Lewannick Geometrical Font
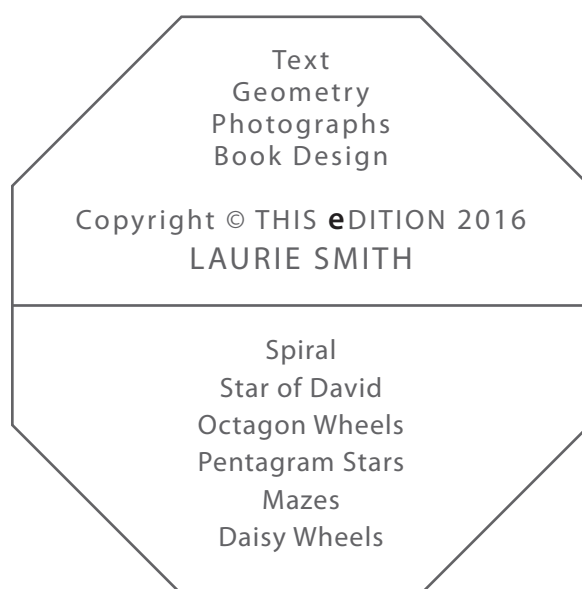## Spiral, Star of David, Arced Wheels, Pentagram Stars, Mazes and Daisy Wheel

Laurie SMITH

HISTORICBUILDINGGEOMETRY

Text
Geometry
Photographs
Book Design

Spiral
Star of David
Octagon Wheels
Pentagram Stars
Mazes
Daisy Wheels

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.

Lewannick Geometrical Font

Spiral, Star of David, Octagon Wheels,

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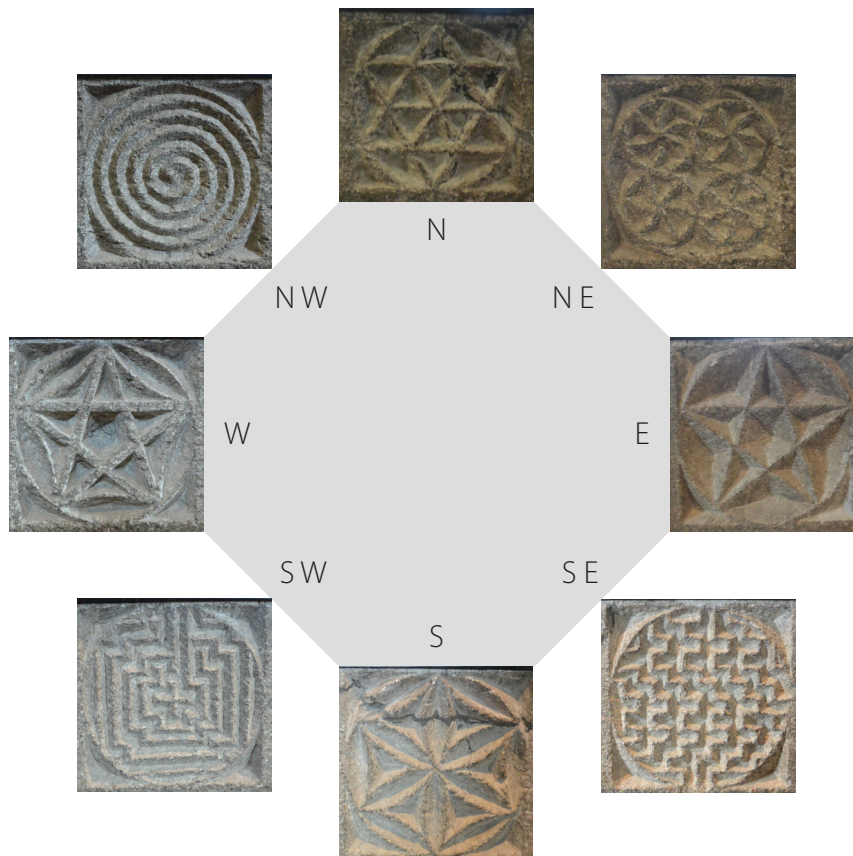
N

NW

NE

W

E

< TOWER

ALTAR >

SW

SE

S

Saint Martins Church, Lewannick, Cornwall   The Geometrical Font

The font is octagonal in plan with all eight facets displaying geometrical carvings, each geome-try framed by a circle within a square. The double boundary is significant because the circle and square are the two primary geometrical characteristics expressive of circularity and angularity both of which are found in nature, circularity in the living growth of plants and angularity in the static crystaline form of minerals. Circularity and angularity are often found juxtaposed in histor-ic architecture, the commonest example being the alternation of cylindrical and multi-faceted columns in cathedral nave arcades. The photographs above show the font's eight facets and their directional relationship to the church, the east and west pentagram stars being on the same alignment as the church nave, east to the altar and west to the bell tower. All the photographs are shown upright, as if seen from immediately in front of their specific facet.

The geometries displayed on the font are encyclopaedic in scope and range from the simplest, the daisy wheel on the south facet which is drawn by compass using a single radius for the whole construction and the star of David on the north facet with a construction derived from it, to the most complex, the two mazes at the south west and south east facets and the spiral at the north west facet, all three of which require several progressive stages of construction.

The following pages show, first, a brief description of the geometries and then a series of larger scale drawings with explanations detailing the development of the constructions. The tools used for marking out the font's geometry were dividers, straight edge and scribe (a compass with pins at either end for scribing circles and arcs, a rule without dimensions for making straight align-ments and a sharp awl for scribing lines along the edge).

