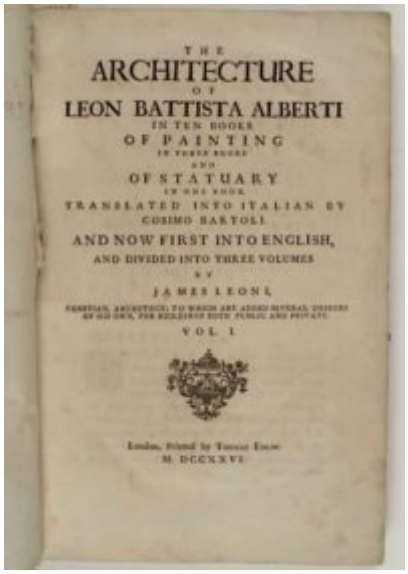
Renaissance Architecture

Martyn Shuttleworth29.2K reads

Part 1 - The Mathematics of Building the Dream

The Renaissance is the period of human history where the focus of human knowledge shifted away from the Middle East to Europe, as the Islamic influence declined. As the Muslim Empire in Spain collapsed, scholars fled to Europe, with many taking up residence in Italy, where they found patronage from the nobility and the Church. This fuelled a devotion to the pursuit of knowledge and society made great advances in science, art and philosophy.

Renaissance Architecture - The Mathematics of Building the Dream Part II

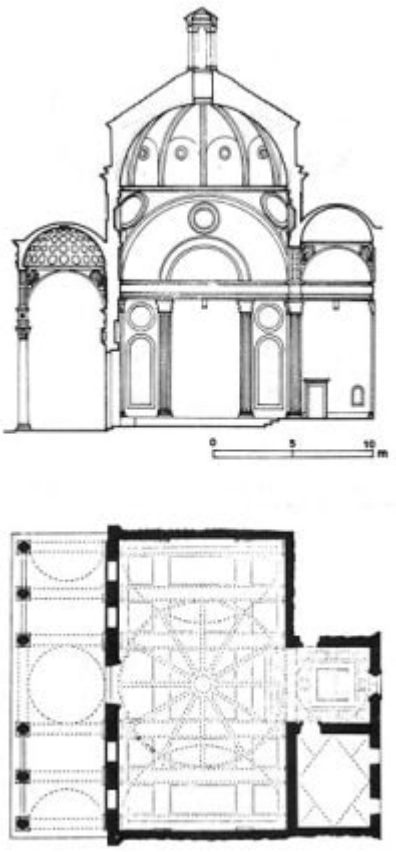


The Architecture of Aliberti Book
(Public Domain)

One area that captures the Renaissance perfectly is the architecture, which delved deep into the history of Greece and Rome for inspiration yet incorporated innovation and new techniques. Like the earlier architects, Renaissance designers believed that the universe was perfect and that the laws of creation were built upon mathematics. This mathematical doctrine pervaded Renaissance architecture and helped the architects create buildings that they felt were harmonious and elegant. Architecture was given a quasi-religious and philosophical status in Renaissance Europe, with many scholars believing that architecture was a way to unite the earth, humanity the cosmos and spirit. As a result, they believed that an architect

should be artist, musician, philosopher, mathematician, astronomer, and linguist, hearkening back to the days when scholars were true polymaths. This trend was dying in other fields as scholars largely immersed themselves in a specific discipline, the beginning of our modern distinctions between the various sciences.

Renaissance Architecture – Looking Backwards



Pazzi Chapel, built in 400's by Filippo Brunelleschi (Public Domain)

Ever since humanity started building edifices and great structures, mathematics and architecture have been inextricably intertwined. Obviously, improvements in surveying and applied mathematics aided engineers and helped them to build greater and bigger monuments, using mathematical techniques to add strength. The pyramids, the Parthenon and the Pantheon are great examples, using angles and numbers, as well as an understanding of centers of gravity and weight distribution to ensure that they endured for many years. In some circumstances, ancient architects used mathematics and astronomy to align buildings with astronomical phenomena or the cardinal points, as the Egyptians, Maya and Ancient Britons showed with pyramids, temples, and stone circles. However, mathematics had another effect on architecture, influencing the abstract ideals of proportion and beauty, with certain mathematical ratios believed to be aesthetically pleasing to the eye. It is unclear, in many cases, whether many of these ratios occurred by design or coincidence, but it seems that architects have always incorporated sophisticated mathematical ratios into their designs. This was certainly true during the Renaissance; not only did the Renaissance architects look back to the classics for the inspiration, recycling and refining Greek and Roman ideas, but they also devised their own techniques. The discovery of perspective in Renaissance art, by Van Eyck and Van der Weyden in the 15th century, influenced the architects by reviving interest in the Platonic solids, with simple spheres, tetrahedrons and cubes readily apparent in many architectural designs, as well as many more complex solids. Added to this was the idea of musical harmonies, which the Greeks and many Renaissance thinkers believed governed the universe. According to Pythagoras [1], strings of certain lengths vibrating together were harmonious: for example, a ratio of 2:1 in length gave a pleasant sound. This harmony, proposed by Pythagoras, further influenced the obsession of the Greeks and Renaissance scholars and artists with using ratios as aesthetically pleasing.

