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## The Evolution of Anatomical Art: The Artists and Methods that Illustrated the Human Body

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# The Evolution of Anatomical Art:

The Artists and Methods that Illustrated the Human Body

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The evolution of anatomical texts and illustrations during the bridge between the 15<sup>th</sup> and 16<sup>th</sup> centuries was greatly influenced by the research of Leonardo da Vinci. Although primarily a painter, sculptor, and illustrator, da Vinci also spent his time studying the scientific mystery that was the human body. Through his human dissections of cadavers and close observances of physiological movements, da Vinci contributed significant and innovative information to the new and growing field of anatomy. His goal was not only to illustrate the accurate structure of the bones and muscles but to understand how emotion and cognitive thought could affect muscle positioning. This was a new direction that no other anatomist or scientist had attempted to study during this time. His detailed and intricate sketches greatly influenced the development of an accurate anatomical model following the Renaissance. Da Vinci's sketches and drawings would also go on to inspire and guide fellow Renaissance anatomical innovators such as Andreas Vesalius and Pietro Francavilla and the later 17<sup>th</sup> century artist Ludovico Cigoli. Together, the research and conclusions made by these scientists, professors, artists, and sculptors would pave the way for understanding and illustrating the design, composition, and function of the human body.

According to Giorgio Vasari, da Vinci can be classified as one of the few artists that reached visual perfection in their artistic field during the Quattro cento<sup>1</sup>. He completely mastered the art of painting and sculpting and would be the motivation and inspiration for future aspiring artists. Despite his focus on the visual arts, he had an interest in science that led him to search for the composition, purpose, and function of the human body. Although he was criticized on his scientific credibility for focusing only on the tangible appearance of body parts as opposed to the explanation of why the muscles, bone, and tissue looked as they did, da Vinci

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<sup>1</sup> Giorgio Vasari, *The Lives of the Artists*, trans. Julia Conaway Bondanella & Peter Bondanella (Oxford: Oxford University Press, 1991), 284.

contributed valuable and ground breaking information to the field of anatomy and physiology<sup>2</sup>. As the subject of the human body had gone publicly uninvestigated until da Vinci's dissections, it could be said that he sparked the evolution of anatomical research that would eventually bring the medical community to the advanced state it is at today. He was very interested in advancing and perfecting the life-like characteristics of visual art simultaneously with the advancement of physiology and anatomy<sup>3</sup>. The challenge was in the creation of an accurate two-dimensional depiction on paper of a three-dimensional object in space<sup>4</sup>. Da Vinci set out to do this through the complete study of the entire human body and all of its components. It was his hope that he would be able to answer all of his deepest curiosities through the understanding of the human mind and body.

At the beginning of his artistic career, da Vinci realized that in order to create a truly realistic scene through drawing and painting he needed to focus on the physical body of the subjects appearing in the scene. To do this, he would need deceased human subjects to closely observe and, da Vinci hoped, to dissect. As da Vinci was only an artist and not a physician, the task of acquiring deceased human bodies to examine was a challenge. Relying solely on the dissections of animal specimens, da Vinci quickly lost hope of progressing in the field of human anatomy. With the fame gained after painting *The Last Supper*, Leonardo gained access to human cadavers through physician admirers of his work. He began to flay the bodies in stages, believing that each section of the body required its own in-depth analysis before moving on to the next section<sup>5</sup>. During this period, da Vinci developed a great interest in the brain and how the

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<sup>2</sup> Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven: Yale University Press, 1990), 324.

<sup>3</sup> David Carrier, "Leonardo and Leonardo da Vinci." *Leonardo* 41, no. 1 (2008): 38.

<sup>4</sup> Lee W. Rensselaer, *Ut pictura poesis: The Humanistic Theory of Painting*. (New York: Norton, 1967), 201.

