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Research

The Church in The Hague by Aldo van Eyck: The Presence of the Fibonacci Numbers and the Golden Rectangle in the Compositional Scheme of the Plan

Abstract. This paper analyses the presence of the Fibonacci numbers and the golden section within a characteristic project of one of the twentieth century's leading architects: the Pastoor Van Ars church in The Hague designed by Aldo van Eyck. By means of a thorough analysis of the building based on field work and consultation of unpublished documents, it is possible to show that the compositional scheme of the plan of the church seems to have been designed according to Fibonacci relationships and the golden rectangle.

Keywords: Aldo van Eyck, proportional systems, design theory, Fibonacci numbers; Fibonacci sequence, golden rectangle, golden section, geometry, Modern Architecture, Hans van der Laan

Introduction

This article deals with the presence of the golden section and the Fibonacci sequence in the compositional scheme of the plan of a prominent building of modern architecture: the Roman Catholic Church Pastoor Van Ars which the architect Aldo van Eyck built in The Hague in 1968 (figs. 1, 2). Specifically, it was found that the rectangle which fit into the general plan of the project (fig. 3) comprises a grid of 5 rows and 8 columns (see fig. 7), linking its design with Fibonacci numbers and the golden section.

In the case of the golden section, its presence in the plan is essentially limited to the appearance of two golden rectangles that are inscribed one inside the other and establishes a geometric echo: the outer perimeter or overall plan (5 x 8), and the space dedicated to the liturgy itself (5 x 3) (see fig. 16). That is, considering the golden ratio as a mathematical principle which could influence the geometrical construction of a project, it does not seem that the Church of Aldo van Eyck in The Hague represents a traditional example of the application of the golden section to its architectural design. However, the position of and relationship between these two rectangles refers directly to the geometric construction of the golden rectangle from a square described by Euclid in the *Elements*. That is to say, on the basis of a grid of 5 rows and 8 columns, the sum of the smaller rectangle (5 x 3) to an initial square (5 x 5) yields the largest rectangle (5x8), both being similar and golden. In this regard, and having consulted versions of the project previous to the final solution, it was possible to observe two interesting aspects.

Fig. 1. The Pastoor Van Ars Catholic church in The Hague, exterior view. Photo: author

Fig. 2. The Pastoor Van Ars Catholic church in The Hague, interior view. Photo: author

Fig. 3. Ground floor and first floor of the Pastoor Van Ars Catholic church. Drawings: author

First, it was found that the compositional scheme of the floor plan appears in several of Aldo van Eyck's initial sketches, and that it was maintained throughout the various and successive draft versions of the project. Secondly, and with regard to the built solution of the church, it was found that the non-specific coincidence (geometric-arithmetic) of the two rectangles described in the floor plan, with respect to the golden rectangle, is due to small variations introduced in the base module in the latest versions; that is, at the time when the base module of the grid of the 5x8 was no longer a perfect square, the value of the figure obtained after dividing the long side of each rectangle by its respective lower side started to deviate subtly away from the golden number, phi or Φ .

Furthermore, this allusion to the base module of the grid that makes up the plan of the church leads us to the presence of the Fibonacci sequence in the project. The ratio of two successive Fibonacci numbers (f_{n+1}/f_n) approaches Φ . Similarly, we know that if we construct blocks (squares) whose sides represent Fibonacci numbers, we obtain a rectangle drawing resembling the golden rectangle (shown in fig. 5 below). In this sense, this resulting composition seems to exactly match the visual and conceptual outline that organizes the plan of the Pastoor Van Ars church, raising the hypothesis of deliberate use of Fibonacci relationships by van Eyck. Additionally, the fact that Dom Hans van der Laan¹ acted as the project supervisor (intensifying the personal relationship between the two architects) seems to give more credence to the possibility that Aldo van Eyck was interested in the application of these mathematical principles in his architectural design.²

