A Geometrically Designed Pole Lathe Turned Triangular Chair

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I am grateful to Alice Brown of Antique Chairs and Museum,
Polson, Launceston, Cornwall
for permission to photograph the triangular chair.

Laurie Smith is an independent early-building design researcher, specialising in geometrical design systems. Because geometry was part of the medieval educational curriculum he uses geometrical analysis to excavate and recover the design methodologies of the past, a process he thinks of as design archaeology. He lectures, writes and runs practical workshops on geometrical design and publishes his work through his website HISTORIC BUILDING GEOMETRY.

This **e**DITION 2016

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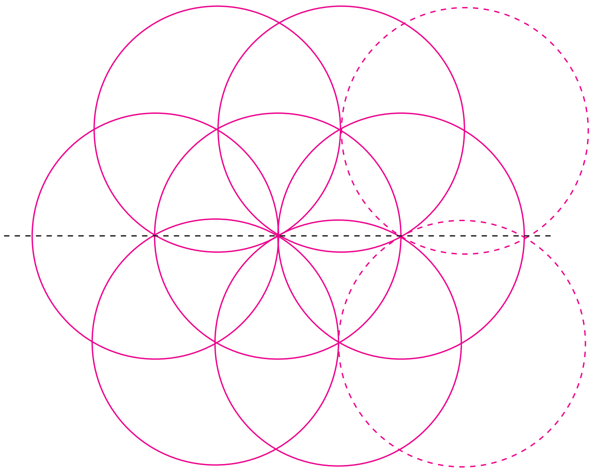
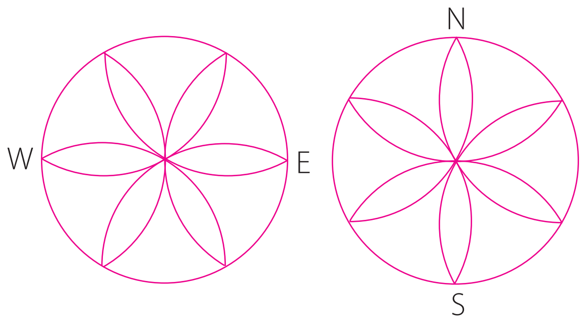
The Triangular Chair
at Antique Chairs and Museum
Polson, Launceston, Cornwall

The triangular chair

The chair, assembled from pole-lathe turned components in oak, is triangular on plan with a leg at each angle of its triangular seat. The back leg supports a horizontal rectangular backrest and the chair's turned arms span the distance from this rectangle to the front legs. The rectangle has decorative carving on both sides including, on the front, a compass geometry six petalled daisy wheel and, as the following drawings show, the chair's design opens like a flower from daisy wheel geometry. The daisy wheel is therefore both a decorative motif at the centre of the chair as well as a design icon or symbol indicating the geometrical design method used in the chair's design. The daisy wheel is, for example, the geometrical source of equilateral triangulation and therefore entirely appropriate to the chair's form.

