RATIONALITY AND IRRATIONALITY IN ARCHITECTURE

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This paper contains a comparison between two Dutch architects – contemporaries, but totally opposed in attitude. I use a criterion supplied by Le Corbusier to bring that opposition to the fore.

I. LE CORBUSIER

Vitruvius, source of inspiration for many generations of architects, leaves no doubt about it: temple-building is a serious matter, subject to rules and regulations of many kinds. Among the primary assignments of the architect worthy of the lofty task of building a house for the gods is the duty to make sure that the measurements of his work can be rationally accounted for.

The concept of rationality which Vitruvius has in mind here is primarily a mathematical one. It implies that the *ratio*, the *logos* of the walls and the doors should come to the fore. The composition of temples comes into being from *symmetry*, says Vitruvius, and architects have to stick carefully to the ratio of that symmetry.[1] Mathematical rationality (a proportion is rational if its terms can be expressed as integers) goes hand in hand with the intellectual rationality needed to explain why, e.g., in a Dorian temple, the height of a pillar is the sixfold of the thickness of its base.

This is the very reason why all those textbooks are wrong which try to convince us that the *golden section* was an important proportion for Renaissance (let alone *classical*) architects. It was not, and it could not have been. It would have been a major flaw in the Vitruvian prescriptions to raise such an irrational proportion as the golden section to the status of standard for architectural measurements. A division according to the golden section (or according to *extreme and mean ratio*, as the classical Euclidean formula has it), is by definition not measurable in terms of integer numbers; it is, in other words, *irrational*, and the mathematical meaning of this term has a strong transfer to its more quotidian sense.

In the twentieth century, the scene is totally different. The mathematical irrationality of the golden section does not frighten the architect anymore. An increasing host of literature tries to make him believe that building according to the golden section provides the edifice with an aesthetical surplus. In France, several books by Rumanian marine-officer Matila Ghyka attract the attention of a larger public. Not only does Ghyka show how several elementary measures, derived from the golden section, can give rise to more complex structures; he also suggests that well-known remnants of an older culture, such as the Egyptian pyramids or the Athenian Parthenon, came into being by grace of the division according to extreme and mean ratio, a division which he proclaimed to be 'la section ou proportion par excellence d'Eudoxe et d'Euclide'.[2] Nowhere in any of his books does he provide *proof* that Egyptian or Greek mathematicians ever bothered to relate the golden section to architecture, but everywhere he *implies* they did.

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[1] ' Aedium compositio constat ex symmetria, cuius rationem diligentissime architecti tenere debent. Ea autem paritur a proportione (....)'. Vitruvius, *De architectura*, III.I.1.

[2] M.C. Ghyka, *Esthétique des proportions dans la nature et dans les arts*, Paris 1927, p. 337.

One avid reader of Ghyka's books was Le Corbusier. In Chapter 2 of *Le Modulor*, Le Corbusier incorporates his acquaintance with Ghyka's work in the chronology of his own intellectual development as an architect. He does not fail to emphasize, however, that his own article on the hidden geometry which regulates the composition of a building precedes Ghyka's publications by several years.[3] After the second World War, Le Corbusier takes stock of forty years of reflection on the rules and regulations that are supposed to make up the right architectural proportions. In *Le Modulor*, whose first part appeared in 1950, he introduces the proportional grid with the same name which, in his dreams, should from now on lie at the basis of every new design, and which is entirely based on the golden section: 'My dream is to set up, on the building sites which will spring up all over our country one day, a "grid of proportions", drawn on the wall or made of strip iron, which will serve as a rule for the whole project, a norm offering an endless series of different combinations and proportions; the mason, the carpenter, the joiner will consult it whenever they have to choose the measure for their work; and all the things they make, different and varied as they are, will be united in harmony. That is my dream'.[4]

In most of the assignments that were commissioned to him, we find this grid, named 'the Modulor', dominating the scene, most notably so in his integral design of Chandigarh, the new capital of the Punjab (India). In his comments on this gigantic project, Le Corbusier describes his proportional grid as a personal assistant: 'the Modulor – that ingenious slave – was the star actor .... together with my head; the two of them together'.[5] But what was the contribution of the Modulor in designing the Ronchamp chapel, which dates from the same period? Le Corbusier is explicitly vague about this: 'It was a pleasure, here, to allow free play to the resources of the Modulor, keeping a corner of one's eye on the game to avoid blunders'.[6]

Just a corner of one's eye? Le Corbusier seems to hold back in his writings a different and less rectilinear approach towards architecture, an approach which surprisingly materialized in Ronchamp.

