

# **Leonardo da Vinci and Filippo Brunelleschi: Renaissance Innovators**

**Madison Goodwin**

## **Introduction**

The Renaissance, which literally means “rebirth” was the period in Europe immediately after the Middle Ages that was revitalized by the surge of interest in Classical scholarship and values. Art was soon seen as a branch of knowledge and was even a science. It was based on the observation of the visible world and practiced according to mathematical principles of balance, harmony and perspective. Ideas like these allowed many artists like Leonardo da Vinci and Filippo Brunelleschi to flourish. These artists showed immense discipline through the processes by which they created work and their ability to overcome the challenges of their time.

## **Da Vinci and His Process**

Leonardo da Vinci was a painter, architect and an inventor during the Italian Renaissance. He was born on April 15<sup>th</sup>, 1452 in the town of Vinci Italy. He was an artist, mathematician, inventor and a writer. His interest in the laws of science and nature greatly influenced his work as a sculptor, painter and an inventor. At the age of 14 he began apprenticing under Verrocchio, and for the next six years he learned many technical skills including: metal working, leather arts, carpentry, drawing and sculpting. By the time da Vinci turned 20 he had qualified as a master artist in the Guild of Saint Luke and had started his own workshop.

Da Vinci was deeply interested in detail and process. Through his observations and countless inventions during his life he recorded somewhere between 20,000 to

28,000 pages of notes and drawings. It is believed that he produced at least 50 notebooks.<sup>1</sup> He studied the movements as well as the skeletal structures and their muscles of animals like oxen, horses and birds. He also had an obsession with the human body and how it worked. Prior to 1506 his representations had been inaccurate. His studies of anatomy began in late 1506 when he began dissecting a 100 year old man who he witnessed passing away. He not only wanted to know how the body worked, but also where emotions came from.<sup>2</sup> To understand these things he dissected muscles, nerves and vessels and recreated them within his drawings. This allowed him to understand how blood flowed throughout the body. To this day some of his sketches are still being used in anatomy classes.

From these notebooks you can learn about da Vinci and how his mind worked.



Figure 1: Leonardo da Vinci, *Study of a Womb*, 1489, Black chalk and pen and ink wash on paper, Royal Collection, United Kingdom

They show his interest in detail and his understanding of process. It is believed that Leonardo was left handed because of how he wrote within the books. His writing was read from right to left, and the letters were often inverted from back to front.<sup>3</sup> You can see his writing in fig. 1: *Study of a Womb*. This style of writing was called mirror writing because you could read the text when it was reflected in a mirror. Da Vinci also wrote in his own made up short hand where he often combined words or even invented new ones. It is believed that he wrote this

<sup>1</sup> Paulin, 1<sup>st</sup> November 2015: pars. 3-4.

<sup>2</sup> Jones, 2012: 319

<sup>3</sup> Sooke, 1<sup>st</sup> November 2015: pars. 1.

way in order to deter others from copying his work and the knowledge he gained. By looking at his notebooks you are able to see that there is an organized sense of chaos, which can also be seen in fig. 1. Each page was limited to one idea, and when his ideas exceeded one page he made note of it. The pages were filled with his interests and experiments but almost never contained anything about his personal life. His interests were varied and included human forms, animals, mechanical inventions and flying machines. Through his drawings and text you can see how detail oriented da Vinci was. You can also begin to see his drawing's progress within his images, from the way he starts with the inner layers and works his way outward similarly, from bones to muscles to skin in order to correctly render a figure. By studying his manuscripts you can really begin to understand the amount of time da Vinci spent learning about process and how he created his highly detailed works.

