The poetics of order: Dom Hans van der Laan’s architectonic space

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Architectural Research Quarterly / Volume 16 / Issue 02 / June 2012, pp 137 - 154
DOI: 10.1017/S1359135512000450, Published online: 27 November 2012

Link to this article: http://journals.cambridge.org/abstract_S1359135512000450

How to cite this article:

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The Dutch architect and monk, Dom Hans van der Laan (1904–1991) leaves us with a legacy of architectural writings and realisations arising from his search for fundamental principles of architecture. His 1977 manifesto *Architectonic Space* aims to combine spatial philosophical concepts with practical design tools [1, 2]. The book is a series of fifteen lessons linking concepts, such as the relationships of inside-outside or mass-space, to his proportional series which he refers to as the Plastic Number. This article aims to offer an understanding and critical assessment of Dom van der Laan’s poetics of order by unravelling how his buildings are made and how they are perceived [3]. I focus on the case study of the Jesu Moder Marias Convent in Tomelilla, Sweden.

In the preface of *Architectonic Space*, Sam J. van Embden writes: “Van der Laan goes far back – indeed to the pre-architectural, rudimentary spatial experience, the interpretative activity of the perceiver of natural things, from which he then derives indications for the productive activity of the maker of artefacts, the architect.”

Already in his first writings in the 1930s, Dom van der Laan aims to define architectural principles that provide an intellectual expression of the act of dwelling (‘wonen’). To dwell is to enter into a relationship with one’s surroundings, meaning to understand them. For van der Laan, this is the primordial function of architecture: it makes space readable. From his Benedictine background, he draws concepts that enable him to understand this complex process of cognition. He studies the old church fathers such as St Thomas Aquinas, especially his comments on Plato and Aristotle. The Benedictine way of life builds upon the intertwined relation between mystery and matter, between intellect and senses, believing that this relation can be expressed through a Platonic order.

Professor van Hooff, in describing the work of Dom van der Laan, defines cognition as a dual process of synthesis and analysis. On the one hand, there is the act of living, a synthesis of the concrete and singular reality. On the other hand, there is the process of analysis by the abstracting intellect. For us to know the concrete and singular reality, an intense
interrelation between the two processes is needed. How can architecture, as a concrete thing, enhance these relations? Van der Laan translates this idea of the reconciliation of wonen and intellect into the concept that the concrete and singular reality is comprehended by reading materiality and understanding its spatial relations. In this light, it is the task of the architect to define an order in nature so that it can be read and understood: to create an inside in an outside as the primordial condition for living. These are motivations that drive Dom van der Laan to look for an order bordering the processes of analysis and synthesis. More concretely, he aims to extract a proportional framework directly from perception, from human ability to relate and differentiate sizes.

Proportional system
Throughout history, artists and architects have used proportional systems as an underlying order, aiming to achieve the kind of beauty able to express this objective reality. In the early to mid-twentieth century this remains a common concern. Many proportional systems are based around the Golden Section 1.608... or Divina Proportione, as being intrinsic to nature. But Dom van der Laan approaches the concept of order from a different perspective. He differs deeply from his contemporaries, for example

Le Corbusier, who builds his Tracés Regulateurs and his Modulor on Ghyka’s analysis of the Golden Section. For van der Laan, the Golden Section in its application is nothing more than an artificial concept to order matter, as abstract as the discrete quantity of mathematical numbers. Because of its abstract nature, it proves inadequate when brought into relation to concrete and singular reality, since it remains on the level of analysis. To overcome this, van der Laan looks for a ratio that is embedded in the synthesis of the act of living itself, that grows from the necessity of relations.

Dom van der Laan claims, already in 1928, that he has discovered a ratio that is capable of interrelating a building and its parts into a continuous and complete hierarchy, in a way that the Golden Section cannot. He develops from it his own series, naming it the Plastic Number. He found it by subdividing a line into three parts, where all the parts are interrelated by the same ratio of $\frac{1}{32471}$... which he practically rounds up to approximate the ratio $\frac{4}{3}$. Unlike the Fibonacci series, where the sum of two terms is the next term in the series, in the Plastic Number series the sum of two terms is equal to the next-but-one term in the series (for example $\frac{7}{4} + \frac{7}{3} = \frac{16}{3}$). The series can be written out arithmetically as:

\[
\begin{align*}
1 & \quad 4/3 & \quad 7/4 & \quad 7/3 & \quad 3 & \quad 4 & \quad 16/3 & \quad 7
\end{align*}
\]

and is discussed in more detail below.

For Dom van der Laan the focus is not on the mathematics of the Plastic Number, but on its ability to interrelate concrete spatial phenomena through the ratio of proportion. Here lies a fundamental difference with the Modulor. Le Corbusier uses the proportional system

Throughout history, artists and architects have used proportional systems as an underlying order, aiming to achieve the kind of beauty able to express this objective reality. In the early to mid-twentieth century this remains a common concern. Many proportional systems are based around the Golden Section 1.608... or Divina Proportione, as being intrinsic to nature. But Dom van der Laan approaches the concept of order from a different perspective. He differs deeply from his contemporaries, for example
Fibonacci series to define his blue and red series of the Modulor system, but does so through selected fixed numbers, relating these to ergonomic measures. Van der Laan does not start from fixed measures. His series remains defined by ratios, which are applicable to all kind of scales. In this sense, he sees the Plastic Number as a bridge between experience and abstraction, between geometry and mathematics.