One place where he does bring the opposition between the two

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[3] Le Corbusier published his article 'Les tracés régulateurs'in 1921.
[4] *The Modulor 1 and 2*, Cambridge (Mass.) 1986, *Modulor* 1, p. 37.
[5] *Modulor 2*, p. 254.
[6] *Modulor 2*, p. 257/8.

approaches to the fore is Chapter 7 of *Le Modulor*. This chapter opens with a description of buildings from centuries foregone, in France, Egypt, Greece, Italy, and Turkey. The reason why he includes these buildings in the description of his own proportional system is his belief that they bring him into contact with his forerunners. Many of the measures seem to him to agree with the Modulor. Le Corbusier visits Istanbul in October, 1948, and measures the height of the balustrade near the black marble disk in the Aya Sofia (where the Byzantine Emperors were crowned), the narthex of Kayrie church, and the arch of the Grand Seraglio.

He is satisfied about the results, since they can be interpreted as a confirmation of the Modulor unity of 2.26 meters. Yet, in none of the three drawings accompanying the descriptions does he compare these measures to others, in order to find their proportions: they remain just isolated measures that do not come to life by engaging relationships to other measures. Finally, Le Corbusier finds the Modulor equivalents for the Turkish architectural units of *kulak*, *zira*, *parmak*, *hat* and *nokta*. There is no argument about the comparison, just the juxtaposition of measures. In this respect Le Corbusier follows his source of inspiration, Matila Ghyka: the evidence is 'by implication'. And since the Modulor runs two parallel streams of golden section relationships, it is not surprising that Le Corbusier finds a parallel for every Turkish unit on his own scale – even if the inaccuracy is sometimes no less than 8%. The chapter continues with many more examples, including Le Corbusier's own earlier paintings. They all go to show – or so the author thinks – that true architecture is characterized by such an integrating standard as the Modulor.

At the end of the chapter, he opposes two architectural worlds: masculine vs. feminine. Le Corbusier claims that the 'spirit of geometry' may produce two types of forms. On the one hand, we have the world of the *man with the ruler*, the geometry of palpable forms, which brings out architectonic reality, the right angles and lines of solid walls and of the spaces they bound. This geometry can be symbolized by the *square*, and it leads to 'strong objectivity of forms, under

the intense light of a Mediterranean sun: *male* architecture'.[7] The other geometry is that of the *man with the compasses*, not focusing on right angles, but on the *tracés d'épures étincelantes*, the 'brilliant diagrams' that show polygons very different from the square, like triangle, pentagon, pentagram, icosahedron and dodecahedron. This world is one of 'limitless subjectivity rising against a clouded sky: *female* architecture'.[8] Le Corbusier even doubts whether this may be called architecture at all. Should this label not be reserved for what can be measured and *appreciated*, like the measures of the Modulor? For the architecture of post-war reconstruction, Le Corbusier believes that 'the rule[r] is necessary and the compasses are dangerous'.[9]

II. DOM VAN DER LAAN

Reading how Le Corbusier qualified his two types of architects, I could not help seeing their incarnations in front of me, personified by two Dutch architects from the past century.

The first is a Benedictine monk: Dom Hans van der Laan (1904-1991), who went a very personal way in the development of his architectonic theory and practice. His deliberate anthropology goes hand in hand with a very strict formalism, exposing a rationality much more serene than either Le Corbusier's or Vitruvius's. Van der Laan's thinking leaves no space for all the detours and side-tracks so characteristic for both the Roman founder of the art and the French innovator.

The point of departure for his research into the 'disposition of the human habitat' is to be found in space as experienced by man. This involves fundamental existential experiences such as partition (by a wall or fence), intimacy within the *cella*, the relationship man has with the surface which his body rests on (and against which he has to push off when moving), as well as elementary oppositions such as those between inside and outside. Human involvement makes space heterogeneous: its different zones belong to different functions, and we relate to these zones in different ways. Our experience influences our understanding, producing

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[7] *Modulor* 1, p. 224.
[8] Ibidem.
[9] *Modulor* 1, p. 225

insight which does not derive from experience, yet is imposed on it. Architectonically important are the *limits*, i.e. ideal measurements with a regulating impact on the concrete measurements which we deal with when building a house. Limits exist in the mind only, but they are abstractions derived from the multitude of dimensions which we meet in daily experience.

