

LE CORBUSIER'S "REGULATING LINES" FOR THE VILLA AT GARCHES (1927 )  
AND OTHER EARLY ARCHITECTURAL WORKS

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"J'ai déterminé mon oeuvre", Le Corbusier, Précisions<sup>1</sup>.

As with all aspects of his works and ideas, Le Corbusier's approach to "regulating lines" and systems of proportions was not static but rather, as we showed in an earlier article, underwent a radical change with only the idea, if not the usage, of the right angle remaining an invariant<sup>2</sup>. By means of Le Corbusier's early writings and preliminary designs it was determined that the theoretical basis for his "Purist" paintings of the early twenties was a pair of opposite facing triangles contained inside the edges of the canvas. (fig. 1) The intersection of these two triangles determined "the place of the right angle" and in turn a right angle. We were however unable to explain how exactly Le Corbusier turned this theory into practice<sup>3</sup>.

The radical change referred to above involved the so-called "golden number"<sup>4</sup>. While, as it was pointed out, Le Corbusier's texts of the early twenties displayed if anything, an anti-golden number attitude, he apparently used the "golden spiral" as the theoretical, if not actual, basis for a 1929 painting. The change in attitude we suggested was due to the publication of Ghyka's Esthétique des proportions in 1927<sup>5</sup>.

Subsequently, however, Mr Gregory Colluchi pointed out to us that this hypothesis was in apparent contradiction with the southern elevation (fig. 3) for Le Corbusier's villa at Garches - whose nominal date is also 1927 - which appears in the Oeuvre complète and also with the discussion of this villa by Colin Rowe<sup>6</sup>. Because of this

we decided to make a detailed study of Le Corbusier's systems of proportions in his early projects, and in particular the villa at Garches.

In order to study the evolution of Le Corbusier's ideas and methods, it is first of all necessary to determine the chronology of the various designs, contracts and constructions at Garches. This we were able to do by means of documents at the Fondation Le Corbusier and in particular the so called "livre noir de l'atelier" (record book) in which some drawings were assigned a number and sometimes a date:

|                                      |  |
|--------------------------------------|--|
| before July 15, 1926:                | five drawings for villa <u>at Garches</u> <sup>7</sup>   |
| before October 20, 1926:             | three plans <sup>8</sup>   |
| November 10, 1926:                   | date of the contractual agreement between Madame Gabrielle de Monzie and the architects Le Corbusier and Pierre Jeanneret <sup>9</sup> |
| December 17, 1926:                   | plans for the basement, ground, first and second floors <sup>10</sup>  |
| January 5, 1927:                     | bill for earthwork from the contractor <sup>11</sup>   |
| January 8, 1927:                     | plans for the basement, ground, first and second floors <sup>12</sup>  |
| March 14, 1927:                      | plans for the basement, ground floor, upper floor, terrace, facades, sections <sup>13</sup>  |
| March 30, 1927:                      | request for the authorisation to build <sup>14</sup>   |
| April 1927:                          | plans for plumbing, glass work, heating <sup>15</sup>  |
| April 29, 1927 to November 23, 1927: | various plans for the inside of the house, terrace, garden, house for the guardian <sup>16</sup> .                                     |

From the above we see that most if not all of the planning for the form and shape of the house was done in the second half of 1926 with the construction itself starting in late 1926 or early 1927. Most of the main construction for the house must have been finished by late autumn of 1927. But the above plans only bring us up to Atelier plan number 982 and as we see the "official" plans of figures 2 and 3 bear the numbers 1086 and 1087. When we check the "livre noir" we find that they date from September 5, 1928 where they are described as "tracés régulateurs". These plans are therefore separated by at least one and one half years from the time when the actual shape and dimensions of the house were fixed.

The dates of these formal plans mean nothing by themselves for it is possible that they merely represent polished versions of preliminary sketches. Thus it is to the mass of sketches which have no record book numbers and no date written on them that we must now turn our attention. Among all the drawings there is only one on which there is a sign of "regulating lines" and that is number 10505 (fig.4)<sup>17</sup>.

We shall discuss figures 2, 3 and 4 in more detail later on, and simply point out here that while most of the features of the building itself are about the same in both sets, the regulating lines are quite different<sup>18</sup>.

