

Leonardo da Vinci on the Human Body: The Anatomical, Physiological and Embryological Drawings of Leonardo da Vinci with Translations, Emendations and a Biographical Introduction by Charles D. O'Malley and J. B. de C. M. Saunders.

Every school child knows that both men are among the greatest of all artists. Yet they were never on friendly terms and the 23 year age gap between them did nothing to diminish their rivalry. Michelangelo, reputed to be a moody character at the best of times, seems to have harbored a strong dislike of Leonardo. The two geniuses were to work on opposing walls. This project promised to give to the world a direct comparison of their skills and artistic approaches. To the misfortune of us all, neither of the men finished their proposed work. This cannot be true. Irrespective of his artistic genius, Da Vinci was quite simply the greatest anatomist in the world at that time. If we move forwards through time and across space to England we find another great anatomist, the Scotsman William Hunter. These drawings proved to be the lost works of Leonardo Da Vinci. After reviewing this treasure trove of about drawings of various parts of the human body, William Hunter wrote in awe: But I saw, and indeed with astonishment, that Leonardo had been a general and deep student. When I consider what pains he has taken upon every part of the body, the superiority of his universal genius, his particular excellence in mechanics and hydraulics, and the attention with which such a man would examine and see objects which he has to draw, I am fully persuaded that Leonardo was the best Anatomist, at that time, in the world! Leonardo was certainly the first man, we know of, who introduced the practice of making anatomical drawings. London , pages 37 and Note the position of the placenta and umbilical cord, and that the 5-month fetus is in the breech position. Now, let us return to renaissance Italy and the time of Leonardo Da Vinci. However, the mind of Leonardo was not constrained by ancient paradigms. More so than anyone, Leonardo was able to keep his thoughts unfettered by received wisdom and the prejudices of others. Irrespective of the whys and wherefores, Da Vinci went onto gain an unprecedented understanding of the form and function of the human body. His profound knowledge of anatomy was the prize won from the dissection of over 30 human cadavers ranging in age from 2 years to about years old. Without embalming techniques Leonardo had to dissect at speed under the harsh conditions imposed by long nights with the decomposing dead. He made drawings by direct observation of the cadavers. He emphasized realism, showed depth and related structure to function. He developed techniques to convey information through his drawings using cross-sections and multiple angles. He learned to dissect the fragile structures of the eye by inventing new methods that involved sectioning the eye after it had been fixed by heating in egg whites. He also discovered that the arterial pulse corresponds to ventricular contraction and that the ventricle shortens during contraction. He was also able to work out specific actions such as that of biceps brachii , which he showed not only flexes the elbow but also supinates the hand through its twisting action on the ulna. He determined that the aortic valves close while the ventricle is still contracted. This occurred because of the pressure created by eddy currents generated by the effect of the sinuses of Valsalva on blood flow through the proximal aorta. Leonardo elegantly demonstrated this using a model of the proximal aorta and ventricular outflow tract through which he allowed water containing millet to flow; the millet allowed visualization of the patterns of current and turbulence created in the flowing fluid. The rest of the world had to wait over years, until , for this ingeniously worked-out theory to be conclusively proven and re discovered using dye and cineradiography methods. Despite these triumphs, Leonardo was by no means correct about everything he studied. Some of his errors and misconceptions included: Leonardo could never have imagined the complex neural processing in the brain that is now thought to mediate this process. In doing so, Leonardo perpetuated the traditional belief that the spinal cord was the source of semen. Yet because Leonardo relied on making meticulous observations and conducting tests perhaps best described as experiments , he had an impressive capacity to correct himself and allow his knowledge to grow. Indeed later in life Leonardo renounced his erroneous view that semen originated in the spinal cord and correctly claimed that sperm originated in the testes and was then stored in the seminal vesicles prior to ejaculation. Vesalius is certainly worthy of the honour – his master work, De

