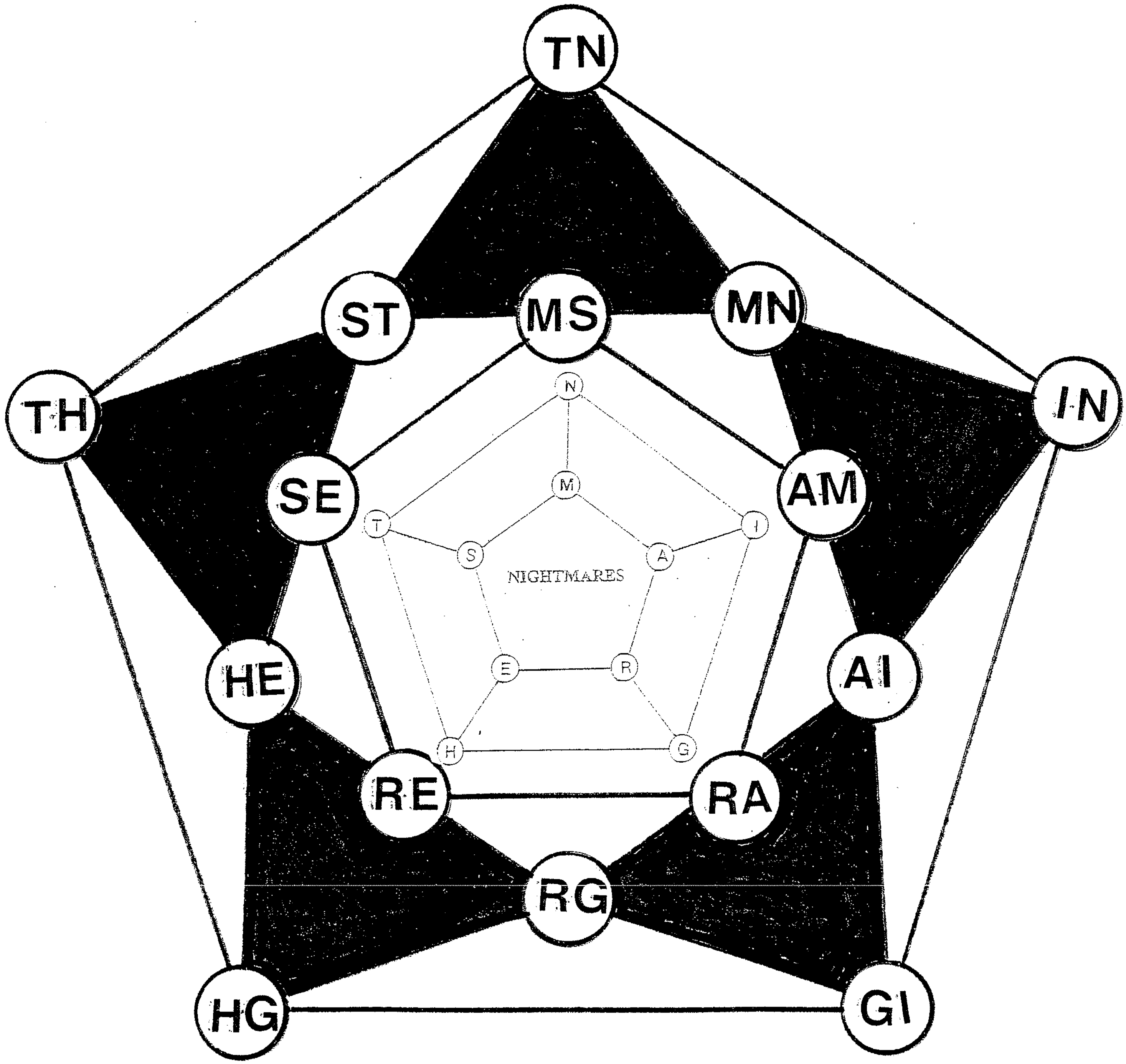
References

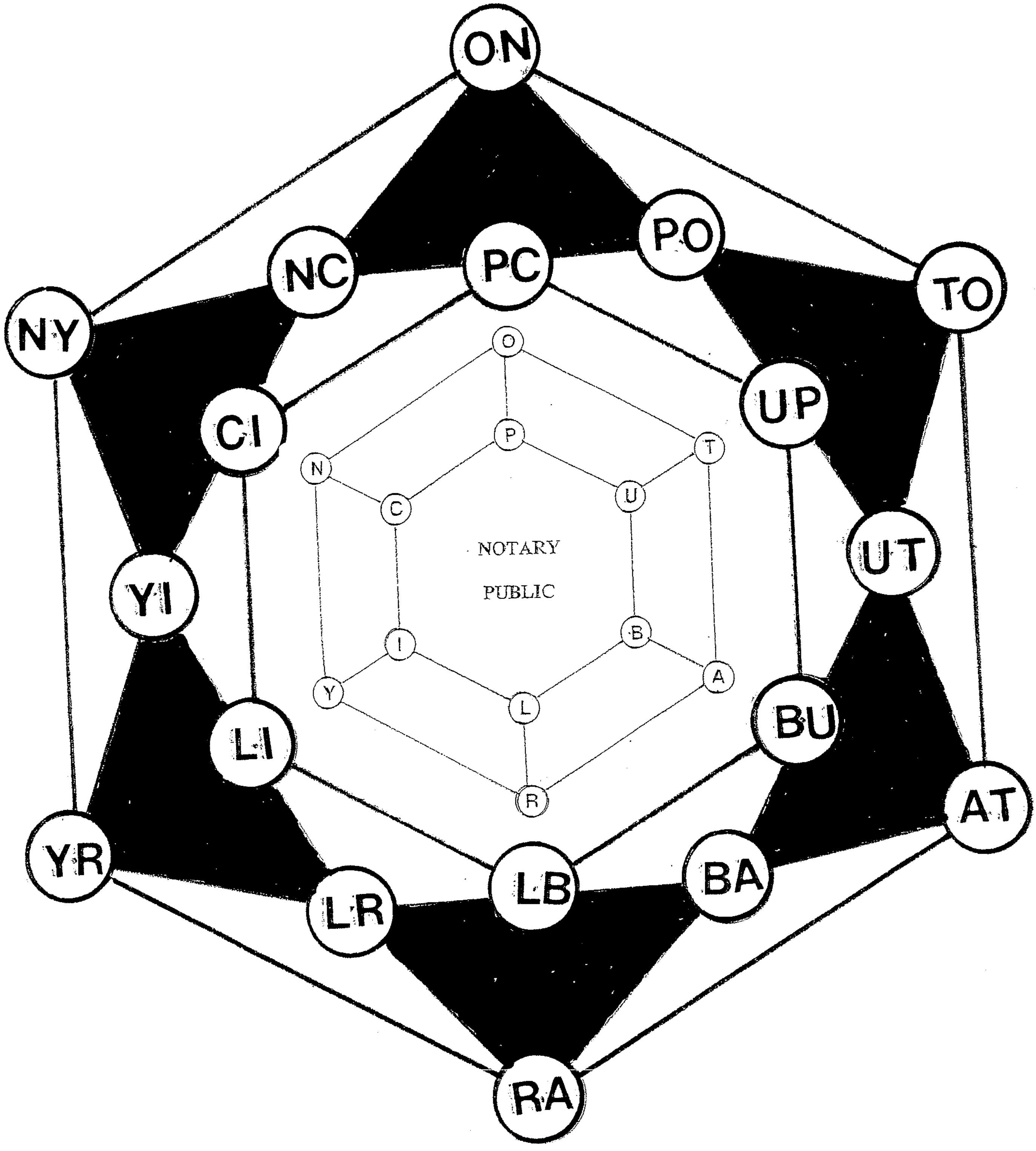
:

(B) Beineke, L.W. "Derived Graphs and Digraphs". In *Beitrage sur Graphentheorie*, ed. H. Sachs et.al., Leipzig, Germany: Teubner 1968.

