

# The Eyes Have It

## Focal Point Choices and Compositional Geometry In Painting

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### Abstract

During research on the paper, *Porter's golden ratio, experimentally*, co-authored by Dr. Dirk Huylebrouck, we initially proposed that the viewer of a painting might be able to discern the underlying invisible geometrical composition of a painting. The experiment showed that points picked by the respondents revealed golden ratio proportions, but perhaps not because subjects could discern it, but more likely because the artist purposely placed important focal points at golden section divisions of space. This paper presents a trial experiment where subjects were asked to choose their own focal points or points of interest in a painting and measure distances from the sides and each other. The results seem to confirm a  $\sqrt{\Phi}$  geometric structure governing the placement of key elements.

### Introduction

In the analysis of the coordinates chosen by the respondents in *Porter's golden ratio, experimentally* [1] the software program immediately revealed that points viewers chose amassed at significant coordinates revealing Porter's golden ratio composition and confirming this author's analysis. However, we concluded viewers were not picking points on the basis of sensing compositional geometry, but were selecting important visual points in the artist's composition. Do artists who have paintings that appear to be based on geometrical compositions make a deliberate decision, or an intuitive placement of key elements, or is it just a coincidence? If no records exist or non-living artists to interview, then any assertion is disputable. (Did Bacon write Shakespeare's plays?) If those facts were in evidence then there is nothing left to prove. Whether it was the artist's intent or not, does that deny the reality of the geometry, which can be measured? These focal points or divisions of space in the composition were selected by the artist and intended as key structural elements, governed by the golden ratio. All the evidence from this and past papers would point to a very deliberate use of a sophisticated geometry based on the golden ratio. [1] Issues of aesthetic preference for the golden ratio are not dealt with here, but it is suggested that some artists are enamored by the mystique surrounding the golden ratio. It is also noted that there is a prevalence of the golden ratio in the pedagogy of art. Even if the golden ratio as an aesthetic preference may be debated, its efficacy, as an organizing device in the composition of a painting would seem a more defensible position. [2]

### The Experiment

I collected data on focal point choices from a class of Towson University math honors students. Without any preliminary discussion they were asked to look at two color reproductions of paintings, (one I had already analyzed)[3], a horizontal interior portrait painting, *July Interior*, (1964) by Fairfield Porter and one I had not except to note its  $\sqrt{\Phi}$  size (and reducing any tendency towards a self-fulfilling prophecy). This was a vertical interior portrait, *Théodore Duret*, (1912)

by the French artist, Edouard Vuillard. Because of space restraints the color images are not included here but are readily available on the Internet. Each is a  $\sqrt{\Phi}$  rectangle (based on the museum's published sizes). This root golden ratio rectangle has sides and diagonal that are in a geometric progression of 1,  $\sqrt{\Phi}$ ,  $\Phi$ . Dividing the diagonal successively by  $\sqrt{\Phi}$  yields the long side and short side with all the same  $\Phi$  proportions as each other. The two image copies measured the same at 177 x 225 mms. Successively dividing 286 (the diagonal) by 1.272 ( $\sqrt{\Phi}$ ) = 225–177–139–109–86–68–53, where every other number is in golden ratio proportion (1.618) and is also the Fibonacci two term recursive sequence.

For each painting the students were asked:

- A. Where are the primary points of interest in the painting? Pick five obvious points of interest (focal points); label the points from 1 to 5 in order of importance.
- B. Where are the primary spatial divisions? Pick points where obvious primary horizontals and verticals intersect and label the points from A to E in order of importance.
- C. Then using a new color copy of the Porter painting, *July Interior*, (a portrait of his wife, Anne, ill in bed with hepatitis) they were then asked to measure the chosen points for that painting from the edges of the painting, (1) and from each other (2).

## Results

### A + B Focal point choices for *Théodore Duret*:

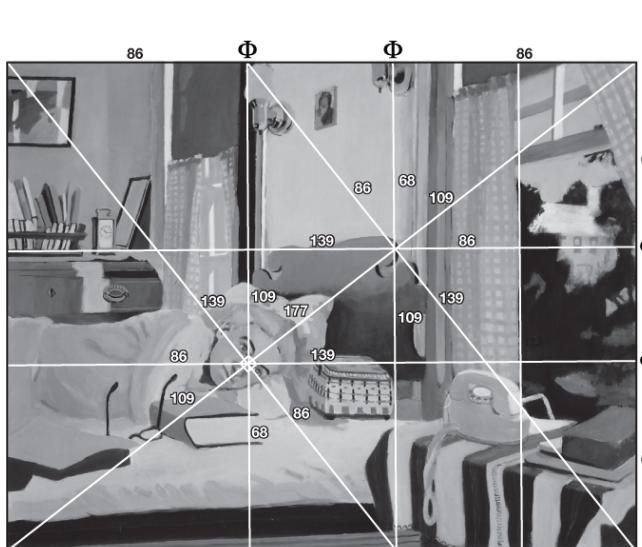
Face:	83%
Cat:	83%
Door:	72%
Center of pile of papers:	61% (coordinates of all choices exactly corresponding with golden ratio: 50%)
Small pile of books:	50% (all correspond exactly with golden ratio)
Foreground paper:	39%

The choices in the Vuillard painting seemed more often located to some generalized areas and except for the face and cat, the precise coordinates were not as useful in tracking choices of focal points or intersections in relation to golden ratio. Nevertheless, 83% of the respondents chose both Duret's face (specifically his forehead) as their first choice focal point (which interestingly is at exactly one third the horizontal and  $\Phi$  of the vertical), and his cat as second or third, which is at a  $\Phi$  distance from the left side (53mm) and a  $\sqrt{\Phi}$  distance from the bottom side (68mm). Rather than using more detail or narrative interest, focal points in the Vuillard are often created by splashes of light as seen in Duret's forehead, the center of the pile of papers and the small pile of books behind Duret's left shoulder. The right side of Duret's face, which also aligns vertically with the large painting behind, that conforms to the golden ratio composition. There were a number of picks that seemed random or arbitrarily near to edges, but upon checking the coordinates, unexpectedly, formed squares within the composition. (Further analysis of the data on this complex painting seems warranted).

