

An Easily Constructed Dodecahedron Model

Shukichi Yamana

Faculty of General Education, Kinki University, Kowakae, Higashi Osaka 577, Japan

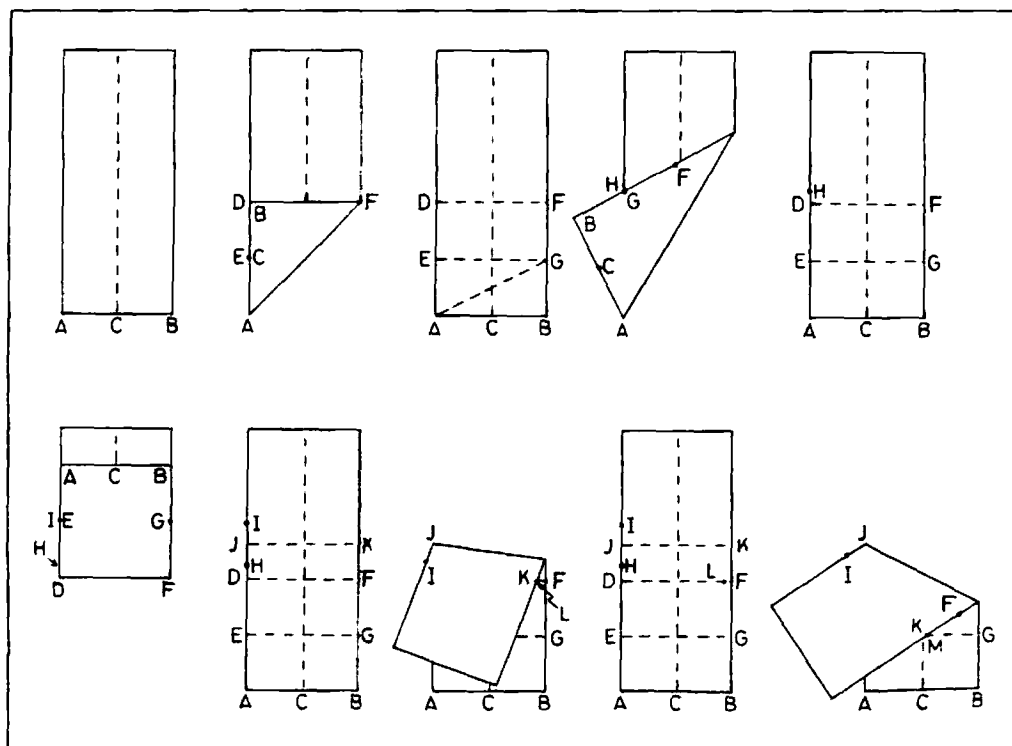
5596
YAMANA, S.
1984

A model of a dodecahedron which is necessary for teaching stereochemistry (for example, that of dodecahedrane $C_{20}H_{20}$)¹ can be made easily by using a sealed, empty envelope. The steps are illustrated in the figure and given below.

- 1) The envelope is folded down the center lengthwise, and the middle point of the base AB is marked as C .
- 2) The lower part of the envelope is folded up at A so that the line AB falls on the left-hand side of the envelope. The points on the left-hand side of the envelope corresponding to points B and C are marked as D and E , respectively. The new corner on the right-hand side of the envelope is marked as F .
- 3) The lower part of the envelope is unfolded.
- 4) A horizontal line, perpendicular to the left-hand side of the envelope at E , is drawn so that it crosses the right-hand side of the envelope at G .
- 5) The lower part of the envelope is folded up at A so that the line AG falls on the left-hand side of the envelope and the corresponding point of the G is marked as H .
- 6) The lower part of the envelope is unfolded.
- 7) The lower part of the envelope is folded up along the line DF . The point on the left-hand side of the envelope corresponding to E is marked as I .
- 8) The lower part of the envelope is unfolded.
- 9) The middle point on the line IH is marked as J .
- 10) A horizontal line perpendicular to the left-hand side of the envelope at J is drawn so that it crosses the right-hand side of the envelope at K .