<sup>5</sup> Lea Dovev, "'On the Hand from Within': Palms, Selfhood and Generation in Leonardo's Anatomical Project," *Leonardo*. 43, no. 1 (2010): 63.

structure affected its' function. This can be seen in the numerous sketches of a human skull that were created during the late 15<sup>th</sup> century. The details in these drawings show that da Vinci was very precise and concerned with providing an accurate illustration of the skull<sup>6</sup>. Although these sketches were the most accurate of the time, Leonardo felt he was missing the details that would answer his questions about the relationship between the brain and emotion<sup>7</sup>. His curiosity would motivate him to obtain more cadavers of various ages and health for observation and comparison.

In 1507, da Vinci performed a dissection of an elderly man that inspired him to continue pursuing the study of the human anatomy. He observed that the man's blood vessels were narrower than a healthy individual<sup>7</sup>. This led him to the diagnostic conclusion that the man had died from a heart related complication. A few years later, he began to work at the University of Pavia alongside the professor Marcantonio della Torre<sup>1</sup>. Through this collaboration, da Vinci was given the opportunity to dissect many different human specimens layer by layer with the guidance of an expert in the field. He started sketching all of della Torre's cadavers with a red crayon and compiled them into a book of drawings. Some of these drawings would go on to inspire the realistic features in some of his most famous pieces. Da Vinci's sketch of a human head and a horse with horseman is very similar to the characters depicted in his famed fresco *The Battle of Anghiari*<sup>8</sup>. The definition of the horse's muscles shows the attention da Vinci gave during his animal dissections while the rough sketch of a man in a slouched position shows the correct tension of even the smallest muscles and ligaments. Such accurate and intricate details could only have been obtained through diligent and precise dissections of the many layers of the human body.

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<sup>6</sup> See Figure 1.

<sup>7</sup> Martin Clayton, "Medicine: Leonardo's Anatomy Years." *Nature* 484 (2012): 315.

<sup>8</sup> See Figure 2.

Later in da Vinci's career, he painted the famous *Mona Lisa* that would be praised for its similarity to reality. The painting is said to show the moistness of the figure's eyes as well as the true emotion of the woman<sup>9</sup>. Knowing the composition of human skin through his cadaver dissections, da Vinci was able to illustrate the emotion of a person through the position and tension of facial muscles<sup>10</sup>. He paid such close attention to the composition and positioning of bones and muscles because he found that this was the key to expressing natural feeling in art<sup>4</sup>. As creating the most realistic illustration of life in art was da Vinci's primary goal, he continued to do in depth analyses of della Torre's cadavers with the hope of producing a complete anatomy in his notebook. During his dissections, da Vinci would focus on the structure of muscles and bones and how they may play a role in how humans use them. The detail of the location and size of each muscle and bone in Leonardo's drawing of the shoulder and arm exemplifies his attention to minute details. He also illustrates where each muscle attaches to the bone and the texture of the muscle tissues<sup>11</sup>. It also appears as if da Vinci went into great detail drawing the joint of the shoulder and the arm. This information would be significantly beneficial to future anatomists studying the function and design of these body tissues.

When da Vinci's studio became surrounded by war in 1511, he left the city and all of his cadaver specimens<sup>7</sup>. He moved into the country to continue his anatomical studies, relying on the comparative anatomy of animal carcasses, specifically goat, to those of the human body. Other than the similarity of the cardiovascular system of a goat compared to a human, da Vinci struggled to find ways to advance the human study of anatomy. After growing frustrated with the lack of progress made with the dissection of animal specimens, da Vinci stopped studying the human body and anatomy all together. Quitting a project before completion was a notorious and

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<sup>9</sup> See Figure 3.

<sup>10</sup> Loren W Partridge. *Art of Renaissance Florence, 1400-1600*. (Berkeley: University of California Press, 2009).