In developing his idea and system of Plastic Number, van der Laan studied classic examples, from the Parthenon to Hagia Sophia, trying to understand their poetics of order, and even superimposing his own. From Aristotle’s Poetics, he learnt how to use archetypical schemes of grid patterns and compositional concepts. From Vitruvius, he borrowed spatial concepts such as symmetry and eurhythmy, defining a concept of rhythmical dispositions through Vitruvius’ categorised densities based on the column-intercolomnium relation. From these sources, he developed his own proportional framework as a formal and hierarchical spatial organisation, aiming for it to be an objective and universal design system. Van der Laan stated that:

we can conclude that the ancients gave the name disposition to the totality of tangible and visible factors, while they called the totality of the factors that have to do with quantity ordinance. [...] Thus ordinance is related to the quantity of things, disposition to their quality, and the two must be coordinated. [...] Just as nature is completed by architecture, so in architecture disposition must be completed by ordinance.

Van der Laan regarded his own realised architectural projects as ‘specimens’, testing grounds where he could develop his theoretical framework. It was only from 1959 onwards, through designing a crypt for the Abbey in Vaals, that he started to understand architecture in terms of space. From this point onwards, he started to define an architecture with no ornamentation and using rough materials. The painter Théodore Strawinsky describing his experience on entering the crypt of the Abbey, says: ‘c’est la première fois que j’ai l’émotion de l’antiquité dans un bâtiment moderne’. A comment that evokes the tactile and ascetic feeling of the building.

The following analysis aims to unravel Dom van der Laan’s formal system, by closely linking his theoretical spatial concepts to practical design solutions exercised in the convent of Tomelilla. Tomelilla is one of the four main projects – all convents built between 1960 and 1995 – in van der Laan’s limited oeuvre [5]. First it is important to explain, very briefly, the proportional framework in relation to perception and what van der Laan defined as three scales of human experience. This is followed by an assessment of the implementation framework. Then each of the three scales is defined through its abstract concept, followed by practical design applications in the convent of Tomelilla. Several of these analyses were developed in conversation with Rik van der Laan, Dom van der Laan’s nephew and right-hand man in the designs for the convents of Waasmunster city and Tomelilla.

The proportional framework of the Plastic Number: interweaving three scales of human perception

Van der Laan starts from the idea that one reads a building through its parts, their interrelation and their connection to the whole. Building parts, such as columns or window series, operate in giving scale to the space, thus making the space understandable. When one reads space, one judges its size by relating it to a reference. A reference is abstracted and superimposed on the measured element through an artificial process of counting. This is rooted in the Pythagorean concept that number is the base of everything; one reads space through its order by counting. Based on this insight, Dom van der Laan develops a framework that interrelates all built elements, from the building stone to the city fabric, as one hierarchical matrix of comparable sizes.

Van der Laan undertook a number of empirical tests with his students in order to define the boundaries within the series, where one scale of perception ends and another begins. He used several teaching aids. The first working tool he named the abacus [6]. He asked his students to group series of stones according to their size, asking the questions: when is there a relation between the stones and when not? When is there a perceivable difference between the stones? These tests resemble those carried out by the German experimental psychologist Gustav Fechner. By this testing method, Dom van der Laan established to his satisfaction that a difference of size between two building parts smaller than the ratio 3 to 4 is not perceivable. The eye ‘levels’ smaller differences, rounding them up to the nearest measure of the order. He calls this ‘aura’ of unperceivable differences the ‘margin’. So the ratio of the Plastic Number allows for the definition of a series of measures that represent, through the play of the margin, the endless variety of natural measures.

In the series of six measures, that is the series:

\[ \frac{3}{4}, \frac{7}{4}, \frac{3}{2}, 1, 2, \frac{4}{3} \]

the difference between the two largest measures 4 and 3 is the smallest term in the series, that is 1. Van der Laan then chooses to extend his original series.
with two numbers, extending the series to the limits of an order of size, where the smallest measure stands in ratio to the largest as $1:7$ [7]. The series then consists of eight terms from 1 to 7. The upper limit is $1:7$, the largest ratio in which two sizes can be related and compared through perception. Beyond this border they differ too much and belong to different orders of size. The smallest size 1 is the unit, the basic module to which the other measures relate. 7 is then the smallest unit for the following order, which will reach until 49. Out of the eight measures, van der Laan defines an authentic series and a derived series. The authentic series then is:

\[
\frac{1}{4}, \frac{3}{4}, \frac{7}{4}, \frac{7}{3}, 3, 4, \frac{16}{3}, 7
\]

One exceeds the other by $4:3$. The derived series incorporates a finer grain and allows for double sizes to become part of the composition:

\[
\frac{7}{6}, \frac{3}{2}, \frac{4}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2}, 6
\]

A derived measure lies in the harmonic middle of two authentic measures.
So van der Laan’s proportional series has eight terms from 1 to 7 where 1 is the unit, the module. There are several relationships that define this series:

- each element exceeds the preceding element by the ground ratio 4\(\frac{3}{4}\)
- the sum of two sequential elements is not the following element but the one after that
- any unit in the series is equal to the difference between the 4th and 5th units after it
- In this sense, a series can grow out of two elements that interrelate in the ratio 3\(\frac{3}{4}\). Their difference is the lower limit, their sum defines the upper limit.