Although this research has been carried out by means of a field study of the building, and consulting all original material³ (mostly unpublished) presently available about the project, it has not been possible to locate any written document where van Eyck recorded his intent with respect to the above mentioned theory. Therefore, this article will focus on describing the presence of the golden rectangle and the Fibonacci numbers in the plan of the church, and later try to argue the hypothesis of Aldo van Eyck's intentionality. In this sense, and together with Hans van der Laan's involvement as project supervisor, we will try to justify that, even if van Eyck had not been interested in applying any mathematical principle in the design of the project, at some point he must have been aware of the presence of the golden rectangle and the Fibonacci numbers in the plan, which in turn will lead us to conclude that there must have been intention on his part.

Review of the literature

Considering the literature that deals with the relationship between the golden section or Fibonacci numbers and architectural design, two features give this present investigation a certain singularity. On one hand, this is a case where the architectural design (plan compositional scheme) seems to originate from Fibonacci relationships, rather than from the principles of the golden section, whose presence is limited to the geometric echo of the golden rectangles. On the other hand, and considering in turn the subgroup of publications that study the presence of Fibonacci numbers and/or the golden section in specific architectural designs, this is one of the few examples where the work in question is framed within modern architecture.

More precisely, the research devoted to studying the relationship between architecture and the golden section from a theoretical or an abstract point of view (without focusing on a particular example) is extensive and diverse. In this sense, and apart from the fundamental works of authors such as Luca Pacioli (*Compendium de divina proportione*

and *Tractato di l'architettura*), Albrecht Dürer (*Underweysung der messing* [1977]), Sebastiano Serlio (*Trattato di architettura* [1996]), Leon Battista Alberti (*De re aedificatoria* [1988] and Adolf Zeising and Gustav Theodor Fechner (all discussed, along with still others by Rachel Fletcher [2006]), there are recent publications that place the discussion of the golden ratio and architectural design in different moments in history (including in fact some prominent cases in the Modern Movement): Rossi and Tout reflect on the knowledge of the golden section in ancient Egypt [2002]; Jay Hambidge focuses on the period of classical Greece [1924]; George Hart delves into the collaboration between Pacioli and Leonardo Da Vinci to produce the book *De Divina Proportione* [2002]; Marcus Frings concerns himself with the treatment of the golden section in architectural theory [2002]; Marco Frascari and Livio Volpi Ghirardini refute its importance throughout the history of art [1998]; Alberto Pérez-Gómez elaborates on the figures of Pacioli and Le Corbusier [2002]; Le Corbusier himself wrote *Modulor I* and *II* [1980]; Jay Kappraff [1996] reflects on the book by P.H. Scholfield, *The Theory of Proportion in Architecture* [1958], where, among other things, the Modulor is recognised as a system of architectural proportions based on the golden section.

Additionally, one can find a number of investigations dealing with the study of specific architectural designs of different periods, whose geometric constructions are presumed to have been based on the principles of the golden section. So, Marie-Thérèse Zenner places the discussion in a French Romanesque church of the eleventh century [2002a, b]; Tomás Gil-López reflects on the subject in the vault of the chapel of the Presentation in Burgos Cathedral [2012]; Mark Reynolds studies the use of the golden section in generating geometry of the Pazzi Chapel of Santa Croce in Florence [2000], Ben Nicholson, Jay Kappraff and Saori Hisano give the example of one of the panels of pavement in the Laurentian library by Michelangelo [1998]; Rachel Fletcher and Lionel March are involved in an interesting discussion in the case of Palladio's Villa Emo [Fletcher 2000; Fletcher 2001; March 2001], J. J. Burckhardt discusses the presence of the golden section in a house in Basel in 1871 [Burckhardt 1986]; and Steven Holl, in *Anchoring* [1989] acknowledges the influence and application of this mathematical principle in his own architectural production.