### Coordinates chosen for *July Interior*:

A	A + B
89% chose 24:6 (phone)	94% chose 24:6 (phone)
83% chose 13:10 (face)	83% chose 13:10 (face)
39% chose 17:8 (sewing box)	72% chose 17:8 (sewing box)
50% chose 28:22 (vertical muntin)	78% chose 28:22 (vertical muntin)
44% chose 29:16 (neighbor's house)	44% chose 29:16 (neighbor's house)

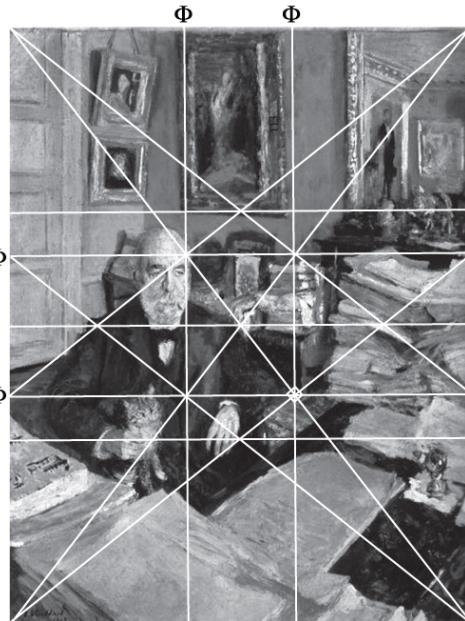
As expected, a near majority of focal point choices for *July Interior* centered on Anne's eyes, (also called the geometric 'eye' of the  $\sqrt{\Phi}$  composition). Less expected were a slightly higher interest in the phone, (especially when coordinates were combined) the sewing box next to her, and more surprising, the 44% who chose the neighbor's house outside the window (which is on the golden ratio horizontal and also the perspective eye level of the painting).



**Figure 1:** Porter, *Fairfield July Interior* 1964, 142.8 X 182.9 cm, Hirshhorn Museum and

Sculpture Garden, Washington, DC. [3]

**Figure 2:** Édouard Vuillard, *Théodore Duret*, 95.2 x 74.8 cm, The National Gallery of Art, Washington, DC.



1.

1. 58.8% measured 138-140 mm
2. 41.2% measured 108-110 mm
3. 64.7% measured 85-87 mm
4. 76.5% measured 67-70 mm
5. 35.3% measured 53-55 mm

2.

1. 70.6% recorded 130-135 mm
2. 41.0% recorded 103-105 mm
3. 70.6% recorded 90-92 mms
4. 35.3% recorded 60-65 mm
5. 11.8% recorded 50 mm

In measuring distances in *July Interior* large percentages of the respondents chose and recorded their measurements within 2 mm of the  $\sqrt{\Phi}$  numbers. Also, interestingly, measures recorded by the subjects from their primary focal point, Anne's eyes, to their other chosen points showed many were at the same distance, (especially 130-135mm and 90-92mm), almost as if Anne was surrounded in equal distance with things important to her in the room. The portrait suggests an allusive painted poem with Anne as the lyric center. This center, her face, is found by using a main diagonal of the canvas, and a diagonal drawn at right angles to it from the opposite corner. Unique to the root golden ratio rectangle is that the vertical and horizontals at the intersection of these diagonals are at the golden ratio divisions of the short and long sides.

## Conclusion

The results of this experiment seem to confirm results gathered in the research for *Porter's golden ratio, experimentally*, in that respondents' choices of primary focal points correspond with

key points in the geometric intersections of the compositional structure of the painting. It is worth recognizing that a viewer's visual experience can be cognitively interpreted for other than aesthetic reasons and may vary according to the viewer's personal life experience and modified if there is a visual task assigned. [4] But this study did suggest some important directions for future empirical research. Objective avenues for this type of study could involve recent eye-tracking technologies. Certainly, Buswell corroborated the thesis that the composition of a work of art influences the pattern of eye movement [5] and Nodine demonstrated that seventy five percent of the subjects in his eye tracking study preferred a golden ratio composition over an altered version, the arrangements of visual elements influencing the way a subject analyzes the composition (largely corroborating the results of the author's studies). [6] Is there a correlation between gaze fixations and aesthetic pleasure, or is it simply a factor of information gathering? There could be important implications for the future of design education curricula if it can be determined that traditional focal point positioning is not necessarily how a work is perceived.

Data gathered by eye-tracking equipment is a way to determine actual response stimulation from points in a given image and a way to assess the claims of certain design attributes, particularly golden ratio compositions. It can provide a more objective measure of actual eye fixations than a viewer's conscious choice of focal points. Until recently only large corporations were benefiting from controlled eye tracking studies, mainly for marketing purposes. Research in eye-tracking is still in its relative infancy, and up until now very expensive, such that only well funded research has been possible but already results have led to revisions in website design and advertising design. However, with web cams now already installed in most computers, the use of less expensive eye tracking technology for empirical research in the fine arts has a rich potential. New objective, empirical data may be generated by eye-tracking experiments to determine if foveal and saccadic viewing has mathematical significance in focal point perception and the geometry of composition as perceived by the viewer. It can provide another empirical manner of gaining an audience's affirmation of an artist's compositional syntax without the more contestable philosophical and psychological issues of perception and cognition. [7]

## References

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