Vasari quoted da Vinci saying,

“This work should commence with conception and should describe the nature of the womb, and how the child inhabits it, and in what stage it dwells there, and the manner of its quickening and feeding, and its growth, and what interval there is between one stage of growth and another, and what thing drives it forth from the body of the mother, and for what reason it sometimes emerges from the belly of its mother before the due time. Then you should describe which are the limbs that grow more than the others after the child is born; and give the measurements of a child of one year. Then describe the man fully grown, and the woman, and their measurements, and the nature of their complexions, color and physiognomy. Afterwards describe how he is composed of veins, nerves, muscles and bones.”<sup>4</sup>

This quote is important because it shows da Vinci's process when studying and drawing a fetus. Many of his drawings were created with black or red chalk, and others with pen and ink on wash paper. His drawing of the fetus inside of a uterus was the first correctly depicted fetus in its proper position, which is seen in fig. 1. He displayed the

---

<sup>4</sup> Jones, 2012: 319

veins and arteries by using a method of cross sectional representation within his depictions. His drawing also showed his intense process because he often displayed four different views of the subject so that every angle could be seen.<sup>5</sup> This is shown in fig. 2: *Views of the Fetus in the Womb*. His drawings followed the techniques that were often used by architects to show three-dimensional views of the subjects. With this he was able to show how much knowledge he attained from his studies and how his knowledge was reflected in his drawings. After he finished his anatomical studies, da Vinci then went on to study measurements and proportions of the human body.



Figure 2: Leonardo da Vinci, *Views of the Fetus in the Womb*, 1510-12, Black chalk and pen and ink wash on paper, Royal Collection, United Kingdom

### Da Vinci's Study of Proportions

One example of this study of proportions is “*The Vitruvian Man*” which can be seen in fig. 3. This drawing is another example of da Vinci's study of process and his ability to render figures correctly and learn from those before him. It was created in 1487, and is surrounded by notes about the ideas and theories of Vitruvius. The drawing depicts a male figure with superimposed positions with his arms and legs apart. The figures limbs are outstretched, touching the circumference of

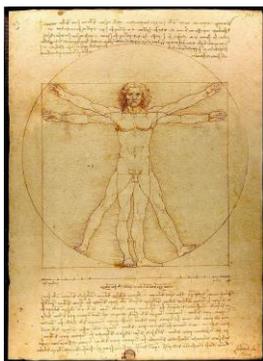


Figure 3: Leonardo da Vinci, *The Vitruvian Man*, 1490, Pen and ink wash over metal point on paper, Gallerie dell'

Accademia, Venice Italy  
<sup>5</sup> Gilson, 1<sup>st</sup> November 2015: pars. 5.

the circle and the edges of the square. The work changes perspective and is both static in its structure and dynamic in its presentation of a moving and living man.<sup>6</sup> It is often referred to as a Canon of Proportions because of its correlation with the ideal human proportions. Leonardo's depiction of Vitruvius was much different than the previous works because his male figure depicts two different positions within the same image. You can see that da Vinci cared about rendering the figure correctly because there are thin lines that show the significant points of the proportion theory that can be seen in fig. 3. His goal with this drawing was to bring together the ideas of art, architecture, human anatomy and symmetry in one remarkable image.

Leonardo was among many prominent artists of the Renaissance, with the other being Filippo Brunelleschi. These two artists were able to create remarkable works of art that were well beyond their time. The link between the two is credited to the dome of the Florence Cathedral. The bronze ball was commissioned to Verrocchio and Leonardo was his apprentice.<sup>7</sup> It is said that da Vinci was obsessed with Brunelleschi's machines that were used to hoist the ball and he made a series of sketches of them. Although they were years apart, they were both great inventors and artist of their time that focused on process and how things related to each other.

Filippo Brunelleschi was one of the leading architects of the Italian Renaissance. He was born in 1377 in Florence Italy. He was an engineer and one of the pioneers of early Renaissance architecture in Italy. In his early days he began training as a goldsmith and a sculptor while he was enrolled in the Arte della Seta, the silk merchants guild. In

---

<sup>6</sup> Campbell, 1<sup>st</sup> November 2015: pars. 3.