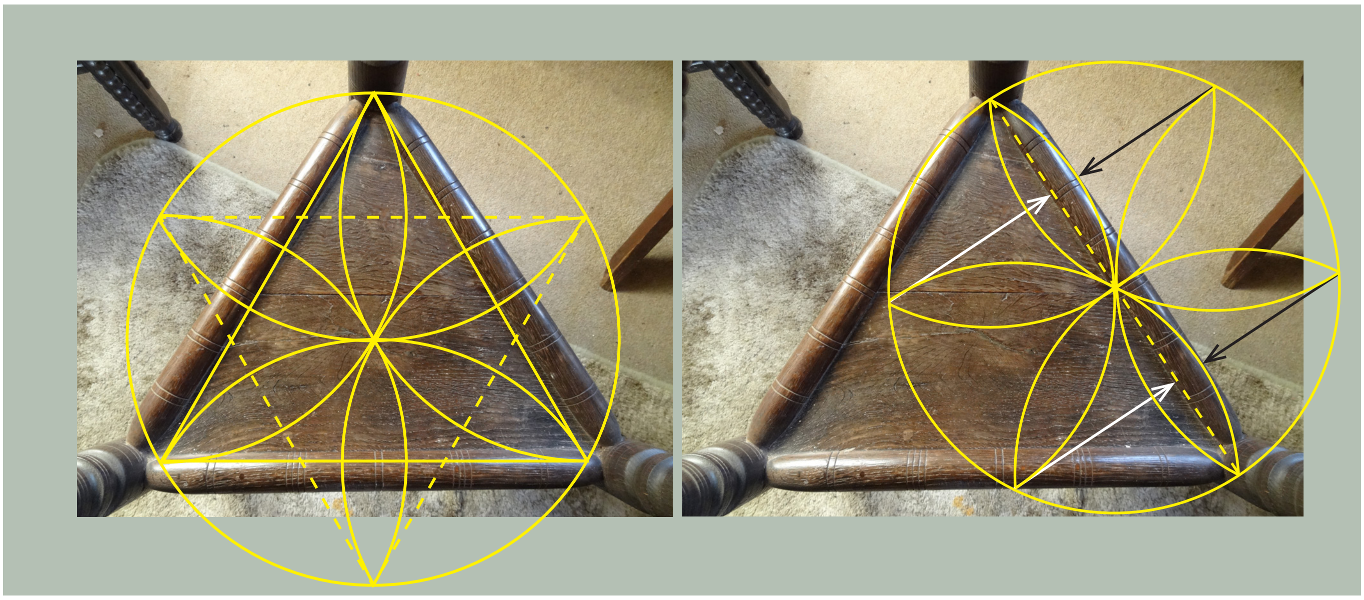


The complete daisy wheel

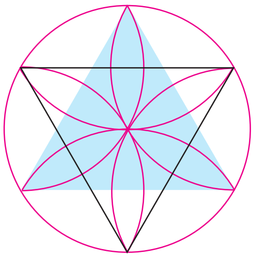


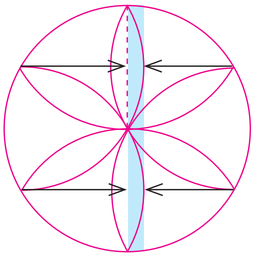
The east-west daisy wheel, left
The north-south daisy wheel, right

The daisy wheel is drawn by compass and in its complete form comprises seven circles, spaced at equal intervals around the circumference of the seventh with all circles drawn to identical radius. The optimum drawing technique is to draw three circles along a centre line first. The three circles intersect at four points, two above and two below the centre line. The four points are centres for the remaining four circles. The wheel can be drawn with either east-west orientation, like the daisy wheel on the chair's decorative back panel, or north-south orientation. It is noticeable that the notches on the east and west edges of the back panel number 7 per side, the number of circles necessary for drawing the complete daisy wheel. The chair's daisy wheel also features vesicas (petal shapes) around its circumference and the method for drawing these is shown in dashed magenta line in the left hand drawing.