Van der Laan sees a double task for architecture: 'making the space of nature at one and the same time both habitable and intelligible'.[10] The measurements of the house need to be unified by the architect before, as he puts it, 'being put back into nature'. Nature was created with a built-in deficiency, and she acquires a greater degree of perfection by means of the contrivances we add to her, making use of the means she provides us with. This perfection is enhanced by subjecting both the space, set apart by the building, and the form of the building elements to the same architectonic order. The power of this order would be most noticeable if the depth of the walls (the smallest size used) and the distance between them would be interrelated. This is possible if the walls are not too far from each other – not more than seven times their depth.

If smaller housing units are juxtaposed at the border of a domain to form its demarcation, Van der Laan believes that this quantitative connection may pervade the total segmentation of a domain: 'Throughout the real urban habitat based on this peripheral disposition – in the square and the inner courts as well as in the streets and galleries – can then be felt the formative power that in the houses emanates from the mass of the walls'.[11] What Van der Laan talks about here is basically the way space can intellectually be appropriated. Like Le Corbusier, he also finds his example in the Aya Sofia, yet as opposed to him, he does not pick out a single element, but builds a mental picture in which the whole comes to be understood as composed of the single element, i.e. the thickness of the columns.

What we make is 'receptive to the ordering of quantity', as Van der Laan puts it. The perceptible properties of a building must be unified by imposing the right measurement. He appeals to what Vitruvius says concerning *ordinatio* and *dispositio*: 'Ordinance is the balanced agreement of the measures of the building's

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[10] Dom H. van der Laan, *Architectonic space*, Leiden 1983, p. 184.
[11] *Architectonic space*, p. 64/5.

members in each part separately, and the relation of all its proportions with a view to symmetry. This is achieved through quantity. This quantity is determined by selecting units of measure, derived from the building itself in the form of elementary parts of its members, and related to the building as a whole.' 'Disposition is the fit collocation of things and the judicious execution of the work in terms of the composition of measures, in harmony with the quality of things',[12] Vitruvius thus connects quantity and quality, and this is exactly what Van der Laan tries to achieve as well. *Ordinatio* allows the quantity of things, which in reality is continuous (and in that sense perceptible but not intelligible), yet to be expressed numerically. The type of number fit to measure the architectonic size is what Van der Laan calls the *plastic number*.[13] This key notion from his theory integrates the concrete, three-dimensional size and the modularisation derived from it. This plastic number, which leads to a modular system much more differentiated than Le Corbusier's Modulor, is a spatial figure rather than an abstract value. Even if the measurements of Van der Laan's modular system can be approached in terms of the decimal system, 'the decimal system as such leaves no trace on the quantitative order of the building, and contributes nothing to the expression that radiates from that order to our intellect'.[14]

This may sound like Le Corbusier's opposition to the idea that his *Modulor* might as well be replaced by a numerical table. Yet, there is an epistemological difference between the two architects. Le Corbusier considers the numbers of the *Modulor* as 'facts in themselves', having 'a concrete body'[15]; Van der Laan distinguishes strictly between the materiality of the building, whose size is recognizable yet not cognizable, and the intelligible world of ideal measurements.[16] Le Corbusier was keen to bring about a link between mathematics and palpable experience, and saw these two coming together in the specific measurements of his proportional grid. Van der Laan's numbers must be understood in the first place as immaterial forms, finding a transcendent hide-out behind the walls of his buildings. Best known of these is the abbey in Vaals, in the southern part of the Netherlands.

As with Le Corbusier, these measurements are to be understood not as

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[12] *Architectonic space*, p. 67. The quotes are from *De architectura*, I.II.2.

[13] More information on the plastic number can be found in R. Padovan, *Dom Hans van der Laan: modern primitive*, Amsterdam, 1994; on the internet, see:
<www.locomediadub.com/NombrePlastique/nbplastic.html#concevoir>

[14] *Architectonic space*, p. 182.

[15] *Modulor* 1, p. 60.

[16] Kantian as this may sound, Van der Laan distinguishes between the perceptible and the knowable rather than between the knowable and the intelligible.

absolute values but in their mutual relationships. Measurements in Van der Laan's buil-dings are to be pure, *relative to one another*; they form intervals in the same sense in which musical tones do. The consonance of tones is not determined by absolute pitch but by mutual relationships. If measurements in the building deviate from these elementary proportions, Van der Laan calls the building *false*, in the same way that an interval between tones played on two separately tuned instruments may be false.[17]

As to the irrational ratio of the golden section, Van der Laan gives a simple reason for banishing it from his modular system. This is not surprising for an architect who, unlike Le Corbusier, takes his departure from the width of the wall as the smallest size, and continues to think in terms of volumes, not of surfaces. The division in extreme and mean ratio refers to two dimensions only; the golden section may serve at most as a fundamental proportion in a plane, whereas cognition of the size of a volume calls for a triple relationship towards unity.