humani corporis fabrica , is a beautiful piece of scientific and artistic consilience. It is thanks to his example and teachings that the dissection of human cadavers became the established means of learning about the human body. Prior to Vesalius the anatomy knowledge of physicians was rudimentary and overshadowed by the theory of body humours and the anatomy teachings of Galen, a man who had never dissected a single cadaver. The great tragedy is that Leonardo never disseminated any of his great discoveries. But why did Leonardo not tell the world? Part of the reason may be that Leonardo felt it was enough for only himself to know. However, comments in his notebooks suggest that he had ongoing plans to spread his knowledge to others. It may simply be that his incredible thirst for knowledge, together with the tyranny of time, prevented him from ever systematically collating his learnings. I finish with the words of Leonardo that form the introduction to his anatomical notebooks: I wish to work miracles; it may be that I shall possess less than other men of more peaceful lives, or than those who want to grow rich in a day. I may live for a long time in great poverty, as always happens, and to all eternity will happen, to alchemists, the would-be creators of gold and silver, and to engineers who would have dead water stir itself into life and perpetual motion, and to those supreme fools, the necromancer and the enchanter. And you, who say that it would be better to watch an anatomist at work than to see these drawings, you would be right, if it were possible to observe all the things which are demonstrated in such drawings in a single figure, in which you, with all your cleverness, will not see nor obtain knowledge of more than some few veins, to obtain a true and perfect knowledge of which I have dissected more than ten human bodies, destroying all the other members, and removing the very minutest particles of the flesh by which these veins are surrounded, without causing them to bleed, excepting the insensible bleeding of the capillary veins; and as one single body would not last so long, since it was necessary to proceed with several bodies by degrees, until I came to an end and had a complete knowledge; this I repeated twice, to learn the differences. And if you should have a love for such things you might be prevented by loathing, and if that did not prevent you, you might be deterred by the fear of living in the night hours in the company of those corpses, quartered and flayed and horrible to see. And if this did not prevent you, perhaps you might not be able to draw so well as is necessary for such a demonstration; or, if you had the skill in drawing, it might not be combined with knowledge of perspective; and if it were so, you might not understand the methods of geometrical demonstration and the method of the calculation of forces and of the strength of the muscles; patience also may be wanting, so that you lack perseverance. As to whether all these things were found in me or not, the hundred and twenty books composed by me will give verdict Yes or No. In these I have been hindered neither by avarice nor negligence, but simply by want of time. My writing is largely a retelling of the notes I compiled while reading the book.

Chapter 2 : Leonardo da Vinci: Anatomy of an artist - Telegraph

A fascinating hybrid, this book is at once a study of Leonardo as a draftsman and scientist, a history of the study of human anatomy and dissection, and the catalog of a touring exhibition. It contains drawings from the three periods of anatomical study made by Leonardo.

Visit Website Did you know? Beginning around age 5, he lived on the estate in Vinci that belonged to the family of his father, Ser Peiro, an attorney and notary. Early Career Da Vinci received no formal education beyond basic reading, writing and math, but his father appreciated his artistic talent and apprenticed him at around age 15 to the noted sculptor and painter Andrea del Verrocchio, of Florence. For about a decade, da Vinci refined his painting and sculpting techniques and trained in mechanical arts. However, da Vinci never completed that piece, because shortly thereafter he relocated to Milan to work for the ruling Sforza clan, serving as an engineer, painter, architect, designer of court festivals and, most notably, a sculptor. The family asked da Vinci to create a magnificent foot-tall equestrian statue, in bronze, to honor dynasty founder Francesco Sforza. Da Vinci worked on the project on and off for 12 years, and in a clay model was ready to display. Imminent war, however, meant repurposing the bronze earmarked for the sculpture into cannons, and the clay model was destroyed in the conflict after the ruling Sforza duke fell from power in 1500. Its composition, in which Jesus is centered among yet isolated from the Apostles, has influenced generations of painters. When Milan was invaded by the French in 1500 and the Sforza family fled, da Vinci escaped as well, possibly first to Venice and then to Florence. In the past she was often thought to be Mona Lisa Gherardini, a courtesan, but current scholarship indicates that she was Lisa del Giocondo, wife of Florentine merchant Francesco del Giocondo. Today, the portrait is the only da Vinci portrait from this period that survives and is housed at the Louvre Museum in Paris, France, where it attracts millions of visitors each year. Ironically, the victor over the Duke Ludovico Sforza, Gian Giacomo Trivulzio, commissioned da Vinci to sculpt his grand equestrian-statue tomb. It, too, was never completed this time because Trivulzio scaled back his plan. Da Vinci spent seven years in Milan, followed by three more in Rome after Milan once again became inhospitable because of political strife. He studied nature, mechanics, anatomy, physics, architecture, weaponry and more, often creating accurate, workable designs for machines like the bicycle, helicopter, submarine and military tank that would not come to fruition for centuries. He saw science and art as complementary rather than distinct disciplines, and thought that ideas formulated in one realm could and should inform the other. Probably because of his abundance of diverse interests, da Vinci failed to complete a significant number of his paintings and projects. He spent a great deal of time immersing himself in nature, testing scientific laws, dissecting bodies human and animal and thinking and writing about his observations. The Codex Atlanticus, for instance, includes a plan for a foot mechanical bat, essentially a flying machine based on the physiology of the bat and on the principles of aeronautics and physics. He was buried nearby in the palace church of Saint-Florentin.