Equilateral triangulation

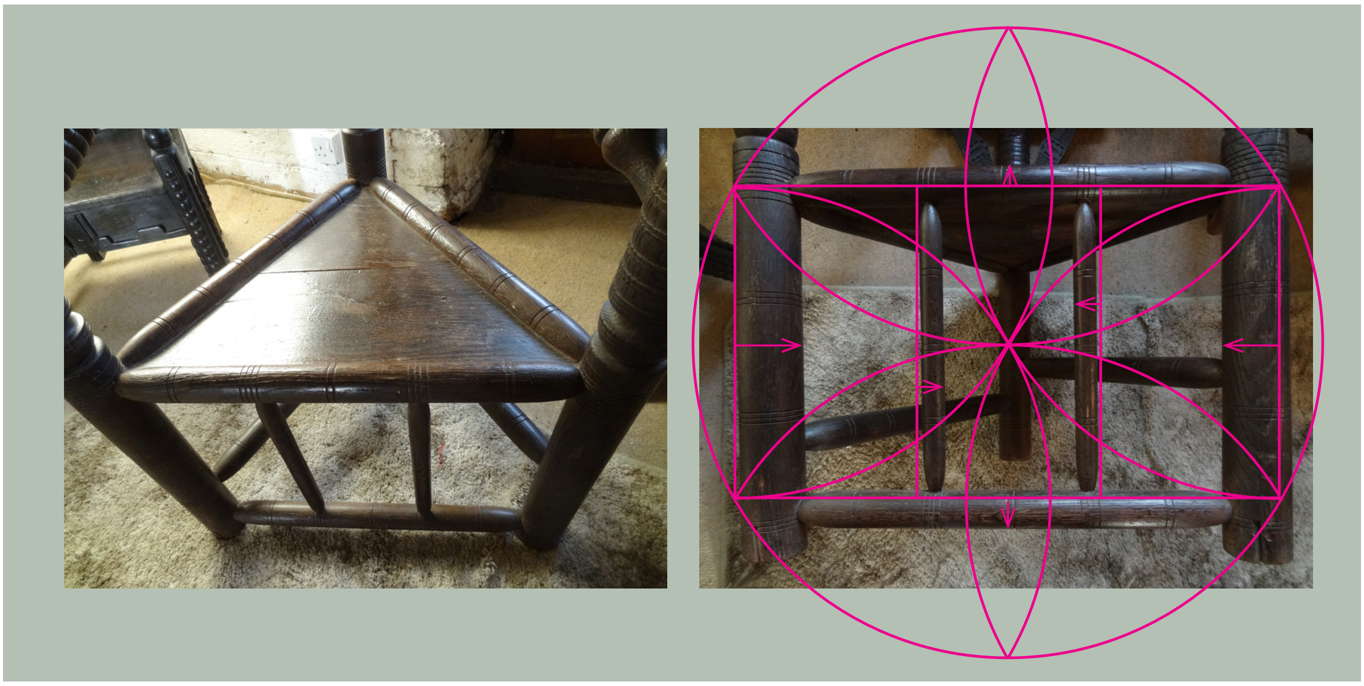


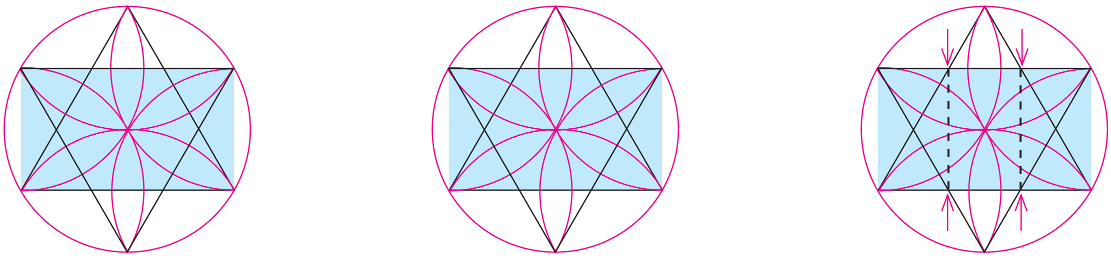


Rail bandwith = half petal width

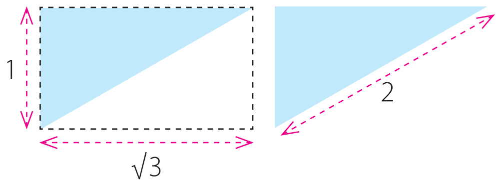
The daisy wheel is a source of equilateral triangulation. The wheel has six equidistant petal tips around the circle's circumference. Connecting alternate petal tips by straight lines forms an equilateral triangle, shown in the top drawing in blue tone and in the left photograph in solid yellow line. Connecting the remaining three tips forms a second equilateral triangle that faces in the opposite direction to the first, shown in black line in the top drawing and dashed yellow line in the left photograph.

The daisy wheel petals can be used to determine timber sections. In the lower drawing the vertical petals are bisected to give a band width, shown in blue tone, and determined at the levels shown by black arrows (which are at the maximum width of the petals). The geometry is superimposed on the right photograph of the seat where it fits the seat's outer rail between the black and white arrows.