The result is a methodology that offers the opportunity to design intuitively from interrelated proportions, as they are expressed through whole numbers. All kind of subtractions or additions are possible, remaining within the harmonious sequence. It is important to understand that the proportion is not about the exact application of the mathematical numbers, it is about the relation between the ratios. It is only this relation that is perceived within experience. So rather than insisting on exact fractions in proportion, the margin of tolerance, based on the limits of perceptible difference allows for measurements to be rounded up or down to simple ratios, that in their turn can be matched with an exact mathematical number within the order. Because of this simplicity, the designer can sketch by hand using interrelations between, for example, 1, 3, 4 and 7. It allows the architect quickly to set harmonic sequences between buildings, the subdivision of spaces or for example the composition of a facade. In an intuitive manner one works from the rough grain to the finer detail, towards the Plastic Number.

Van der Laan not only applies this proportional framework to the composition of building parts, but also to the relation between mass and space within a building. For van der Laan, this relation which he defines as nearness or proximity is primordial and can only exist within the outer limits of one order of size. The thickness of the wall, as the unit for the space, is always 1:7 in relation to that space. If two constructed elements define a wider space, they cannot enter into a relationship. From this relation, a basic spatial module is set, from which the building can grow. The yardstick for this scale is the size of the human body. In Dom van der Laan’s own words:

\[\text{The smallest space in an architectonic sense, the space-cell, can therefore be either large or small, according to the demands put upon it. The space we normally live in is of a double-type of size with threshold measures of about 3, 4 or 5 metres. With smaller dimensions the space becomes less human; with larger ones it takes on a regal character, until excessive large dimensions once more make it inhuman.}\]

Influenced by the philosophical phenomenologist Otto Friedrich Bollnow, Dom van der Laan introduces phenomenological concepts to explain the relation between mass and space, and the interrelation of spatial elements. It allows him to express architecture in a more direct manner through its role as a spatial boundary between inside and outside, a more concrete separation of the human habitat from nature. To explain the relation between space and man he introduces a threefold experience space: the space that we draw into our existence through movement [9, 10]. It is formed by three interlocking zones: the intimate workspace (cell), the bigger walking-space (court) and the vast visual field (domain). The experience-space is then literally translated into a threefold architectonic space. He expresses this in abstract archetypical models. The human habitat is seen as a play between three separations: cell, court and domain. They are those three scale-levels that, together with the thickness of the wall, feed into Dom van der Laan’s proportional framework. The thickness of the wall is taken as the measure by which to read the cell, the cell is the measure to read the court, and the court the measure to read the domain. They interrelate to each other as 1 to 7, and in this define the ordered terms of a series.

When it comes to a concrete design, mathematical values are assigned to the different scales [11]. The first step is to determine the size of the cell, the basic space-cell that has its relation to the thickness of the wall. This can fluctuate between 3 and 5 metres: a living unit functionally suitable for one person with a bed, a closet and a desk. In the Tomelilla abbey, the thickness of the wall is 600 mm and the cell is 4.2 m. These basic units are incorporated into the framework, automatically determining the other scales of court and domain. In comparison: the scale of Roosenberg Abbey is slightly smaller: the thickness of the wall is 500 mm and the space-cell is 3.5 m.

**Dynamic superposition of models**

Dom van der Laan uses the cell as the building block to define a grid. Architectural design mostly uses a grid as an underlying logic. Typically this is based on standards inherent to construction methods, materials or economics – for example span length or the organisation of underground parking. But here, these rationales are not regarded as driving forces for the design. The grid is used in the same way as it is used in classical architecture – it is linked to a proportion framework. In classical architecture grid schemes are used to define models based on the relation of the parts to the whole. A primary example is taxis, the framework defined by Aristotle. Dom van der Laan adopts this idea of working with grid schemes and models. He defines abstract typological models on the three scales of building: building plans (domain), interior spaces (court) and wall compositions (cell), which coincide with the interlocking orders of the measure-system of the Plastic Number. As in classical architecture, ‘superposition’, a term defined and used by van der Laan, is essential. By this he means that elements are always inherent parts of a whole. From the smallest building part to the whole terrain, everything is interrelated.
Dom van der Laan interlocks his cell-court-domain models into architecture through a dynamic process. They are never incorporated as singular modules or closed entities. His design sketches do not start from a clearly predefined form or proposition. They can more be read as generic studies of rhythms and lines. His lines form an endless pattern and from the crossing of those traces, a figure slowly emerges [12]. A plan or a wall is built out of several series, each with its own rhythm related to the open/closed relation and its influence on the neighbouring space [13]. His buildings do not have a classical symmetry. The spatial construction is not instructed by a structural logic, as in modern functionalist buildings. Dom van der Laan’s buildings are a three-dimensional matrix of rhythms: a polyrhythmic space defined by several series and their spatial superposition. The result is a dynamic layered architecture that induces an effect of simultaneity and unfolds as one moves through it [14]. The spaces are experienced as a continuous whole, not as a succession of parts.