<sup>11</sup> See Figure 4.

expected quality of da Vinci. Very characteristically of Leonardo, he left his notebook drawings unfinished and unpublished. He left them with a friend for safe keeping while he continued painting and sculpting for commission. It was not until the twentieth century that these notebooks were officially published and available for public viewing and analyses. Despite the delay of Vinci's research being published long after the Renaissance, da Vinci was one of the first to delve into the study of human anatomy. He created an anatomical reference for future scientists to build and elaborate. The most notable physician to use and build on da Vinci's work was Andreas Vesalius.

Vesalius began studying the structure and composition of human bodies during his mid twenties. During this time, he would study the bones of bodies in a cemetery. He then went on to teach at the University of Padua where he would instruct by performing dissections for his students to observe<sup>12</sup>. This hands-on teaching method was the first of its kind in the medical field and would continue to be one of the primary ways to instruct medical students today. As he dissected bodies for his teaching, he also drew detailed sketches of the interior components of the cadavers. He referenced Leonardo's drawings and notes to mimic and improve upon da Vinci's propositions, drawings, and techniques. Unlike da Vinci, Vesalius was eager to get his drawings published before any other physicians or professors could beat him to it. This reference book, published in 1543, would come to be called *De humani corporis fabrica* which translates to 'On the fabric of the human body'<sup>11</sup>. This collection of drawings also contained detailed notes of observations and procedures used by Vesalius<sup>13</sup>. These drawings and notes were an improvement on da Vinci's incomplete collection because Vesalius drew his figures in physical action. The characters are moving in the scene where as da Vinci's are limp and motionless as

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<sup>12</sup> JB Saunders & Charles O'Malley. *The Illustrations from the Works of Andreas Vesalius of Brussels*. (New York: Dover 1973)

<sup>13</sup> See Figure 5.

cadavers tend to be. The drawing of a standing man shows the muscles in action which would lead to a better and more thorough understanding of the human body<sup>14</sup>. The consideration and inclusion of motion in the anatomical drawings was a huge discovery that would be used in all following anatomical art and texts.

As for the majority of the drawings in *De humani corporis fabrica*, they are said to have been drawn by one of the famous Titian's students, Jan Stephen van Calcar. It has been proposed that Calcar would sit in on the dissections and sketch based exactly on what he was looking at on the dissection table. This can be seen in his drawing of a dissected human hanging from a rope. Vesalius used a rope to hang the dead bodies up so that the dissection could be seen from all angles<sup>15</sup>. This method was accurately illustrated, supposedly, by Jan Stephen van Calcar. Although this illustration is lacking internal organs, it acts as an excellent model of the positioning of muscles and bones when pulled down by the physical force of gravity. Calcar's first-hand observation of the human dissections explains why his drawings in Vesalius' collection are so intricate and precise. The drawings truly express a real representation of the process and visions of dissecting a cadaver. The shading and definition of each muscle could only have been illustrated by seeing the dissection in person alongside Vesalius<sup>15</sup>. The identity of Vesalius' illustrator has been the topic of debate for many years now<sup>16</sup>. Even though Vesalius would still be credited with the masterful and complete compilation of the study of human anatomy, it would be beneficial to know who to credit for the well-drawn illustrations of his research.

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<sup>14</sup> See Figure 6.

<sup>15</sup> See Figure 7.

<sup>16</sup> Patricia Simons and Monique Kornell. "Annibal Caro's After-Dinner Speech (1536) and the Question of Titian as Vesalius's Illustrator." *Renaissance Quarterly* 61 (2008): 1069-1097.



Along with contributing to the gradual evolution of Renaissance anatomical art and text, Vesalius was also known for assembling one of the first complete hanging skeletal models of a deceased human's bones. Contributions such as these make Vesalius a vital part of the progression towards a complete, accurate, and understood anatomy of the human body. The consistent progress made by Vesalius during the Renaissance significantly contributed to the evolution of anatomical texts and illustrations. *De humani corporis fabrica* became a standard textbook used by studying physicians and anatomists as well as a reliable reference for practicing and researching physicians. Both the drawings of da Vinci and the text of Vesalius would inspire and guide the Mannerist sculptor Pietro Francovilla to apply the knowledge of the human anatomy in the creation of a three dimensional bronze statue. This statue would become an important representation of the work of many artists, physicians, and anatomists through the Renaissance.