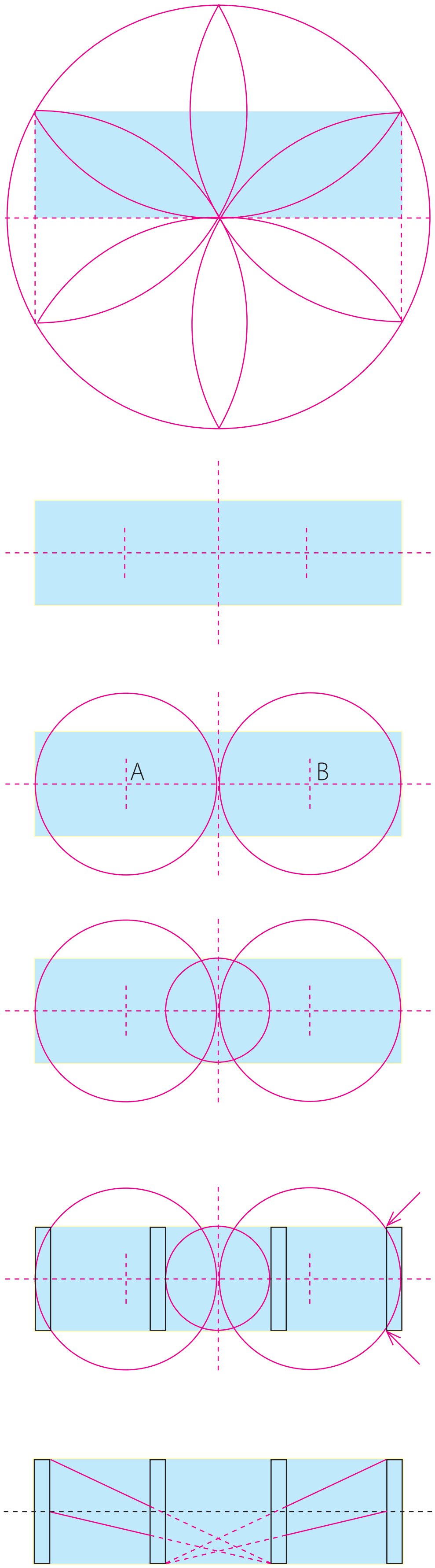


Proportions, below, and rail positions, above



The daisy wheel is also a source for rectangular proportions. Connecting four of the petal tips generates a rectangle that has the specific harmonic proportions 1:2 between its short side and diagonal, above. The rectangle can also be formed by linking the base lines of the two equilateral triangles, upper left drawing. The rectangle is known in modern terminology as a √3 rectangle: if the short side measures 1 unit then the long side measures the square root of 3 (1.73205080757. . . . . . and counting! *The website www.schwartz-omalley.com shows the decimal value of √3 to the first 100,000 digits).*

The chair seat, front legs, horizontal brace and vertical braces conform to √3 proportions. The upper central drawing shows how the equilateral triangles cut the √3 rectangle at four points and the upper right drawing shows how these can be connected to mark the positions of the vertical braces. As with all carpentry, the legs and braces are set *beside* the geometrical boundaries and alignments.



