The Fibonacci Sequence and the Golden Section in the Lunette Decoration of the Medieval Church of San Nicola in Pisa

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(1) The surprising colored lunette decoration
(2) The geometrical model of the tarsia pattern
(3) The geometrical model of the linear decoration
(4) Unsolved questions and final observations


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## Introduction

The Surprising Colored Lunette Decoration


We use geometry to show that the lunette represents two themes:
(1) The Fibonacci numbers, from 1 to 55, with the tarsia pattern.
(2) The calculation of the Golden Section with the linear geometric decoration around the tarsia




Golden section
of a segment $L$


Golden rectangle of a square with side $L$

Golden section $\varphi=\mathbf{1}, 618$

The Lunette of San Nicola

The octagonal star


From the Double Quaternary to Octagons
The Lunette of San Nicola
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From the Double Quaternary to Octagons

Interior dome of the Dolat Abad pavilion of Yazd in Iran


The Fibonacci Sequence with Fine Circumferences:
$55,34,21,13,8,5,3,2,1,1$


How to make a geometric model of the tarsia with ruler and compass?


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The Tarsia Ideal Model: 55 and the Colored Square






Squares to Draw 8 Angled Pilaster as in the Bell Tower


The Lunette of San Nicola

## The Tarsia Pattern

How to Draw the Final Ideal Model with Thick Lines


Circumference
Central thickness Internal thickness External thickness

The Tarsia Final Colored Model with Thick Lines


The Linear Geometric Decoration
The Golden Rectangle $R$ is Built Using the Square Inscribed in the Semicircumference of the Lunette


## The Linear Geometric Decoration

The Golden Rectangle $R$ on the Basis of the Lunette


## The Linear Geometric Decoration

The Red Point to Find the Golden Section of a Segment and the Tarsia size


The Golden Rectangle $R$ and the Right Triangle Inscribed in the Semicircumference


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## The Linear Geometric Decoration

The Red Point to Find the Golden Section of a Segment and the Tarsia size


## The Linear Geometric Decoration

The " M " of the Ideal Model of Linear Geometric Decoration


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## The Linear Geometric Decoration

The Golden Section of $R$ Short Sides for the Final Ideal Model of Linear Geometric Decoration


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## The Linear Geometric Decoration

The Final Model of the Lunette Decoration with Thick Lines


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## Unsolved Questions and Final Observations

(1) Who and when decided to build the lunette decoration with the representation of two themes: the golden ratio and the Fibonacci sequence? The two themes represented different concepts, or there was an implied relationship between them?
(2) When the lunette was built the mathematical relationship between the two themes represented was not known.
(3) It

It was only in 1611 when J. Kepler showed that the ratio of two successive numbers of the sequence is either greater or less than the value of $1,618 \ldots$ (golden section) and that, with the progress of the succession, the golden section is the limit of this ratio.
(4) Therefore, unwittingly, the unique lunette decoration of the XIII century anticipated a discovery of four centuries later. May 26, 2018 36/38

There are Many Works of Art Inspired by the Fibonacci Sequence. .


## For further details see the paper

Antonio Albano, The Fibonacci Sequence and the Golden Section in a Lunette Decoration of the Medieval Church of San Nicola in Pisa, Territori della Cultura, 21, 48-59, ottobre 2015.