Santa Maria Novella, Florence, Designed by Alberti (Creative Commons [2])

In 1414, a text, *De architectura libri decem*, by the Roman architect, Vitruvius, was discovered in the Monte Cassino abbey, and this began to ignite the interest of Renaissance thinkers in using proportions for their designs. He believed that the various parts of a building design should be a whole ratio number of the whole, because this was aesthetically pleasing. He likened a building to the proportions of the human body, an idea that was also incorporated by the great Renaissance painters into their work, a process depicted perfectly in Da Vinci's Vitruvian Man. Renaissance architects adopted this idea with relish, and Vitruvius' proportions, Pythagoras' harmonics, and Plato's solids became an essential part of the design process for architects across Europe, the idea spreading, as with so many things, from the university cities of Italy. For example, the artist Titian, the architect Serlio, and other luminaries approved the design of the San Francesco della Vigna, in Venice, an edifice built entirely around the proportions stipulated by Plato and Pythagoras. This idea of perfection

pervaded architecture and was tied into mysticism and philosophy, with occultists such as John Dee, and Renaissance philosophers believing that it tied the architecture to the laws of the cosmos and could reveal inner perfection. In the modern world, many conspiracies abound, stating that Freemasons and other secret organizations hid numbers and meanings in the symbolism of architecture; this has a ring of truth to it, even if we stop some way short of The Da Vinci Code. With these ideas firmly ensconced, Italian Renaissance architects took their inspiration from the Classical period, relying heavily on the Roman and Greek styles and, for most practitioners, a trip to view the buildings of Rome was seen as an essential part of the learning process. This involved studying the styles of the columns, arches, and domes, studying the aesthetic qualities that dominated that period of history.

The Great Renaissance Architects – Brunelleschi and Alberti

Dome of the Florence Cathedral, designed by Filippo Brunelleschi (Creative Commons [3])

The first architect of the Renaissance era was Filippo Brunelleschi (1377-1446), from Florence, the mind responsible for designing and engineering the Dome of the Florence Cathedral. Like many of his structures, the design for this building was deceptively simple, but he used repeating ratios and measurements to create the feeling of harmony, with the height and the distance between columns in perfect proportion with the main building. Brunelleschi's dome of Florence cathedral is still the largest masonry dome in the world, showing the engineering skill of this great architect. The techniques he used were centuries ahead of their time, and this octagonal dome was a true masterpiece of structural engineering, carefully designed to spread the load without creating stress. Importantly, Brunelleschi also invented a number of lifting machines for raising the materials to the great height needed for building the dome, possibly his most significant contribution to architecture and construction. Leon Battista Alberti was the next of the great Italian architects and he was a true Renaissance man, worthy of mention alongside Da Vinci and Michelangelo as one of the great minds that defined the early Renaissance period. He was the father of Renaissance architecture and he subscribed wholeheartedly to the idea of proportion, but later scholars and architects, Francesco di Giorgio Martini (1439–1502) and Ficino, also followed the idea of the perfection of the human body and the cosmos as a whole as the foundations for elegant architectural design. As with

the majority of Renaissance architects, Alberti was inspired by the Roman architect, Vitruvius c. 80/70BCE – c. 15BCE), and he used his work to recreate a small piece of Roman history in his Tempio Malatestiano (1450) in Rimini and the Santa Maria Novella church in Florence (1470). Aliberti not only believed that architecture should be aesthetically pleasing, but he believed that the proportions should be used to give a building strength and durability. Upon these tenets of proportion and aesthetics, the seeds of modern architecture were sown, and the architect, Palladio, would be the designer to cultivate the process and bring the ideas together.

Links
[1] https://explorable.com/pythagoras
[2] http://commons.wikimedia.org/wiki/User:Blorg
[3] http://commons.wikimedia.org/wiki/User:Sailko