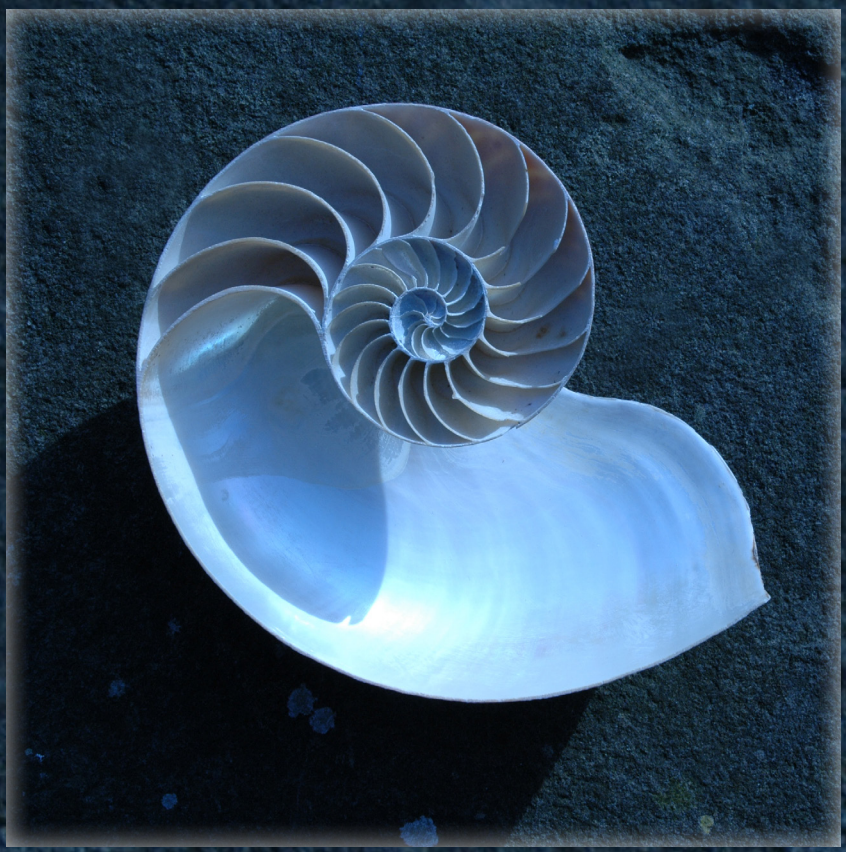
Drawing the Golden Rectangle and Logarithmic Spiral



Laurie SMITH

HISTORICBUILDINGGEOMETRY

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The photograph above shows the spiral cross-section of a Mediterranean Nautilus Pompilius shell. The growth pattern of the mollusc that inhabited the shell is recorded in the shell's form: it's life beginning at the centre of the spiral with each consecutive cell extending in length and expanding in width around the axis at a constant rate until the final mature cell is complete.

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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.

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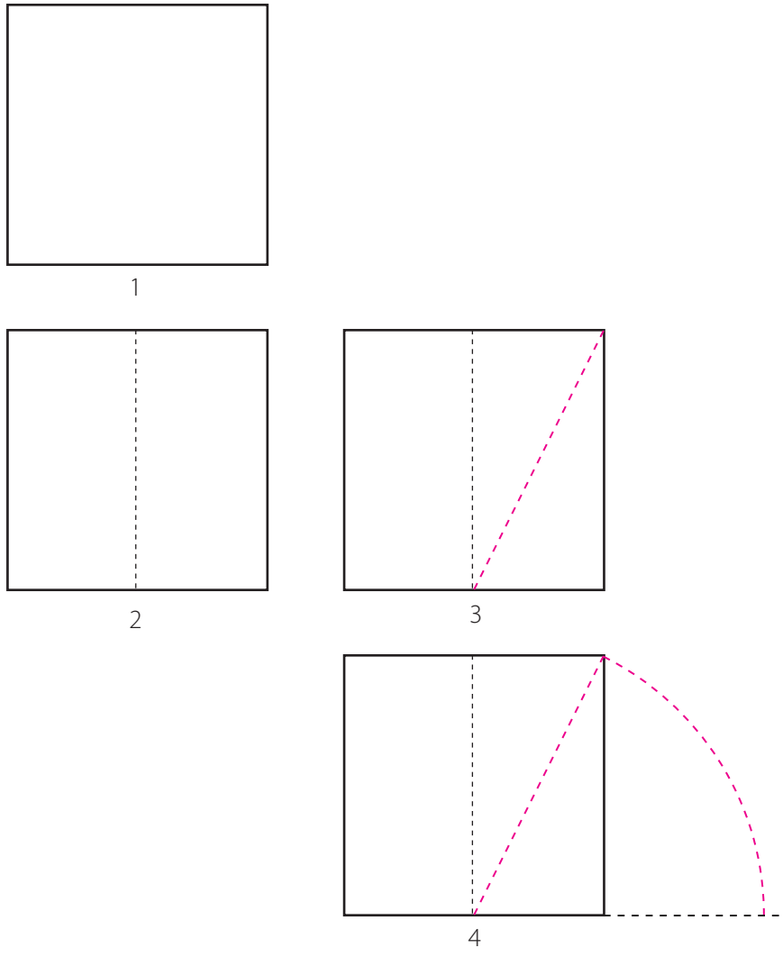


