

Some Perspective Considerations On Vermeer's

The Music Lesson

(reviewed version, Sep. 24, 2009)

TOMÁS GARCÍA-SALGADO

National Autonomous University of México

tgsalgado@perspectivegeometry.com

Abstract

The scene of *The Music Lesson* looks quite natural, unlikely constructed by any perspective method available at the time. The mirror suggests that it was placed on purpose to reflect the apprentice's face, moreover, the vertical alignment of the mirror, the apprentice, the viol, the chair, and the table's rug falling into the floor, seems to be arranged with the intention of creating a virtual plane of composition. Looking carefully at the furniture of the room, one wonders if the teacher can freely walk toward us without skipping the viol. However, the paramount question of the Music Lesson is whether it was produced by a perspective method or by the aid of a camera obscura; a question that is at the core of the controversy between Philip Steadman and Allan Mills. Here, we will discuss the main arguments of this controversy while introducing some other new arguments related to the scene's perspective that might help to understand how it was constructed.

1 Steadman-Mills Controversy

Philip Steadman, based on his reconstruction experiment [1], sustains that Vermeer traced *The Music Lesson* in full-size using a cubicle-type camera obscura: "*He used this arrangement to project the scene onto the back wall, which thus served as the camera's screen.*" [2] On the other hand Allan A. Mills suggests that Vermeer constructed the composition according to the perspective methods taught by Vredeman and Hondius [3]. Also Mills says: "... *that he had seen —and was stimulated by— compositions in a portable camera obscura and could well have traced major outlines on thin paper.*" [4]

A weak supposition because it lacks to mention what the real size of the painting versus its projected image might be. About this, Steadman refers: "*Each of Vermeer's six pictures is the same size as its 'projected image' because he traced it. It is extremely difficult, on the other hand, to see how this strange geometrical phenomenon could arise from any use of conventional perspective techniques.*" [5] To which Mills argues: "*Use of two perspective grids in a fixed ratio (in the manner of the well-known 'squared grids' technique) would, I think, lead to the phenomenon of size matching that has been pointed out by Steadman.*" [6] To sustain such thesis, Mills must have to prove how the phenomenon of size matching can be achieved by a drawing, and furthermore, to prove that the "use of two perspective grids in a fixed ratio" was indeed known at the time.

To analyze the perspective of *The Music Lesson*, we have first to know what were the theoretical and practical possibilities of Vermeer's contemporary methods, and second, to unveil the undeniable geometrical truths that the painting itself holds. Hans Vredeman de Vries (1527-c. 1607) was an architect. His Perspective treatise [7] exclusively contains imaginary examples since no one of them seems to depict a real building, and it does not illustrate any example of mirror reflection. A couple of errors I found in his treatise can tell us how far his method was of being accurate [8]. Several of Vredeman drawings suggest the use of the so-called distance points, laying these points either inside the drawing's area, or beyond of it —beyond the *limit of the visual field*, in Modular Perspective terms. In all cases, his drawings do not suggest the use of

perspective grids in a fixed ratio, they rather seems deduced to each solution. Another peculiarity in Vredeman's drawings is the frequent use of wide angles, larger than 100° , as for instance, that of the small room represented in Plate 28 of his treatise's, which is of 119.27° as I have proved [9]. On the contrary, Vermeer's preference was the use of normal angles, closer to 90° . Therefore, what possible learning could have Vermeer gained from Vredeman's treatise to construct real scenes? Moreover, how Vredeman's method could have helped him to cast the mirror's reflected image? These questions inevitably lead us to hypothesize about how the perspective scene was outlined.

1 Assuming that both plan and elevation of the room, scale 1:20, were used by Vermeer to deduce its perspective, the size of the drawing would have resulted of 8.1 x 9.5 cm; useless for detailing the scene and very imprecise to be amplified almost eight times its current size. Besides, there is no evidence of Vermeer being familiar with Scheiner's *Pantographice* (1631); an instrument that ever since was mainly used for copying and scaling simple shapes. Therefore, to "...copy the result at an enlarged scale onto his prepared canvas..." as Mills suggests, is not a practical procedure to enlarge a complex drawing. Thinking as a painter, it would be easier to copy the scene at full-size on paper (as projected on the back wall), corrected the upside down and reversed image, and in turn, transfer it to canvas. Thus, the process of detailing each element of the scene and so the color layering, were mere routine for a dexterous painter as Vermeer was.