Chapter 3 : Leonardo Da Vinci first Anatomist

Leonardo da Vinci: Anatomy of an artist If Leonardo da Vinci's uncannily accurate studies of the human body had been published in his lifetime, they would have changed the course of science.

Leonardo da Vinci, Anatomist Annelisa Stephan June 4, 2 min read Leonardo da Vinci worked for 25 years on a complete guide to the human form that would have transformed the study of anatomy in Europe. But the project was never finished and the notes were all but lost for centuries after his death. The new book Leonardo da Vinci: From the new book: Leonardo created the outline for his book as early as , but his progress was hampered by lack of access to anatomical material—in other words, corpses. Existing books and the dissection of monkeys, cows, dogs, and the occasional human skull could only teach so much. By about , however, he was gaining fame as an anatomist; bodies, primarily of executed criminals, began to flow, likely due to his partnership with anatomist Marcantonio della Torre of the University of Pavia medical school. Leonardo dug in, creating the first exploded views of structures such as the foot, hand, shoulder, and spine. Alongside the drawings, he added to-do lists: Begin your book on anatomy with a perfect man, and then draw him old and less muscular, then stripping him in stages down to the bone—and then draw the infant, with a diagram of the womb. Describe what sound is, and what din is, tumult, noise, etc. Depict here the foot of a bear, a monkey, and other animals, inasmuch as they differ from the foot of a man, and also put in the foot of some bird. And you, man, who witnesses in this labor of mine the marvelous works of nature, if you would judge it to be a wicked thing to destroy it, well think what a very wicked thing it is to take the life of a man. In his collaborator della Torre died of the plague, and political turmoil drove him to Rome and later to France, where his anatomical studies largely petered out. Upon his death in , the hundreds of fluid-stained notes and drawings passed from collector to collector, forgotten, rediscovered, forgotten again, and not published in a coherent form until This loss makes a note found on his renderings of the spine all the more poignant. Aware that his drawings would only be properly captured in engravings, rather than the woodcuts that dominated book illustration of the time, he noted: I pray to you, O successors, that avarice does not constrain you to make the prints in woodcut. Inspiration and Invention , including one that compares the layers of skin, membrane, and bone covering the human brain to the structure of an onion. Of course Leonardo knew about onions, too; botany was a topic of yet another of his unfinished treatises.

Chapter 4 : Leonardo da Vinci: Studies of the Human Body and Principles of Anatomy by Leonardo da Vinci

Books. Photography. New section human anatomy. Leonardo's interest in anatomy began when he was working for Ludovico in Milan. There was only reference to Leonardo da Vinci. There are.

