= Stars (M. C. Escher) =

Stars is a wood engraving print created by the Dutch artist M. C. Escher in 1948 , depicting two chameleons in a polyhedral cage floating through space .

Although the compound of three octahedra used for the central cage in Stars had been studied before in mathematics , it was most likely invented independently for this image by Escher without reference to those studies . Escher used similar compound polyhedral forms in several other works , including Crystal (1947) , Study for Stars (1948) , Double Planetoid (1949) , and Waterfall (1961) .

The design for Stars was likely influenced by Escher 's own interest in both geometry and astronomy , by a long history of using geometric forms to model the heavens , and by a drawing style used by Leonardo da Vinci . Commentators have interpreted the cage 's compound shape as a reference to double and triple stars in astronomy , or to twinned crystals in crystallography . The image contrasts the celestial order of its polyhedral shapes with the more chaotic forms of biology .

Prints of Stars belong to the permanent collections of major museums including the Rijksmuseum , the National Gallery of Art , and the National Gallery of Canada .

= = Description = =

Stars is a wood engraving print ; that is , it was produced by carving the artwork into the end grain of a block of wood (unlike a woodcut which uses the side grain) , and then using this block to print the image . It was created by Escher in October 1948 . Although most published copies of Stars are monochromatic , with white artwork against a black background , the copy in the National Gallery of Canada is tinted in different shades of turquoise , yellow , green , and pale pink .

The print depicts a hollowed @-@ out compound of three octahedra , a polyhedral compound composed of three interlocking regular octahedra , floating in space . Numerous other polyhedra and polyhedral compounds float in the background ; the four largest are , on the upper left , the compound of cube and octahedron ; on the upper right , the stella octangula ; on the lower left , a compound of two cubes ; and on the lower right , a solid version of the same octahedron 3 @-@ compound . The smaller polyhedra visible within the print also include all of the five Platonic solids and the rhombic dodecahedron . In order to depict polyhedra accurately , Escher made models of them from cardboard .

Two chameleons are contained within the cage @-@ like shape of the central compound ; Escher writes that they were chosen as its inhabitants " because they are able to cling by their legs and tails to the beams of their cage as it swirls through space " . The chameleon on the left sticks out his tongue , perhaps in commentary ; H. S. M. Coxeter observes that the tongue has an unusual spiral @-@ shaped tip .

= = Influences = =

Escher 's interest in geometry is well known , but he was also an avid amateur astronomer , and in the early 1940s he became a member of the Dutch Association for Meteorology and Astronomy . He owned a 6 cm refracting telescope , and recorded several observations of binary stars .

The use of polyhedra to model heavenly bodies can be traced back to Plato , who in the Timaeus identified the regular dodecahedron with the shape of the heavens and its twelve faces with the constellations of the zodiac . Later , Johannes Kepler theorized that the distribution of distances of the planets from the sun could be explained by the shapes of the five Platonic solids , nested within each other . Escher kept a model of this system of nested polyhedra , and regularly depicted polyhedra in his artworks relating to astronomy and other worlds .

Escher learned his wood engraving technique from Samuel Jessurun de Mesquita . He illustrated the octahedral compound of Stars in the beveled wire @-@ frame style that had been used by Leonardo da Vinci in his illustrations for Luca Pacioli 's 1509 book , De divina proportione .

The stella octangula (Latin for " eight @-@ pointed star ") in the upper right of Stars was first

described by Pacioli , and later rediscovered by Kepler , who gave it its astronomical name . H. S. M. Coxeter reports that the shape of the central chameleon cage in Stars had previously been described in 1900 by Max Brückner , whose book Vielecke und Vielflache includes a photograph of a model of the same shape . However , Escher was not aware of this reference and Coxeter writes that " It is remarkable that Escher , without any knowledge of algebra or analytic geometry , was able to rediscover this highly symmetrical figure . "

= = Analysis = =

Martin Beech interprets the many polyhedral compounds within Stars as corresponding to double stars and triple star systems in astronomy . Beech writes that , for Escher , the mathematical orderliness of polyhedra depicts the " stability and timeless quality " of the heavens , and similarly Marianne L. Teuber writes that Stars " celebrates Escher 's identification with Johannes Kepler 's neo @-@ Platonic belief in an underlying mathematical order in the universe " .

Alternatively , Howard W. Jaffe interprets the polyhedral forms in Stars crystallographically , as " brilliantly faceted jewels " floating through space , with its compound polyhedra representing crystal twinning . However , R. A. Dunlap points out the contrast between the order of the polyhedral forms and the more chaotic biological nature of the chameleons inhabiting them . In the same vein , Beech observes that the stars themselves convey tension between order and chaos : despite their symmetric shapes , the stars are scattered apparently at random , and vary haphazardly from each other . As Escher himself wrote about the central chameleon cage , " I shouldn 't be surprised if it wobbles a bit . "

= = Related works = =

A closely related woodcut , Study for Stars , completed in August 1948 , depicts wireframe versions of several of the same polyhedra and polyhedral compounds , floating in black within a square composition , but without the chameleons . The largest polyhedron shown in Study for Stars , a stellated rhombic dodecahedron , is also one of two polyhedra depicted prominently in Escher 's 1961 print Waterfall .

The stella octangula , a compound of two tetrahedra that appears in the upper right of Stars , also forms the central shape of another of Escher 's astronomical works , Double Planetoid (1949) . The compound of cube and octahedron in the upper left was used earlier by Escher , in Crystal (1947) .

Escher 's later work Four Regular Solids (Stereometric Figure) returned to the theme of polyhedral compounds , depicting a more explicitly Keplerian form in which the compound of the cube and octahedron is nested within the compound of the dodecahedron and icosahedron .

= = Collections and publications = =

Stars was used as cover art for the 1962 anthology Best Fantasy Stories edited by Brian Aldiss , and for a 1971 Italian edition of occult guidebook The Morning of the Magicians . It also formed the frontispiece for a 1996 textbook on crystallography .

As well as being exhibited in the Escher Museum , copies of Stars are in the permanent collections of the Rijksmuseum , National Gallery of Art , Mildred Lane Kemper Art Museum and the National Gallery of Canada .