<sup>7</sup> Ross King, *Brunelleschi's Dome: How a Renaissance Genius Reinvented Architecture* (New York: Bloomsbury USA, 2000)

1401 he competed for a commission to make the bronze reliefs for the door of the Florence baptistery. His entry “The Sacrifice of Isaac” was the high point of his sculpting career, however Lorenzo Ghiberti won the commission. From there he transitioned into architecture. His style soon changed from the Gothic and medieval manner to classicism.<sup>8</sup> This difference can be seen in the change of the intricacy and verticality of the Gothic style to that of balanced proportions of the rounded arches and domes in the Classical style. Brunelleschi’s conversion can be attributed to his visit to Rome to study the ancient ruins with his good friend Donatello.

### **Brunelleschi and Perspective**

Brunelleschi’s first major achievement was his rediscovery of the principals of linear perspective, which was lost in the Middle Ages and with this rediscovery he was able to change the way that artists displayed perspective, thus changing the way that art was rendered. Through studying previous paintings and drawings he realized that there was always something that was slightly off within the buildings and the architecture. He then devised a way to achieved perfect linear perspective by drilling a small hole in a mirror and then standing directly in front of the Baptistery.<sup>9</sup> In doing this he was able to show that when he moved the mirror in and out of the way he had created an exact copy of the 3- dimensional, octagonal building, on the two dimensional surface of his mirror. He was then also able to analyze the structure mathematically and discover that there was not only a central vanishing point, but also a horizon line. He also knew that all parallel lines drawn on that same plane converge at the vanishing point and because of this the relationship between distance and reduction of objects as appear to recede in space.

---

<sup>8</sup> Hyman, 1<sup>st</sup> November 2015: pars. 6.

<sup>9</sup> Holm, 1992: 21

Brunelleschi's invention allowed him to paint an exact copy of the Baptistery in front of the famous cathedral in Florence that represented perfect linear perspective. With this discovery Brunelleschi as well as other artists were able to create works of art that displayed accurate realism. His ability to think outside of the box and to push himself to be the best, showed that he was able to overcome the challenges he was presented with during the Renaissance.

### **Brunelleschi and the Dome**

Brunelleschi's greatest accomplishment was the completion of the dome on top of the Santa Maria del Fiore and with this dome he was able to show his ability to overcome some of the biggest challenges of his time. The biggest issue was how to build a dome that was 150 feet across, and would have to be started from nearly 171 feet above the ground on top of the existing walls.<sup>10</sup> It wasn't until 1418 that the problem with building the dome was finally addressed, when the Cathedral authorities announced a contest for the ideal dome design. Filippo submitted his idea to build not one, but two domes where one would be nestled inside the other without elaborate and expensive scaffolding this can be seen in fig. 4. The only part of the plan he left out was how he would achieve this idea, because he feared a competitor would steal his ideas. This soon led to the Cathedral authorities believing that he was incompetent and they denounced him as "a buffoon and a babblers."<sup>11</sup> After much convincing,

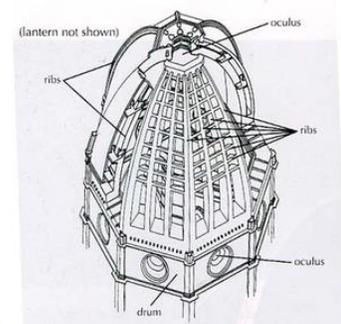


Figure 4: Filippo Brunelleschi, *The Dome of the Santa Maria del Fiore*, 1446-1461, Brick, Florence Italy

Brunelleschi was able to prove to the authorities that his design would work.

<sup>10</sup> Ceperley, 1<sup>st</sup> November 2015: pars. 3.

<sup>11</sup> Muller, 1<sup>st</sup> November 2015: pars. 5.