He believed the workings of the human body to be an analogy for the workings of the universe. The text is in two parts, above [a] and below [b] the image. The first paragraph of the upper part reports Vitruvius: The second paragraph reads: The lower section of text gives these proportions: The points determining these proportions are marked with lines on the drawing. Below the drawing itself is a single line equal to a side of the square and divided into four cubits, of which the outer two are divided into six palms each, two of which have the mirror-text annotation "palmi"; the outermost two palms are divided into four fingers each, and are each annotated "diti". For the human body is so designed by nature that the face, from the chin to the top of the forehead and the lowest roots of the hair, is a tenth part of the whole height; the open hand from the wrist to the tip of the middle finger is just the same; the head from the chin to the crown is an eighth, and with the neck and shoulder from the top of the breast to the lowest roots of the hair is a sixth; from the middle of the breast to the summit of the crown is a fourth. If we take the height of the face itself, the distance from the bottom of the chin to the under side of the nostrils is one third of it; the nose from the under side of the nostrils to a line between the eyebrows is the same; from there to the lowest roots of the hair is also a third, comprising the forehead. The length of the foot is one sixth of the height of the body; of the forearm, one fourth; and the breadth of the breast is also one fourth. The other members, too, have their own symmetrical proportions, and it was by employing them that the famous painters and sculptors of antiquity attained to great and endless renown. Similarly, in the members of a temple there ought to be the greatest harmony in the symmetrical relations of the different parts to the general magnitude of the whole. Then again, in the human body the central point is naturally the navel. For if a man be placed flat on his back, with his hands and feet extended, and a pair of compasses centred at his navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described therefrom. And just as the human body yields a circular outline, so too a square figure may be found from it. For if we measure the distance from the soles of the feet to the top of the head, and then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces which are perfectly square. In drawing the circle and square he correctly observes that the square cannot have the same centre as the circle, [6] the navel, but is somewhat lower in the anatomy. The drawing itself is often used as an implied symbol of the essential symmetry of the human body, and by extension, the symmetry of the universe as a whole. The pose with the arms straight out and the feet together is seen to be inscribed in the superimposed square. On the other hand, the "spread-eagle" pose is seen to be inscribed in the superimposed circle. Church Design Castle Design Evidence has been found that Leonardo may have been influenced by the work of Giacomo Andrea de Ferrara, a Renaissance architect, an expert on Vitruvius and a close friend.

Chapter 5 : Leonardo on the Human Body by Leonardo da Vinci

This exhibition is the largest ever of Leonardo da Vinci's studies of the human body. Leonardo has long been recognised as one of the great artists of the Renaissance, but he was also a pioneer in the understanding of human anatomy.

He spent his first five years in the hamlet of Anchiano in the home of his mother, and from lived in the household of his father, grandparents and uncle in the small town of Vinci. His father had married a sixteen-year-old girl named Albiera Amadori, who loved Leonardo but died young [17] in without children. When Leonardo was sixteen , his father married again to twenty-year-old Francesca Lanfredini, who also died without children. In later life, Leonardo recorded only two childhood incidents. One, which he regarded as an omen, was when a kite dropped from the sky and hovered over his cradle, its tail feathers brushing his face. A local peasant made himself a round shield and requested that Ser Piero have it painted for him. Leonardo responded with a painting of a monster spitting fire that was so terrifying that Ser Piero sold it to a Florentine art dealer, who sold it to the Duke of Milan. Meanwhile, having made a profit, Ser Piero bought a shield decorated with a heart pierced by an arrow, which he gave to the peasant. One writer, called the Anonimo Gaddiano , claims that in Leonardo was living with the Medici and working in the Garden of the Piazza San Marco in Florence, a Neo-Platonic academy of artists, poets and philosophers that the Medici had established. When she died in , the list of funeral expenditures suggests that she was his mother. Seventy tons of bronze were set aside for casting it. The monument remained unfinished for several years, which was not unusual for Leonardo. In , the clay model of the horse was completed. With Ludovico Sforza overthrown, Leonardo, with his assistant Salai and friend, the mathematician Luca Pacioli , fled Milan for Venice , [40] where he was employed as a military architect and engineer, devising methods to defend the city from naval attack. Maps were extremely rare at the time and it would have seemed like a new concept. Upon seeing it, Cesare hired Leonardo as his chief military engineer and architect. Later in the year, Leonardo produced another map for his patron, one of Chiana Valley , Tuscany, so as to give his patron a better overlay of the land and greater strategic position. He created this map in conjunction with his other project of constructing a dam from the sea to Florence, in order to allow a supply of water to sustain the canal during all seasons. He spent two years designing and painting a mural of The Battle of Anghiari for the Signoria, [40] with Michelangelo designing its companion piece, The Battle of Cascina. His brothers received land, and his serving woman received a black cloak "of good stuff" with a fur edge. In , it was announced that DNA tests were to be conducted to investigate the veracity of the attribution, with results expected in . Many artists assisted in their creation. The painter Uccello , whose early experiments with perspective were to influence the development of landscape painting, was a very old man. Piero della Francesca had made a detailed study of perspective, [62] and was the first painter to make a scientific study of light. Many of these were created in tempera or glazed terracotta by the workshops of Filippo Lippi, Verrocchio and the prolific della Robbia family. Ghirlandaio and Perugino were both prolific and ran large workshops. Leonardo was not part of this prestigious commission. His first significant commission, The Adoration of the Magi for the Monks of Scopeto, was never completed. Leonardo was also later to visit Venice. Leonardo was sent as an ambassador by the Medici court to Ludovico il Moro , who ruled Milan between and . Leonardo was twenty-three when Michelangelo was born and thirty-one when Raphael was born. One such aspect was his respect for life, evidenced by his vegetarianism and his habit, according to Vasari, of purchasing caged birds and releasing them. They included the mathematician Luca Pacioli , [69] with whom he collaborated on the book *De divina proportione* in the s. Leonardo appears to have had no close relationships with women except for his friendship with Cecilia Gallerani and the two Este sisters, Beatrice and Isabella. His sexuality has been the subject of satire, analysis, and speculation. This trend began in the midth century and was revived in the 19th and 20th centuries, most notably by Sigmund Freud. It has been claimed since the 16th century that these relationships were of a sexual or erotic nature. Court records of , when he was aged twenty-four, show that Leonardo and three other young men were charged with sodomy in an incident involving a well-known male prostitute. Leonardo is thought to have used Salai as the model. After only a year, Leonardo made a list of his misdemeanours, calling him "a thief, a liar, stubborn,