12 A study by Dom van der Laan for a church and crypt in Vaals. The rhythm of the horizontal layers is still ‘equal’. The rhythm of the windows above is still related to the rhythms of the pillars below. For every pillar there are two windows, which is a traditional symmetry. From 1959 onwards, this changes and he designs with a more dynamic approach. This can be seen in the built church

13 Axonometric of the church (after 1968) by Dom van der Laan showing eight openings at the bottom and fourteen windows, rather than sixteen, at the top

14 Roosenberg Abbey, Waasmunster, Belgium, 1972–75
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The scheme of peripheral disposition is closely related to the archetypical form of a farm or of a small convent: cells around a court with a church or main building [18, 19]. Cell, court and domain remain close to the scheme, as a city in its embryonic state. In the convent, the cell has two different expressions. Adjacent to the church, living cells immediately surround the court. They are the first habitable space, but also the framing of the court. They define this court as a first exterior. In larger convents, the cells are situated on the first floor. The relation with the court is then realised through the bigger spaces on the ground floor, a gallery and stairs. In the church itself the smallest space-cell appears as a gallery, becoming the unit of size for the bigger space.

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Scale I, disposition of the overall plan:  
between cell, court and domain

Cell, court and domain can relate to each other in different ways. Dom van der Laan develops a series of nine models where cell court and domain are placed together, either from the centre of the plan or around the periphery [15, 16]. The models are called either central or peripheral disposition accordingly. He gives preference to a peripheral disposition, expressed in models 5, 6, 8 and 9. Here, the three spaces interlock. A court is formed by a cell and not subdivided by it. On model 9, he explains:

*This combination of the peripheral juxtaposition of cells around the inner court and the inner courts around the square produces the great unity of threefold architectonic space. This space, which has to fit our threefold space-experience, is no longer generated by three independent concentric boundaries; the same wall that gives rise to the cell now, through the cell, calls the inner court into being, and through the court the square.*

As an example of this interlocking concept of superposition, he makes an analysis of the Hagia Sophia [17]. The thickness of the wall A stands in relation to the whole space, through the cell-spaces B and the side-chapels C.

15 Nine schemes for the disposition of cell, court and domain, according to an order of size a1–a4:  
1 central court with central cell  
2 central court with peripheral cell  
3 central court with peripheral juxtaposition of cells  
4 peripheral court with central cell  
5 peripheral court with peripheral cell  
6 peripheral court with peripheral juxtaposition of cells  
7 peripheral juxtaposition of courts with central cell  
8 peripheral juxtaposition of courts with peripheral cell  
9 peripheral juxtaposition of courts with peripheral juxtaposition of cells (from Architectonic Space [Leiden: Brill, 1983], III.13, p. 30)

16 Models from the exhibition:  
Architectuur, modellen en meubels, Museum Bonnefanten, Maastricht, 1982

17 Analysis by Dom van der Laan of the Hagia Sophia (first drawings from 1955, this drawing is from Le Nombre Plastique [Leiden: Brill, 1960], XIII.13, fig. 26). One can compare it to scheme 9 of the peripheral disposition

18 Scheme 6 of the peripheral disposition, in comparison to a Syrian convent. The three zones are expressed in their embryonic state. Study: Rik van der Laan

19 Plan form: Early Churches in Syria by H. C. Butler (Princeton University, 1929). This book was often used by Dom van der Laan and his students as study material
Disposition of the plan for Tomelilla
The layout for this convent builds upon the concept of peripheral disposition: a complex of interlocking spaces situated on the edge of the domain [20]. Dom van der Laan regards it as a conglomerate of material layers interlocking an exterior space, the ungraspable nature, and an interior, the convent’s ‘hortus conclusus’, a restored Garden of Eden.” As there is not yet a real location, the design of the domain is fictive and directed towards the building. The convent is organised around two inner courts: one part for the guests around a small square court at the front and, diagonally to the rear, a court for the sisters with the church. Two wings line up in the middle, so that the two fields with courts touch each other in a corner. This disposition leads to a crucifix-shaped plan and allows for several distinct squares and gardens around the convent. This abstract scheme, as first idea, will be kept intact during a design process of more than four years.

At the beginning of the design process, the space-cell is used as a base for the definition of a modular grid. On the grid, several formulas for dispositions can be traced.

The first sketch for Tomelilla builds upon a general formula defining the convent wings in relation to the court [21]. Rik van der Laan made the two first schemes shown, documenting this basic formula used for all Dom van der Laan’s convents.” As an ‘under layer’ it concretises the abstract models of cell-court-domain and their peripheral disposition. We see four loose wings that through their placement shape a court. The size of the cells is repeated in the court. Between court and wing there is a gallery, which resembles a stretched cell. The wings themselves are formed by a double row of cells. Theoretically, the court is seven times bigger than the cell or gallery, as in the second scheme. The gallery in this sense is marginal compared with the court: they belong to the same order of size, as extreme measures. In this case, the cells transform from a living room or sleeping cell to galleries around a court. In the first case, they are functional, in the other they are expressive, as the framing of the court. In the embryonic convent, the cells are at the same time living units and frame. This formula feeds directly into the concrete plan of Tomelilla: seven wings around two courts. The church is wider and consists of four cells [22].