III. TON ALBERTS

If Le Corbusier has been labelled a *lyrical rationalist*, the sober Benedictine Van der Laan seems to be a rationalist without even the slightest touch of lyricism. What else would he need but a ruler?

The architect who fulfills Le Corbusier's description of the *man with the compasses* is in every respect the opposite of Van der Laan. Ton Alberts (1927-1999) thinks lyrically, feels lyrically and builds lyrically; on the other hand, rationality (in the colloquial sense of the word) seems to be wasted on him. After finishing his most famous building, the ING Bank headquarters in a newly developed quarter in South East Amsterdam (1986), he published a book that gives a clear insight into his way of thinking – or rather, his way of trying to avoid thinking any more than the absolutely required minimum.[18] His faith is placed entirely in intuition.[19]

As his sources of inspiration in architecture, Alberts names Jugendstil (which he relates to theosophy), especially Gaudí, and the anthroposophically

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[17] Le Corbusier calls certain buildings *false* (though not in the musical sense) when their dimensions have lost any relationship with the human measure. *Modulor 2*, p. 262.

[18] *Een organisch bouwwerk, – Architectuur en spiritualiteit*, Utrecht/Antwerpen 1990.

[19] Alberts's own ideas on 'Architecture and Intuition' can be read in his article under that name in *World Goodwill Newsletter*, 1995, no.4, pp.3/4, also published on the internet:
<www.satori.net.au/fountain/97/97part3.htm>

inspired building style of Rudolf Steiner; his own buildings do indeed bring both Steiner's Dornach and Gaudí's Barcelona to mind. But more than by famous architects, Alberts is inspired by architecture that seems to grow out of nature. He mentions specifically one place in Turkey as guiding his thoughts in the designing process: Göreme Valley.

Alberts promotes a radical form of *organic architecture*, which he relates to the expectation that in the astrological *Age of Aquarius* (the 'New Age'), which will soon assume the reins of our way of life and our way of thinking, we will come to see Mother Earth as a living being (the 'Gaia'-hypothesis) and shift the focus of our attention from the filthy lucre of material interests towards the plain of spiritual awareness. Alberts sees matter and spirit as a continuity. Matter is the lowest form of spirit, spirit is the highest form of matter. The industrial use of raw material in the building process is also to the benefit of that material: 'We must help matter to evolve and develop (....) It will be taken to a different level, and we must realize that this is a better condition for the material'.[20] On the other hand, we must minimize our interference with nature: 'the Netherlands would become a paradise of plants and trees and green, ten years after we stop taking care of it'.[21]

Principles of organic architecture have a long standing tradition, both as a comparison between the building and a living organism (as Vitruvius does when he relates the architectonic proportions to the proportions of the human body), and in the sense of organic integration of the several functions of a building (which is what Le Corbusier promoted). Alberts combines both these aspects in a building style which emphasizes ecological and environmental considerations. This style is not guided by the old mimetic tradition of imitating the *principles* which brought about nature, but by an orientation towards *living nature*. Van der Laan put the building *back into nature*, after organizing it rationally at the drawing board, as a contribution to the completion of Creation; in Alberts's organic architecture, on the other hand, the building grows up as *part of nature*. The strict separation between natural and organized environment vanishes. This approach is not a stylistic choice made at the drawing board; it is part and parcel of New Age thinking. Once the Age of Aquarius is

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[20] *Een organisch bouwwerk*, p. 58.
[21] *Een organisch bouwwerk*, p. 26

in full bloom, so Alberts believes, all architecture will be organic architecture.

For Van der Laan, the 'man with the ruler', *measurement* was the way to order space. Alberts, the 'man with the compasses', concentrates on *form*. In his conception, form is an instrument to evoke the powers which the future user of the building will need. Form is conceived here both in a physical and in a spiritual sense. and as an interaction between those who deal with it: we are formed by the forms which we have ourselves brought to life. This conception of mutual creation is not new in history, but Alberts takes it a step further and believes that eventually, the ethereal powers evoked by the architect may materialize, and bring about the desired form in palpable substance.

In a way similar to Le Corbusier, Alberts distinguishes two groups of architectonic forms. The first group, ruled by the right angle, is dominant in our culture. The right angle even seems to be the symbol of our square way of thinking, and the tower block style of building stimulates man to narrow his imagination and to think in a cold, rational way. The other group consists of architectonic forms that are to be found by intuition. This will enable man to free himself from the dic-tatorship of the right angle, since this angle will be reduced to the status of one among many possibilities.

