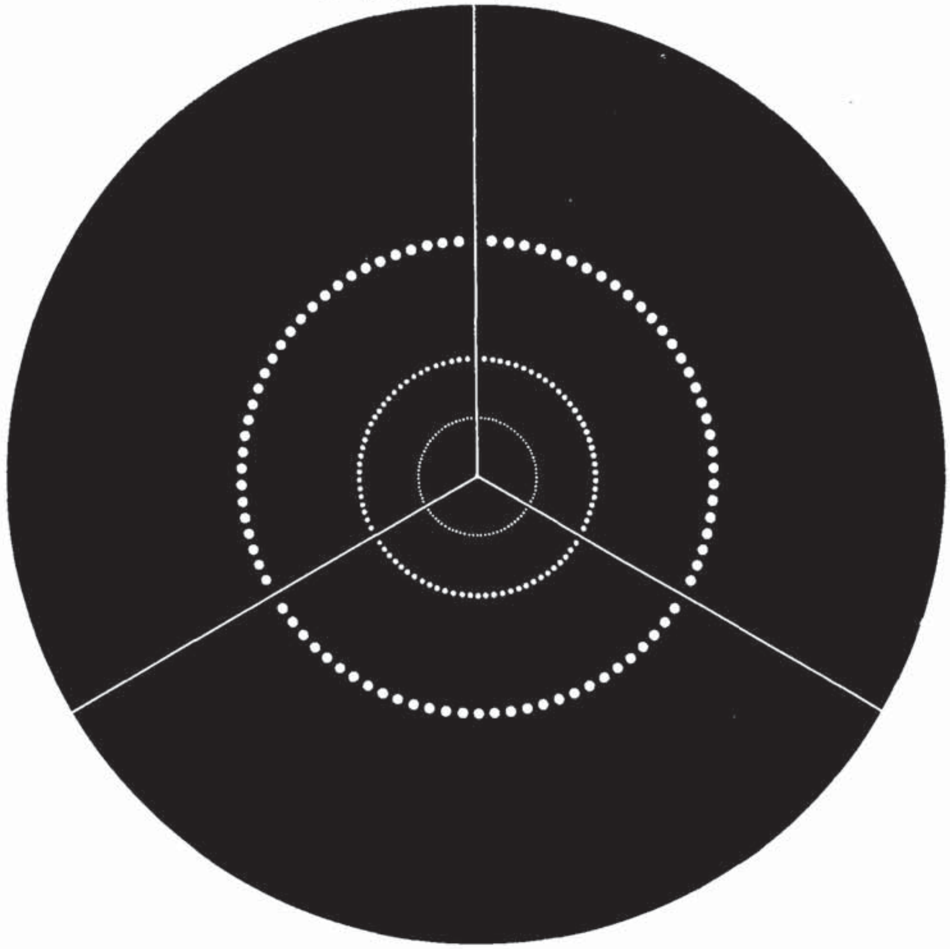
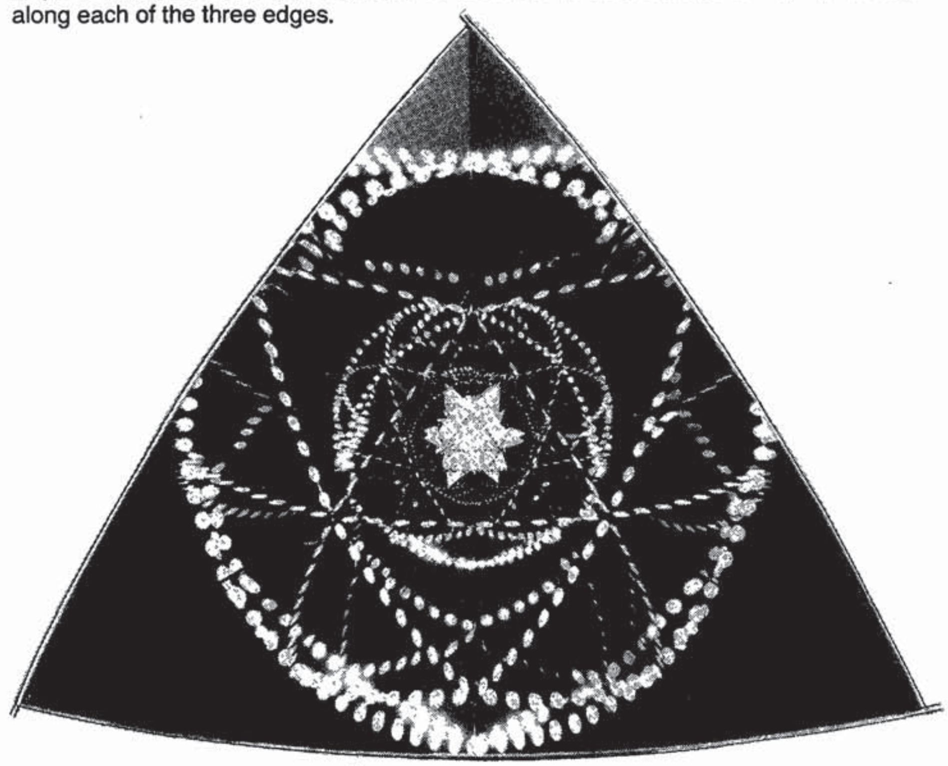
SPACE ERECTING: A FLEXIBLE KALEIDOSCOPE