The chair back proportion

Division into four

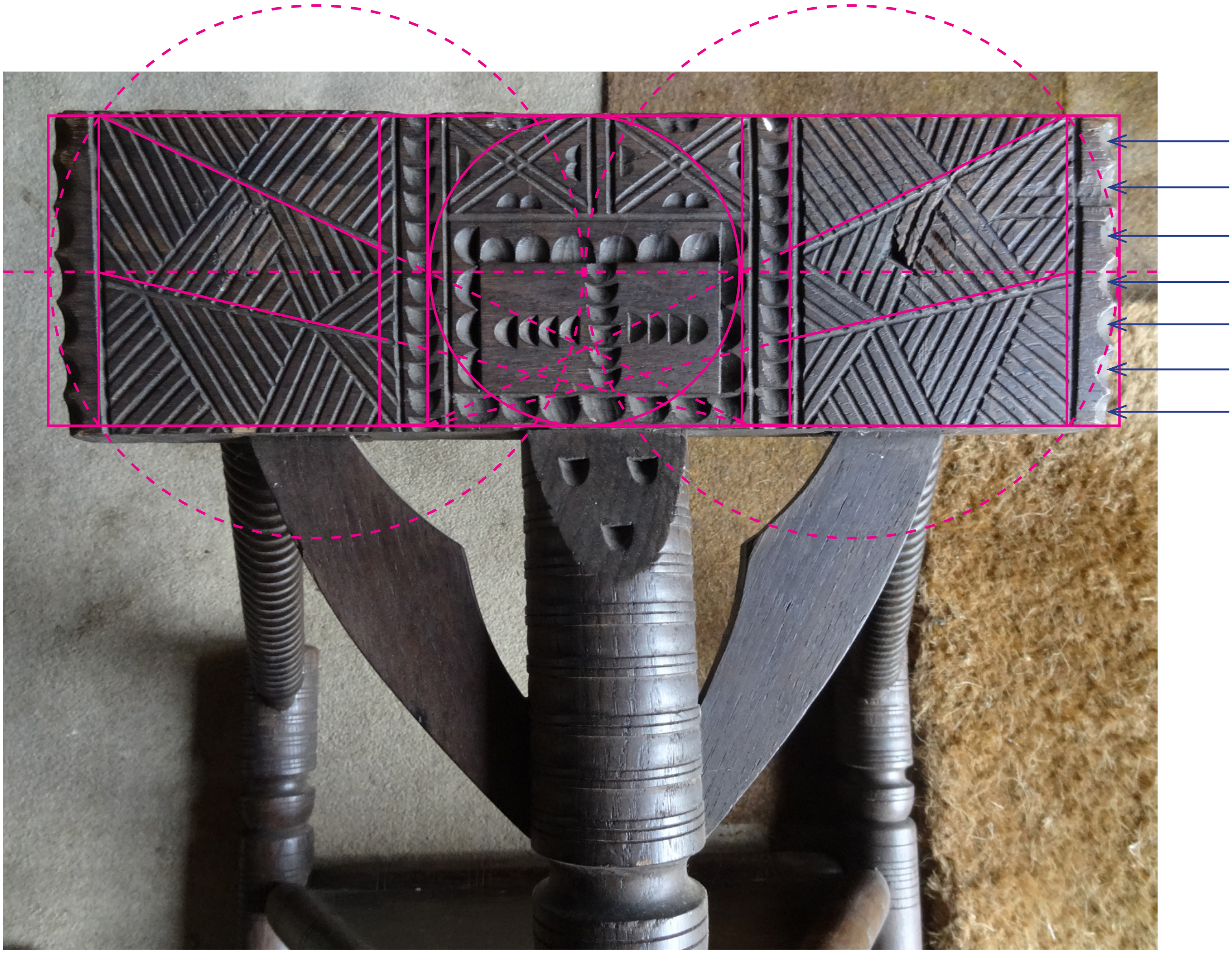
Two large circles drawn from A and B

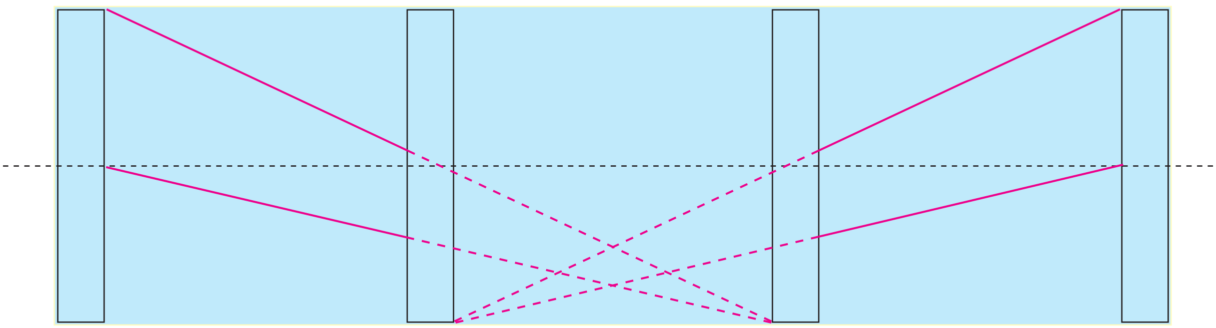
One small circle drawn from the centre to the edge

The circles cut the proportion at the edge to give a band. The band is drawn in the four places shown.

Lines are drawn between the central bands and the outer bands. The solid lines are cut into the chair back.

ABOVE Stages in the geometrical development of the chair back pattern, starting at the top

