A symmetric flexible Connelly sphere with only nine vertices

by Klaus Steffen (I.H.E.S.)

1.) Make 14 rigid triangles and attach them to each other in a flexible fashion as indicated in fig. 1,2 (two copies!); a good choice of parameters is e.g. $a := 6$, $b := 5$, $c := 2.5$, $d := 5.5$, $e := 8.5$.

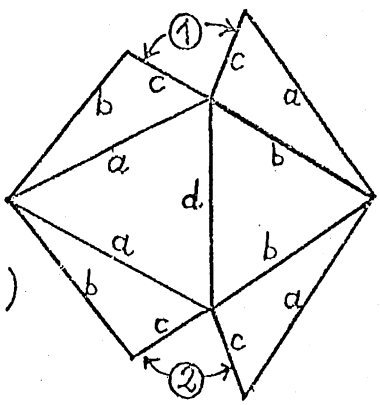
2.) Connect (in a flexible way!) the two edges marked ① in fig. 1 by rotating the corresponding triangles upward and the two edges marked ② by rotating the corresponding triangles downward (in either copy!).

3.) Attach the two aggregates of 6 triangles to each other as indicated by ③, ④ in fig. 3.

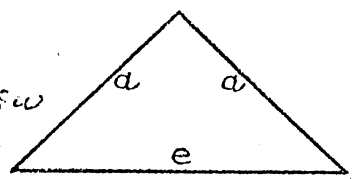
4.) Connect the two remaining single triangles (fig. 2) along edge e thereby making a "roof" which is attached to the configuration of 12 triangles from step 3.) as indicated by ⑤, ⑥, ⑦, ⑧ in fig. 3.

5.) If you did not mess up everything the resulting sphere looks like fig. 4 and flexes by about 30° as indicated by the arrows. (It is a good idea to cut a "window" in the "roof" to make the inside visible.)

fig. 1 (2 copies)



a = u
b = v
c = ~~2.5~~ w
d = θ ×
e = y fig 2 (2 copies)



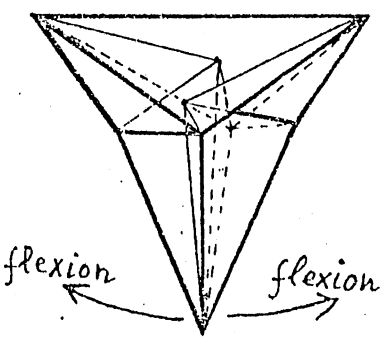


fig. 4

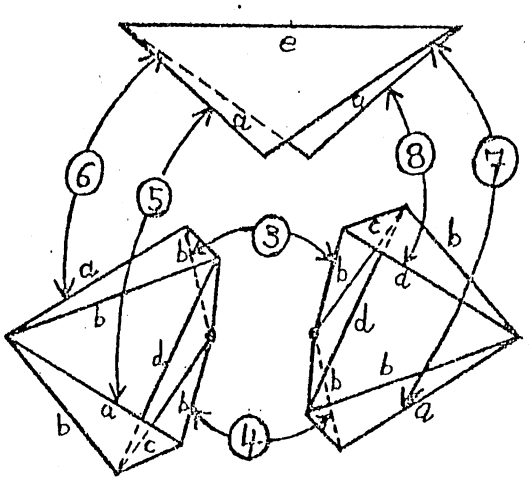


fig. 3