Not only were cadavers, reference drawings, and textbooks important for an anatomy classroom, but a tangible reference model was also needed for comparison to a generalized anatomical man. The sculptor Pietro Francovilla would use past anatomical texts and illustrations to construct such a model that would become a staple in anatomy and physiology classrooms across the world. The bronze statue, *Ecorché Statuette*, represents the culmination of elaborate research performed on the cadavers of humans. The purpose was to provide students with a human body that had been flayed of its skin to show the composition and location of the skeletal muscles<sup>17</sup>. The position of the statue allows the viewers to observe a human model in action as opposed to being in the resting state<sup>18</sup>. The arm and neck are slightly twisted to show the tension of the muscles connecting the shoulder to the spine. This anatomically correct model

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<sup>17</sup> Lisa Jardine. "Inside Out." *New Statesman* (2000): 40-41.

<sup>18</sup> See Figure 8.

shows the final product after combining the intricate drawings of da Vinci and the in depth methods and study of Andreas Vesalius.

Later in the 16<sup>th</sup> century, other artists started to recognize the rapid advancement occurring in the field of science and anatomy. This caused more artists to begin researching anatomical texts and illustrations to perfect their works of art. They also hoped to produce accurate models of anatomy for other artists and scientists to learn from. One sculptor of mention in the early 17<sup>th</sup> century is Ludovico Cigolo. He would produce a similar statue to Francovilla's of a flayed man based on his rough sketch of a human body<sup>19</sup>. This model is slightly more realistic because the muscles are not as defined and the stance is very relaxed and natural. Most humans are not constantly flexing their muscles, so Cigolo's model acts as an actual representation of an average human being. Cigolo's bronze statue is just another example of the growing interest in the composition of the human anatomy through the Renaissance and even the following years<sup>20</sup>. The desire to illustrate and understand the human body would continue throughout Europe and would eventually spread to other nations as the realm of human anatomy expanded.

During the Renaissance, the progress made in the visual arts greatly overshadowed any progress that was made in the scientific arts. Luckily, da Vinci combined the two fields by using drawings and sketches to illustrate his dissections and discoveries. In the mid-fifteen hundreds, Andreas Vesalius produced an improvement to the work of da Vinci with his anatomical reference text *De humani corporis fabrica*. This would change how anatomy was perceived and taught. Later in the 1500s, Pietro Francovilla sculpted a model of a flayed man based on the information that had been gained through the late 1400s and early 1500s. Francovilla researched

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<sup>19</sup> See Figure 9.

<sup>20</sup> Anthony M. Clark, "Renaissance Bronzes Acquired by Institute," *The Minneapolis Institute of Arts Bulletin* 51, no. 2 (June, 1962): 38-46.

the works of past artists to create his masterpiece. A similar piece was sculpted after the Renaissance by Ludovico Cigolo. These works of art would provide a solid reference for aspiring anatomical artists and physicians and would eventually lead to the anatomical knowledge the medical community possesses today.