and a glutton", after he had made off with money and valuables on at least five occasions and spent a fortune on clothes. In , he painted a nude version of the Mona Lisa , known as Monna Vanna. A handful of works that are either authenticated or attributed to him have been regarded as among the great masterpieces. These paintings are famous for a variety of qualities that have been much imitated by students and discussed at great length by connoisseurs and critics. By the s Leonardo had already been described as a "Divine" painter. All these qualities come together in his most famous painted works, the Mona Lisa, the Last Supper, and the Virgin of the Rocks. It is a "predella" to go at the base of a larger composition, a painting by Lorenzo di Credi from which it has become separated. Although previously attributed to Ghirlandaio , the larger work is now generally attributed to Leonardo. Mary is not submissive, however, in the larger piece. The girl, interrupted in her reading by this unexpected messenger, puts a finger in her bible to mark the place and raises her hand in a formal gesture of greeting or surprise. Two of the three were never finished, and the third took so long that it was subject to lengthy negotiations over completion and payment. His kneeling form takes on a trapezoid shape, with one arm stretched to the outer edge of the painting and his gaze looking in the opposite direction. The other remarkable feature is the sketchy landscape of craggy rocks against which the figure is silhouetted. The daring display of figure composition, the landscape elements and personal drama also appear in the great unfinished masterpiece, the Adoration of the Magi , a commission from the Monks of San Donato a Scopeto. It is a complex composition, of about x centimetres. Leonardo did numerous drawings and preparatory studies, including a detailed one in linear perspective of the ruined classical architecture that forms part of the background. The painting, to be done with the assistance of the de Predis brothers , was to fill a large complex altarpiece. The painting demonstrates an eerie beauty as the graceful figures kneel in adoration around the infant Christ in a wild landscape of tumbling rock and whirling water. The painting was eventually finished; in fact, two versions of the painting were finished: The Brothers did not get their painting, however, nor the de Predis their payment, until the next century. It represents the last meal shared by Jesus with his disciples before his capture and death, and shows the moment when Jesus has just said "one of you will betray me", and the consternation that this statement caused. Vasari describes how Leonardo, troubled over his ability to adequately depict the faces of Christ and the traitor Judas, told the Duke that he might be obliged to use the prior as his model. In the present era, it is arguably the most famous painting in the world. Vasari, who is generally thought to have known the painting only by repute, said that "the smile was so pleasing that it seemed divine rather than human; and those who saw it were amazed to find that it was as alive as the original".

Chapter 6 : Leonardo da Vinci: Anatomist, Clayton, Philo

saw this one while I was wandering in the stacks and just had to take it home. It's the book on anatomy that da Vinci never published, but had several finished plates for.