20 First sketch made by Dom van der Laan for the Jesu Moder Marias convent at Tomelilla, Sweden, soon after the visit of Abbess Moder Tyra, 16 March 1986
21 Underlying patterns, drawings: Rik van der Laan
22 Impression of the convent at Tomelilla, Caroline Voet. The part for the guests on the right is not yet built
Ordinance of the plan for Tomelilla
The scheme below traces the general measurements of the courts in relation to the domain [23–25]. All of them can be situated in the first order of size which ranges from 302 dm to 2162 dm. Van der Laan always takes measurements in decimetres (10dm =1m). Here measurements are always taken from the centre of the wing.

\[302 \text{ dm} \times 7 = 2114 + 42 + 6 = 2162 \text{ dm}\]

The overall layout is square: 1060 dm x 1060 dm.
The smaller guest court is 302 dm x 302 dm.
The bigger court for the sisters is 456 dm x 456 dm.
The distance between the convent and the perimeter of the domain is 302 dm, being the measure for the whole domain.

The measurements between court and cell follow order II from 42 dm to 302 dm [24–27].

\[42 \text{ dm} \times 7 = 294 + 6 + 2 = 302 \text{ dm}\]

The wings have a width of 84 dm, or 2 x 42 dm, the doubled cell.
The church has a width of 196 dm, with side aisles of 42 dm and a central nave of 2 x 56 dm.

\[42 \text{ dm} : 56 \text{ dm} = 3 : 4\]

The proportion of the core-measurements gives one approach. The plan is also conceived from the proportions of the wings in relation to the net measurements of the courts. Depending on the different widths of the wings, these receive a specific proportion of their own. Also the partial addition of the galleries has its influence here.

Court of the sisters: 5 x 42 dm : 7 x 42 dm
Court of the guests: 4 x 42 dm : 5 x 42 dm

The proportion 42 dm : 302 dm gives the initial relation between the gallery and the court.
Eventually, the width of the gallery is fixed on 36 dm instead of 42 dm. As such, the courts become slightly bigger.
Six different types of convent spaces
Throughout the designs of the four convents, Dom van der Laan develops a catalogue of spatial types, which he reuses several times.\footnote{11}

The cell as sleeping unit
The sleeping cell is the smallest spatial unit within the convent [30–33]. It has the immediate 1:7 relation to the thickness of the wall. As a contained unit it offers one bed, one desk with one chair and one closet. Combined into series, the cells occupy the first floor. They are connected with each other through a central wooden corridor. Each cell has two large windows. Already here, there is the contrast between the inward movement through the heaviness of the walls and the outward projection of the framed view.

In Tomelilla, the sisters have a bathroom in each cell. Here the formula is adjusted: a strip of wet cells borders one row of cells, connected by a side corridor.

Scale II, disposition of the house: from cell to gallery to hall space
As the wall serves as a unit for the cell, this smallest space serves as a unit for the larger spaces. Dom van der Laan states that: ‘the smallest space, the space-cell, is the basis of the complete human habitat. It spreads out into the form of the whole house, which in its turn is absorbed into the urban context’.\footnote{31}

As the cell is stretched in one direction, the other direction is still under the influence of the nearness of the adjacent walls. A bar-like space arises, presenting itself as a gallery \[28, 29\]. One wall can remain closed, the other needs openings to express the thickness of the wall. The gallery is a maximum of seven times bigger than the cell, since a space in which the distance between the walls is more than seven times their thickness, according to Dom van der Laan, has no architectural form. So in larger spaces, the relation between mass and space is realised through the superposition of a gallery. This superposition of the gallery in the space, the fact that they are situated one inside the other, allows for a relation between them. The wall relates to the gallery, and the gallery to the whole space. In this way, the nearness relation with the wall is secured. The proportions of the hall can then be expressed in relation to the gallery.

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\begin{figure}
\centering
\includegraphics[width=0.8\textwidth]{cell.png}
\caption{Cell in Roosenberg Abbey, Dom Hans van der Laan}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=0.8\textwidth]{gallery.png}
\caption{Gallery at Roosenberg Abbey}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=0.8\textwidth]{hall-space.png}
\caption{Hall-space}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=0.8\textwidth]{disposition-of-the-house.png}
\caption{Disposition of the house: from cell to gallery to hall space}
\end{figure}

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\textbf{Notes:}
\begin{itemize}
\item \textit{From cell to gallery to hall space, models: Architectonic Space, XII.2 to XII.10}
\item \textit{Cell in Roosenberg Abbey}
\item \textit{Cell in Roosenberg Abbey, Dom Hans van der Laan}
\item \textit{Typical plan of cells in Roosenberg}
\item \textit{Typical plan of cells in Tomelilla}
\end{itemize}
The hall as the model of the church