2 Let us see now what kind of problems must have faced Vermeer in the remote case of constructing the scene by some perspective method at the time.

- To determine the central vanishing point, the horizon line, the distance points location, the base line modulation, the height of the apprentice and the teacher, the horizon line of the mirror and the position of its corresponding vanishing points, specific rules of perspective were needed, of which, those for the mirror were unknown.

- It would be complicated to draw the perspective directly on the canvas because the distance points would have fallen outside of it, unless it was used a wider canvas to fix the distance points. Most likely, a full-size drawing on paper was used to transfer the perspective to canvas, which is more consistent with the apparent narrowed angle that the scene shows in the painting, despite the interval between both distance points depicts an ample visual angle. Years later of being written this article, I have analyzed in detail how a trimmed scene always retains its visual angle [10].

- In the Music Lesson, the so-called base line (commonly set into lower position of a drawing to initiate the modulation of a floor) does not match with the marble-tiles corners of the first row. An impractical and complicated way to start drawing a floor without mastering perspective, of which, we are not certain Vermeer was capable of. On the other hand, the base line in Vredeman's drawings is consistently referred to the modulation of the floor either in frontal or oblique position.

- It is also common to appreciate in Vredeman's interior perspectives, how the vertical modulation is continued with the floor —even with the celining. Whereas the modulation between windows and floor do not match to each other in the Music Lesson, strongly suggesting a still-life room representation. Thinking as an architect, I believe that the the room's tiling work was commenced at left corner of the floor at the rear wall —laying half pieces in diagonal position along the left and rear walls. Therefore, what the tiling is telling us is how it was lay by the floor tiler.

- Intriguingly, the horizon line in the Music Lesson is not placed at the sight level of the personages (*Orison* in Vredeman's terms), as adopted after Alberti. Here, the *orison* levels at the apprentice's elbow, suggesting a sat position of the painter —and the observer too— to comfortable delineate the projected image on canvas (or paper), fastened upon the back wall of the room somehow.

- The pictorial scene do not entirely represent the observer's visual field, as it can easily be proved by the asymmetrical position of the central vanishing point. Moreover, it is noticeable how

the floor is shown in excess while the view of the ceiling seems abruptly cut, as if Vermeer wanted to hide something []. Because of this, the left wall looks oddly trimmed, and almost half of the floor-tiling is hidden by the table's rug. It seems as if all the elements were intentionally arranged to compose a trimmed scene.

- To accurately depict the elements of the scene, Vermeer must have faced puzzling problems, all of them beyond any perspective method available at the time. As for instance: the soft folds of the rug and its intricate design, the foreshortening of both the viol and the chair, the reflected image of the hanging mirror, the letters on the opened virginal cover, and the stained-glasses design.

- If truly the scene was outlined directly on canvas, then the X-rays studies (reported by Mills) would have revealed the existence of some traces of the overlapped outlining of the figures (thin lines between the table and the rug, the chair and the viol, the apprentice's dress and the virginal). Unfortunately, such traces were not found according to Steadman [11]. Theoretically, 6 vanishing points (3 for the room plus 3 for the mirror) were needed to control and verify the perspective outlining during the color application, being the central vanishing point the only accessible one on canvas. This maybe explain why all the orthogonal lines are more accurately represented than the diagonal lines.

As we have seen, the theory of the scene being deduced by a perspective method looks to be improbable; instead, I am convinced that the scene was taken with a camera obscura. In doing this, Vermeer corrected the image reversed left-to-right and upside-down projection, and adjusted the image at canvas' size —or better to say, at its framing size. How he did it, we do not know yet for certain, but somehow he copied the wall's projected image at full-size on paper (or, oiled paper to make it more transparent), and thence transfer it to canvas. A simple technique like applying black crayon over the drawing's reverse (in Saenredam's manner), and then rubbing it against the canvas, all over its surface, would have sufficed. Any way, he needed to retouch all the scene details directly on canvas before applying the color.