Bring fact-checked results to the top of your browser search. It cannot be determined exactly when Leonardo began to perform dissections, but it might have been several years after he first moved to Milan, at the time a centre of medical investigation. His study of anatomy, originally pursued for his training as an artist, had grown by the 1500s into an independent area of research. Over the following two decades, he did practical work in anatomy on the dissection table in Milan, then at hospitals in Florence and Rome, and in Pavia, where he collaborated with the physician-anatomist Marcantonio della Torre. By his own count Leonardo dissected 30 corpses in his lifetime. From observing the static structure of the body, Leonardo proceeded to study the role of individual parts of the body in mechanical activity. His findings from these studies were recorded in the famous anatomical drawings, which are among the most significant achievements of Renaissance science. The genuine value of these *dimostrazione* lay in their ability to synthesize a multiplicity of individual experiences at the dissecting table and make the data immediately and accurately visible; as Leonardo proudly emphasized, these drawings were superior to descriptive words. He did not consider himself a professional in the field of anatomy, and he neither taught nor published his findings. Courtesy of Biblioteca Ambrosiana, Milan

Although he kept his anatomical studies to himself, Leonardo did publish some of his observations on human proportion. Imposing the principles of geometry on the configuration of the human body, Leonardo demonstrated that the ideal proportion of the human figure corresponds with the forms of the circle and the square. In his illustration of this theory, the so-called Vitruvian Man, Leonardo demonstrated that when a man places his feet firmly on the ground and stretches out his arms, he can be contained within the four lines of a square, but when in a spread-eagle position, he can be inscribed in a circle. He believed the workings of the human body to be an analogy, in microcosm, for the workings of the universe. Throughout his life Leonardo was an inventive builder; he thoroughly understood the principles of mechanics of his time and contributed in many ways to advancing them. The two Madrid notebooks deal extensively with his theory of mechanics; the first was written in the 1500s, and the second was written between 1505 and 1515. Their importance lay less in their description of specific machines or work tools than in their use of demonstration models to explain the basic mechanical principles and functions employed in building machinery. As in his anatomical drawings, Leonardo developed definite principles of graphic representation—stylization, patterns, and diagrams—that offer a precise demonstration of the object in question. Leonardo was also quite active as a military engineer, beginning with his stay in Milan. But no definitive examples of his work can be adduced. His studies for large-scale canal projects in the Arno region and in Lombardy show that he was also an expert in hydraulic engineering. Leonardo was especially intrigued by problems of friction and resistance, and with each of the mechanical elements he presented—such as screw threads, gears, hydraulic jacks, swiveling devices, and transmission gears—drawings took precedence over the written word. Throughout his career he also was intrigued by the mechanical potential of motion. This led him to design a machine with a differential transmission, a moving fortress that resembles a modern tank, and a flying machine. Screw-cutting machine by Leonardo da Vinci, c. 1508. In his drawings based on the numerous experiments he undertook, Leonardo found a stylized form of representation that was uniquely his own, especially in his studies of whirlpools. He managed to break down a phenomenon into its component parts—the traces of water or eddies of the whirlpool—yet at the same time preserve the total picture, creating both an analytic and a synthetic vision. SuperStock

Leonardo as artist-scientist As the 15th century expired, Scholastic doctrines were in decline, and humanistic scholarship was on the rise. Leonardo, however, was part of an intellectual circle that developed a third, specifically modern, form of cognition. In his view, the artist—as transmitter of the true and accurate data of experience acquired by visual observation—played a significant part. Finally, although he made strenuous efforts to become erudite in languages, natural science, mathematics, philosophy, and history, as a mere listing of the wide-ranging contents of his library demonstrates, Leonardo remained an empiricist of visual

observation. In the face of his overall achievements, therefore, the question of how much he finished or did not finish becomes pointless. The crux of the matter is his intellectual forceâ€”self-contained and inherent in every one of his creationsâ€”a force that continues to spark scholarly interest today. In fact, debate has spilled over into the personal realm of his lifeâ€”over his sexuality, religious beliefs, and even possible vegetarianism, for exampleâ€”which only confirms and reflects what has long been obvious:

Leonardo da Vinci's Handwritten Resume () Leonardo Da Vinci's To Do List (circa) Is Much Cooler Than Yours Josh Jones is a writer and musician based in Durham, NC.