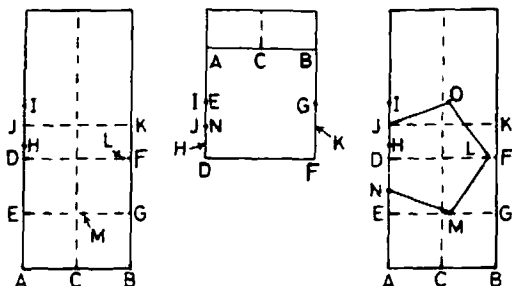
- 11) The upper part of the envelope is folded down at J so that the K falls on the horizontal line DF , and its corresponding point is marked as L .
- 12) The upper part of the envelope is unfolded.
- 13) The upper part of the envelope is folded down at J so that the K falls on the other horizontal line EG and its corresponding point is marked as M .
- 14) The upper part of the envelope is unfolded.
- 15) The lower part of the envelope is folded up along the line DF . The point on the left-hand side of the envelope corresponding to J is marked as N , and the point on the original front of the envelope corresponding to M is marked as O . Thus, a regular pentagon $OLMNJ$ is obtained.
- 16) The lower part of the envelope is unfolded. Thus, a regular pentagon $OLMNJ$ is obtained.
- 17) All diagonal lines of this regular pentagon are drawn, and all intersections obtained are marked as P , Q , R , S , and T , respectively.
- 18) All diagonal lines of the small regular pentagon $PQRST$ are drawn and all intersections of their extensions with the five sides of the large regular pentagon $OLMNJ$ are marked as 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , and 10 , respectively, as shown in the figure.
- 19) The intersection of the extension of the line $R3$ and the left- (or right-) hand side of the envelope is marked as U (or V).
- 20) The corresponding points on the reverse of the envelope, of the three points L , O , and P , are marked as L^* , O^* , and P^* , respectively.
- 21) The envelope is turned upside down. Now, the original back of the envelope becomes the new front.
- 22) The upper part of the envelope is folded down along the line VU , and the corresponding points on the new front of the envelope, of the three points L^* , O^* , and P^* , are marked as L'' , O'' , and P'' , respectively. Now, a new regular pentagon $P''7J'O''L''$, is obtained.

¹ Ternansky, Robert J., Balogh, Douglas W. and Paquette, Leo A., *J. Amer. Chem. Soc.*, 104, 4503 (1982).

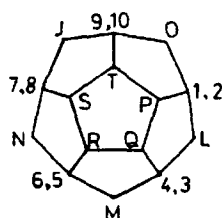
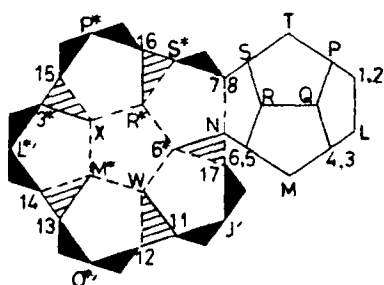
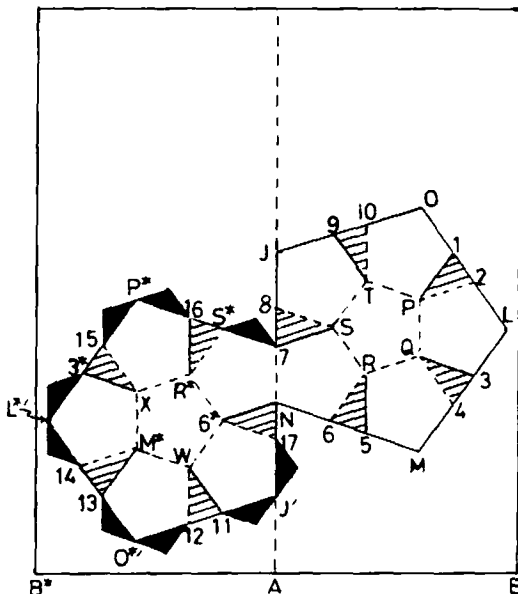
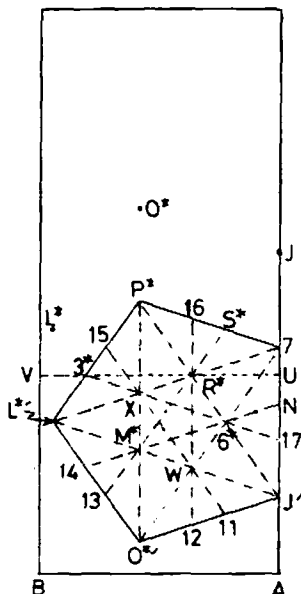
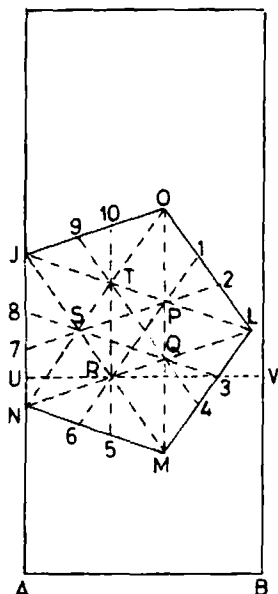