The church is of the classical basilica type, a central space with a narthex and an apse [34–36]. Together with the two lower side aisles or galleries, these smaller conglomerate spaces ensure the interrelation of the whole church with the surrounding walls. The galleries relate to the whole space as 2:9. The higher vertical nave allows for a series of top windows, allowing zenithal light into the central space. The church embodies the effects of phenomenal transparency through the different overlapping rhythms of the four bottom column-spaces and the nine top windows. It gives a horizontal layered effect to the overall space in contrast to its verticality. In Tomelilla, the church has a specific eurhythmic shape: height to width to length relate to each other as 3:4.15
The half-space
The spaces on the ground floor, for example the refectory or the chapter room, are shaped according to the specific formula of a hall space with one gallery [37–39]. The gallery relates to the space as 2:5. Also here different bay-rhythms evoke an overall dynamic spatial effect. The typical half-space is based on the bay-rhythm of the cells on the first floor. In Tomelilla this is four. In a classical composition, this would lead to a further organisation of the space according to the rhythm of four, meaning four windows in the facade and four column-spaces. But Dom van der Laan chooses to use a shift: five windows and three column-spaces. In the facade this gives a bay-rhythm of five that relates as 3:4 to the cells. For the column-spacing this gives a bay-rhythm that relates to the cells as 4:3. In this way, the half-space becomes an interrelated play of three successive bay-rhythms.

The library
As the half-space, the library is in superposition with a gallery relating to the space as 2:5 [40–42]. But here this gallery becomes a double-height vertical reading space. In Vaals, two rows of windows provide an abundance of light. In Tomelilla there is only one high row of windows, as the library is partially underground. Here, the zenithal light emphasises the verticality of the space. Adjacent to the gallery are two levels for the storage of books. They are quite low and dark. So besides the typical shifts in the rhythms of column-spaces and window openings, also a vertical-horizontal overlap is emphasised here. Within the expression of the building elements, this effect is reversed. The continuous concrete threshold and buttress of the windows give a horizontal effect, while the columns are articulated as vertical masonry elements. All of these different rhythmical narratives come together in the reading room. Moving along the central stair allows for this experience to unfold through changing diagonal perspectives.
The staircase
The dark staircase has an overall size of four cells [43–45]. It formulates a connection between the functional spaces and the brightly-lit central court gallery. In this sense, it is an in-between space, offering a progression from light to dark before entering. The stair itself is situated in a slot between the facade and a parallel wall. The slot is lit from above by four windows on the first floor. In this way, the stair is a brightly lit focal point from where the light guides you upstairs, in contrast with the dark hall. This is enhanced by the fact that the upward movement is ‘announced’ by five steps towards the slot: first a movement towards the light, then a movement alongside the light. The wall ends on the first floor as a parapet, so the perspective opens up as one moves upwards.

Disposition of the spaces in Tomelilla
For the disposition of the spaces in the general plan, Dom van der Laan uses the plan with the bay-measures as an under layer [46]. The drawing is then used as a grid on which the actual spaces are further organised. Many of these first grid layouts are effectively drawn on squared paper, the squares being the basic space-unit (4.2 m in Tomelilla).

On the first floor, the space-unit is directly translated into the bay-measure of the sleeping cells. A connecting corridor and halls for stairs are inserted. On the ground floor, space-units are combined into bigger hall spaces. The main circulation is the cloister gallery around the inner court. Circulation halls are linked to this spine, forming a connection with the cloister entrance, the first floor and the different spaces. To organise the different spaces functionally, Dom van der Laan follows the universal and generic convent layout. Every space has its specific use, reflecting daily life.36

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43 Staircase in Rosenborg
44 Staircase in Tomelilla, drawing: Caroline Voet
45 Typical plans of a staircase
46 Programmatic layout, Dom van der Laan, 25 May 1986
The size of the openings is always seen in relation to the bay-rhythms of the wall, in other words the opening is superimposed on the wall. To define the rhythm of these open and closed relations, Dom van der Laan uses the five column-spacings of Vitruvius \[48\]. Here the column interval is expressed as a function of the diameter of the column, fixing five distinct proportions. Dom van der Laan translates these through Plastic Number ratios, defining the column width to the distance between the columns, which is the bay-rhythm. The eustylos is the most ‘pleasing’. \[39\]

**Practical example:**

**Ordinance of the Tomelilla garden wing**

The grid of 42 dm x 42 dm is used as a basic layer from which the plan is refined \[51-54\]. The central axis that divides the wing in two equal parts of 42 dm (the double nearness of the cell) is shifted according to successive rhythms: 18 – 24 – 32 – 42.

Also in section the wing is composed through a multitude of relations. Within the framework of compositional dimensions, several options are possible. In this way it is possible to shift the outcome until also the functional dimensions are achieved. For example: the basic wing with its depth of 84 dm has a height of 98 dm. They are derived measures. The heights of the first floor and roof, 42:56 are related as 3:4. The gallery at the inner court is reduced to 36 dm. 36 = 6/7 of 42.

**Scale III, disposition of the wall:**

**Column-spacing and window arrangement**

Dom van der Laan regards the wall as a composition of wall pieces with clearly delineated orthogonal open and closed parts \[47\]. The size of the parts is defined within the order relating the wall to the cell. Every wall piece is an eurhythmic and symmetric play of measures in the order defined by the wall thickness as basic unit. The direct perception of the different shapes: block-bar-slab can be clearly found \[48,50\]. He calls it ‘the articulation of the wall under the influence of the Plastic Number’. \[37\] Through the repetition of openings and columns, each wall defines a distinct bay-rhythm.

