

# Da Vinci's anatomy

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## Abstract

Leonardo Da Vinci was born in the Tuscan hill town of Vinci in 1452. Da Vinci's artistic works such as the 'Mona Lisa' and the 'Last Supper' have made his name synonymous with art. Acknowledged as one of the greatest and most gifted painters that has ever lived, Da Vinci spent the latter half of his life dedicated to anatomical drawings which detailed the inner human anatomy to much preciseness. His anatomical drawings included those of the skull and cerebral ventricles, the heart and blood vessels, lungs, alimentary tract and abdominal viscera, urogenital system and sketches of the human skeleton, muscles and tendons. Da Vinci has been credited as the first person to describe the heart as composing of muscles and comprising four chambers, portray cross sectional anatomy and making the first known clear illustration of a human fetus in utero. He also went beyond just drawing anatomical structures by performing animal experiments so as to correlate structure with function. His scientific drawings of the human body have set him apart from any other artist that has walked the face of earth.

**Keywords:** anatomical drawings, artist, dissection, human structure, Leonardo Da Vinci.

## 1 Introduction

The 'Renaissance genius', as termed by many and known to mankind as a person of phenomenal intellect and creativity, Leonardo Da Vinci (Figure 1) has often been described as a man whose unquenchable curiosity was equaled only by his powers of invention (GARDNER, 1926). His achievements as an artist have been far-reaching. The 'Mona Lisa' and the 'Last Supper' are works that have made art synonymous with the name of Leonardo Da Vinci. With the coming of the modern era, Leonardo Da Vinci's name has not been swept to the ash heap of history. Cinematography has depicted him as a master and genius of his time and his works have ramifications up to this day. The latter half of his life was dedicated to anatomical works and it is hard to imagine how one would have been able to detail the inner human anatomy to such preciseness.

## 2 Da Vinci, artist extraordinaire

Born in the Tuscan hill town of Vinci in 1452, his name simply meant 'Leonardo of Vinci'. As a teenage boy in the 1460's, Leonardo Da Vinci was apprenticed and entrusted to the care of Andrea del Verrocchio, a sculptor. The period under Verrocchio's tutelage was a decisive point of transition in Leonardo's life (NICHOLL, 2004). Verrocchio was one of the finest artist and sculptor of his time, with most of his paintings and statues carrying religious undertones. Some of his famous works include 'Christ and St Thomas', 'Madonna with Child' just to name a few. Through Verrocchio, Leonardo acquired the skills of a painter, sculptor and draughtsman. His first significant contribution to maestro Verrocchio's art piece 'The Baptism of Christ' had taken the artistry circle by surprise. It was the first of many brilliant works of art to come.

Leonardo Da Vinci was not only a gifted artist in his early years, but he took a keen interest in technology and music. He was an expert at playing the lyre and apart from constructing his own lyre, he also invented other musical instruments that intrigued those who saw them. Da Vinci was as musically inclined as he was an inventor. He had a mind which was creative and futuristic in its perception. His notebooks contained drawings of machines which required cutting edge technology during his time. Sketches of winged machines and military machinery were some of his ingenious ideas. Da Vinci's name becoming synonymous with art had not come to fruition during this period of time (1480's) as drawings such as 'St Jerome and the Lion' and 'The Adoration of the Magi' were left unfinished. It would take another 10 years before he would produce his most famous works of art.

The second half of Leonardo Da Vinci's life was characterized by paintings that would see him take the aesthetic world by storm as well as his anatomical drawings which surprised many of our time. The 1490's and early 1500's marked Da Vinci's most productive period as a painter. The 'Last Supper' and 'Mona Lisa' were some of the pieces of art painted during these two decades. Both works have been reproduced far more times than any artwork and their fame perhaps only matched by Michelangelo's 'Creation of Adam'. Many would also have seen Da Vinci's iconic drawing of the Vitruvian man (regarded as a symbol of the Renaissance) with one head and neck, and one trunk for two pairs of limbs inside a circle superimposed on a square (LE FLOCH-PRIGENT, 2008).

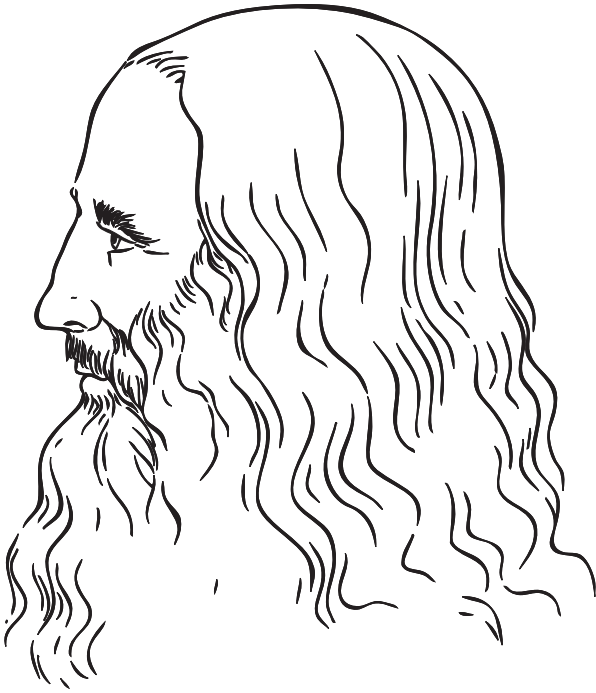


Figure 1. Sketch of Leonardo Da Vinci.