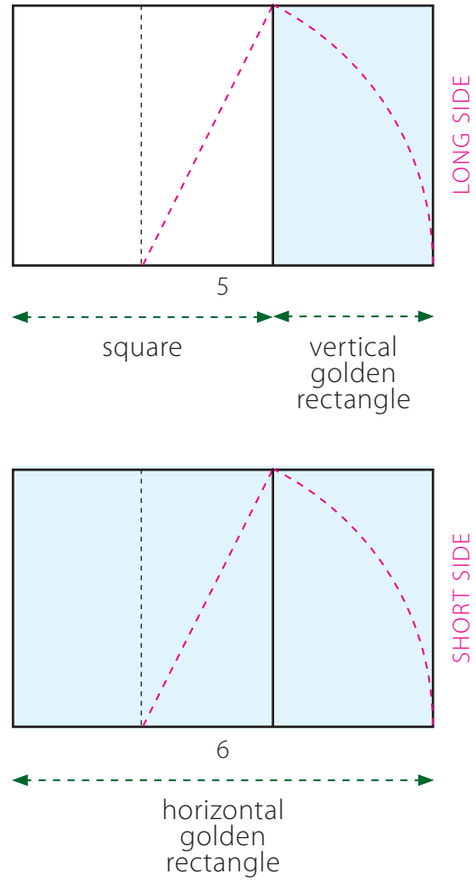
Drawing the Golden Rectangle

1 Draw a square (which needs to be drawn with precision or the geometrical construction will fail).

2 Divide the square into equal halves.

3 Draw the diagonal of one half.

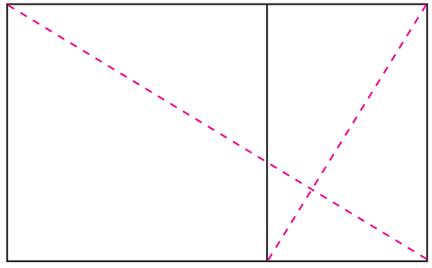
4 Using the diagonal of the half square as a radius, draw an arc of circle from the top corner of the square down to its base line. It is useful to extend the baseline first so that the arc can be drawn exactly to it.



5 Extend the square to where the arc cuts the square's extended baseline. The extended sector (shown in blue tone) is a ***vertical*** golden rectangle.

6 The original square and the extended sector combined (shown in blue tone) form a ***horizontal*** golden rectangle.

*Because the **long side** of the vertical golden rectangle and the **short side** of the horizontal golden rectangle both equal the sides of the original square, they share an intimate proportional relationship at the heart of the golden rectangle.*



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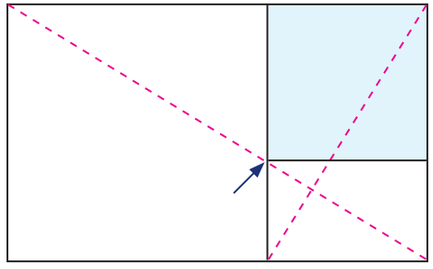

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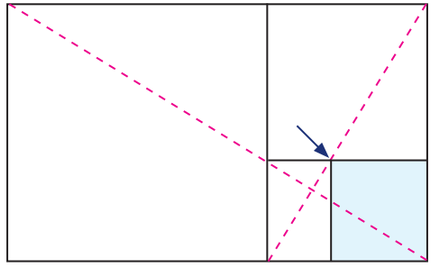

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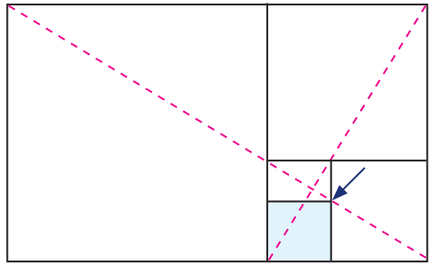
Preparing for the Spiral

7 Diagonals drawn in the large horizontal golden rectangle and the small vertical golden rectangle intersect at the eye of the spiral. This will become apparent as the spiral is drawn.

