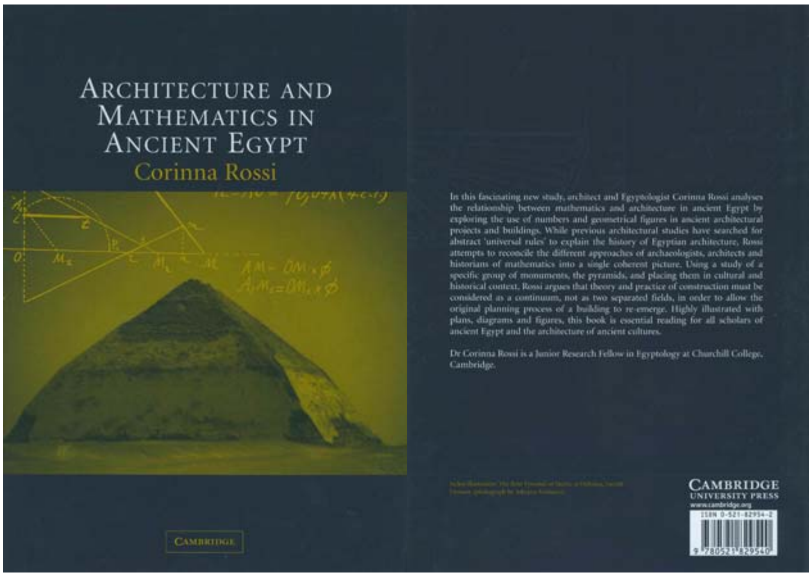
Rossi, C. 2004. Architecture and mathematics in ancient Egypt. – Cambridge, Cambridge University Press

Book review by A.M. Hense



Ever since I came across Schwaller de Lubics's (in)famous depiction of the plan of the Luxor temple compared with a human skeleton (Schwaller de Lubics, 1957), I have a strong aversion against any attempt to deduce a mathematical or symbolic pattern in the Egyptian temple plans. I still wonder what would have happened to the skeleton–drawing if another pylon of an earlier building phase, or a late one in front of the first pylon, had been excavated. Among other aspects of Egyptian architectural mathematics and its interpretation, this type of theories is described and put into the right perspective, by showing its weak points, in 'Architecture and mathematics'.

In the first chapter, preceded by a short historical overview of proportion and harmony in architecture in general, several of the mass of theories concerning the proportions in Egyptian architecture formulated since the early 19th century are described. Strangely, the architectural historian Quatremere de Quincy believed in 1803 that Egyptian architecture lacked any system of proportions. In sharp contrast, soon after publication of the 'Description de l'Egypte' provoked an immense popularity of the ancient Egyptian architecture, a stream of theories concerning all kinds of supposed proportion systems emerged. The writer describes some of the many attempts to formulate a geometrical system based on either polygons or series of numbers. These attempts concentrate predominantly on plans of Egyptian buildings, although sometimes column heights and facades were also subject of these Grand Theories. Rossi signals some fundamental errors in the approach of the analysis of the architectural plans used. Scaling errors in the drawings, line width and dubious reconstructions, all make the application of networks of polygons and series of numbers a precarious operation.

Somewhat puzzling is the remark of Rossi (p. 54) that Badawy's "schemes seem to work", although she convincingly proved earlier in the text that his theory has several serious flaws. Besides the earlier mentioned problems with the use of (small) plans, there is not a fixed correspondence between the network of lines and the various elements of the buildings. There is also the unlikely use of the 8:5 triangle, which produces three sides with dimensions of irrational numbers. In general, the analysis of the plans produced networks of lines which were far too complicated to be of any use for the ancient builders.

Rossi also signals a problem even with the more likely analysis. Several geometrical schemes can be superimposed to a plan. Not all of them must necessarily correspond to methods of design adopted by the ancient builders. It is not easy, if possible at all, to draw a clear distinction between intention and coincidence because of the possibility of a general human tendency towards certain geometric patterns (p.73).

Part II reviews the mathematical content of ancient plans and other contemporary documents. The plans are evidence for one of the findings of Part I: complicated building schemes were not used by the ancient builders, as all these plans seem to be drawn *after* construction of the depicted buildings. It appears from studies of Dieter Arnold (1974, 1999) that the ancient Egyptians generally laid out their plans on the basis of simple numbers of cubits, palms and fingers. Details in the structures were supplied by 'long consolidated building practice'.

Chapter four, the last part of section II, deals with foundation rituals. The stretching of the chord is both a central element of the foundation ceremony and the important first stage of the layout of the plan. It seems that cords were used to fix the alignment, to establish the overall dimensions and the position of walls and other elements. The idea that these cords were also used to design geometrical figures in order to establish the proportions of the plan, is based on misinterpretations of a text of 5th–4th century BC(!) philosopher Democritus and 3rd century AD writer Clemens of Alexandria.

Not much attention is given to astronomical alignment, the playground of several present–day popular writers, although some of the mathematics involved in the few proved alignments could have been an interesting addition to this book.

Part III is completely dedicated to pyramid architecture. In fact these chapters are a case study, as it focuses on the angel of slope of the pyramids solely. Although already slopes of Old Kingdom pyramids can be related to triangles based on Pythagorean triplets, there is no evidence of the intentional use of these triplets before the 3rd century BC. The introduction of the *Seked,* the horizontal displacement of a slope for the vertical drop of one royal cubit, in these chapters is very useful in describing the slope of the pyramids, although the *Seked* is only known form Middle Kingdom sources.

The mathematics in this well written book are accessible for most readers. Its warning against the multiple of proportion theories concerning the Egyptian architecture is a very welcome addition, as is the overview of ancient architectural drawings, models and texts. The author also states that Egyptian architecture mostly has been analyzed from modern mathematical perspectives. The concluding chapters on pyramid architecture are interesting, but now the book seems somewhat to much focused on a single building type, as the mathematics involved in the determination of less spectacular details like the slope of monumental walls or the calculation of architrave width are missing.

Important is Rossi's conclusion that too much attention has been given to possible symbolic intentions in the proportions and composition in, mainly plans of, Egyptian architecture. As the Egyptian builders had to work with simple tools and mathematics, most of the layout of structures was a result of practical considerations, or, as Rossi concludes: ‘One must never forget the weight of stone’.

Rossi, C. 2004. Architecture and mathematics in ancient Egypt. – Cambridge, Cambridge University Press. 302 pp. ISBN 0 521 82954 2. Price £ 60.00/$ 100.00 (hardback).

Cited literature

Arnold, D. 1974. Der Tempel der Königs Mentuhotep von Deir el–Bahari. Vol. I. – Mainz, Philipp von Zabern.
Arnold, D. 1999. Temples of the last Pharaohs. – Oxford, Oxford University Press
Schwaller de Lubics, R.A. 1957. Temple de l'homme. – Paris, Caractères.