Through the groundbreaking research and illustrations of the human anatomy during the late 15<sup>th</sup> century and early 16<sup>th</sup> century, the anatomical world has greatly expanded and improved. Were it not for the work of da Vinci, Vesalius, and Francovilla, the public interest in anatomy may not have ever progressed and the complete and accurate anatomical design may not have been completed. Da Vinci's drawings would start the revolution that would shape the development of the anatomical figure. His attention to detail and segmented method of dissecting cadavers allowed him to produce elegant and elaborate drawings. Andreas Vesalius would continue with da Vinci's studies, eventually producing a widely used text for the medical community. This compilation would contain slightly more realistic and accurate drawings believed to be drawn by Jan Stephen van Calcar. Vesalius also included a detailed method and procedure for his dissections. Da Vinci's and Vesalius' work eventually led to the production of a three-dimensional bronze statue of a flayed man sculpted by Pietro Francovilla. Compared to current anatomical drawings and sketches, the works of the Renaissance artists, physicians, and sculptors were not far off in detail and accuracy. Although there is a better understanding of the function and relation of human body parts in the medical world today, the physical appearance of the body was very well illustrated by the artists of the past. Without the work and collaboration of da Vinci, Vesalius, and Francovilla, the medical community may not be as advanced as it is today.



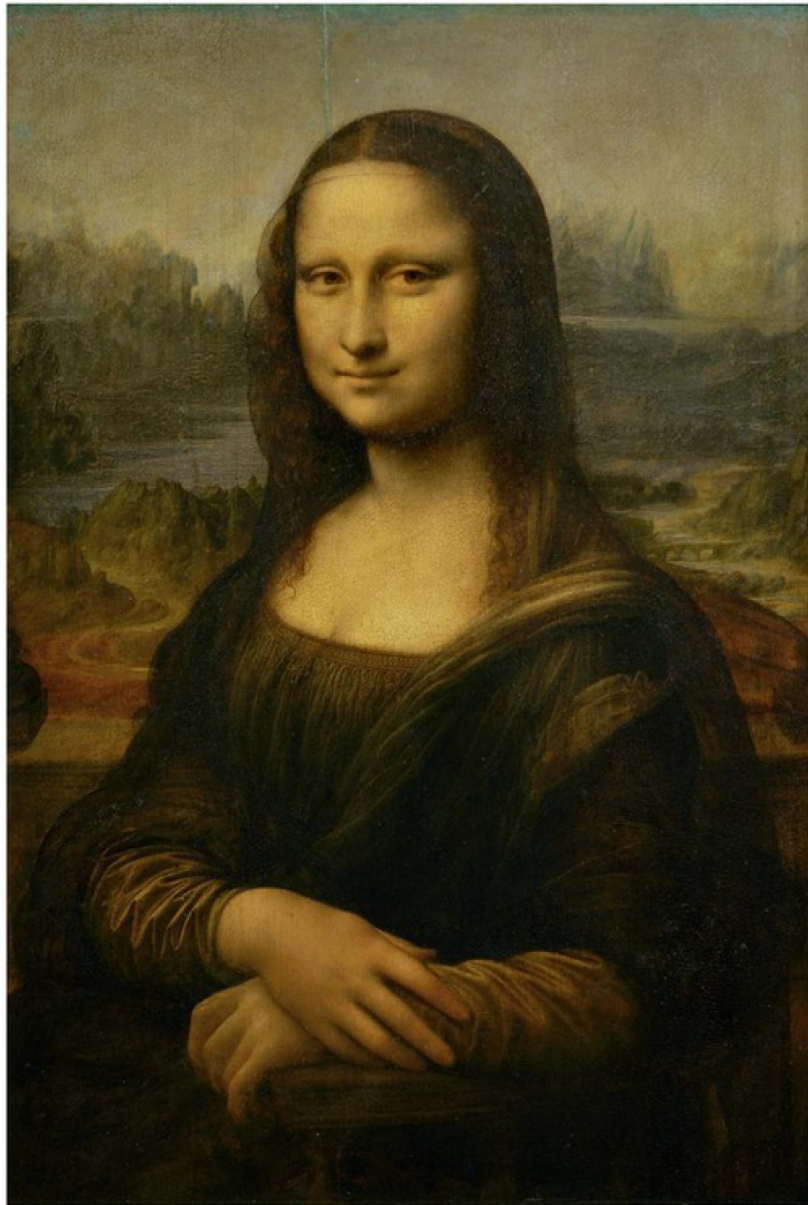
**Figure 1**

Leonardo da Vinci's "Anatomical study of the human skull in sagittal section, seen from the front," 1489