8 From where the large diagonal cuts the right hand side of the original square draw a horizontal line parallel to the rectangle's baseline. The line forms a square at the top of the vertical golden rectangle.

9 From where the baseline of the new square cuts the diagonal of the vertical golden rectangle draw a vertical line parallel to the rectangle's vertical sides. The construction generates a third, smaller square in the vertical golden rectangle.



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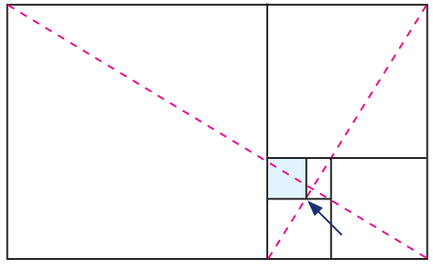

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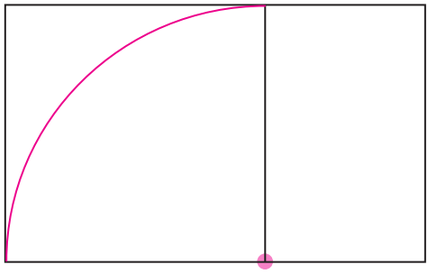
10 From where the third square cuts the large horizontal golden rectangle's diagonal draw a small line parallel to the large rectangle's baseline. The construction generates a fourth, even smaller square within the vertical golden rectangle.

11 From where the fourth small square cuts the vertical golden rectangle's diagonal draw a very small vertical line parallel to the rectangle's vertical sides.



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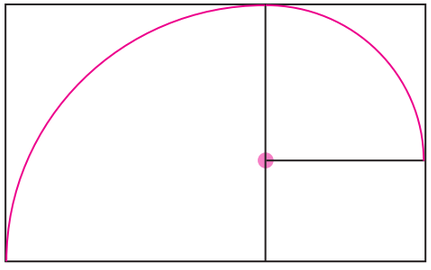

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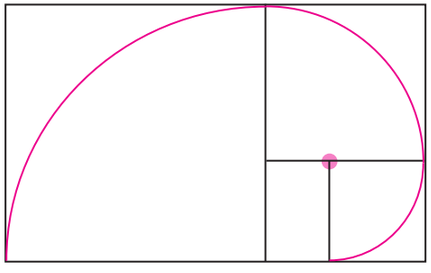

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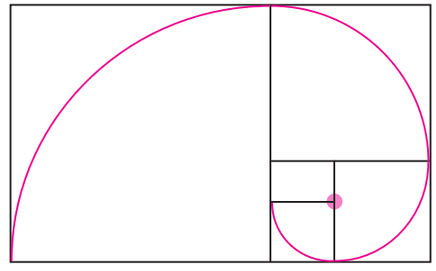
Drawing the Logarithmic Spiral

12 Draw a quarter circle arc in the largest square from the axis shown at the magenta point.

13 Draw a second quarter circle arc in the next smaller square from the axis at the magenta point. Ensure that the arc connects with and continues the line of the first arc.

14 Draw the third quarter arc of circle.



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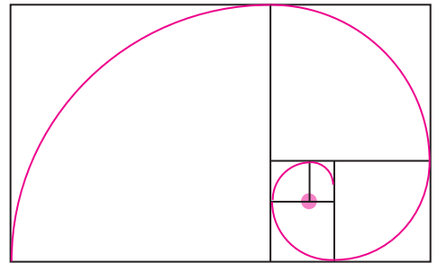

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15 Draw the fourth quarter arc of circle.

16 Draw the fifth quarter arc of circle.

NOTE The sixth quarter arc of circle has also been shown in drawing 16.

It is possible to continue the spiral further towards infinity by commencing the drawing at a larger scale but eventually the point is reached where it becomes difficult to draw further diminishing squares with accuracy. Everything beyond this scale is contained within the eye of the spiral, the small solid circle found at the centre of volutes in classical Greek column capitals. Philosophically, the spiral continues diminishing, or expanding, to infinity but neither infinity can be drawn.

When Greek geometers discovered how to draw the logarithmic spiral 2,500 years ago they unveiled the natural pattern of growth in the Nautilus shell, a revelation of equal significance to the modern discovery of the DNA spiral.

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