2 The Music Lesson in *modular* measures

All the measures presented here were deduced in modules, being a module (m) of any dimension, as larger or smaller we want it to be. The modular values estimation is based in the author's *Modular Perspective* method [12]. This method can be applied either by using the customary plan(s) and elevation(s) projections, or by deducing a perspective directly onto the *Perspective Plane*, that is, without the aid of geometrals. Moreover, it can be recovered geometral data from any given perspective, as in the case of the Music Lesson.

To deduce the room's dimensions I took as reference the floor tiling modulation, as it is show in **Figures 1** and **2**. In turn, we have to pick one element of the scene as reference to deduce the size of the floor's tiles; in this case, the teacher is the best clue we have at hand. Assuming that the teacher has a stature of 180 cm, then it would correspond to 4.6 m in perspective, as it can be proved by rising the floor modulation along its vertical position. Now, dividing 180/4.6, we have as result a tile dianogal of 39.13 cm, and consequently, their sides are of 27.67 x 27.67 cm. If we increase the size of the tiles one centimeter, it in turn would increase 4.6 cm the teacher's height, which gives us a trustworthy variation of ± 1 cm for the tiles measurement. Applying the same criteria we have deduced the following measurements:

The observer's horizon level rises 109 cm form the floor. The depth of the floor, as shown in the painting, is 367 cm. The base of the left wall is 285 cm, and the width of rear wall is of 328 cm. The high of the room from the bottom to the ceiling's beams is 299 cm. The chair's seat is 46 x 46 cm and its high of 46 cm too. The apprentice's stature is 167 cm. The virginal's width is 178 cm, and the keyboard high is 98 cm. The mirror's width is 82 cm. As the rug covers the table, presumably squared, its sides approaches 88 cm, and its high 86 cm.

Among other interesting measurements we have: the distance points on the horizon line are located 76 cm from the central vanishing point, to its left and right sides respectively —being these dimensions in true size. The natural scale of the virtual picture plane (*Perspective Plane* in Modular Perspective terms) is about 162 x 190 cm. The distance between the observer's vantage point and the *Perspective Plane* is 196 cm. The angle of the observer's visual field, which rather I prefer to call "framing-angle", opens horizontally 45° while 51° vertically. Here, the term "framing-angle" is used to avoid mistaken with the natural angle of vision. Moreover, the "framing-angle" of the Music Lesson is asymmetrical, since it opens 25.5° to the left side of the observer's sightline, and 19.5° to its right side; whereas, it opens 22.5° upwards, and 28.5° downwards, from the observer's sightline too. At this point we have to wonder how possible such asymmetrical scene could have been constructed without the aid of some mighty method.

The framed-scene projected at full-size on the back wall is of 63 x 74 cm, which turn out to be exactly the size of the painting. The observer's distance (from the projected image) is about 75.6 cm.

Theoretically, the procedure presented here would be the same as if we were so lucky of working with the original. According to my experience in perspective reconstruction, working on a copy is reliable since all lines in perspective are related one to another, and therefore, we always have more than one option to verify whatever we want to.

3 The Mirror

The mirror is the main element of the composition due to the virtual plane of composition it generates by aligning the apprentice, the viol, the chair and the silhouette of the rug [13]. As a second perspective, the mirror plays back partially the image of the room while reflecting the motionless face of the apprentice, as wondering what key to play next. It is unimaginable an empty space between the apprentice and the observer's position without killing the composition; seemingly, nothing was placed at random in the room except its architectural features.