*This repetition in the wall of open and closed parts to the rhythm of the smallest spatial unit is a universal architectural phenomenon; at all times and in all places, walls display rows of doors or windows, of columns or piers, which can moreover be built up in tiers if the space they bound is also developed vertical. \[38\]*

47 Study of the window arrangement for a facade at Tomelilla, Dom van der Laan

48 The five column-spacings, Architectonic Space, XI.10

49 Opening from small to big, Architectonic Space, IV.12–14

50 Crypt in Vaals

Small opening in a wall, central disposition of the smaller size.

Opening losing its shape, becoming a framing of beam and piers, peripheral disposition of the smaller sizes.
The poetics of order  Caroline Voet

Each wall is a composition of several wall pieces that are all derived from order III and order IV. From the inside, they define the bay-rhythms of the spaces, from the outside they define the composition of the facade. For example: the ground floor windows are arranged according to a central disposition (the window is defined as the smallest unit). Window and bay-width relate to each other as $14:32$, or $3:7$. The relation between mass and opening is $4:3$. A typical hall space has five windows. This design process is equally applied throughout the whole convent and also in section.

Although the halls of the ground floor are organised according to the bay-width of the cells, meaning $4 \times 42$ dm, this rhythm is not accentuated in the spaces. It is the rhythms of the window arrangement and the column-spacing of the gallery that are dominant.

Window arrangement: $5 \times 32$ dm
Columns-spacing: $3 \times 56$ dm

$32, 42$ and $56$ are three consecutive authentic measures. The overlay of these three rhythms gives the specific asymmetrical dynamics, which are so inherent in the architecture of Dom van der Laan.
For no proportional system offers a guarantee to create beautiful buildings [56]. This is dependent on the manner in which the system is implemented, design choices made and, most importantly, the skill of the designer. In this sense, it is important to understand that the dynamics of superposition used by Dom van der Laan, his skill in the detailed realisation of the design, is equally important in achieving the desired spatial effects in his buildings. It is not only about the order, but also about the poetics. What is unique about the interwoven series of the Plastic Number, is that it offers an intuitive framework. It is not about designing with a ruler to achieve exact proportions. The loose margins enable the designer to sketch by hand. For Dom van der Laan and his students this methodology is far removed from an artificial application that sets limitations. On the contrary, for them it means freedom.

In 1959, Gerrit Rietveld, in assessing Dom van der Laan’s work, writes: 

“Our perception is based on distinction. [...] The more clear the distinction, the more clear reality is to us. Dom Hans van der Laan’s Plastic Number is one of the systems through which one gets acquainted with the laws of our discernment and how it reacts to plane and spatial measures. In my opinion, the knowledge of the laws of discernment is pre-eminently useful to

Expression through matter and light
The result is an architecture that is expressed through interrelated rhythms [55]. Surely, such an architecture can also be achieved with other proportional systems, but the aesthetics would be slightly different. The Plastic Number 1.325 gives a more robust expression than for example the Golden Section 1.618. But the essence of the Plastic Number is not its aesthetic appearance in itself. Its strength lies in the way it defines a series of relations. It is the conscious use of the van der Laan series that allows for the design to be a play of rhythmical compositions, interweaving all the scales.

To materialise his designs, Dom van der Laan develops a formal language inspired by Old Syrian churches and Italian medieval monastic architecture. The rectilinear approach within the design is expressed by a minimalist formal language, dominated by heavy walls and galleries in masonry or concrete. Because of the lack of ornamentation or standardised detailing such as plinths, frames or cantilevered inclined window sills, the building parts are defined by clear lines between mass and void. Lintels and thresholds are continuous concrete elements that give a horizontal articulation. Windows are rhythmical openings with the same dimensions inside and outside. The use of simple material finishing, wood, paint or roughcast with plaster in complementary grey colours, enhances the sensorial qualities of the materials, rendering the space extremely tangible. The focus moves from the building material to matter. This is enhanced by the light. Because of the articulated series of openings, daylight illuminates the space through different intensities. It creates patterns of its own through a pronounced light/dark shadow play. Because of the rough finishing of the spaces, the light plays with the effect of the subtle topography of the surfaces, bringing the architecture to life.

Dom van der Laan’s aim is to create an architecture that induces an immediate sensorial experience which directly feeds into an intellectual assessment, allowing the reading of space through the senses. This architecture does not rely on religious symbolism for the production of meaning. Instead it thrives on a different type of spirituality through its affective qualities.
intuitively correct certain proportions, until the highest clarity is achieved. More systems seem possible to approach this, but I don’t know any that is so complete and scientifically described.”

It is not an easy methodology. It cannot be grasped in an instant. To explain his method Dom van der Laan developed a course of fifteen lessons, grounded in his general philosophical approach. In order to grasp the ‘method’ with any certainty van der Laan emphasised the need for practising, sketching and experimenting with the method. His proportional framework is ultimately about seeing. For him this understanding of seeing is fundamental to the craft of an architect, it is the architect’s main skill. Architecture is about order, order that can be seen to be skilfully proportioned according to our perceptual limitations and abilities, and in this sense, the Plastic Number can offer a useful tool to train designers to develop a consciousness towards space.