The font's equilateral octagonal plan is the product of compass geometry.

The Pentagram Stars (E and W)

The east and west faces of the font both feature five point pentagram stars. The star facing east is drawn with a sharp arris and has the central pentagon's angles linked to the star's axis by five triangular facets. The star facing west is drawn as a flat strap and has the vesica piscis repeated five times around the circle's rim. The vesica piscis is the fish-like form generated by the overlap of two circles and is named from this shape (literally fish's bladder).
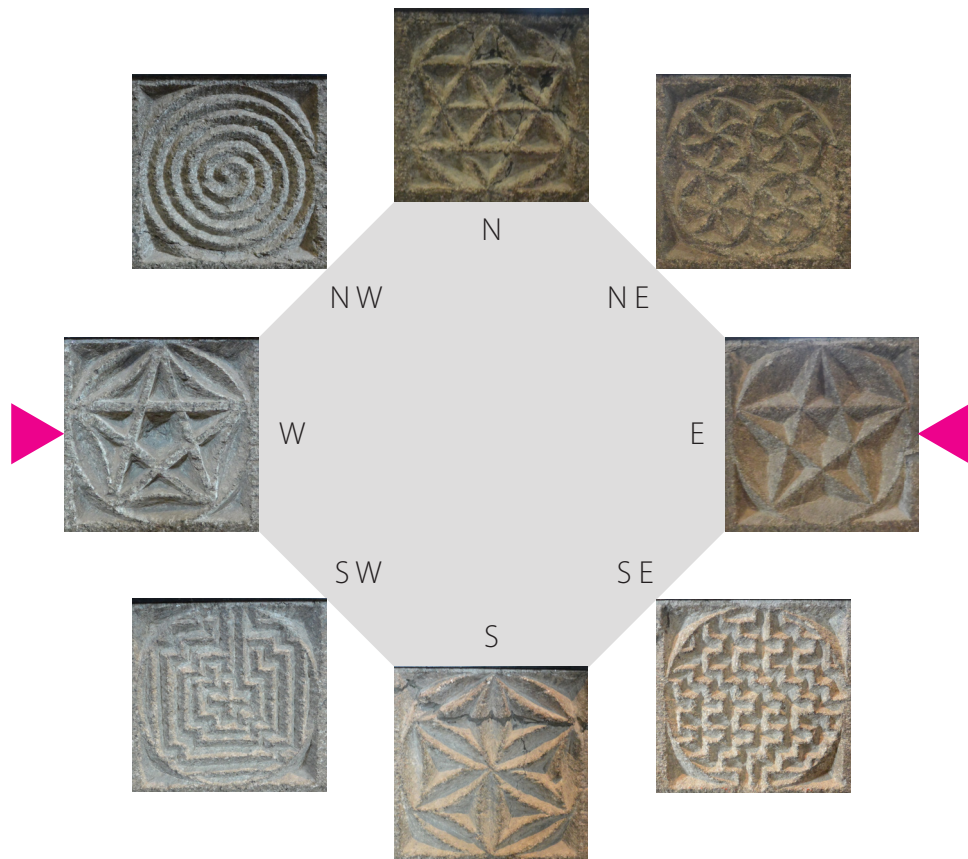
The Daisy Wheel and Star of David (N and S)

The Daisy Wheel on the south facet and Star of David on the north facet are both drawn using fixed radius compass geometry. This means that all circles and arcs of circle are drawn to identical radius so that, once the radius is set, no further measurements are necessary. Drawing the Daisy Wheel automatically generates six equidistant points around the circumference of the circle (where the petal tips meet the circle on the south facet) and these points are connected by line to give the Star of David on the north facet. Drawing the Star of David automatically generates a hexagon at the centre of the construction.

The Spiral and the Mazes (NW, SW and SE)

The Spiral and the Mazes are constructed on pre-drawn grids, the Spiral on an 11 x 11 grid of 121 small squares and both Mazes on a 12 x 12 grid of 144 small squares. The grids themselves are derived from further precursor compass geometry constructions.

The Four Circles with arced Radials (NE)

The Four Circles and their internal arcs are the product of compass geometry.
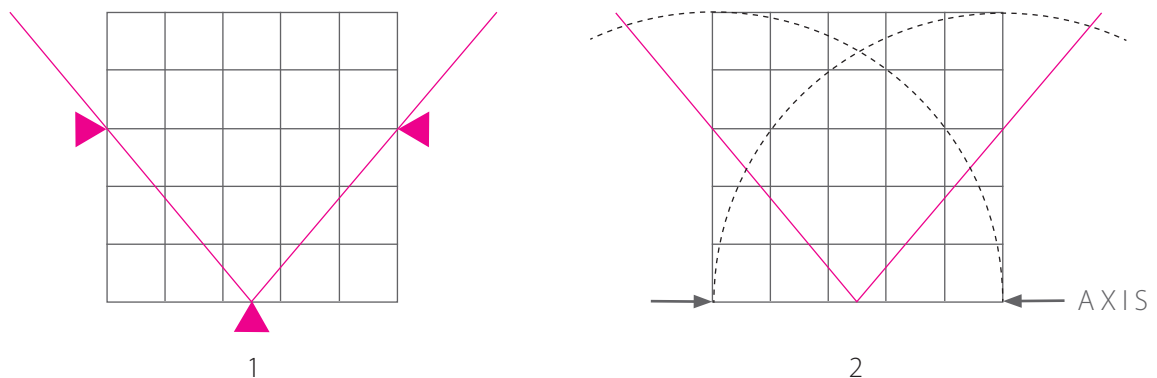
Saint Martins Church, Lewannick, Cornwall The Pentagram Stars

The east and west face pentagram stars share a common geometrical construction.