Bring fact-checked results to the top of your browser search. In its monumental simplicity, the composition of the scene is masterful; the power of its effect comes from the striking contrast in the attitudes of the 12 disciples as counterposed to Christ. Only one other being shares the secret knowledge: Judas, who is both part of and yet excluded from the movement of his companions. In this isolation he becomes the second lonely figure—the guilty one—of the company. SuperStock In the profound conception of his theme, in the perfect yet seemingly simple arrangement of the individuals, in the temperaments of the Apostles highlighted by gesture, facial expressions, and poses, in the drama and at the same time the sublimity of the treatment, Leonardo attained a height of expression that has remained a model of its kind. It has become widely known through countless reproductions and prints, the most important being that produced by Raffaello Morghen in 1846. Technical deficiencies in the execution of the work have not lessened its fame. Leonardo was uncertain about the technique he should use. He bypassed traditional fresco painting, which, because it is executed on fresh plaster, demands quick and uninterrupted painting, in favour of another technique he had developed: This procedure proved unsuccessful, inasmuch as the base soon began to loosen from the wall. Damage appeared by the beginning of the 16th century, and deterioration soon set in. By the middle of the century, the work was called a ruin. Later, inadequate attempts at restoration only aggravated the situation, and not until the most-modern restoration techniques were applied after World War II was the process of decay halted. A major restoration campaign begun in 1964 and completed in 1981 restored the work to brilliance but also revealed that very little of the original paint remains. During this period, his interest in two fields—the artistic and the scientific—developed and shaped his future work, building toward a kind of creative dualism that sparked his inventiveness in both fields. He gradually gave shape to four main themes that were to occupy him for the rest of his life: He scorned speculative book knowledge, favouring instead the irrefutable facts gained from experience—from *saper vedere*. Hence, Leonardo conceived the staggering plan of observing all objects in the visible world, recognizing their form and structure, and pictorially describing them exactly as they are. It was during his first years in Milan that Leonardo began the earliest of his notebooks. He would first make quick sketches of his observations on loose sheets or on tiny paper pads he kept in his belt; then he would arrange them according to theme and enter them in order in the notebook. Surviving in notebooks from throughout his career are a first collection of material for a painting treatise, a model book of sketches for sacred and profane architecture, a treatise on elementary theory of mechanics, and the first sections of a treatise on the human body. Of more than 40 codices mentioned—sometimes inaccurately—in contemporary sources, 21 have survived; these in turn sometimes contain notebooks originally separate but now bound so that 32 in all have been preserved. To these should be added several large bundles of documents: Leonardo was left-handed, so mirror writing came easily and naturally to him—although it is uncertain why he chose to do so. While somewhat unusual, his script can be read clearly and without difficulty with the help of a mirror—as his contemporaries testified—and should not be looked on as a secret handwriting. But the fact that Leonardo used mirror writing throughout the notebooks, even in his copies drawn up with painstaking calligraphy, forces one to conclude that, although he constantly addressed an imaginary reader in his writings, he never felt the need to achieve easy communication by using conventional handwriting. His writings must be interpreted as preliminary stages of works destined for eventual publication that Leonardo never got around to completing. In a sentence in the margin of one of his late anatomy sketches, he implores his followers to see that his works are printed. Leonardo strove passionately for a language that was clear yet expressive. The vividness and wealth of his vocabulary were the result of intense independent study and represented a significant contribution to the evolution of scientific prose in the Italian vernacular. Despite his articulateness, Leonardo gave absolute precedence to the illustration over the written word in his teaching method. Hence, in his notebooks, the drawing does not illustrate the text; rather, the text serves to explain the picture. The Mona