Caspar SCHWABE
Ars Geometrica, AHA Gallery
Spiegelgasse 14, 8001 Zürich



The drawing shows the layout of the flexible kaleidoscope, made from three electro-polished chromium steel mirrors, each 120 degrees circular mirror meeting at the center vertex. The mirrors are joined windmill-fashion. Each mirror is punched with three times 29 holes at four degrees distance from each other. Depending on the interplanar angles set within this trihedral kaleidoscope, the holes offer a practical method for counting most of the possible fundamental divisions of the sphere. When it lies flat on the table we start by seeing a 2-fold image (a kaleidoscope is called *n*-fold if the number of images, including the original object, is *n*). The first regular space is erected when the image shows a 4-fold spherical tetrahedron made from an equilateral triangle counting 27 holes along each edge (Maraldi angle). The next image in the chain is an 8-fold spherical octahedron with a 22 hole edge length. (A 6-fold as well as a 30-fold image cannot be seen in a trihedral kaleidoscope, instead we would need a tetrahedral kaleidoscope). So next in the row is the less harmonic image of the 12-fold triakis tetrahedron with an isosceles triangle with edges counting 22/17/17 holes. The next image is the regular 20-fold icosahedron with an equilateral triangle with 15 holes along each edge. Alan Mackay mentioned already in 1967 that the the most interesting position of a polyhedral kaleidoscope is when it shows the icosahedral group, because with it we can explore the geometry of polyhedral viruses, carbon molecules and quasicrystals. If we go on inclining the mirrors to each other we come back to the orthorhombic position of our kaleidoscope and get the 24-fold tetrakis hexahedron with an isosceles triangle counting 22/13/13 holes and the 48-fold hexakis octahedron with 13/11/11 holes along each of the three edges.



The picture shows a 60-fold spherical pentakis dodecahedron with an additional stellated dodecahedron in the center. I call it the «Trinity Scope» because the diameter of the center sphere is doubled three times. Its isosceles triangle has 10/9/9 holes. Although it is an artificial construction it represents a sort of natural planetary system. The final version and the most fundamental modul of the sphere is the 120-fold hexakis icosahedron with the maximum of 31 great circles made from a right-angled triangle counting 9/7/5 holes. R. Buckminster Fuller named this triangle the «Quantum Modul».

References: Coxeter, H.S.M. (1974) *Regular Complex Polytopes*, London: Cambridge University Press, Page 24.
Mackay, A.L. (1967) *A polyhedral kaleidoscope for demonstrat...*, London: Physics Education, Vol. 2.
Nagy, D. (1990) *Symmetry in a kaleidoscope*, Budapest: ISIS-Symmetry Vol.1, No. 2, see Page 122.