We are not done however with drawings involving regulating lines for Garches, for a third version (fig.5) appears in Précisions and again, this sketch does not correspond to either the "official" drawings of figures 2 and 3 or the version of figure 4.<sup>19</sup>

We see then that to understand the design process at Garches we cannot rely upon the "official" sketch alone and that the meaning of the version of figure 4 is far from being transparent. What we must do is consider the drawings for earlier works that contain regulating lines and also Le Corbusier's writings on the subject.

For ease of reference and as an aid to further research, we have tabulated the source of various drawings with regulating lines<sup>20</sup>. When we examine the drawings for buildings before Garches we notice several things. First of all, the lack of consistency between versions that we saw with respect to Garches is also true in other cases. Thus for Villa Schwab none of the Archives designs show a regulating line whereas we have at least one in each of the three articles entitled "Tracés r gulateurs". For the villa at Vaucresson, there is a "final" version with the right angle sitting above the roof line but this is not the case for the preliminary version. For the Maisons La Roche-Jeanneret, the preliminary drawing (15183) seems to be missing some of the lines of the "final" version (15232, TR2, OC) but this may be the result of a bad reproduction.

Next we notice that the "regulating lines" consist entirely of various perpendicular and parallel lines and that neither the equilateral triangle (fig. 1) nor the "golden number" appear. Further as far as the degree of complexity of the system of regulating lines is concerned, it appears that we can distinguish three types (fig. 6). In the first type the vertex of a right triangle indicates the location of an important point. This is illustrated by the analyses of Michelangelo's Capitol in Rome and the Petit Trianon at Versailles. In the second type we have one main diagonal and several lines perpendicular to it. Illustrations of this are given by Villa Schwab, the northern elevation of the "official" version of Garches (fig. 2), and house C-1 at Stuttgart.

In the third type we have several diagonals and sets of perpendicular lines, this type being illustrated by Maison Ozenfant, the main facade of maisons La Roche-Jeanneret and house C-2 Stuttgart. Further we see from these examples that the degree of complexity of the systems does not follow any particular chronological order.

What, then, about Le Corbusier's writings on the subject of regulating lines? Aside from a few very brief statements the first discussion appears to be that of the 1921 article with Ozenfant entitled "Le purisme", but this deals only with the equilateral triangles and place of the right angle of figure 1.<sup>21</sup>

In "Les tracés régulateurs" (TR1; text repeated in TR2) which also dates from 1921, Le Corbusier states that Michelangelo used the "place of the right angle" to give definiteness to his ideas and used the same principles for the details as for the overall plan.<sup>22</sup>

Then as far as Villa Schwab is concerned we have the following statement (fig. 6, type II):

"The facades, as a whole, correspond to the same angle A which determines [the slope of] the diagonal; the various parallels and perpendiculars [to this diagonal] give the correcting factor for the secondary elements: doors, windows, panels, etc. down to the last detail"<sup>23</sup>.

Notice this idea of correction of the secondary elements which also appears to be the idea behind the following statement found earlier on in the text:

"A regulating line is an assurance against the arbitrary: it is the operation of verification which gives its stamp of approval to all work born in the heat of creation, the schoolboy's proof by [the casting out of] 9s, the Q.E.D. of the mathematician".<sup>24</sup>

The statement is far removed from the following found in the 1918 "Après le Cubisme":

"The painter's [instrument] is his eye which indeed acts as an instrument which controls, checks and penetrates".<sup>25</sup>

<sup>→ Par.</sup>  
In the period between 1921 and 1928 we have only a few brief remarks published in the journal, L'Architecture Vivante, and the book, Almanach d'architecture moderne<sup>26</sup>. remarks in the journal L'Architecture Vivante

"What work of the imagination worthy of a poet and what cunning on the part of an inventor is necessary in order that each centimeter of the terrain be used to its utmost,

in order that life inside be easy, that the placement of the rooms, closets and heating and of everything in general, be worthy of the facade and that nothing important be neglected; all that is translated by the divine language of proportion. Then, a window in the facade is like a diamond."<sup>27</sup>