- 23) All diagonal lines of the regular pentagon $P''7J'O''L''$, are drawn and all intersections obtained, are marked as R^* , 6^* , W , M^* , and X , respectively, as shown in the figure.
- 24) All diagonal lines of the small regular pentagon $R^*6^*WM^*X$, are drawn and all intersections of their extensions and the five sides of the large regular pentagon $P''7J'O''L''$, are marked as 11 , 12 , 13 , 14 , 3^* , 15 , 16 , S^* , N , and 17 , respectively, as shown in the figure.
- 25) Separate the front and back of the left part of the envelope from each other by cutting the left-hand side and the base AB of the envelope along their lines.
- 26) Unfold the whole envelope.
- 27) Oblique lines are drawn to shade ten equilateral triangles ($1P2$, $3Q4$, $5R6$, $7S8$, and $9T10$, on the right moiety; and $11W12$, $13M^*14$, 3^*X15 , $16R^*S^*$, and $N6^*17$ on the left moiety).

10596



- 28) Nine congruent equilateral triangles are drawn and painted black to cover the nine outer sides (S^*7 , P^*16 , P^*15 , L^*3^* , L^*14 , O^*13 , O^*12 , J^*11 , and J^*17) of the five small regular pentagons on the left moiety.
- 29) Cut off the blank paper along the outlines of the figure.
- 30) Cut the remaining portion along the lines ($1P$, $3Q$, $5R$, $7S$, and $9T$, on the right moiety and $11W$, $13M^*$, 3^*X , $16R^*$, and $N6^*$, on the left moiety).
- 31) The remaining portion is folded both backward and forward along all the sides of all the small regular pentagons.
- 32) The five outer corners of the regular pentagon $OLMNJ$, are forced to approach each other so that the five lines $1P$, $3Q$, $5R$, $7S$, and $9T$, fall on the other five lines $2P$, $4Q$, $6R$, $8S$, and $10T$, respectively, and the shaded triangles ($1P2$, $3Q4$, $5R6$, $7S8$, and $9T10$) are folded inside. The sides are taped together to form the right half of the dodecahedron.



- 33) Similar procedures are applied to the other regular pentagons on the left moiety. In this step, the five lines $11W$, $13M^*$, 3^*X , $16R^*$, and $N6^*$, fall on the other five lines $12W$, $14M^*$, $15X$, S^*R^* , and 6^*17 , respectively. The sides are taped together to form the left half of the dodecahedron.
- 34) The left and right halves are forced to approach each other so that the nine outer edges of the right moiety ($8J$, $J9$, $10O$, $O1$, $2L$, $L3$, $4M$, $M5$, and $6N$) fall on the other nine outer edges of the left moiety ($7S^*$, $16P^*$, P^*15 , 3^*L^* , L^*14 , $13O^*$, O^*12 , $11J^*$, and J^*17), respectively, infolding all the black triangles inside. The sides are taped together to produce the dodecahedron.

An Early Account of the Unhappy Consequences of Unauthorized Experiments

Those in charge of student laboratories have continually sought to discourage students from conducting unauthorized experiments. Here is an early, perhaps the earliest, account of such an unauthorized experiment and the consequences thereof. This account clearly indicates several important points. It shows that unauthorized experimentation has long been disapproved and by an authority even higher than many deans. It further illustrates the dire consequences that can result from such activities.

"And Nadab and Abihu, the sons of Aaron, took each of them his censer, and put fire therein, and laid incense thereon, and offered strange fire before the Lord, which He had not commanded them. [Emphasis mine.] And there came forth fire from before the Lord, and devoured them, and they died before the Lord."

(Leviticus 10:1,2)

Benjamin Ruekberg

Lyndon State College
Lyndonville, VT 05851