**Figure 2**

Leonardo da Vinci's "Studies of Human Physiognomy and Horsemen," 1490-1504



**Figure 3**

Leonardo da Vinci's "Mona Lisa," 1503-1506

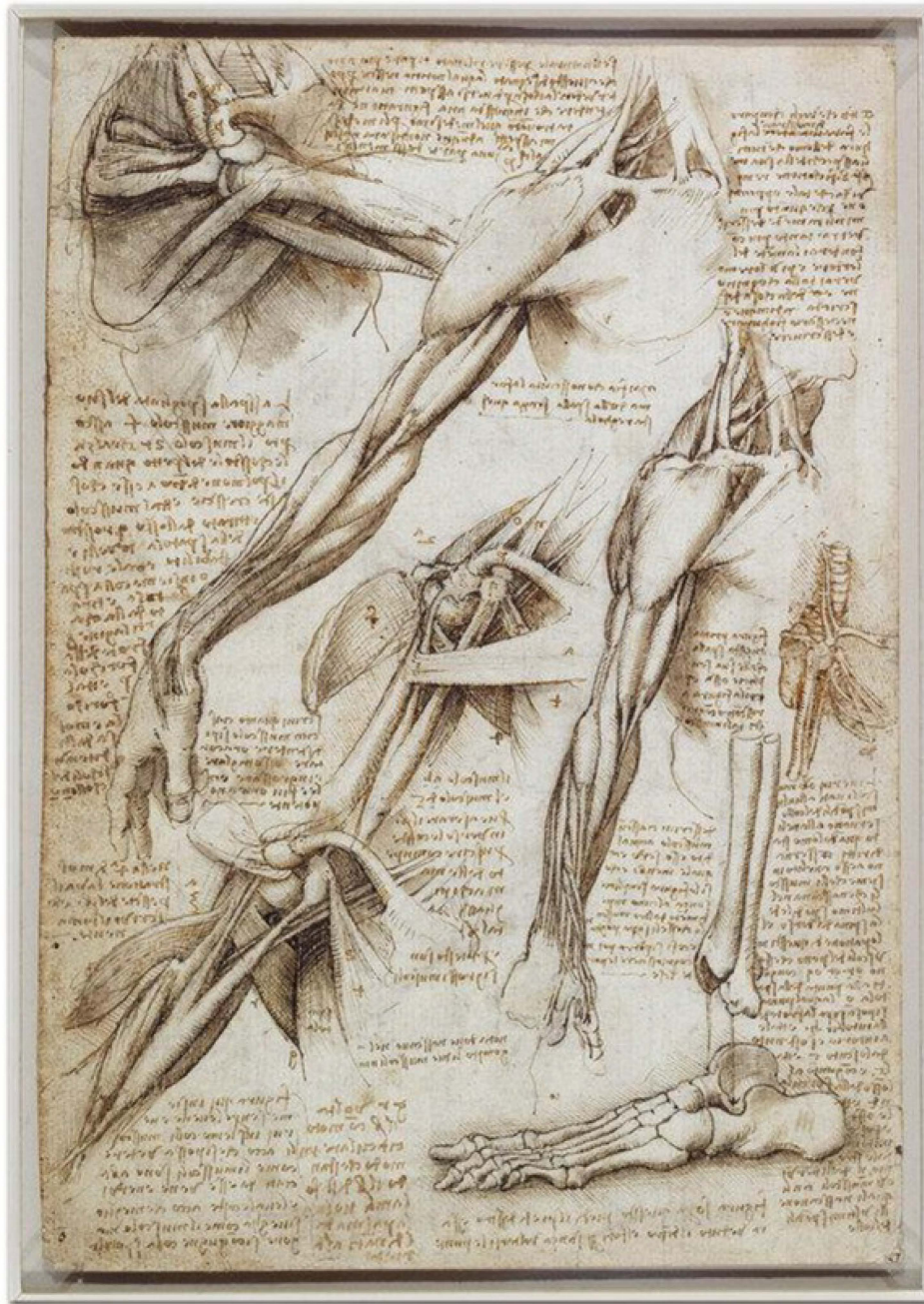


Figure 4

Leonardo da Vinci's "The muscles of the shoulder and arm," 1510-1511

