

Leonardo da Vinci's Embryological Drawings of the Fetus

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By: Gilson, Hilary Keywords: Fetus [2] Human development [3]

Leonardo da Vinci's embryological drawings of the [fetus](#) [4] in the [womb](#) [5] and his accompanying observational annotations are found in the third volume of his private notebooks. The drawings of Leonardo's embryological studies were conducted between the years 1510-1512 and were drawn with black and red chalk with some pen and ink wash on paper. These groundbreaking illustrations of the [fetus](#) [4] reveal his advanced understanding of human development and demonstrate his role in the vanguard of [embryology](#) [6] during the Renaissance. His famous embryological drawings of the [fetus](#) [4] have since been collected and held in the Royal Collection at Windsor Castle in England.

Leonardo first ventured into human anatomy with the purpose of depicting the human body more accurately in his artwork. Although there is some evidence of his intentions to do so, Leonardo never published his work. The ultimate distribution of his journals and drawings is attributed to Orazio, the son of Francesco Melzi who was the faithful disciple to whom Leonardo entrusted his notebooks in his last testament. With the death of Francesco Melzi, Leonardo's life work was scattered and lost, never to be fully rediscovered.

In 1506 while in Milan, Leonardo's acquaintance with anatomist Marcantonio della Torre led him to many first-hand human dissections with the guidance of the younger professor. Four years later the expertise he gained with the help of della Torre would prove most useful in his studies of [embryology](#) [6]. In one of his most famous drawings, Leonardo depicts a human [fetus](#) [4] lying inside a dissected [uterus](#) [7]. Leonardo is considered to be the very first in history to correctly depict the human [fetus](#) [4] in its proper position within the [womb](#) [5]. He was also the first to expertly draw the uterine artery and the vascular system of the [cervix](#) [8] and [vagina](#) [9]. Leonardo is credited with drawing the [uterus](#) [7] with only one chamber, contradicting theories that the [uterus](#) [7] was comprised of multiple chambers which many believed divided fetuses into separate compartments in the case of twins.

After his surgical exposure of a [fetus](#) [4] within a cadaver, Leonardo's subsequent drawings portray an accurate understanding of the [umbilical cord](#) [10] as consisting of vessels. Further drawings of the umbilical vessels illustrate his belief that menstrual blood nourished the [fetus](#) [4] through the [umbilical cord](#) [10]. Leonardo showed the [umbilical cord](#) [10] connecting to the liver and his drawings of hepatic veins show the passing of blood to the heart. In his drawings, the feet of the [fetus](#) [4] are crossed and the right foot is shown as blocking the urinary passage. Leonardo concluded that the position of the fetus's feet did not allow for the movement of urine through the urethra and so he theorized that the [umbilical cord](#) [10] was the structure responsible for exporting the fetus's urine outside of the [womb](#) [5].

Leonardo used a method of cross-sectional representation for his depictions of veins, arteries, and nerves in order to show the layouts in greater detail. He was also fond of drawing four views of the subject so that every angle could be seen by the viewer for a more inclusive study, which he did for the drawings of the [fetus](#) [4]. Leonardo's philosophy of the human body

was often represented by comparisons to architecture. His drawings followed rigorous techniques often employed by architects to depict three-dimensional views of his subjects. He viewed the body as an architectural masterpiece created by nature, in which the skeleton was akin to rocks that laid the foundation for the body.

Much of Leonardo's preliminary understanding of anatomy came from textbooks by [Avicenna](#) [11], [Mundinus](#) [12], and [Galen](#) [13]. The words of these previous philosophers were taken as fact for centuries, and by relying on their works, Leonardo's own studies often conflated animal and human anatomy: his drawing of the [fetus](#) [4] in the [womb](#) [5] signifies the discovery of the correct position of the [fetus](#) [4] within the [uterus](#) [7], although the [placenta](#) [14] depicted in his drawings is that of a [cow](#) [15]. These illustrative representations give reason to believe that Leonardo did not have any knowledge of the human [discoidal placenta](#) [16].

In addition to Leonardo's reliance on knowledge of animal anatomy, botanical drawings of seeds are found intermingled along the bottom of his embryological drawings, revealing his comparison of botanical understandings with human anatomy. He wrote that all seeds have umbilical cords that break when the seed is ripe, associating the human [fetus](#) [4] with the maturing seed of a plant. The [uterus](#) [7] is drawn splayed open to reveal the [fetus](#) [4] much like an opening seed pod reveals its contents. Leonardo also makes drawings of flower-like projections, called cotyledons, within his drawing of the [womb](#) [5] which are found in a [cow](#) [15] [uterus](#) [7] but not in [humans](#) [17]. His depictions of the curled up [fetus](#) [4] in the [womb](#) [5] seem analogous to the seed that grows and becomes ready to unfold and blossom.

Leonardo's methods of accurately portraying human anatomy through drawings and diligently mapping out characteristics of the body are considered to have been the foundation of modern anatomical illustration. His approach of classifying, quantifying, and repeating his experiments was a wholly modernistic approach to his scientific methods. What began as work to capture the human features more precisely in artwork eventually turned into a task of accurately illustrating for the first time the human [fetus](#) [4] inside the [womb](#) [5]. Leonardo corrected a few misnomers of the time through his observations, while leaving more to be discovered, and his detailed drawings reflect unprecedented curiosity in depicting embryological anatomy.