There are a number of ways to draw a pentagon. Historically, Albrecht Durer constructed his pentagon within a circle, Mathes Roricser constructed his on the curve of a semi-circle. The method shown here is used because three of the font's other faces (the spiral and the two mazes) use grids of squares, so this may have been the method of the Lewannick sculptor. For clarity, the construction is shown over two pages.
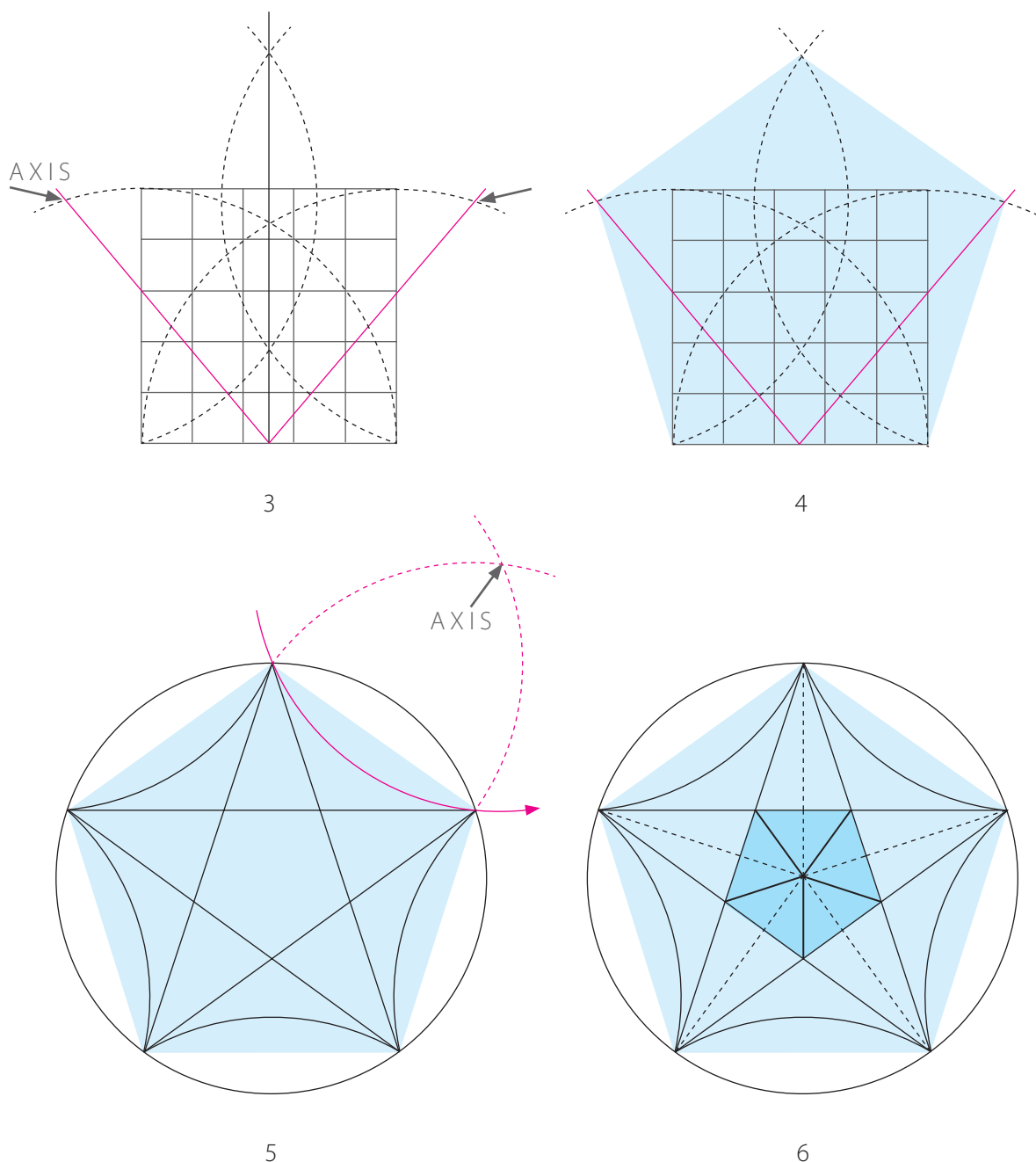
First, in drawing 1, a 5 by 5 grid of equal squares is constructed. From the centre of the grid's base, angles are drawn to pass through the third square up on the grid's sides until level with the top of the grid. Drawing 2 shows how, using the grid's base as a radius, arcs of circle are swung up to cut the angle lines.
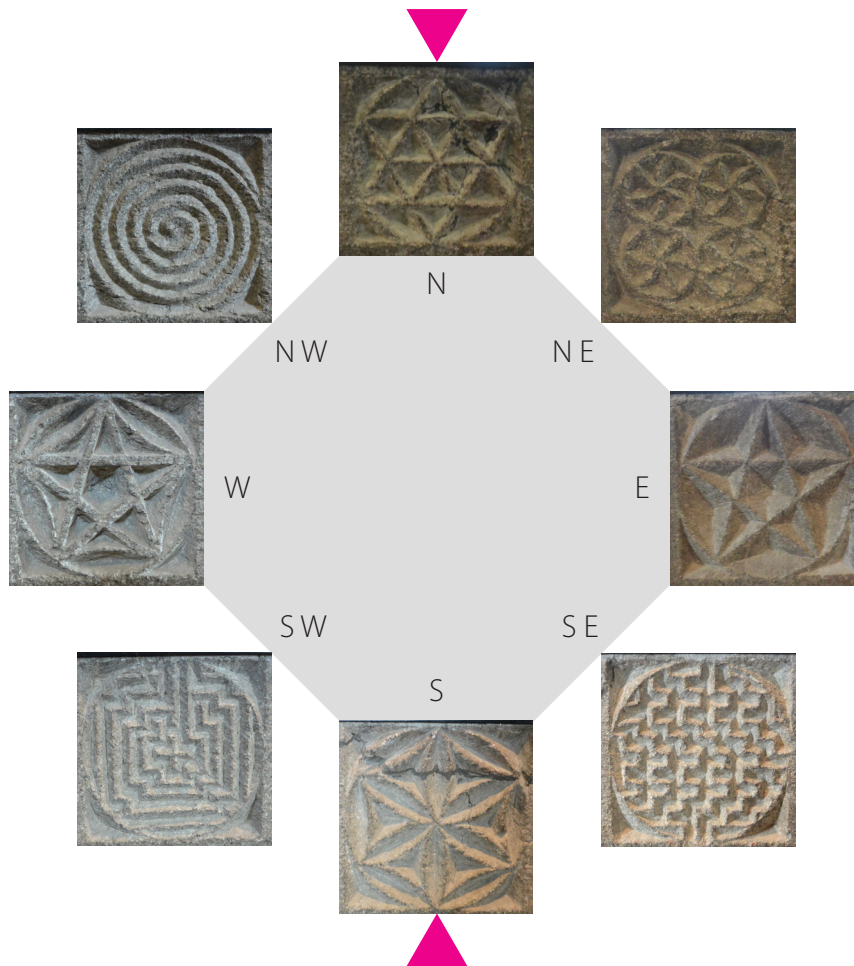