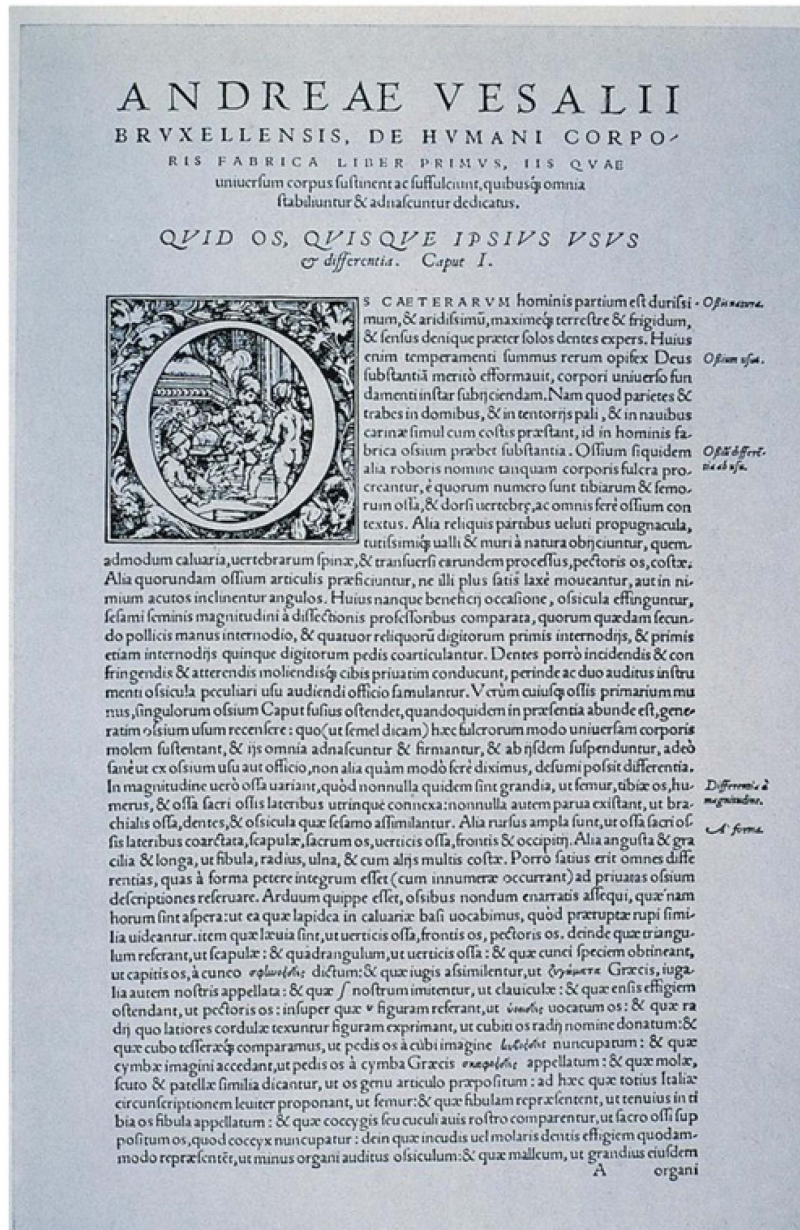


Figure 5

Andreas Vesalius's *De Humani Corpori*, first page, 1543





**Figure 6**

Jan Stephen van Calcar's "Anatomical Drawing of Standing Man" from Andreas Vesalius *De Humani Corporis*, 16<sup>th</sup> century A.D.

