

Shape and Geometry. Genesis of the shape and the use of the geometry till the a.d.

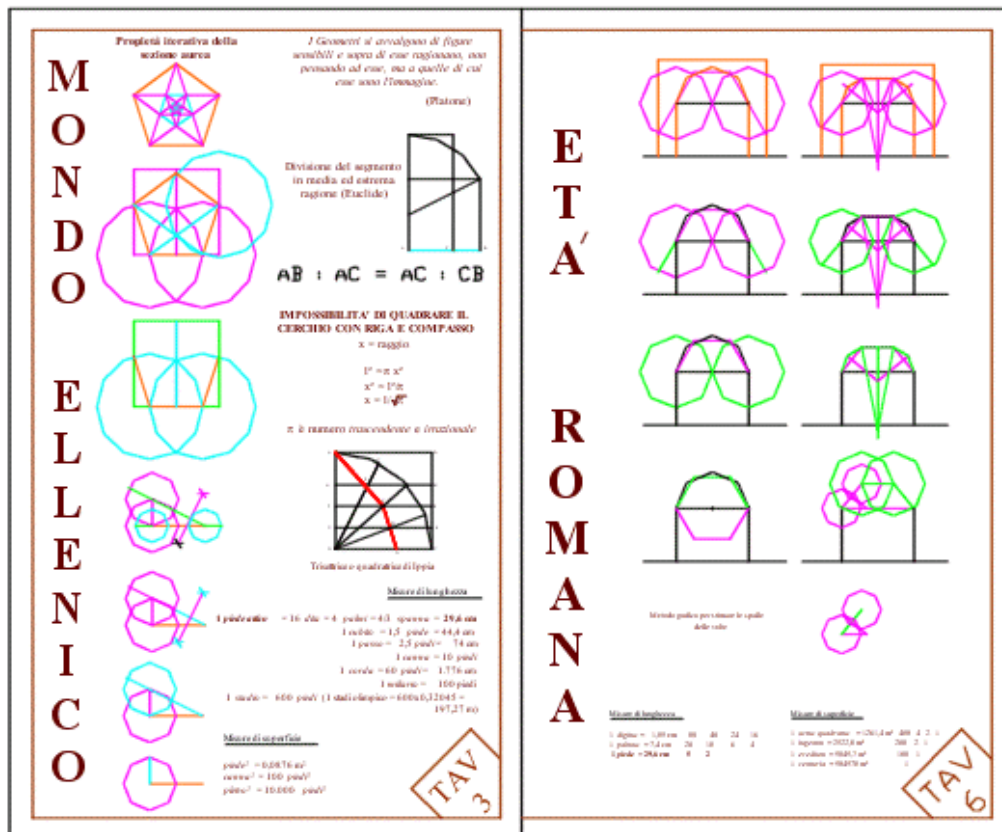
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In the geometric-architectonic review of the history of the mathematics from the archaic civilisation to the II century b.C. and by the practical application in the roman world, it is proposed a further widening of the cognitive route in the research field of "orderer criteria of the formal invention that – by the already well-established Theory of the Formal Geometry – is inborn in the geometry".

To understand the process of the formal invention expressive modality it needs to put aside the modern culture that makes use of the descriptive and projective geometry: everything transmitted took a graphic form by the ruler and compasses use. Understanding the geometric link to the form draw and to the space control means to understand the "fourth dimension" (the evolution of the shape in the time and space), to verify the unitariness and consequentially to understand the meaning of every single being constitute the whole. It can not be possible to have a strong and deep idea of the greek mathematics without, in some way, have a knowledge of the greek philosophy, indeed one of the objective of this study was to research the reasons because a certain discovery occurs in a specific age, place and by that specific people who realise that knowledge progress.



It can be true that the geometry in the archaic age was not released from the rough matrix of a spatial experience that comprehends every measurable element (the geometry was geography, sometimes surveying, its figures have nothing mysterious, secured to the reality without needs of abstraction). It must wait till the Greek of the IV century b.C. (after the problems raised by the discovery of the irrational numbers) to find a God surveyor: the Hellenic world set the first step on the way of "scientific spirit", that goes on the "way of the object" opened and travelled from Mesopotamia to Egypt.

The Greeks built up an abstract science of the geometry based on a strictly logical-rational criteria and world wide valid. They made, for the first time, a simulation of a physical phenomena, they developed the calculus as a one-discipline, they set theoretical problems up to the infinitesimal calculus, up to the trigonometry, up to the explanation of the sky mechanic (Eudoxus, beginning of the IV century). This attitude itself allowed "to use the so called Euclid's geometry as a methodological path even for the control of the architectonic space".

The objects of the physical world have, more than the specific properties of the formed matter, two common properties: the Shape and the Extension (as the capacity to occupy the space). If for every body it is neglected the strictly material property, it remains only the "idea".

Plato was used to say: "The Surveyors are using perceptible figures (materials) and argue over them, not thinking about them but to their image".

Must pass about two thousand years before other researchers, already in full modern age, took substantial and radical newness from the Euclid's studies, that are still an essential reference point.