1

2

Saint Martins Church, Lewannick, Cornwall The Pentagram Stars

Drawing 3 shows how the intersection between the angle lines and arcs give the axes for two further arcs that are swung up from either end of the grid's base line so that they intersect on a vertical centre line. Drawing 4 shows how interconnection of the intersections generates the pentagon. In drawing 5, connecting the pentagon's angles generates a pentagram star, the configuration in the east and west faces of the font.

The east face pentagram star is cut as an arris. The west face pentagram is cut as a strap with vesicas connecting it's angles within the boundary circle. Drawing 5 also shows the construction of one vesica is shown in magenta line. Drawing 6 shows the construction for the five triangles within the small central pentagon. The main pentagon points upwards and the small central pentagon points downwards, a reverse in direction common to many geometrical constructions when their scale is changed.
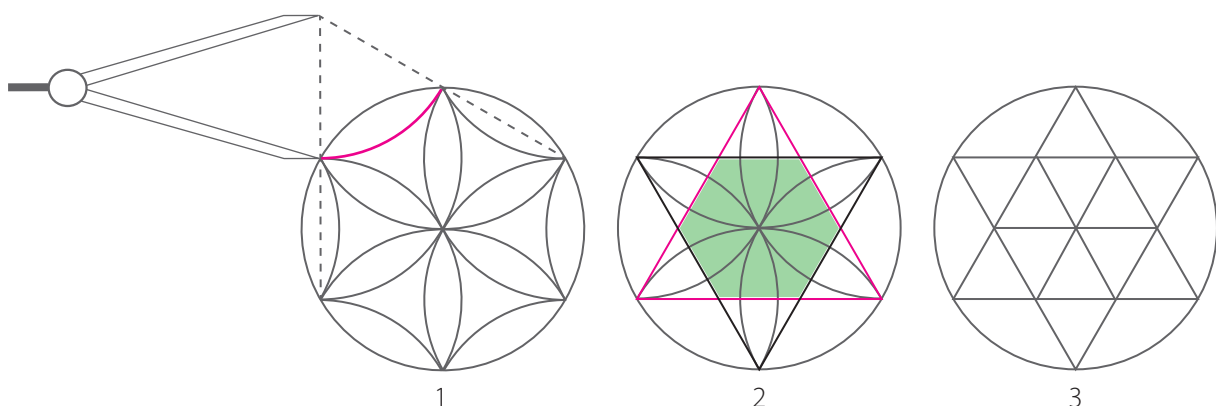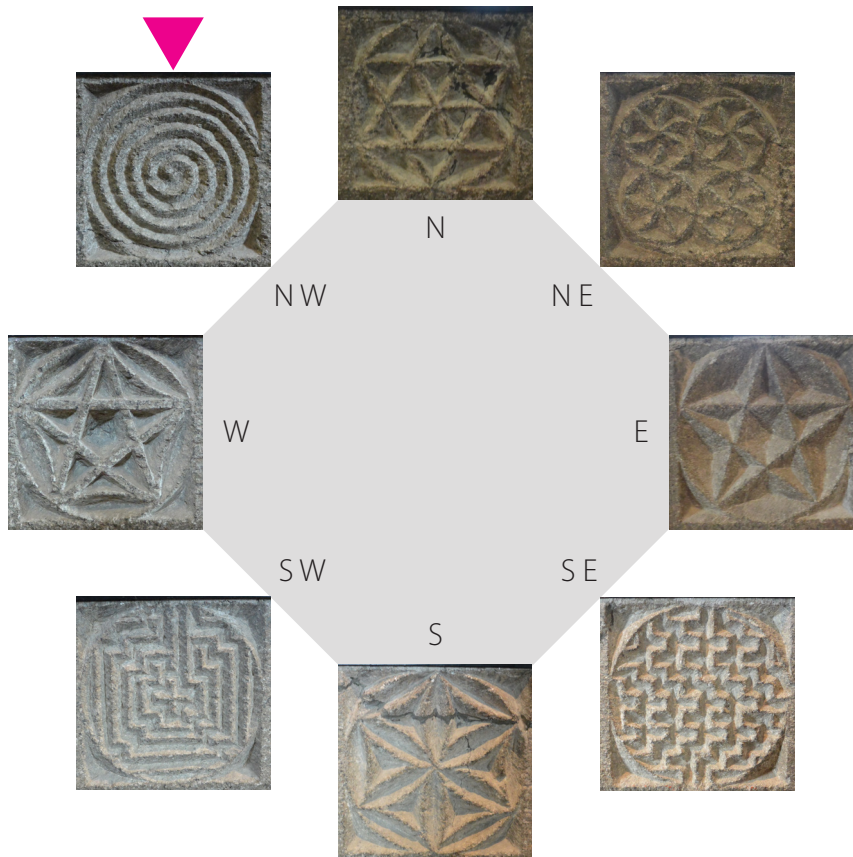
AXIS

