Le Corbusier (Charles Edouard Jeanneret)

The Modulor and *Modulor 2*

2 volumes. Basel: Birkhäuser, 2000.

Reviewed by Michael J. Ostwald

> *Mathematics is the majestic structure conceived by man to grant him comprehension of the universe* [Modulor: 71]

In 1954 the first English language edition of Le Corbusier's (Charles Edouard Jeanneret's) seminal work *The Modulor* was published by Faber and Faber. This edition, translated by Peter De Francia and Anna Bostock from the 1948 French edition, has since been reproduced in facsimile form by a variety of publishers. The most recent edition from Birkhäuser contains both the 1954 volume of *The Modulor* (subtitled *A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*) *as* well as the 1955 *Modular 2* (*Let the User Speak Next*) in a reduced facsimile format inside a common slipcase featuring the graphic colour representation of the Modulor and its twin red and blue series.

Le Corbusier developed the Modulor between 1943 and 1955 in an era that was already displaying widespread fascination with mathematics as a potential source of universal truths. In the late 1940s Rudolf Wittkower's research into proportional systems in Renaissance architecture began to be widely published and reviewed [Wittkower 1998]. In 1951 the Milan Triennale organised the first international meeting on Divine Proportions and appointed Le Corbusier to chair the group. On a more prosaic level, the metric system in Europe was creating a range of communication problems between architects, engineers and craftspeople. At the same time, governments around the industrialised world had identified the lack of dimensional standardisation as a serious impediment to efficiency in the building industry. In this environment, where an almost Platonic veneration of systems of mathematical proportion combined with the practical need for systems of coordinated dimensioning, the Modulor was born.

For Le Corbusier, what industry needed was a system of proportional measurement that would reconcile the needs of the human body with the beauty inherent in the Golden Section. If such a system could be devised, which could simultaneously render the Golden Section proportional to the height of a human, then this would form an ideal basis for universal standardisation. Using such a system of commensurate measurements Le Corbusier proposed that architects, engineers and designers would find it relatively simple to produce forms that were both commodious and delightful and would find it more difficult to produce displeasing or impractical forms. After listening to Le Corbusier's arguments Albert Einstein summarised his intent as being to create a "scale of proportions which makes the bad difficult and the good easy" [Albert Einstein quoted in *Modulor*: 58] A more mundane motive might also partially explain this endeavour. Le Corbusier saw that such a system could be patented and that when it became universally recognised and applied he "would have the right to claim royalties on everything that will be constructed on the basis of [his] measuring system" [*Modulor* : 46].

Like Vitruvius and Alberti before him, Le Corbusier sought to reconcile biology with architecture through the medium of geometry. Just as Vitruvius describes the human body pierced with a pair of compasses and inscribed with Euclidean geometry as an allegorical connection between humanity and architecture, so Le Corbusier uses a Euclidean geometric overlay on the body for similar purposes [Vitruvius 1914: 73]. After much experimentation, Le Corbusier settled on a six-foot-tall (1.828m) English male body with one arm upraised. The French male was too short for the geometry to work well [*Modulor* : 56] and the female body was only belatedly considered and rejected as a source of proportional harmony [Evans 1995].

According to Le Corbusier, the initial inspiration for the Modulor came from a vision of a hypothetical man inscribed with three overlapping but contiguous squares. Le Corbusier advised his assistant Hanning to take this hypothetical "man-with-arm-upraised, 2.20 m. in height; put him inside two squares 1.10 by 1.10 m. each, superimposed on each other; put a third square astride these first two squares. This third square should give you a solution. The place of the right angle should help you to decide where to put this third square" [*Modulor* : 37]. In this way Le Corbusier proposed to reconcile human stature with mathematics.