However, although it is not so easy to locate publications that consider the use of Fibonacci numbers in the geometric composition of architectural design, two specific cases can be highlighted. First, Maria Teresa Bartoli [2004] presented the case of the Palazzo della Signoria, in whose elevation the repeated presence of the Fibonacci rectangle was detected. Since it was one of the most important non-religious buildings in Gothic architecture, and also taking into account the example of the Palazzo Strozzi built about two centuries later, the author concluded by stating the importance the Fibonacci sequence had on Florentine architecture. Second, Jin-Ho Park and Hong Kyu Lee [2009] published their study on the Braxton-Shore house by Rudolph Schindler of 1930. Since the authors linked the proportional system on which the underlying design of the house is based to the Fibonacci sequence (in addition to the Lucas sequence, and musical ratios), and dealing with a building belonging to modern architecture, this article becomes virtually the only publication that shares the two aforementioned peculiarities about this investigation [Park and Lee 2009].

The golden section and the Fibonacci numbers

Around 300 B.C., the ‘extreme and mean ratio’, or what we today call the ‘golden section’, was defined by Euclid in his mathematical treatise *The Elements* as follows:

A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the less.

Then, the golden number (Φ) can be defined as the numerical value of the ratio between two segments a and b that satisfy this relationship:

$$\frac{(a+b)}{a} = \frac{a}{b}.$$

If we assign a value of 1 to the smaller segment b and then solve this mathematical expression, we will get the following second-degree equation:

$$a^2 - a - 1 = 0$$

whose positive solution is:

$$a = \frac{1 + \sqrt{5}}{2}.$$

This means that the value of a would be 1.6180339887..., which defines the relationship between a/b and the value of the golden number. In other words, given a segment of dimension x , we will obtain its golden section if we divide it by the number Φ (1.618033...); or if we want to calculate the initial value of which segment y is the golden ratio, we will, in turn, have to multiply it by Φ . The golden number therefore really represents a certain dimensional relationship between two elements that form part of a set, a product of a larger composition, or that are simply associated with each other. In this respect, throughout the history of art and architecture, the concept of proportion has taken precedence over the strictly numerical component. It is therefore unnecessary for the dimensional relationship (division) between two entities or objects to coincide exactly with Φ to be considered as a golden ratio. It will be enough if its value lies reasonably close to it. An excellent example of this can be found in the well-documented relationship between the golden section and the Fibonacci sequence.

The ‘Fibonacci numbers’ consist of the following progression tending to infinity: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144..., in which each term is obtained from the sum of the two preceding terms (for example, $21 = 8 + 13$, or $55 = 21 + 34$). Mathematically, we could say it is similar to any progression starting from any two initial numbers a_1 and a_2 , whose law of recurrence is:

$$a_n = a_{n-1} + a_{n-2}.$$

However, the most interesting part of this progression for us is that if we divide any term by its predecessor we get a result close to the golden number (1.6180339...). For example:

$$\frac{8}{5} = 1.6; \frac{13}{8} = 1.625; \frac{21}{13} = 1.615385...; \frac{34}{21} = 1.619047...; \frac{55}{34} = 1.617647...;$$

$$\frac{89}{55} = 1.618181...; \frac{144}{89} = 1.617977...; \frac{377}{233} = 1.618025...$$

In the history of art, one of the most frequently found sets of three for applying the principles of proportion contained in the golden section is that formed by the numbers 8, 5 and 3. In fact, if we divide 8 by 5 we obtain 1.6, so that 5 can be considered a good approximation for the golden ratio of 8. Also, if we divide 5 by 3 the result is 1.66..., so that 3 can be considered a close approximation of the golden section of 5 (and so on for all the respective multiples). In this way, between 8, 5 and 3 we accept that Euclid's initial definition is satisfied, i.e., that a straight line (in this case with a value of 8) is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment (8/5), so is the greater to the less (5/3), i.e., approximately 1.6.

However, there is a geometrical method of defining the golden section much more suitable in the case of van Eyck's church in The Hague: the 'golden rectangle'. The figure it offers, composed of a sequence of four steps, shows us how from a square we can obtain a rectangle whose shorter side represents the golden section of its longer side (fig. 4).