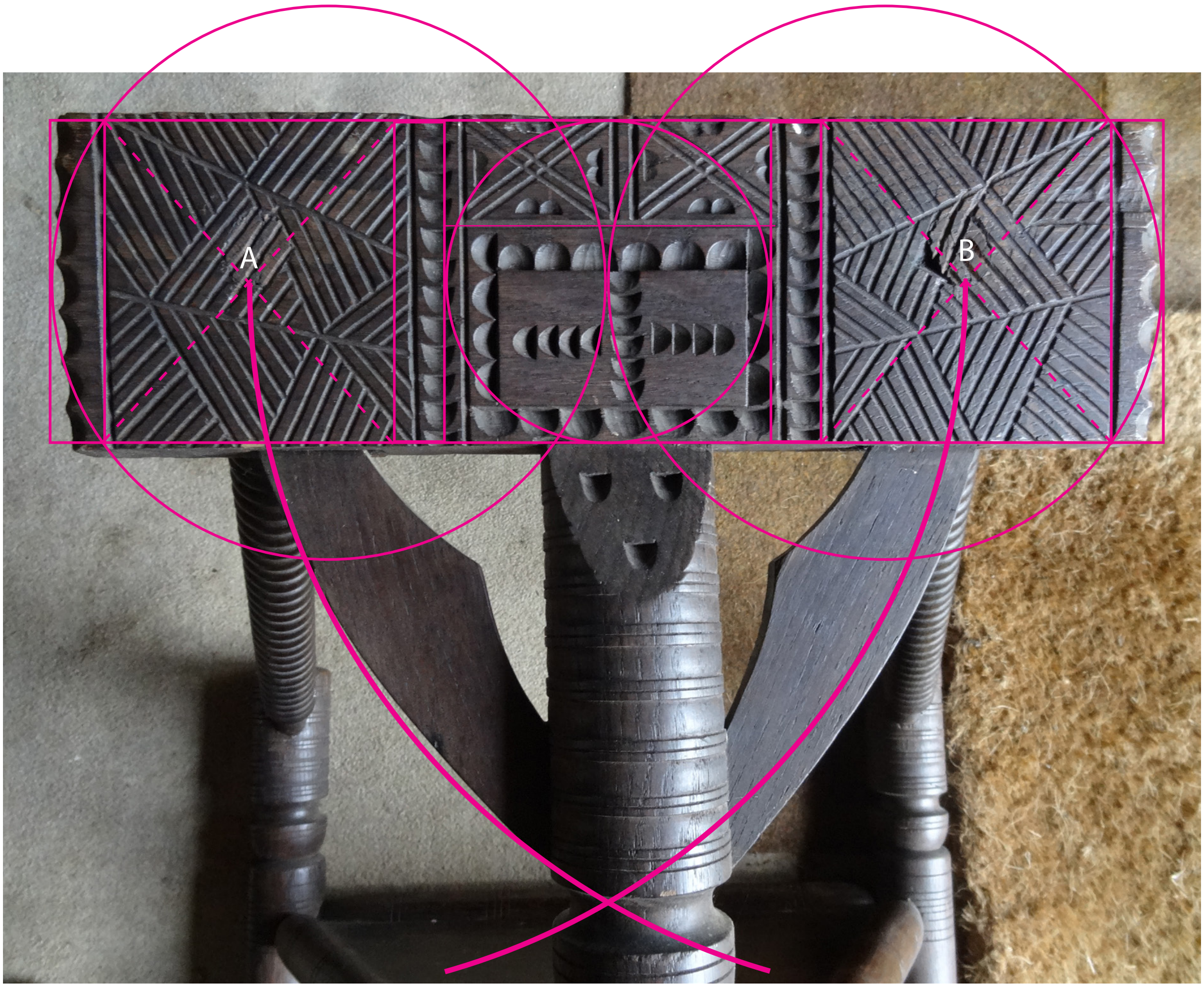


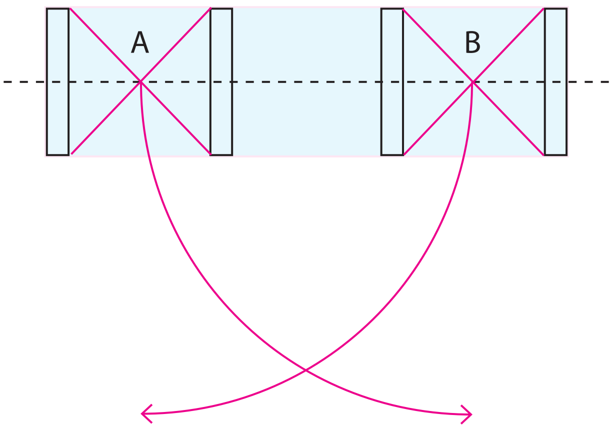


ABOVE   Stages in the geometrical development of the chair back pattern.

Because the geometry is marked up manually and the chair is made manually using hand tools there is a slight drift from the precise geometry. This is normal in hand work and the geometry can be seen as a guide that is followed as closely as possible.

It is noticeable that the notches on the east and west edges of the back panel number 7 per side, the number of circles necessary for drawing the complete originating daisy wheel. The blue arrows, top right, show the 7 notches in the right hand edge of the back panel.





ABOVE   Geometrical development of the arced chair back braces www.historicbuildinggeometry.uk

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