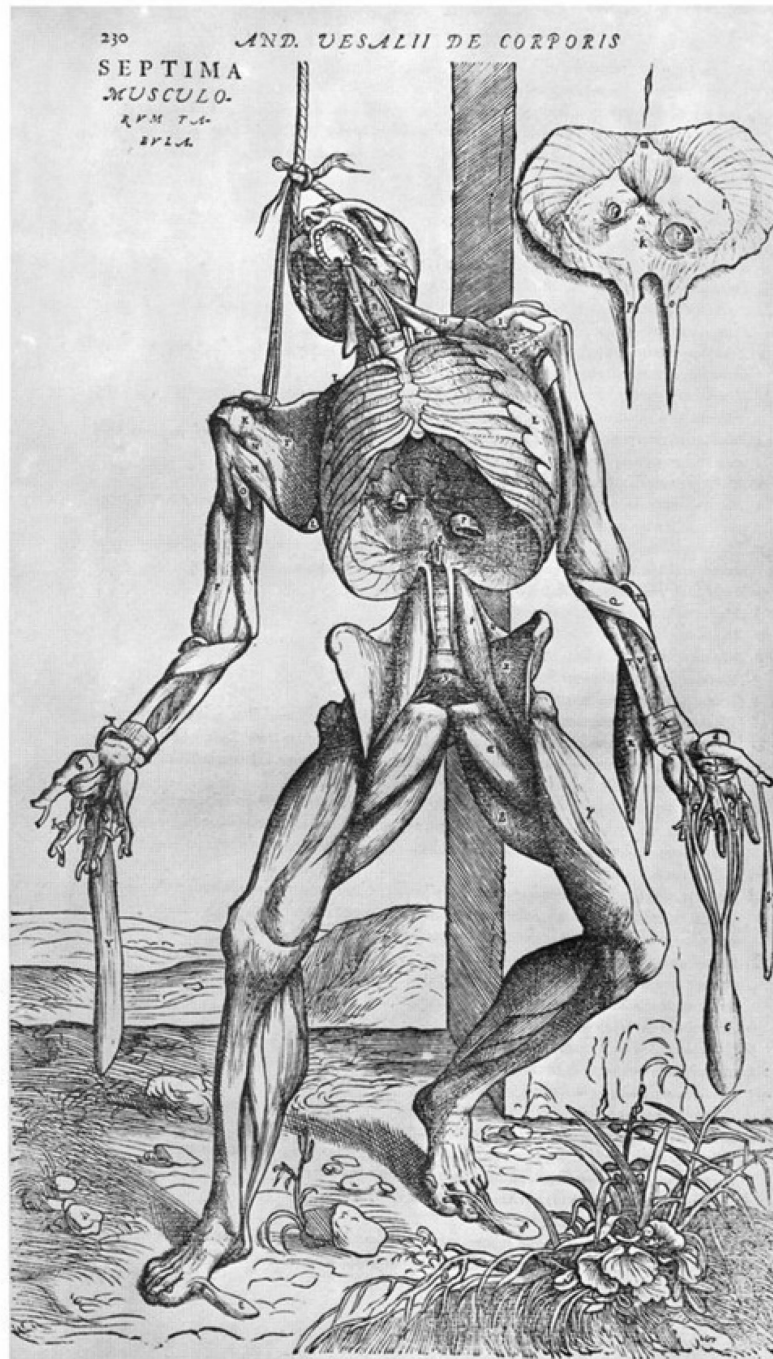


Figure 7

Jan Stephen van Calcar's illustration from Andreas Vesalius' *De humani corporis fabrica*, 1543



**Figure 8**

Pietro Francavilla's *Ecorché Statuette* in bronze, late 16<sup>th</sup> century



**Figure 9**

Ludovico Cigoli's *Flayed Man sketch*, early 17<sup>th</sup> century

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