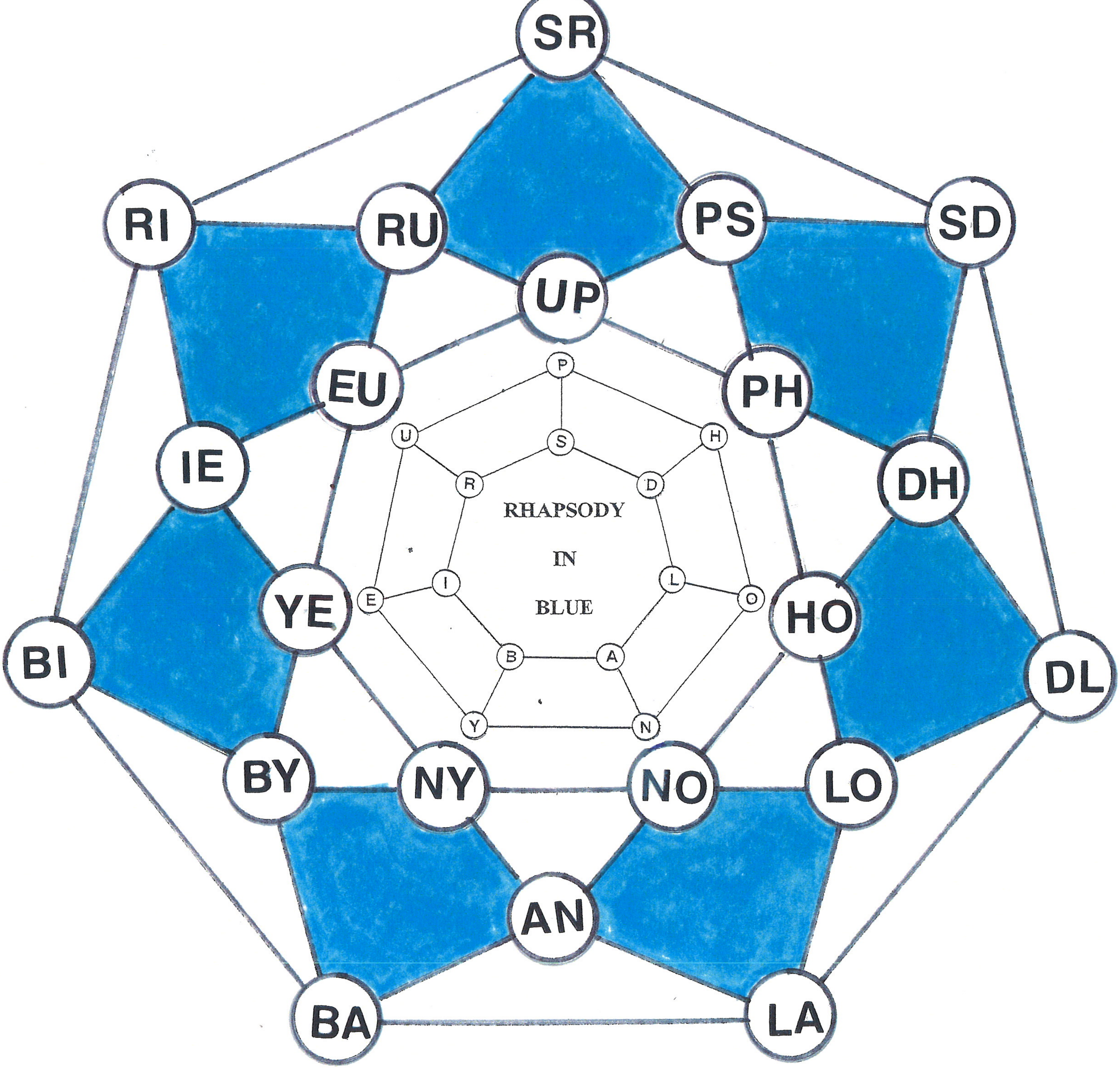
(H) Harary, F. *Graph Theory*. Reading, MA: Addison-Wesley, 1994.