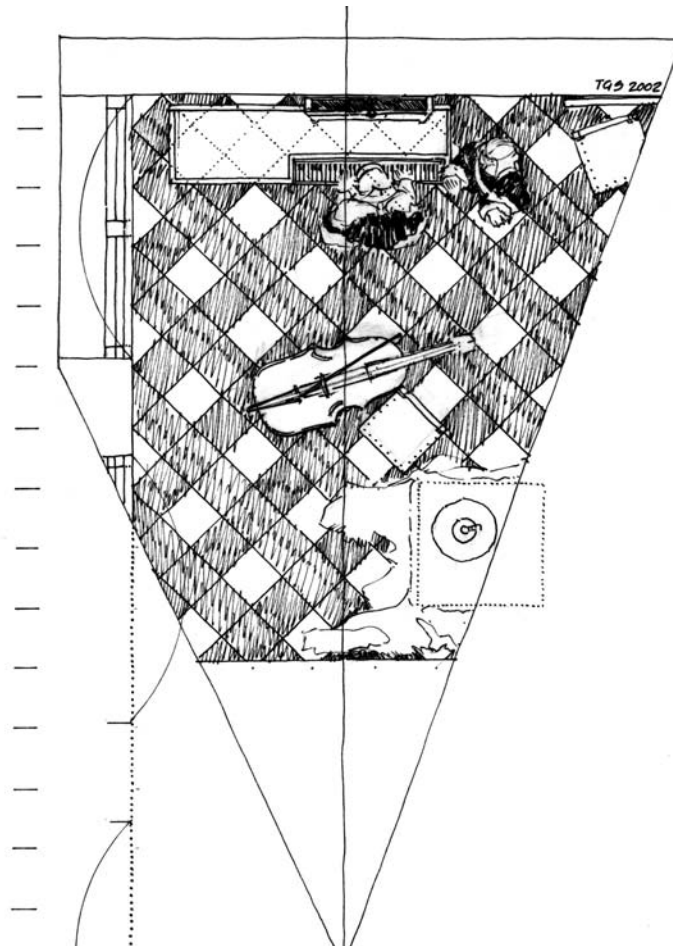
The shadow of the mirror's frame projected on the wall, by the daylight sourced by the left window, is useless to determine the mirror's inclination. Since the only trustworthy data we have is the mirror's reflected perspective, we have first to calculate the height of its horizon onto the *perspective plane*, and next, the distance at which the imaginary vantage point is located; calculations that lead us to the conclusion that the mirror slants approximately 18° [14]. The mirror has indeed not only useful clues to determine its own inclination, it also holds the only piece of visual information to estimate the depth of the room (about of 640 cm). Although less precisely, the mirror also reflects three objects at the back of the room, which could be identified as the piers of an easel, a box-like that could be the famous cubicle-type camera obscura, and the artist's chair.

The composition of the first pictorial plane truly is remarkable. The depth of the room is increased by the near position of the porcelain pitcher to the observer, cleverly placed together with the apprentice's elbow at the visual horizon level, creating thus a visual tension between them and the observer's vantage point. Such visual tension can be made disappear by occluding from the scene the porcelain pitcher; try this and you will be convinced of the important role that the pitcher plays strengthening the depth of the room. In addition, if you carefully analyze the position of the pitcher, you will realize why it was displaced from the center of the table.

Finally, to correctly perceive the image formation of the original painting —or what is the same, to perceive its illusory effect of deepness— you have to place yourself at the painter's vantage point (about 75.6 cm of distance). In doing this, make sure that your eye's level coincides with the horizon line, and your sightline runs perpendicularly to the apprentice's elbow. To increase the effect you have to see the painting with one eye while occluding the other, thus you will vividly perceive how the floor tiles recede as if you were about to walk into the room (see Figure 2).