3

4

AXIS

5

6

N

NW — NE

W — E

SW — SE

S

Saint Martins Church, Lewannick, Cornwall The Daisy Wheel and Star of David

The north and south faces are both determined by compass drawn daisy wheel geometry.

The south face has a full six-petalled daisy wheel with vesica piscis borders. Drawing 1 shows how the vesica piscis is drawn between each pair of petal tips and to the same radius as the daisy wheel so that the perimeter vesicas are identical to the daisy wheel's petals.

The north face has a Star of David, drawn by connecting the daisy wheel's petal tips in two opposing equilateral triangles. The star automatically forms a hexagon at its centre, drawing 2, and its six angles are linked across three diameters, drawing 3.
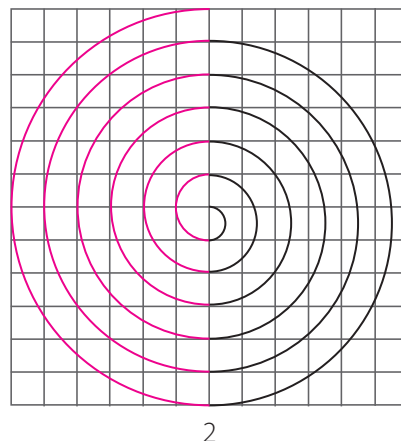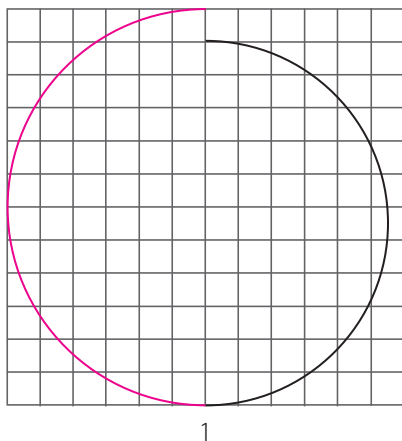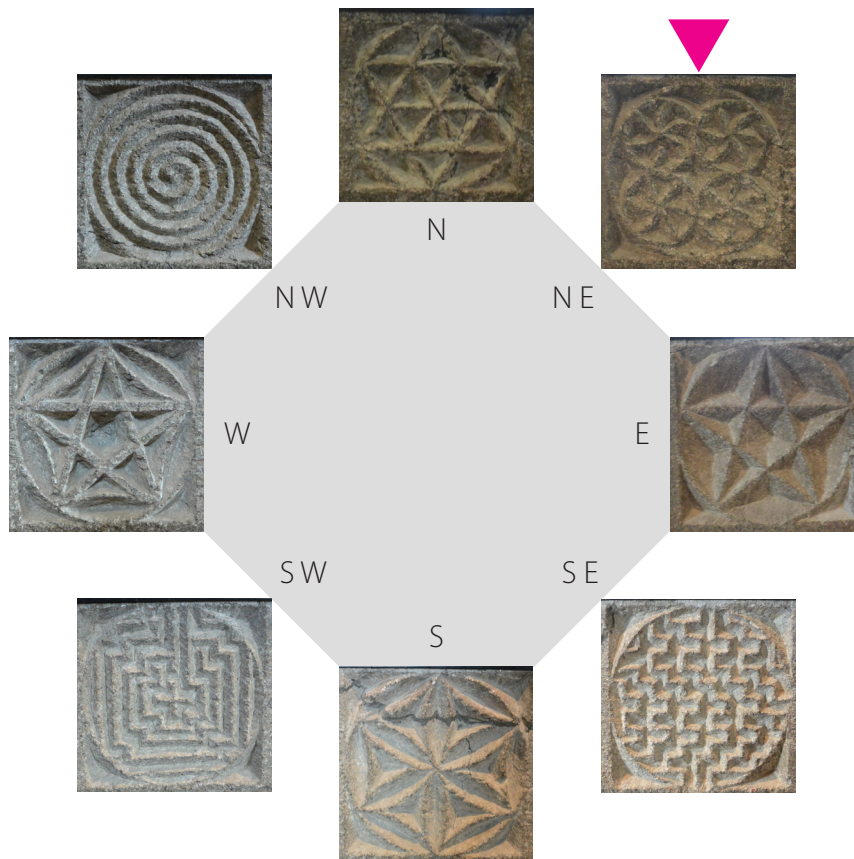