Fig. 4. Sequence of four steps to obtain Euclid's golden rectangle

1. Step 1: we start with square ABCD whose side is given the value of 1.
2. Step 2: point G is obtained simply by dividing one of the sides of the square into two equal parts.
3. Step 3: we extend side AB and with point G as centre we trace an arc of radius GC, which gives us point E.⁴
4. Step 4: the rectangle AEFD thus obtained from the initial square is a golden rectangle; i.e. AD is the golden section of AE, or which is the same, if we divide AE by AD we obtain the golden number (1.6180339...). And, of course, to obtain the value of AE we only have to multiply AD (or AB) by Φ :

$$AE = AB \times \Phi$$

$$AE = 1 \times 1.619033...$$

$$AE = 1.618033...$$

Moreover, there is an additional singularity in this operation: the smaller rectangle formed by BEFC is similar to the larger rectangle in which it is contained, and is therefore also golden. So that, if we start from this rectangle BEFC and repeat the operation to describe square of side CF in its interior, the rectangle obtained in this operation, tangent to the square and also inscribed within BEFC, will also be golden. In other words, we find here what could be described as a geometric echo.

In this regard, it is also possible to develop a geometric construction of the Fibonacci sequence that links to this method of defining the golden section. What we call 'Fibonacci rectangle' is obtained by building blocks (squares) whose sides are equal to the Fibonacci numbers, resulting in a figure similar to the golden rectangle. So, starting with a square unit value (1x1), and adding more units in order to make blocks that meet the arithmetic order of the sequence itself, after the first four steps we obtain the following rectangle (fig. 5).

Fig. 5. Fibonacci rectangle (sequence 1-1-2-3-5)

In this sense, we can establish that this Fibonacci rectangle originates from an endless mesh or grid of identical squares (of dimension 1x1), on which it would be possible to gradually draw equivalent blocks to the remaining sequence. Thus, in the example provided, the individual blocks (1, 2, 3 and 5) would be drawn on a grid composed of 5 rows and 8 columns (fig. 6).

	C1	C2	C3	C4	C5	C6	C7	C8
R1								
R2								
R3								
R4								
R5								

Fig. 6. Fibonacci rectangle grid (with 5 rows and 8 columns)

The presence of the Fibonacci numbers and the golden rectangle in the church

At this point it now becomes possible to put forward our hypothesis concerning the Pastoor Van Ars church in The Hague. Bearing in mind these last figures, if we were to take any plan of the building (ground floor, first floor or deck floor) it would be possible to observe how the compositional scheme could fit almost perfectly within this grid of 5 rows and 8 columns (fig. 7).

In fact, this compositional scheme provides a basis for the spatial organisation of the church and the distribution of the functions required by the program. In this sense, in fig. 7, the first vertical band C1 includes the development of the parish house on the ground floor and first floor (6.75 m high), the columns C2 + C3 + C4 form a volume containing the main entrances and the area of enlargement for the liturgy (4.75 m), the vertical column C5 corresponds to the central nave of the church (9.75 m), and the last three columns C6 + C7 + C8 comprise the space for the liturgical celebration (4.75 m), also known as the crypt area. Additionally, the structural scheme of the project and the skylights which provide natural light also seem to adhere to this grid: if the six horizontal lines of this grid represent the traces where the six main structural plans of the project run, the large cylindrical skylights in the roof are also placed according to these lines and their intersections.

Fig. 7. The grid of the Fibonacci rectangle overlapping the church plans. Drawing: author

The original graphic information consulted seems to reinforce the idea that Fibonacci relationships were used in designing the floor plan of the church. That is, the review of the sketches and line drawings of the church shows that Aldo van Eyck himself drew this 5x8 grid on many plans of the project. By way of samples, we provide two site plans (figs. 8, 9) belonging to different phases in the evolution of the project, showing both floors according to an interior breakdown of 5 rows and 8 columns, a ground floor sketch based on a 5x8 grid equivalent (although in this case the scheme is only coloured in the part of the project that depicts the actual program of the church) (fig. 10), and a drafted version of the first floor plan that also belongs to an intermediate design of the building, which seems to show a geometric breakdown based on Fibonacci relationships (5 x 8) (fig. 11).