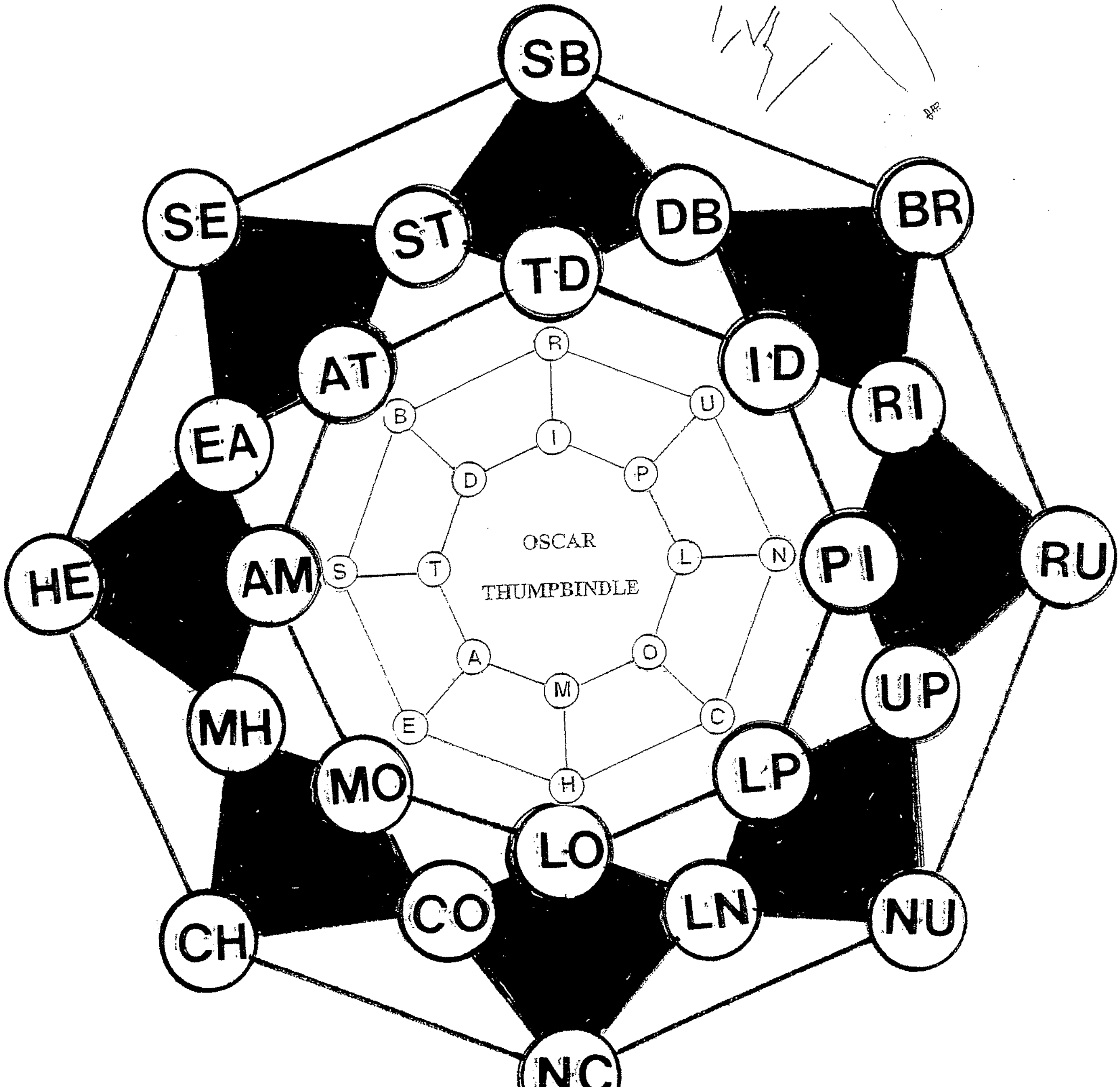
Solution Hint: We used MINUS, ORATE, MIRÓ, SUET, SOME, UNIT, and RAIN.





ON
PO
TO
NC
PC
NY
UP
CI
UT
YI
LI
BU
AT
YR
LB
BA
LR
RA
O
P
T
N
C
U
NOTARY
PUBLIC
I
B
Y
A
L
R


SR
RI
RU
PS
SD
UP
EU
PH
IE
DH
YE
HO
BI
DL
BY
NY
NO
LO
AN
BA
LA
P
U
S
H
R
D
RHAPSODY
IN
BLUE
E
I
L
O
B
A
Y
N


SB
SE
ST
DB
BR
TD
AT
ID
RI
EA
HE
AM
PI
RU
MH
UP
MO
LP
LO
CO
LN
NU
CH
NC
R
B
U
I
D
P
S
T
L
N
A
O
M
E
C
H
OSCAR
THUMPBINDLE