1   2   3

Saint Martins Church, Lewannick, Cornwall   The Spiral

The north west face spiral is the product of compass geometry drawn within a square subdivided into a linear grid of 12 by 12 small squares.

Drawing 1 shows a magenta 12 unit circle in the left half of the grid and a black 11 unit circle in the right half. The two units are linked at the base of the grid but are one unit apart at the top.
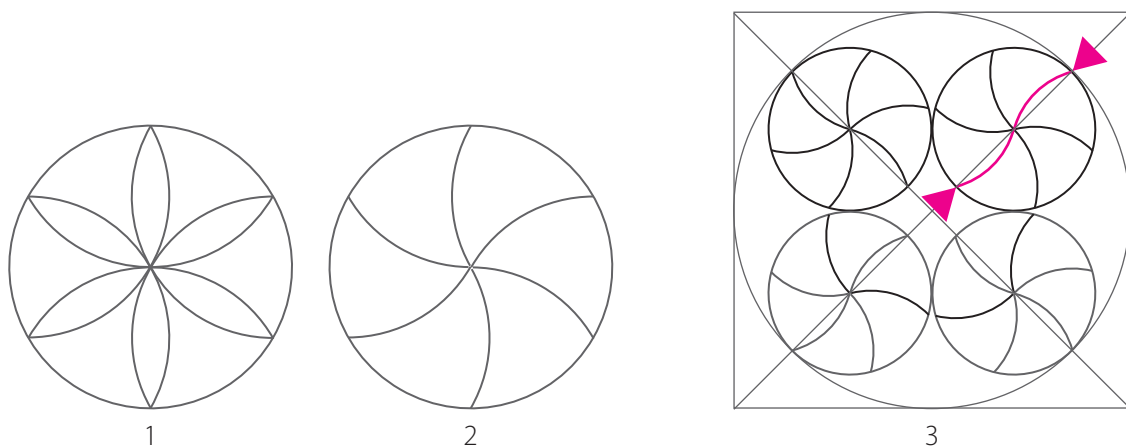
Drawing 2 shows how this principle is applied to a series of diminishing half circles that combine to form the spiral. The drawn spiral determines the arris (the sharp ridge) so the mason cuts downwards in a V-cut between the lines of the spiral. Finally, the quadrants in the square's corners (the space between the full square and full circle) are cut.
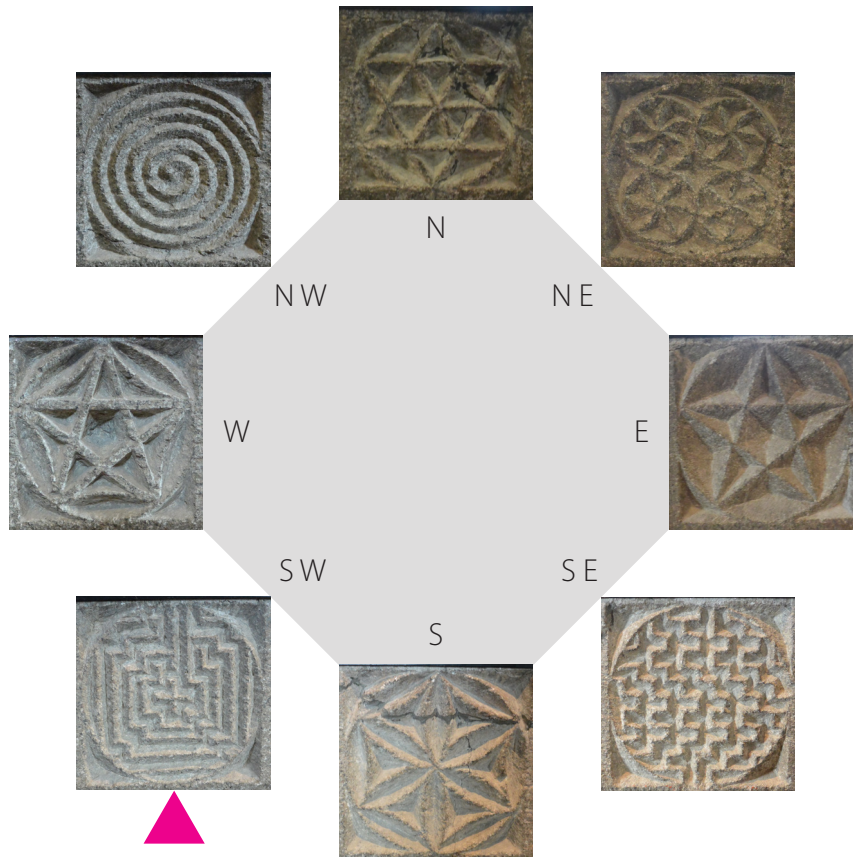