"Regulating lines are used to solve the problem of unity.... [They] were widely used in certain great periods.... There is no universal, easy to apply formula for obtaining these regulating lines; it is truly a question of inspiration, of true creation..."<sup>28</sup>

"We can accept that the great periods in architecture were based on a pure system of structure. This pure system of structure which satisfies the insatiable demands of reason brings to the mind a satisfaction, a feeling of wonder, a joy which brings forth the spiritual and purely intellectual expression of a pure system of architectural aesthetics."<sup>29</sup>

While these texts indicate Le Corbusier's continuing enthusiasm for proportions they hardly elucidate his methods. To obtain some precise statements we must turn to the article, "Tracés régulateurs" (TR3) that appeared in the printemps-été 1929 issue of L'Architecture Vivante. In fact the readership was prepared for this issue, which is entirely devoted to Le Corbusier and Pierre Jeanneret, by an advertisement on the back of the summary of contents of the issue of hiver 1928 (number 22). We read:

"This issue presents, in the luxurious format dear to our journal, the theory and the practice of the application to modern construction of the eternal principles of architecture which have been forgotten for two centuries: the regulating line and the golden number."<sup>30</sup>

We notice two things: First Le Corbusier is claiming credit for the revival of the principles and secondly he is making a distinction between regulating lines and the golden number.

The article "Tracés régulateurs" (TR3) itself starts

off by some general statements as to the purpose of regulating lines. We are told that regulating lines were used in the past but were abandoned because of "academic pedantry" ("académicisme"). There is also a jab at some "recent commentators" who had suggested systems of regulating lines for certain historical edifices which are much too inefficient and complicated to really correspond to "plastic phenomena"<sup>31</sup>.

Now Le Corbusier informs us that while designing a house "a good 15 years before" he had the impression of complete disorder ("ensemble cacophonique"), and felt that order could be established by means of diagonals. He checked to see if the various lines were parallel or perpendicular "And if this was not the case [Le Corbusier] did all in his power to obtain this result".<sup>32</sup>

Note how, just as in the 1921 "Les tracés régulateurs" (TR1), the regulating lines for the building spoken about above were used to bring about order rather than to design the building as such. That this was their general purpose is made clear right from the beginning of the article.

"The regulating line is a geometrical or arithmetical means of bringing great precision in the determination of the proportions of a composition in the plastic arts (in the domain of architecture, painting or sculpture).

There is nothing mystical or mysterious about all this; we simply have a rectification and purification of the intentions of the artist vis à vis his work.

The regulating line does not bring any lyricism to the work; it can, if it is precise and categorical, add limpidity and a certain sparkle and all this thanks to the unity that it confers on all the elements of the composition. In purifying the composition, it affirms the intent."<sup>33</sup>

Sometimes, we are told, a simple, one-diagonal, system does not work, and one is obliged to work with two diagonals. This textual statement corresponds to our dichotomy into types II and III, based on drawings, that we discussed before.

The introductory part of the article ends with the following statement:

"Let us rest assured that behind all the theories and all the verifications one thing is dominant for the creator: namely his judgement, his artistic sense which in the final analysis will never allow mechanical methods to reign supreme."<sup>34</sup>

Le Corbusier now gives examples: the first involves house C-1 at Stuttgart (1927) which is of the "pure diagonal type" (our type II). The second involves Garches. Here is what Le Corbusier says about it, not in the "Tracés régulateurs" (TR3), but rather in the 1929 Précisions text where, at perhaps his poetic height, he discusses drawing 54 in figure 5.

"Playing with these fundamental elements [described in the preceding paragraphs] has become a real passion for me. Consider drawing 54 with the details of the proportions of the villa at Garches. The choice of proportions, of full and empty, the determination of the height with respect to a length which in turn is dictated by the constraints of the terrain, all these are in the domain of lyrical creation: such is the creation which has sprung out of a deep stock of acquired knowledge, experience and personal creative power. However the mind, curious and grasping, tries to get to the heart of this unrefined product in which the destiny of the work is already permanently inscribed. This search by the mind and the improvements which result from it give rise to the establishment of a mathematical order (arithmetical or geometrical) based on the "golden number", on the interplay of the perpendicular diagonals, on arithmetical relationships involving 1, 2, 4, between the horizontal bands etc. Thus all the elements of this facade are in harmony with one another. Precision has created that something



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final, sharp, true, unchangeable and permanent, which is the architectural moment."<sup>35</sup>

In addition to what we learn from the Precisions text, the "Tracés régulateurs" (TR3) text tells how the supporting frame gives a 2-1-2-1-2 cadence to the building. This is referred to as an "automatic system of proportioning" ("tracé que j'appellerai automatique").