To solve Le Corbusier's conundrum, Hanning started with the central (overlapping) square and then generated a golden section arc (from a diagonal of half the square) in one direction and another arc (from the diagonal of the full square) in the opposite direction. These arcs then generate two new contiguous squares which are also defined by a right-angled triangle with its right angle passing through the common boundary between the two newly-formed squares, the idea being that the resulting form can be used to create a series of golden section rectangles at multiple scales; except that it doesn't work geometrically. The final "squares" generated by the golden section and the arc are rectangles not squares; they are very close to being square (sufficiently close to fool amateur geometers) but are not equal-sided as the mathematician Taton pointed out to Le Corbusier in November 1948 [*Modulor* : 232]. A few weeks later, in December 1948, Mlle Elisa Maillard proposed an alternative solution for Le Corbusier's problem. Maillard's solution initially produces a golden section from the starting square to generate the second square and then uses the diagonal of the newly-produced golden rectangle (the two overlapping squares) to form one edge of the right angle triangle. The remainder of the triangle generates the second square. Le Corbusier rapidly simplified Maillard's geometric solution (it had too many circles and thus looked too feminine) to the three square problem and replaced the human figure at its centre. He then used the vertical dimensions or heights generated by these three squares (which now overlap creating golden rectangles) to produce measures that are proportional to the human body and reflect the Golden Section.

Despite now being geometrically valid, Le Corbusier's proportional system had another problem. Specifically, the divisions between the ideal dimensions were too widely spaced to be useful or practical. Le Corbusier solved this problem by producing two parallel syncopated strips of dimensions, one based on the unit 108 cm., the other on double that unit, 216 cm. After further development the first sequence, now called the red series, became 1.130 m. (height of the navel of "man-with-arm-upraised") and the second sequence, now called the blue series, became 2.260 m. (height of the tip of his upraised fingers). Thus Le Corbusier finally defined the Modulor as "a measure based on mathematics and the human scale: it is constituted of a double series of numbers, the red series and the blue" [*Modulor* : 60].

Le Corbusier's Modulor represents a curious turning point in architectural history: In one sense it represents a final brave attempt to provide a unifying rule for all architecture; in another it records the failure and limits of such an approach. Le Corbusier is quite open when he notes that the Modulor has the capacity to produce designs that are "displeasing, badly put together" or "horrors" [*Modulor* : 130]. Ultimately he advises that "[y]our eyes are your judges" [*Modulor* : 130] and that the "Modulor does not confer talent, still less genius" [*Modulor* : 131]. He also completely abandons the Modulor when it does not suit and persistently reminds people that since it is based on perception, its application must be limited by practical perception. Large dimensions are impossible to sense with any accuracy and so Le Corbusier does not advocate the use of the Modulor for these scales. Similarly construction techniques render the use of the Modulor for very small dimensions impractical. This proviso is important to remember and it is in part responsible for the way in which Le Corbusier eventually applied the rule. Having developed the Modulor and used it selectively in a few designs, it then became largely invisible (and also immeasurable) in Le Corbusier's later works, where it instinctively informed his eye as a designer but did not control it.

Ultimately the two books of *The Modulor* represent a maddening and enthralling description of the trials and tribulations of an architect trying to find a universal solution to the problems of human proportion. The maddening aspects include a complete lack of consistency in geometric conventions or descriptions and a blatant ignorance of actual human proportions. None of this is helped by the erratic index in each volume or the occasionally inaccurate and misleading cross-reference. Those unfamiliar with Le Corbusier's circuitous prose will also find much of this famous work irritating and exasperating. Many dozens of pages are filled with self-congratulatory notes, ramblings about Indian mysticism and obscure literary perambulations into territories best left to the Rabelaisian characters Gargantua and Pantagruel [*Modulor 2*: 198-200]. Le Corbusier's hand-drawn illustrations are also occasionally geometrically difficult to understand or replicate and he is quite unconcerned about the mixture of degrees of accuracy he uses to support his thesis. A lengthy section at the end of the first volume even uses inaccurate measurements (taken while he was studying in Turkey some 40 years before) to trace the presence of the Modulor in several famous ruins and buildings! Yet, for all of these obvious flaws, Le Corbusier also helpfully records some of the dimensions that don't work as well as those that do. In this way he infers that certain proportions that are close to the Modulor are as beautiful as those that are more precisely Modulor. Despite all of these criticisms, Le Corbusier's two volumes on the Modulor are landmark works on the relationship between architecture and mathematics. These volumes describe the grand and quixotic search for a universal system; they record the practical and metaphysical problems of such an approach and they show how difficult it is to meld the human form with geometry and with architecture.

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About the reviewer

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