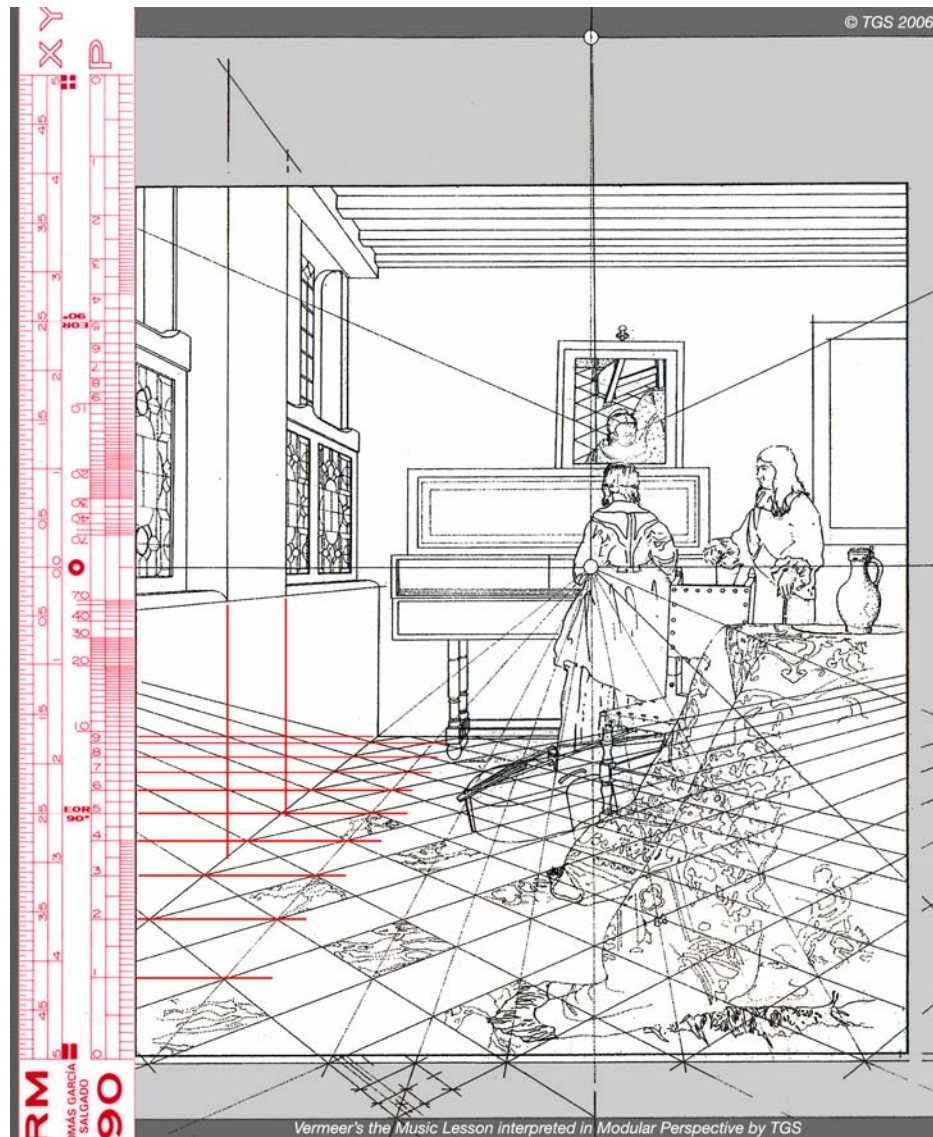
Conclusions

The accurate outlining of The Music Lesson perspective strongly suggest that it was beyond of any theory, or practice, available to Vermeer at the time. Certainly the use of the distance points was extensible practiced by Vredeman, despite of which the geometric principle of controlling the observer's visual angle was unknown at the time. Therefore, it seems unlikely the "use of two perspective grids in a fixed ratio..." as Mills suggests, unless it can be proved that they were in fact used. Furthermore, how possible such grids could have helped to render the mirror's reflected image; a complex problem to solve even nowadays. The architecture of the room and the furniture seems to be depicted in real proportions, and so the floor grid, producing a precise image formation []. The size of the projected image on the back wall (63x74 cm), after been trimmed by the framing-angle (45°/51°), allow us to corroborate an observer's distance of 75.6 cm, compatible to that of the cubicle-type camera obscura suggested by Steadman. In other words, our perspective analysis confirm Steadman's thesis of the painting's size corresponding with its projected image. Finally, our reconstruction plan of the room can prove indeed that the teacher can freely walk across of it (to greet you) without skipping the viol.



Figures 1

Plan and perspective as reconstructed by the author. The latter shows the calculation of the image formation of the painting.



Figures 2.

For further explanation see the author's article:

"Modular Perspective and Vermeer's Room" Bridges London (Conference Proceedings 2006/ R. Sarhangi & J. Sharp, Editors, pp. 379-386.

References and Notes

[1] Philip Steadman, Commentary on "Vermeer and the Camera Obscura: Some Practical Considerations." Leonardo, 32, No. 2 pp. 137-141, (1999): "In 1989, I oversaw the reconstruction of Vermeer's room for a BBC film, furnished as in The Music Lesson, in a Bristol television studio (—)." p. 138.