The most outspoken counterpart of the tower block style is the sphere. Alberts spe-culates about living in spherical shapes, and believes this is too dangerous: dwelling in a smooth sphere, man would gradually dematerialize, and die. Boxes and spheres should keep each other in balance; Alberts recommends the *mosque* as a successful example of their integration: half a sphere on top of half a box.

The ING Bank headquarters, however, do not show boxes and spheres, but rather the *tracés d'épures étincelantes* which Le Corbusier finds characteristic of the work of the man with the compasses. The building was planned in close coope-ration with its future users; Alberts emphasizes that the process of building should be as beautiful as the building-to-be'.[22] In the course of this process, the original design of an elongated rectangle with one 500 meters long corridor was transformed into its extreme counterpart, a garland of ten towers which are all

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[22] *Een organisch bouwwerk*, p. 84.

slightly different, yet share the same style. This is truly a monument of *unity in variety* if there ever was one.[23]

The variety of angles is far from arbitrary. It results from the way in which Alberts selected the golden section as his module – not in terms of proportions of length, as did Le Corbusier, but as proportions of angles. He chose the angles of a *pentagram*, a figure which he saw as a symbol for humanity, as his point of departure. Working only with divisions and multiples of these, Alberts succeeded surpri-singly in making all angles of the building commensurable. With his unit of 9°, Alberts realized for the angles what Vitruvius demanded for the parts. In this way, he achieved his ideal to transform the status of the 90° angle to that of one among many possibilities: it has now become the tenfold of the 9° module rather than 'the'right angle. At the same time, the golden section stopped being an irrational ratio: as an angular module, it could be used in an arithmetical way – symmetrically, as Vitruvius would say. In an interview, the architect described his building as 'a symphony of golden section ratios'.[24]

Comparing, in conclusion, the four architects mentioned in this paper as for their attitude towards rationality and the architectonic choices they base on this attitude, especially as far as their measures and proportions are concerned, we can first of all say that Vitruvius, Le Corbusier, Van der Laan and Alberts have each found a way to relate their architectonic measures to the human scale.

For Vitruvius, the temple imitates the body; this implies that the building must follow the symmetry of the body, not just in the present meaning of the word 'symmetry'but also in the sense that all its measures must be sym-metrical, i.e. understandable from the same unit. An irrational measure such as the golden section would be inconceivable for a classical architect, for whom the intellectual interpretation of the term 'rationality'runs parallel with its mathematical sense.

Le Corbusier uses a capricious style to argue for a rational architecture, based on a human scale; he rejects subjectivity and lack of law and order in architecture. Living in a period in which mathematically irrational measures are no

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[23] Other pictures of the ING-Bank can be found on the internet on <http://tour.ing.nl> or <http://home.wxs.nl/~jvansant/ing.html>

[24] M. Mastenbroek, "Architectonische kamelen", in *Jonas* 3, 2 okt. 1987, p. 22.

longer anathema, he chooses the irrational ratio of the golden section as a point of departure for a rational grid of proportions (and following Ghyka's mystification, he believes this choice makes him part of an old and respectable history). Yet, Le Corbusier does not live up to his own standards: Ronchamp is the living denial of what he advocates in *Le Modulor*.

Dom van der Laan is by far the most consistent of the four architects, and the only one to strictly follow the rationality that Le Corbusier confesses. In all its sober purity, his building conforms to his teaching. He develops his own proportional system, rejecting the irrational two-dimensional golden section and adopting the likewise irrational but three-dimensional plastic number. The human measure here presents itself in a different light: as the human capacity to intellectually understand measures that cannot be empirically perceived. In his integral planning of the building on the basis of 'proper agreement between the members of the work itself', Van der Laan may truly be said to be more Vitruvian than Vitruvius.

Ton Alberts, finally, is most radical in rejecting rationality altogether as an intellectual attitude. Intuition and spiritual awareness rather than hard-boiled calculation are to guide the architect in his design. For him, the human basis is not to be found in the right size or even the right proportion, but rather in the good vibrations. Fortunately, Alberts is not consistent in rejecting rational consistency. In an admirable way, he succeeds in translating his ephemeral intentions in very well calculated buildings, using a variety of forms, but certainly not haphazardly. The golden section is a favourite in his arsenal. And here we see where Le Corbusier's expectation breaks down; not so much in the fact that it is the man with the compasses rather than the man with the ruler who sticks to the golden section, but rather in the point of view from which they evaluate this particular proportion. For whereas Van der Laan *rejects* the golden section *as a measure*, Ton Alberts *adopts* it *as a form*.

Frans van Peperstraten (red.)

Jaarboek voor esthetica

Trefw.: Filosofie, esthetica