Fig. 8. Aldo van Eyck's original sketch of a site plan of the church showing a breakdown of 5 rows and 8 columns in the deck floor. © Aldo van Eyck Archive. Reproduced by permission

Fig. 9. Aldo van Eyck's original sketch of a site plan of the church showing a breakdown of 5 rows and 8 columns in the deck floor. © Aldo van Eyck Archive. Reproduced by permission

Fig. 10. Aldo van Eyck's original sketch of a ground floor plan based on a 5 x 8 grid.
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Fig. 11. Aldo van Eyck's original drawing of the first floor plan showing a geometric breakdown based on a 5 x 8 grid. © Aldo van Eyck Archive. Reproduced by permission

In any case, further analysis of the plans of the final solution of the project (1968) permits us to characterise more accurately this presence of Fibonacci relationships in the compositional scheme of the church plan. In this sense, although discrepancies initially derived from this study might raise some questions, the fact is that their justification certainly leads to an enrichment of the proposed hypothesis.

On one hand, it should be checked whether or not the presence of Fibonacci numbers described so far (mainly conceptual) is also accompanied by an arithmetic correspondence (dimensional). In this respect and in accordance with the measurements of the project, the overlap of the Fibonacci rectangle as seen (see fig. 5) on the plan of the building (see fig. 7) shows that there is not an exact match between the grids of both schemes, because the base module (square) of the grid of the church is not entirely constant. That is, although the width of the six horizontal bands of the compositional scheme of the plan remains unchanged (5.34 m), the same cannot be said about the eight vertical bands (or columns). So in accordance with the described program and described spatial organization, these eight columns present four different measurements: 5.11 m (parish), 4.67 m (enlargement area), 5.34 m (central nave) and 5.45 m (crypt area) (fig. 12).

Fig. 12. Grid measurements of the church plan (final solution of the project). Drawing: author

However, judging by the evolution of the project, this fact seems to be due to small dimensional variations that Aldo van Eyck progressively introduced in the organisational structure of the plan in order to optimise the spatial distribution of the program. Thus a plan of the ground floor belonging to a solution of the project before June 1965 (fig. 13) clearly shows how in those times the initial grid that van Eyck started with had a constant base module (5.5 x 5.5 metres in this case) (fig. 14), which would reinforce the idea that, conceptually, the design of the plan could be based on Fibonacci relationships.

Fig. 13. Aldo van Eyck's original drawing of the ground floor plan belonging to a solution of the project before June 1965. © Aldo van Eyck Archive. Reproduced by permission

Fig. 14. Grid measurements of the church plan (solution of the project before June 1965).
Drawing: author

Fig. 15. Organisation of the church program (scheme of uses). Drawing: author

On the other hand, and in view of the lack of a direct connection between the organisation of the church program (fig. 15) and blocks determined by the Fibonacci numbers, it is worth questioning the true incidence of these in the configuration of the project. In this sense, it is clear that a decision made by an architect to use a particular compositional principle (mathematical or not) when designing does not imply the

impossibility of limiting its scope according to the functional needs of the project itself, or with his own creative freedom. That is, even if the use of the Fibonacci rectangle as a template to geometrically organise the program of the church was intentional, special needs or characteristics would have made it exceedingly difficult to adjust each of the different uses to different blocks equivalent to the sequence 1-1-2-3-5 contained in the grid of 5 rows x 8 columns. Therefore validating the hypothesis that van Eyck resorted to Fibonacci numbers to design his church, their use would be limited to the configuration of the plan compositional scheme from relationships posed by the sequence itself. In fact, solely on the basis of the spatial distribution of the church program, it would be easier to draw a geometric parallelism between the plan of the project and the figure of the golden rectangle.