This system we are told was used at Maison Cook and Pessac. Further we learn that Le Corbusier did not stop at simply shifting the positions of doors and windows for in order to have the slope of the handrail of the staircase leading to the garden (fig.3) parallel to the main diagonal, the ground was raised at the point where the staircase touched (see fig. 3,4).

The article also discusses in great detail the method used for Mundaneum (1929). In this case, the text says that the shapes were determined by the system of proportions and not simply modified. In particular the basic shape was chosen to be a "golden rectangle" i.e. the ratio of the sides is the golden number. An appendix discusses how the new second storey of a house at Ville d'Avray (1929) was made to harmonize with the already existing first floor.

Although nothing can be said to be certain, we believe that we are now in a position to give a reasonable hypothesis concerning Le Corbusier's approach to his work and in particular to explain some of the anomalies that we have seen.

First of all Le Corbusier's "regulating lines" should not, at least for Garches and earlier, be taken as a formal system of design but rather as a very general method which, while leaving a great deal of flexibility and choice to designer, guided him in making certain modifications and corrections in his original plan. The degree of complexity, one versus several main diagonals, was a variable that did not follow a strict chronological development.

Secondly, as a consequence of the non-formal nature of the system, Le Corbusier probably did not feel that only one set of regulating lines would fit a given structure. In particular there would be no discrepancy and no distortion

in having several sets of lines drawn at different times.

This latter view of Le Corbusier's approach would explain the difference between preliminary and final versions of various buildings. In particular, let us look at Garches in this light.

Consider first the northern (street) elevation. In the "official" version, (fig.2) Le Corbusier has simply used the main diagonal sloping down from the upper left instead of the one sloping down from the upper right as in figure 4. Thus the line perpendicular to it now determines the right hand side of the central door instead of the left side. While this change in itself does not really mean anything because of symmetry, we do have new elements in the way the left hand door (the diagonal parallel to the main diagonal in figure 2 versus the main diagonal passing through the vertex in figure 4) and the small door (the diagonals are parallel to different lines in the two cases), are determined. Furthermore, the shapes of two windows are determined in figure 2 whereas they are not in figure 4.

In the southern (garden) elevation we notice that the earth under the staircase is raised in both figures 3 and 4. Recall that Le Corbusier spoke of this in connection with figure 3 and said that this was done so that the handrail would appear to be parallel to the main diagonal. But in figure 4 there is no main diagonal indicated and the line through the railing would appear to be parallel to the line leading up from the right. Unfortunately we can only speculate on the origin and/or function of this line or for that matter the very light lines sloping up from left to right. The same is true for the vertical line to the left of centre but there certainly is no golden number relationship indicated anywhere<sup>36</sup>.

Despite this uncertainty there is no reason to assume that figure 4 did not represent a perfectly good set of regulating lines for Le Corbusier<sup>37</sup>. Then in September 1928

Le Corbusier drew the "official" versions 1086, 1087 (fig. 2, 3), of the elevations for Garches<sup>38</sup>. Since in the time period following the second half of 1926, when figure 4 had been drawn, he had been influenced by Ghyka's book, he simply added in the golden number relationship as an additional proportioning method for the southern elevation<sup>39</sup>. The main diagonal was drawn in and the other sloping line of figure 4 was eliminated. For the northern elevation he used a mirror image, determined the doors in a new way and added in lines for the windows. But in doing all this Le Corbusier was not changing his building, he was just verifying and confirming it with a different set of regulating lines and now with something new and more mystical, namely the golden number. That everything now "checked" using the golden number was, we suspect, gratifying for him<sup>40</sup>.

By the time he designed Mundaneum, Le Corbusier actually used his methods to design his building but as for Garches and earlier, we have seen that the statement of our opening quotation, "I have determined my work" must be understood in the light of Le Corbusier's special approach and thought.