The developed historical period goes to the Roman period. It can be gathered the more applicable aspects of the scientific knowledge inherited from the past, addressed principally towards the perfecting of the technical quality more than the speculative or logic investigation. In fact they couldn't improve in pure mathematics and philosophy but they could, for their advanced organisation, mark the territory in an indelible way.

Coming back to the a.D.: for understanding how the interest in the mathematics could complete the education of an architect in the Roman age, it can not avoid to read the only treatise on architecture came from the ancient: *De Architectura* of Marcus Vitruvius Pollio. Was focalised the attention on the terms *mathematics* and *geometry*, and on the communications modality of the architectonic form, taking off the more significant steps.

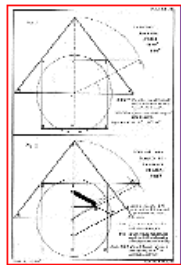
It is understood how the geometric process could help the ancient civilisations for practical problem solving. By the way the evolution and the capacity to reproduce a project drawing, to implement the way for projecting, the raising up of some construction material carrying on new expressive value, eliminate the described geometric drawing and slowly eliminate the geometric-deductive support as a methodology for projecting of architectonic opera.

Metodo per calcolare un pezzo di terra circolare di diametro 9 khet. Qual'è la superficie di terra?

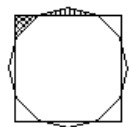
Tu devi sottrarre la nonaparte di esso (diametro), cioè 1; resto 8. Devi moltiplicare il otto volte; diventa 64. Questa è la sua area di terra, 64 setat

ANTICO EGITTO

(Papiro Rhind, prob. n. 50)

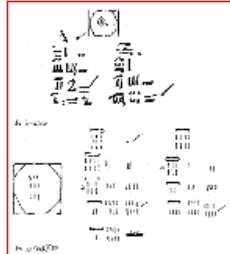


Piazzi Smyth (1819-1900)

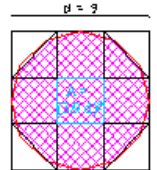


$$A_c = (d - 1/9 d)^2$$

$$A_q = (8/9 d)^2$$



Papiro Rhind (1650 a.C.), particolare, prob. n. 48



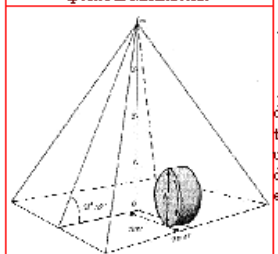
$$\text{Area Cerchio} = \pi (1/2 d)^2 = 1/4 \pi d^2$$

$$1/4 \pi d^2 = 64/81 d^2$$

$$1/4 \pi = 64/81$$

$$\pi = 2.56/81 = 3,1605$$

Piramide di Khafu (2620-2597 a.C.), ipotesi di Merdeksohn



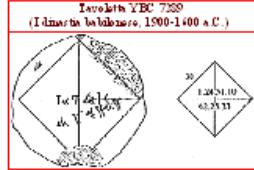
...non possedevano il concetto di spazio isotropico tridimensionale; usavano unità di misura diverse per le distanze verticali ed orizzontali.

TAV 1

La matematica non era un'attività speculativa astratta ma un prodotto sociale generato dai bisogni di una civiltà in continua espansione.

I processamenti dei Babilonesi erano essenzialmente algebrici e la geometria aveva un ruolo quasi esclusivamente ausiliario.

MESOPOTAMIA



$$124.51.10 = 1,4142128$$

$$42.25.33 = 42,4263888 \text{ (diagonal)}$$

$$42,4263888 = 30 \times 1,4142129$$

$$\Rightarrow \sqrt{2} = 1,4142135$$

$$d^2 = a^2 + a^2 = 2a^2$$

$$d = a\sqrt{2}$$

Talote: una retta parallela a uno dei lati di un triangolo taglia proporzionalmente gli altri due lati del triangolo stesso...

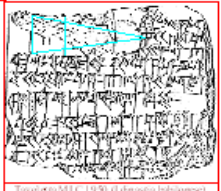
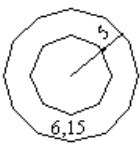


Tavola M.L. 1930 (il diametro del cerchio)



Ho tracciato il confine di una città. Non conosco la sua lunghezza. Mi sono allontanato di 5 dal primo cerchio, rispetto al centro, e ho tracciato un secondo confine. L'area compresa tra i due confini è 6,15. Trovate il diametro della nuova e della vecchia città.

In altri problemi il numero irrazionale (Lambert, 1764) e trascendente (Lindeman, 1882) risulta essere:

$$\pi = 3$$

$$\pi = 3 + 1/8 = 3,125$$

Il 60 tra tutti i numeri è il più conveniente, perché essendo il più piccolo, tra tutti quelli che hanno il maggior numero di divisori, è anche il più maneggevole. (Teone, *Composition Mathématique de Ptolémée*)

Imitando Vitruvio (...) mi servirò ancor io di tal misura in tutti gli ordini, e sarà il Modulo il diametro della colonna da basso diviso in minuti sessanta, fuorchè nel dorico (...): nel quale il Modulo sarà per il mezzo diametro della colonna, e diviso in trenta minuti: perchè così riesce più comodo ne' compartimenti di detto ordine.

(Andrea Palladio)

TAV 2

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