In this sense, the position of the crypt area within the context of the overall project plan may not be a coincidence. That is, given that the crypt houses the most important activity of the program of a Catholic church (the celebration of the liturgy itself), it is interesting to construct the following simplified plan that graphically illustrates this circumstance (fig. 16).

Fig. 16. Position and shape of the crypt area within the general plan of the church.

Drawing: author

This scheme, compared with the figure of the golden rectangle AEFD obtained from a square ABCD (see fig. 4), in addition to enhancing the identified geometric parallelism, shows that the crypt area seems to highlight a position within the composition of the plan. Symbolically, it is as if the space reserved for the liturgy represents the geometric construction of the golden section of the project.

Discussion of Aldo van Eyck's intentionality

As noted in the introduction, in the field research on the building no writing or testimony was found where Aldo van Eyck explicitly affirms his intention to design the plan of his church in The Hague from Fibonacci relationships or the golden rectangle. Likewise, there is no document or publication by authors other than van Eyck that refers to – or even mentions – the theory explained here. Consequently, one wonders if it could be a coincidence that the plan of the church ended up reflecting the presence described of the Fibonacci numbers and the golden section, or whether this circumstance responds to the opposite case: was van Eyck aware of this factor or not? And, if so, was there intent on his part, or was it sheer coincidence?

If we consider the presence of Fibonacci relationships and the golden rectangle in the project plan to be unintentional, the original graphic documentation would suggest that this was not in any case a last minute coincidence. Thus, having identified the presence of these elements in some early van Eyck sketches (see, for example, figs. 8, 9 and 10) and in the different sets of drafted plans corresponding to the evolution of the project (see figs. 11, 13), it seems clear that the compositional scheme, shown in fig. 7, did not come about as a result of a last minute, random modification of the project.

On the other hand, and still considering van Eyck's 'non-intentionality' on the issue, the question would be whether all this casuistry could go unnoticed in the eyes of someone like him. That is, from the instant when it is possible to identify the Fibonacci sequence and the golden rectangle in the design of the project, it seems reasonable to ask whether (assuming this presence as something coincidental) van Eyck would not have realised that the compositional scheme of the plan reflected these geometric ratios. In this sense, the characterisation of the architect can provide definitive information to clarify the question in more depth, since along with his status as a leading architect of modernity and a defender of avant-garde intellectual heritage, van Eyck was a decidedly educated man who became interested (among other things) in the art and architecture of other times and other places.

Aldo van Eyck (16 March 1918 – 13 January 1999) is regarded as one of the most influential architects of the second half of the twentieth century.⁵ He belonged to the so-called third generation of the Modern Movement and was a founding member of Team 10.⁶ Singularly well-read and endowed with a restless mind, as an architect he stands out for his special sensitivity to the needs of contemporary society in general and of the individual in particular. Van Eyck grew up in a family- and school-oriented environment characterised by cultural refinement, motivation and self-training. Much of his childhood and teenage years were spent in England, where the family had moved due to his father's work as a London correspondent of a well-known Rotterdam newspaper. However, the true passion of the family patriarch was literature, and he became a prominent poet in his country. So, apart from being a decisive intellectual reference for van Eyck, the figure of his father becomes the best explanation for the love he professed throughout his lifetime for the literary world (and especially poetry). In the run-up to Aldo van Eyck entering university, the family left England to settle again in Holland. This situation represented a serious setback in his training, since due to the problems with validating his British school certificates, he did not have access to architecture studies at the Delft School. Leaving him with no other choice but to embrace a path of non-university architectural training (after which he could have had access to higher education), from 1935 to 1938 van Eyck experienced a difficult period marked by academic demotivation. However, far