Notes
4. Sam J. van Embden, Preface in: De Architectonische Ruimte, p. IX.
5. For more information on Dom van der Laan’s liturgical background in relation to his architecture, see: Michel Remery, Mystery and Matter (Leiden: Brill, 2010).
6. Dom van der Laan reached these insights through the work of for example Maurice Blondel. In the 1970s, Brother van Hooff in the Abbey Sint-Benedictusberg developed a Ph.D. on his work. See: Anton van Hooff, Over wonen en meten, ontwerpen als menselijke handeling, Lecture at the van der Laan dag (Boxtel, January 2011).
9. Anton van Hooff, Over wonen en meten, ontwerpen als menselijke handeling.
12. This is how it is explained by him in Richard Padovan, Dom Hans van der Laan, Modern Primitive (Amsterdam: Architectura & Natura, 1994), p. 85.
13. It can be compared to the Golden Section \(x^2 = x + 1\), which is used in the Fibonacci sequence. See also: Godfried Kruithof, Ruimte en Getal, Het Plastische getal en Het gouden snedegetal (Amsterdam: Architectura & Natura, 1998).
14. Dom van der Laan only quotes Aristotle and Vitruvius as sources in Architectonic Space.
17. For a relation between van der Laan’s theory and buildings, see also: Richard Padovan, Dom Hans van der Laan, Modern Primitive. This paper emphasises also the link with the practical design process.
19. In the light of the publication of a cahier on Tomelilla, Rik van der Laan and Caroline Voet had several working sessions and interviews, in which Rik became an important mentor on the design methodology of Dom van der Laan. He explained and documented the methodology through drawings and analysis, thus enabling Caroline Voet to develop an in-depth and critical thesis. The realisation of the cahier is organised by the Friends of the Van der Laan Stichting, Amsterdam, under the direction of Rob de Carpenterier, Gerhard Brüggemann and Babs Rentjies.
21. The abacus was used as the first teaching aid to compose buildings. Symmetry is to compare two lengths in the same direction, the corresponding dimensions of two distinct forms. ‘This the ancients called symmetry, not in the sense in which the word is used at present, to mean the identity of two opposite halves, but in the sense of the proportion between the sizes of the parts of a building, from a smallest up to the whole.’ See: Architectonic Space, IX, ‘Symmetry’. These lengths can be juxtaposed or superimposed.
22. Another compositional term used by Dom van der Laan is eurhythm, in which several dimensions of a single form are compared. See: Architectonic Space, X, ‘Eurhythm’.
23. Richard Padovan translates the word ‘nabijeheid’ as ‘neighbourhood’, with the approval of Dom van der Laan himself. Nevertheless, the author here prefers the term ‘nearness’.
26. Aristotle, Poetics, bk. VII, para. 35. Another reference is Vitruvius and his practical definition of grid schemata and tripartite taxis. This is explained in for example: Alexander Tzonis and Liane Lefaivre, Classical Architecture: the Poetics of Order.
27. This is for example explained in: Stan Allen, ‘From Object to Field’,
Stan Allen here describes generic patterns as the Cordoba Mosque.


29. van der Laan, Fourteen Lessons on the Plastic Number or the Architectonic Ordinance, Expressivity, Kruithuis, 7 and 21 May 1955 (Van der Laan Archives Sint-Benedictusberg Abbey).


31. These drawings can be seen as a concretisation of the abstract models in Architectonic Space, III, ‘Inside and Outside’ into more concrete formulas. They are based on the formulas for city patterns that Dom van der Laan developed in Architectonic Space, XIII, ‘Disposition of the Town’.

32. Architectonic Space, XII, ‘Disposition of the House: Space-cell, Unit of Size’.

33. The typical plans are fragments from several plans of Dom van der Laan.

34. Eurhythmy is the relation between the measures within one form. The length is put in relation to the width and the height. This is in contrast to symmetry, which is to compare two lengths in the same direction. See: Architectonic Space, IX.

35. The measurements of the church in Tomelilla are: 14.3 m x 19.6 m x 26 m.

36. Van der Laan is guided in his planning by the tradition of convent layout. See for example: H. C. Butler, Early Churches In Syria (Princeton University, 1929), a book often used by Dom van der Laan and his students as study material.


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arq gratefully acknowledges:
Author, 3, 4, 14, 19, 22, 26, 27, 29, 30, 32–34, 36–45, 50, 53, 55
Xavier Botte, 56
Van der Laan Archives, Sint-Benedictusberg, Vaals, 1, 2, 6, 8-10, 12, 13, 15-17, 20, 28, 31, 46-49
Rik van der Laan, 5, 7, 11, 18, 21, 23-25, 35, 51, 54, 54

Acknowledgements
I would like to express my gratitude to Rik van der Laan, who became a true mentor in understanding this work.

I would also like to thank all of those who read preliminary versions of this paper: my supervisor Dr Yves Schoonjans, Brother Lambertus Moonen from Sint-Benedictusberg Abbey and Leo en Joke Tummers. Without the editing support and confidence of Rob De Carpentier, Babs Rentjes and Gerhard Brüggemann, friends of the Van der Laan Stichting, this part of the research would not have seen the light of day.

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