Brunelleschi's plan was well thought out and highly detailed and displayed his attention to detail and process. He later disclosed to the Cathedral authorities that his dome would consist of two concentric shells, an inner one visible from within the cathedral, which would be nestled inside a wider and taller external dome. In order to counteract the outward stress, Brunelleschi planned to bind the walls with tension rings of stone, iron and wood.<sup>12</sup> After building the first 46 feet in stone seen in fig. 4 as the drum, his plan was to continue with lighter materials like brick. With this plan they agreed to make him the superintendent of the project, but with one stipulation, Lorenzo Ghiberti was to be the co-superintendent.

Brunelleschi is recognized as one of the first modern engineers who relied on his ability to invent new ways in order to solve problems. One challenge of the dome that Brunelleschi had to solve was how to lift and maneuver the heavy materials that were needed to build the dome. He was able to invent a hoisting system that used gears, pulleys, screws, rope, a drive shaft and oxen to turn a wooden tiller. With this he was able to use the oxen as well as a clutch system he invented, to lift the materials and then lower them without having to change the direction of the oxen. He also overcame other challenges by inventing the Castello, which was a 65-foot tall crane that allowed them to move materials laterally. It was with these inventions, that he was able to create one of the greatest buildings that Florence had ever seen.

## **Conclusion**

Both Leonardo da Vinci and Filippo Brunelleschi are still considered two of the greatest artists and architects, as well as inventors of their time during the Renaissance.

---

<sup>12</sup> Muller, 1<sup>st</sup> November 2015: pars. 6.

They were able to pave the way for cultural and social revolutions. It is because of their abilities to create, as well as invent new ways, that their work continues to be studied around the world, and still influences people today. Brunelleschi and da Vinci were able to create remarkable works of art through their dedication to understanding process, and it is because of their aptitudes, that they were able to invent new ways that revolutionized the Renaissance.

## Works Cited

- Campbell, Shawn. "Vitruvian Man." *Leonardo Da Vinci's Life*.  
<http://www.davincilife.com/vitruvianman.html> (Accessed November 1, 2015).
- Ceperley, Peter. "Brunelleschi's Dome- Its Structure and Construction." *Resonances, Waves and Fields*. <http://resonanceswavesandfields.blogspot.com/brunelleschis-dome-its-structure-and.html> (Accessed November 1, 2015).
- Gilson, Hilary. "Leonardo da Vinci's Embryological Drawings of the Fetus". *Embryo Project Encyclopedia*. <https://embryo.asu.edu/pages/leonardo-da-vincis-embryological-drawings-fetus> (Accessed November 1, 2015).
- Holm, Lorens. "Reading Through the Mirror: Brunelleschi, Lacan, Le Corbusier: The Invention of Perspective and the Post-freudian Eye/I", MIT Press, 1992.
- Hyman, Isabelle. "Filippo Brunelleschi | Italian Architect." *Encyclopedia Britannica Online*. <http://www.britannica.com/biography/Filippo-Brunelleschi> (Accessed November 1, 2015).
- Jones, Rodger. "Leonardo Da Vinci: Anatomist." *The British Journal of General Practice* 62.599(2012): 319.
- King, Ross. "Brunelleschi's Dome: How a Renaissance Genius Reinvented Architecture" New York, Bloomsbury USA, 2000
- Muller, Tom. "Duomo." *National Geographic*.  
<http://ngm.nationalgeographic.com/2014/02/il-duomo/mueller-textPaulin>  
(Accessed November 1, 2015).
- Gabriela. "Interesting Facts about Leonardo Da Vinci's Journals." *HubPages*.  
<http://hubpages.com/education/Interesting-Facts-about-Leonardo-Da-Vincis-Journals> (Accessed November 1, 2015).
- Sooke, Alastair. "Leonardo Da Vinci's Groundbreaking Anatomical Sketches." *BBC*.  
<http://www.bbc.com/culture/story/20130828-leonardo-da-vinci-the-anatomist>  
(Accessed November 1, 2015).