from becoming an unsuccessful period, he took advantage of this adverse situation to begin a training process that was essentially autonomous, mainly oriented to studying in depth Western art and architecture prior to the avant-garde of the early twentieth century.⁷ This predilection for classical culture (as opposed to modern or modernity) is portrayed by the two trips he made to Italy in the late 1930s: the first was taken in 1936 with his older brother Robert, where they came to know cities like Verona, Siena, Florence and Mantua; and the second trip was taken in 1938, after joining the Eidgenössische Technische Hochschule (ETH) of Zurich, when accompanied by his friend and fellow Fulco ten Houte Lange, he traveled through the mainland of Italy, to Sicily and Tunisia. On the other hand, the study and travel that Aldo van Eyck devoted to the ancient art and the primitive art of other cultures, such as the Dogon tribe in Africa, and the Pueblos in New Mexico, represents a distinctive characteristic within his rich career.

In spite of its brevity, this biography of van Eyck focuses on two interesting aspects of the case at hand: his devotion to literature and culture in general, and his knowledge of classical art and architecture, including the history of art and architectural theories. In this sense, and again on the assumption of his non-intent, it seems unlikely that someone with such training would not detect the presence of (theoretically casual) Fibonacci relationships or golden rectangle on the plan of his church. In fact, considering that in most of the plans developed during the design phase it is possible to identify this presence, and that this phase lasted from 1963 to 1968, it is even stranger to think that during those five years van Eyck would not have recognised these geometric relationships in the plans that he worked on almost daily and which, according to Joseph Rykwert,⁸ were drawn by him.

Finally, one last peculiarity seems to support the hypothesis that Aldo van Eyck used Fibonacci relationships and the golden rectangle intentionally to develop the plan compositional scheme of the project for his church in The Hague: the presence of Hans van der Laan¹ during the design phase. When in 1963 the Bishopric of Rotterdam formalised the request for van Eyck to design and build a church in The Hague, one of the few conditions imposed regarding the project was it be overseen by a “mentor”. A mentor should be an architect specialising in the construction of Catholic churches, and could also be proposed by van Eyck himself. And so, it was in this way that Hans van der Laan (who was a Benedictine monk as well as an architect) became his “mentor”, and the official supervisor of religious authorities for the project of the Pastoor Van Ars Church in The Hague.

Trained as an architect at the Delft School, Hans van der Laan (1904-1991) has to his credit three main texts: *Le Nombre Plastique* (*The plastic number*) [1965], *Het Vormenspel der Liturgie* (*The Shape of the Liturgy*) [1985] and *De Architectonische Ruimte* (*Architectural Space*) [1977]. Through his writings, the long-lived Dutch architect gives expression to most of the architectural reflections that characterised his career, notably his interest in the configuration of religious space, or the relationship between architecture and nature. However, the common denominator of van der Laan's thought were measurements and proportions (the numbers in general). In this way his discovery and architectural application of the plastic number [Padovan 2002: 181-193] is a good example of his dedication to the mathematical and geometric issues. In this sense, and in a similar way to what happens between the golden number and the Fibonacci sequence, it is also possible to link the plastic number with the Padovan sequence and Perrin sequence in such a way that in both cases the limit that sets the quotient between a

term and the previous one is the plastic number. It is not in vain then, according to Aarts, Fookkink and Kruijtzter [2001: 56-58], that the golden number and the plastic number are called the morphic numbers.

In short, although the presence identified in the compositional scheme of the Pastoor Van Ars plan corresponds to the Fibonacci sequence and the golden rectangle (and not to the exposed casuistry of the plastic number) it does not seem unreasonable to think that, as a result of the professional and personal relationship with van der Laan, van Eyck would have ended up developing an interest in applying this type of geometrical principles to design his project. In any event, in all cases the underlying issue is the importance of proportion when configuring and perceiving the architectural space, and the ability of such mathematical principles to be used in the creative phase of the architect.

