
The Vitruvian concept of architecture as *scientia* finds expression in the modern age mostly in the theory of proportions. Up to the 18th century at least, the concept of beauty in architecture was strictly linked to the harmony of numbers: an ordered ensemble of ratios governing space, form, and in many cases structure as well. The harmonious relationship of numbers governed the sizing of the architectural orders, that was deemed a well-tested system where each element related to the others in such a way that, as Leon Battista Alberti explained, “nothing can be added and nothing can be taken away or changed except for the worse”. The hand and mind of the architect were thus guided by proportional calculation. Special compasses, which became real calculating instruments in the 16th century, were used for these often laborious calculations. From Leonardo to Galileo, the “proportional compass” evolved as a mathematical instrument applicable to various disciplines, gradually assuming a specifically architectural function within the most glorious context of proportional beauty, that of Palladian architecture. The *archisesto*, or architectonic sector, of Ottavio Revesi Bruti, an architect in Vincenzo Scamozzi’s circle, is the instrument that best exemplifies the mathematical dimension of the building art. This architectural version of the Galilean compass came into widespread use with the introduction of the Palladian style in 18th-century England, in a cultural context where the ideal of classical beauty was interwoven with the mathematical propensity of the new professional figure of architect.

The history of “architecture as mathematical practice” in 17th-18th-century England is knowledgeably surveyed in the volume by Anthony Gerbino and Stephen Johnston, referring to an exhibition they curated at the Oxford Museum for the History of Science. From the Medieval building site to the architectural education of King George III, English architecture reveals a mathematical tradition that is symbolically expressed in Freemasonry texts by portraying Euclid in the guise of architect. Stonecutting, in fact, called for a thorough knowledge of geometric design, and it is no coincidence that the square and compasses, its indispensable tools, became Masonic symbols par excellence. Over the course of the 16th century these tools underwent radical transformation, evolving from instruments for drawing to instruments for proportional calculation. This evolution was imposed partly by the new military architecture with bastioned front that required scale drawings for the whole building, and partly by the infiltration of the classical style into civil and religious architecture.

Consolidating the tradition of practical mathematics applied to the building art was a book by Leonard Digges, the *Tectonicon*, published in 1556. Specifically dedicated to surveyors, woodworkers and stonecutters, it was widely read throughout the 17th century. The “carpenter’s rule” described in this work was the first of the calculation instruments destined to improve building site operations, by eliminating the imprecision of traditional rulers and indicating the need for craftsmen to acquire specific mathematical knowledge. The book also opened the way to a
glorious tradition of constructing mathematical instruments. Thomas Gemini, the printer of the *Tectonicon*, became a leading figure in this field, producing many refined astrolabes that entered the Royal Treasuries of England.

Already by 1575, in Humphrey Cole’s immediate re-elaboration, the carpenters’ rule had assumed the characteristics of the proportional compass that was being developed in Italy by such outstanding mathematicians as Federico Commandino and Guidobaldo del Monte. Edmund Gunter’s “sector” represented a major step forward in this direction. With its scales for trigonometry calculation and for extracting square and cube roots, it became an instrument symbolically associated with higher intellectual status. This is clearly apparent, for example, in the portrait of the shipwright Phineas Pett, shown proudly holding one of these compasses.

The two souls of British architecture, the artistic and the mathematical, can be clearly illustrated by comparing its two greatest figures, Inigo Jones and Christopher Wren. Jones, who was above all an intellectual, is responsible for introducing Vitruvian culture into 17th-century England. The many notes scribbled in the margins of the books he owned reveal a humanistic rather than a practical inclination. His library contained such fundamentally important books as Daniele Barbaro’s edition of Vitruvius, Palladio’s *I Quattro libri* [The Four Books of Architecture], and Vignola’s *Regola delli cinque ordini* [Rules for the Five Orders of Architecture]. Although his notes on Bonaiuto Lorini’s treatise on fortifications also show an interest in measuring instruments, his concept of architecture is far removed from the practical direction taken by many other architects of his day.

Quite different is the case of Christopher Wren, a true scientist who found in architecture a further stimulus to his great mathematical talent. The beauty of numbers that Jones saw expressed in the design of the architectural orders, appears subordinate in Wren to the beauty of the forces that model the structural elements. The inverted arches in the foundations of Trinity College Library at Cambridge and the dome over St. Paul’s Cathedral in London, for instance, are inventions that can rightfully claim a place among such properly scientific ones as machines, mechanical clocks, air pumps, instruments for perspective drawing and even a micrometer for telescopes. The dome of St. Paul is modelled after the statics of a catenary, deemed by Robert Hooke the ideal curve for a perfect arch in masonry. A few years prior to Hooke’s discovery, Wren had devoted an unpublished treatise called *Tract* to the problem of arches and vaults, presenting his considerations on statics. Some study sketches of the London dome show the evolution of the idea of designing its three calottes by imagining the one in the middle as generated by the rotation of a parabolic curve. In the final version its geometry is simplified, while clearly retaining the geometric and mechanical matrix that shaped one of the most innovative structures in modern architecture.

The attempt to fuse artistic and mathematical culture is recorded in the editorial projects widely read among “gentlemen” engaged in architectural pursuits. *The Mirror of Architecture* (1669), for instance, is a work divided into two complementary parts, one devoted to the five orders of architecture, taken from a Dutch edition of Vincenzo Scamozzi’s *Idea della architettura universale* [The Idea of Universal Architecture], the other dealing with a new folding rule invented by John Brown,