1

2

N

NW   NE

W   E

SW   SE

S

Saint Martins Church, Lewannick, Cornwall   The Four Circles with arced radials

The north east face both contains four daisy wheels, drawing 1, each of which is drawn with only one side per petal, drawing 2. The four wheels are drawn to fit circumference to circumference within a full circle, in turn within the panel's square. The half petal arcs within the four wheels are drawn so that opposite petals on their circumference are aligned to the diagonals of the square (see upper right circle) which brings visual symmetry to the group. It is simple to draw this within each of the four circles, once they are drawn, by placing the dividers on their circumference where it is cut by the square's diagonal. There are two such points in each circle and those in the top right circle are indicated by magenta arrows.
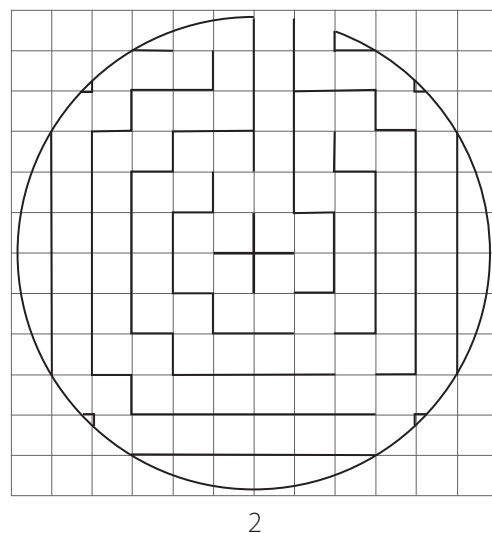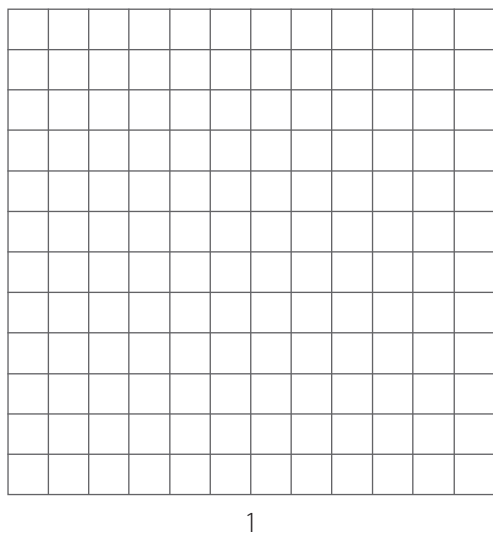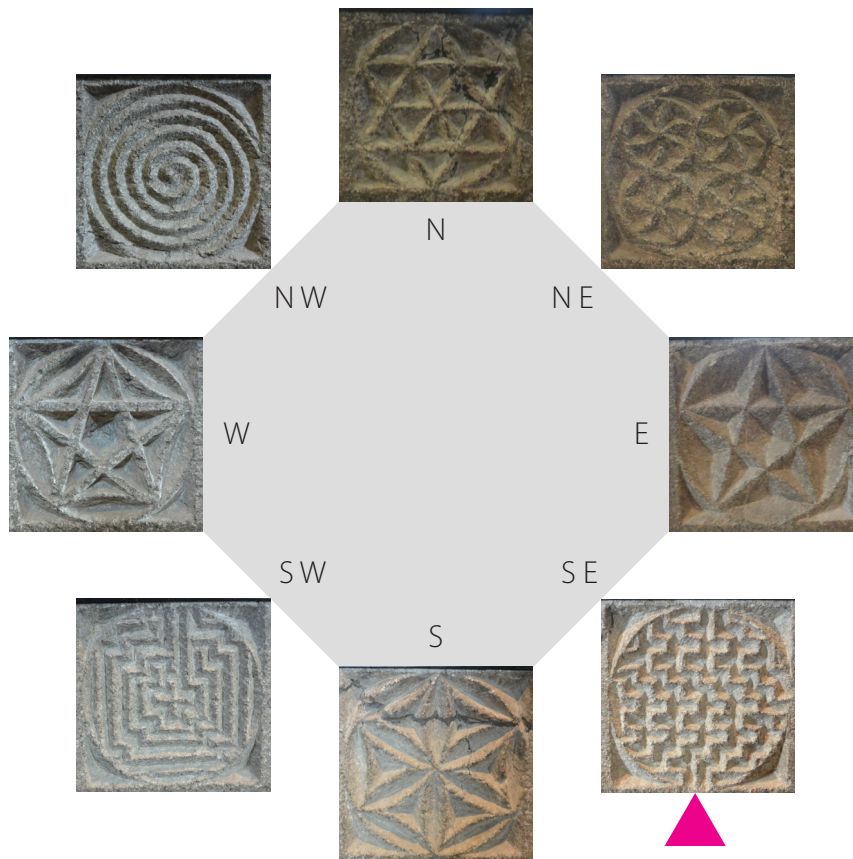

1   2   3

Saint Martins Church, Lewannick, Cornwall The Cruciform Maze

The south west face is occupied by a cruciform maze, constructed around the epicentre of a cross, the symbolism without doubt referencing the crucifixion. It is possible to enter the maze, reach the cross and leave again.