Finally, the fact that there is no detection of the presence of Fibonacci relationships or the golden rectangle on other parts of the project, such as the elevations or the sections, would not take away the validity of the hypothesis shown, to the extent that it is entirely consistent with the usual way in which Aldo van Eyck designed. Although the issue deserves a long and interesting discussion in itself, the fact is that, as Sara Riboldi [2012] stated recently, a panoramic study of the original artwork by Aldo van Eyck reflects how most of his projects are conceived initially from the plan. It is therefore through these kinds of sketches how van Eyck seems to organise his first ideas of the project, although in his work as an architect he is characterised by approaching (and drawing) so thoroughly every aspect that composes the project: from spatiality, scale or urban image, to the constructive detail itself. In this regard, the case of the Pastoor Van Ars church is not only a good example of Aldo van Eyck's way of designing, but may explain why the Fibonacci relationships and the golden rectangle appear only in the plan of the project.

Acknowledgments

The authors wish to express their gratitude to the Architecture Department of the Delft School of Architecture of the Delft University of Technology (TU Delft) for their invitation to carry out research in The Netherlands for a six-month period, as this was the real starting point for the rest of the research. We must also, of course, express our thanks to the members of the Pastoor Van Ars Church for their kindness in allowing us to visit the building on numerous occasions and to consult all the available information, also to the Diocese of Rotterdam (who ordered the church to be built in 1963) for granting us permission. Finally, special thanks are due to the van Eyck family, especially to Tess van Eyck Wickham, for letting us consult the architect's private documents and for their infinite patience and consideration.

Notes

1. Dom Hans van der Laan (1904-1991) was a Dutch architect and a Benedictine monk who showed a special attention throughout his life for numbers, measurements, proportions and geometry in general.
2. This information appears in the book by Francis Strauven (personal friend and international reference on the subject), *Aldo van Eyck: The Shape of Relativity* [1998: 486]. This book is probably one of the most complete works that exists on van Eyck's life and professional career.
3. The three sources of information consulted in the Netherlands were the Aldo van Eyck Archive, the private archives of the promoter or client (Bishopric of Rotterdam), and the municipal archives in the city of The Hague (*Dienst Stedelijke ontwikkeling Inzage bouwtekeningen*).

4. Note that at this point segment AE is divided between the extreme and its ratio, i.e., the golden section of AE would be AB, while the golden ratio of AB would be BE.
5. Some of the prizes won by Aldo van Eyck throughout his life were the Wolf Prize in 1997, the Royal Gold Medal of the Royal Institute of British Architects (RIBA) in 1990, the Wihuri International Prize (Finland) in 1982 and the Sikkens Prize (together with the artists Constant and Joost van Roojen) in 1961. He was given an honorary doctorate from Delft University of Technology in 1990, the University of Nova Scotia (Halifax) in 1985, Tulane University (New Orleans) in 1979 and the New Jersey Institute of Technology in 1979. He was Visiting Professor at different prestigious international centers, such as University of Pennsylvania (Philadelphia) from April to May 1960, Washington University (St. Louis) from September 1961 to January 1962 and Harvard University (Cambridge, MA) from March to April 1963. His buildings, projects and writings have been published in many languages and he also produced an extensive corpus of articles and books (see [van Eyck 2008] edited by Ligtelijn and Strauven).
6. Team 10 was a group of architects that “officially” came into being in 1954 by means of the Doorn Manifesto [Smithson and Team 10 1968]. They revolutionized the architectural world of the time and are considered to be the main reason for the dissolution of the, until then, all-powerful International Congress of Modern Architecture (CIAM).
7. Although van Eyck will go down in history as one of the great defenders and one who continued the cultural discourse of so-called Historic Avant-garde, it was not until 1943 that he would enter into true harmony with his intellectual and cultural universe. Specifically, it would be the move to the city of Zurich to study architecture (1938-1943) where he would meet Carola Giedion-Welcker, the person who opened his eyes to this new reality.
8. See [Rykwert 1999]. Specifically on p. 11, Rykwert recounts a personal anecdote of Aldo van Eyck in the beginning of the 1960s in which, invited by Rykwert to give a lecture, he affirmed in a short conversation with another architect: ‘I will not have people doing drawings for me. I enjoy doing them myself too much!’

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