### 3 Da Vinci, perceptive anatomist

The latter part of Da Vinci's life saw him take a profound interest in the human anatomy. It is believed that his friendship with Marcantonio della Torre, a Professor of Anatomy at the University of Pavia in Milan, provided him with the opportunities to perform dissections on the corpses of criminals (VASARI, 1921; CLAYTON, 1992). But there were others who believed that his collaboration with Marcantonio was overstated as the latter's name was not mentioned in his drawings and the disparity in age and training made them unlikely to have worked together (O'MALLEY and SAUNDERS, 1952). Da Vinci made anatomical drawings of the skull and cerebral ventricles, the heart and blood vessels, lungs, alimentary tract and abdominal viscera and the urogenital system over the next 25 years from 1487-1513. It is interesting that he compared the layers of the scalp, cranium and the meninges to that of an onion. His sketches of the human skeleton, muscles and tendons were made to great precision. His drawings on the shoulder girdle and spine has been compared with the work of Andreas Vesalius, a very eminent anatomist at that time who published two outstanding pieces of anatomical work, *Tabulae anatomicae* and *De humani corporis fabrica, libri septem* (GANSEMAN and BROOS, 2008; VESALIUS, 1543).

It is certainly a marvel that Da Vinci was able to reconstruct the innate human structure to such accuracy without the aid of present day science and medical technology during the 1500s. More than six hundred of his drawings are currently in the possession of the Queen of England and housed in the Royal Library at Windsor Castle. A catalogue of Da Vinci's drawings can be seen in Martin Clayton's '*Leonardo Da Vinci. The Anatomy of Man*' (CLAYTON, 1992). In Da Vinci's own words, a pictorial depiction of a human organ

such as the heart is advantageous over just mere description as "the more detail you write concerning it, the more you will confuse the mind of the hearer" (BELT, 1955). In fact, Da Vinci has been acclaimed as the first person to describe the heart as composing of muscles and comprising four chambers (JOSE, 2001).

There are indications from many sources that Da Vinci had unfulfilled plans to complete an atlas. William Hunter, an accomplished anatomist in the eighteenth century, was apparently so impressed with Da Vinci's drawings that he wanted to publish them but unfortunately, his early death prevented him from doing so (KEMP, 1976). A hypothetical question that comes to mind is that if Da Vinci had completed the treatise on his anatomical work, would this piece of work surpass that of 'Gray's Anatomy' (arguably the most authoritative textbook on the human anatomy). Of course, it would not be a fair comparison as 'Gray's Anatomy' has evolved since it was first published by Henry Gray in 1858 under multiple editors.

Some of Da Vinci's drawings, especially his earlier ones were peppered with inaccuracies as they reflect the misconstrued human physiology, prevailing viewpoints and beliefs handed down from antiquity during that period of time. Moreover, it is a known fact that Da Vinci was not familiar with the Latin or Greek language. Hence, he relied on Johannes de Ketham's *Fasciculo di Medicina*, a collection of works by authors that included Hippocrates, Aristotle and Galen which were filtered by Arabian writers during the Middle Ages who transcribed the works (SCHULTHEISS, GRÜNEWALD and JONAS, 1999). The circumstances that shaped his earlier drawings can be observed in his anatomical drawing entitled 'Coition of a hemisected man and woman'. In this drawing, a channel is seen passing from the penis of a male to the spinal cord (which stemmed from the Hippocratic belief that the 'animal spirit' came from the spinal cord) (CLAYTON, 1992). Another tube connected the testis to the heart which was regarded as the seat of emotions. As much of the anatomical knowledge that was known during Da Vinci's era was passed down from the days of Galen who lived in the second century and whose contributions to human anatomy was based on dissection of animals, mainly monkeys (JOSE, 2001), it is also no wonder that Da Vinci's drawings such as the 'tree of vessels' and the distribution of peripheral nerves in the limbs were influenced by observations from animal dissections.

Since Da Vinci was first and foremost an artist, it is not surprising that surface anatomy was one of his many strengths (CLAYTON, 1992). However, Da Vinci has also been credited with being the first to depict cross sectional anatomy and making the first known clear illustration of a human fetus in utero (JOSE, 2001). He has also been called the first 'modern medical illustrator' (SCHULTHEISS, GRÜNEWALD and JONAS, 1999). Da Vinci went beyond just drawing anatomical structures by performing animal experiments to correlate structure with function such as pithing the spinal column of the frog to demonstrate the abolition of spinal reflexes. In one of his human dissections, he described the cause of death of the cadaver as due to coronary insufficiency and hence, Da Vinci has even been hailed as a "pioneer of morbid anatomy and forensic medicine" (DUNN, 1997).

#### 4 The legacy of Leonardo Da Vinci

The man of multiple talents passed on at the age of 67 in 1519, leaving behind a legacy that would carry on throughout the ages. Almost 5 centuries have passed but the name of Leonardo Da Vinci has not faded away. Every year, millions of visitors visit the various art museums that house his famous works, and marvel at the artistic brilliance of this man. He was not only an artist extraordinaire but also recognized as “one of the most original and perceptive anatomists of his own or any other time” (CLAYTON, 1992). Undoubtedly, Da Vinci's scientific approach to the drawing of the human body has set him apart from any other artist that has walked the face of earth.

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