The geometrical construction indicates the arrises, with the space between them V-cut into the stone to make the maze's pathways. The various access and exit points to the paths break into the theoretical symmetry of the maze so, although it looks symmetrical, it isn't quite.
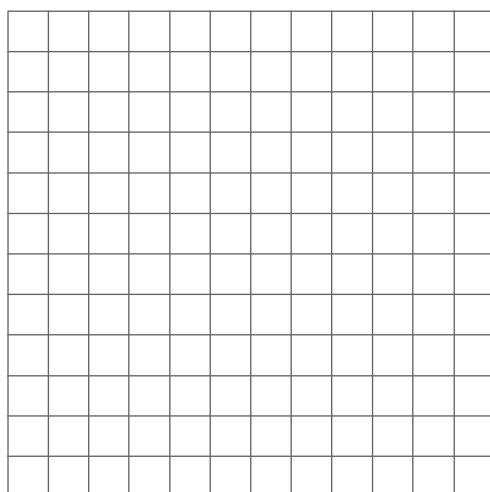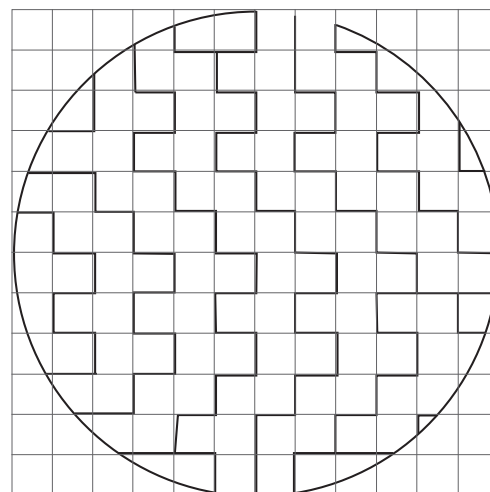

1

2

Saint Martins Church, Lewannick, Cornwall The Pseudo Maze

The south east face is occupied by a pseudo maze, which, though possible to enter, does not give access to a central focus. Although the linear rythm of horizontal and vertical lines give the maze a symmetrical appearance it is, in fact, asymmetrical.

Drawing 1 shows the 12 by 12 grid and drawing 2 shows the superimposed maze. The geometrical construction indicates the arrises, with the space between them V-cut into the stone to make the maze's pathways.
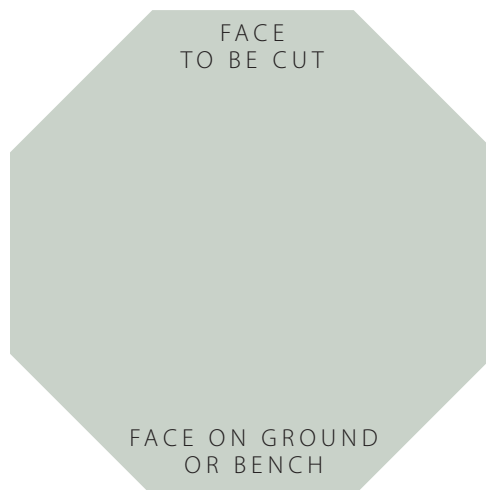
1

2

Saint Martins Church, Lewannick, Cornwall   The Geometrical Font

The font in Saint Martins Church, Lewannick is a geometrical tour de force of encyclopaedic range that demonstates an area of knowledge and skill that is largely missing from the industrial world of the present. Although the font's ecclesiastical significance is beyond doubt the focus of this text is on the language of geometry through which it's characteristics are manifested.

Each face of the font is framed within a square and it's harmonic circle, where the circle's diameter equals the square's side and meets the sides exactly at their half way point. The circle and square are the two primary yet opposite geometrical characteristics that underly the natural world. The circle is the simplest and most obvious, visible in the sun and moon, the cross section of felled trees, the radial patterns of flowers and in the spherical human eye and it's circular iris. The square is one of the three main cross sections of mineral crystals, the others being the triangle and hexagon, all shapes that lock together in a continuum without intervening space. Circularity and angularity govern the opposing states of motion and inertia in the natural world and are expressed architecturally in the alternation of cylindrical and angular piers in cathedral naves.

Within the combined square and circle boundary of the font's faces a range of other geometries are drawn, based either on either compass, square geometries or combinations of them. The exceptions are the east and west faces which show five point pentagram stars. All of these geometries are either the result of, or give rise to, constructional stages and all of these can be seen as geometrical scaffolding, necessary to support the development of the required image and obsolete once it is achieved.

The practical process of marking up and cutting would commence from the font as a solid block with parallel base and upper surface, scribed to it's octagonal form around a pre-drawn and pre-cut octagonal template. The bowl was probably marked and cut next. The font could then be stood on one face and it's opposite, upward face marked out geometrically for cutting. Once complete the font would be rotated onto it's next face. Cutting the top face allowed the mason to move around the font and cut from all sides, a crucial factor in the north west face's spiral. The geometrical configurations would be time consuming to set out and may have been transposed from trial drawings on boards or parchment. The cutting, into the almost impenetrable mass of granite, was hard physical work and it is a tribute to the mason that the geometries are so precise. His work is a folio of geometry as a Norman design language.

FACE
TO BE CUT

FACE ON GROUND
OR BENCH

www.historicbuildinggeometry.uk