[2] Steadman [1] p. 140.

[3] Allan A. Mills, "Vermeer and the Camera Obscura: Some Practical Considerations." Leonardo, 31, No. 3, pp. 213- 218, 1998: "I believe That Vermeer painted his canvases right side up and in good light, first Laying out a perspective grid according to the graphical methods then taught by his fellow countryman de Vries (—) and Hondius (—)." p. 218.

[4] Steadman [1], Response by Allan A. Mills: “*To have used such sketches as a basis of his paintings, Vermeer must then have had to flip them over, extend and rectify the orthogonals as pencil lines and, finally copy the result at an enlarged scale onto his prepared canvas.*” p. 141.

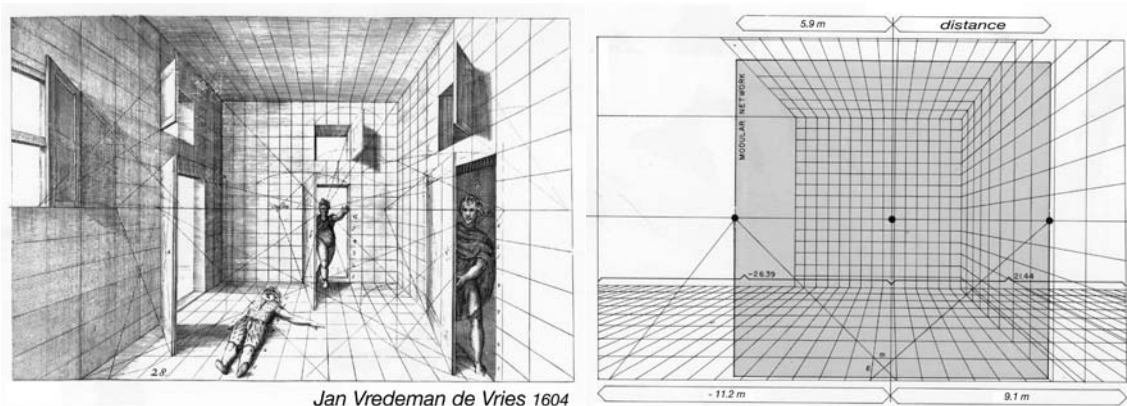
[5] Steadman [1] p. 140.

[6] Response by Mills [1] p. 141.

[7] Jan Vredeman de Vries, *Perspective* (New York: Dover Pub., 1968/ originally published by Henricus Hondius, 1604).

[8] Vredeman [7], Plates 11 and 12.

[9] Tomás García-Salgado, “*The Concept of distance in classic Perspective and Modular Network Perspective.*” Proceedings of the 10th Congress of the International Council for Building Research, Studies and Documentation, Vol. 7 pp. 3005-3011, 1986.



Jan Vredeman de Vries 1604

Note 9, complementary figures. Vredeman frequently used wide visual angles, larger than 90° , as we had proved through his treatise’s Plate 28, deducing in it an angle of 119.27° (second figure by the author).

[10] Tomás García-Salgado, “*Modular Perspective and Vermeer’s Room.*” Bridges London (Conference Proceedings 2006, Editors: R. Sarhangi & J. Sharp), p. 380

[11] Steadman [1] p. 139: “*No measured perspective drawings by Vermeer survive, and there are no signs of preparatory construction lines or grids under the painted surface of his canvases.*”

[12] To consult about the author’s perspective method, see: Tomás García-Salgado, “*A Modular Network Vs. Vectorial Models*” Leonardo, vol. 21, N° 3, pp. 277-284, 1988.

[13] An axe into the space becomes a ‘plane’ (virtual or real), meanwhile an axe onto a plane becomes as a ‘straight line’.

[14] Tomás García-Salgado, “*The Music Lesson and its Reflected Perspective Image on the Mirror.*” Art+Math Proceedings, University of Boulder Colorado, 2005, pp. 156-160.

This article must be cited as follows:

GARCÍA-SALGADO, Tomás. 2009. “Some Perspective Considerations on Vermeer’s The Music Lesson”. Website/ perspectivegeometry.com