Lisa and other works In the Florence years between and , Leonardo began three great works that confirmed and heightened his fame: The Virgin and Child with Saint Anne c. Even before it was completed, The Virgin and Child with Saint Anne won the critical acclaim of the Florentines; the monumental three-dimensional quality of the group and the calculated effects of dynamism and tension in the composition made it a model that inspired Classicists and Mannerists in equal measure. The painting presents a woman revealed in the 21st century to likely have been Lisa del Giocondo, the wife of the Florentine merchant Francesco del Giocondo—hence, the alternative title to the work, La Gioconda. The picture presents a half-body portrait of the subject, with a distant landscape visible as a backdrop. Although utilizing a seemingly simple formula for portraiture, the expressive synthesis that Leonardo achieved between sitter and landscape has placed this work in the canon of the most-popular and most-analyzed paintings of all time. The young Raphael sketched the work in progress, and it served as a model for his Portrait of Maddalena Doni c. For a moment the intense and expanding movement of the swirl of riders seems frozen. He studied and described extensively the baring of teeth and puffing of lips as signs of animal and human anger. On the painted canvas, rider and horse, their features distorted, are remarkably similar in expression. The highly imaginative trappings of the painting take the event out of the sphere of the historical and put it into a timeless realm. During this period, Leonardo is believed to have painted Salvator Mundi c. Salvator MundiSalvator Mundi, oil on walnut panel believed to have been painted by Leonardo da Vinci, c. During his years in Milan he returned to the Leda theme—which had been occupying him for a decade—and probably finished a standing version of Leda about the work survives only through copies. It influenced classical artists such as Raphael, who drew it, but it had an equally strong effect on Mannerists such as Jacopo da Pontormo. The drawings he prepared—revealing examples of his late style—have a curious, enigmatic sensuality. Perhaps in Rome he began the painting St. John the Baptist, which he completed in France. Leonardo radically used light and shade to achieve sculptural volume and atmosphere; John emerges from darkness into light and seems to emanate light and goodness. Consummate drawings from this period, such as the Pointing Lady c. Leonardo suggested that the immaterial forces in the cosmos, invisible in themselves, appear in the material things they set in motion. What he had observed in the swirling of water and eddying of air, in the shape of a mountain boulder and in the growth of plants, now assumed gigantic shape in cloud formations and rainstorms. These rules govern the life and death of every created thing in nature.

Chapter 8 : Leonardo da Vinci - HISTORY

The Vitruvian Man (Italian: Le proporzioni del corpo umano secondo Vitruvio, which is translated to "The proportions of the human body according to Vitruvius"), or simply L'Uomo Vitruviano (Italian pronunciation: [l'wɛˈmo vitruˈvjaˈno]), is a drawing made by the Italian polymath Leonardo da Vinci around

By Alastair Sooke 21 October We tend to think of Leonardo da Vinci as a painter, even though he probably produced no more than 20 pictures before his death in . Yet for long periods of his career, which lasted for nearly half a century, he was engrossed in all sorts of surprising pursuits, from stargazing and designing ingenious weaponry to overseeing a complex system of canals for Ludovico Maria Sforza, the ruling duke of Milan. During the course of his life, Leonardo filled thousands of pages of manuscript with dense doodles, diagrams, and swirling text, probing almost every conceivable topic. Not for nothing, then, is he often considered the archetypal Renaissance man: Yet according to Leonardo da Vinci: After executing a sequence of stunning drawings of a skull, though, his studies went into abeyance, probably because he lacked access to corpses that he could dissect. Bodies of evidence But his ambitions to publish a comprehensive treatise on human anatomy persisted – and around two decades later, he returned to his otherwise unused notebook, which is now known as the Anatomical Manuscript B and is kept at the Royal Library at Windsor Castle. In it he made a number of pen-and-ink drawings recording his observations while dissecting an old man who had died in a hospital in Florence in the winter of . In the years that followed, Leonardo concentrated on human anatomy more systematically than ever before – and by the end of his life he claimed that he had cut up more than 30 corpses. In the winter of , while probably collaborating with a young professor of anatomy called Marcantonio della Torre at the University of Pavia, Leonardo compiled a series of 18 mostly double-sided sheets exploding with more than individual drawings and over 13, words of notes. Now known as the Anatomical Manuscript A, and also in the Royal Collection, these sheets are full of lucid insights into the functioning anatomy of the human body. Leonardo made many important discoveries. For instance, he produced the first accurate depiction of the human spine, while his notes documenting his dissection of the Florentine centenarian contain the earliest known description of cirrhosis of the liver. Had he published his treatise, he would be considered more important than the Belgian anatomist Andreas Vesalius, whose influential textbook *On the Fabric of the Human Body* appeared in . But he never did. It was here that he became obsessed with understanding the structure of the heart. Moreover, he discovered that the atria or filling chambers contract together while the pumping chambers or ventricles are relaxing, and vice versa. This is because the heart empties itself with a twisting motion – it wrings itself out, a bit like the wringing out of a towel. In heart failure it loses this twist. You or I would probably enjoy a nice glass of red wine while the pork was cooking, but Leonardo was thinking about this at the time. They killed the pigs by pushing little spears through the chest into the heart, and Leonardo noticed the rotational movement of these little spears in the heart. It was totally blue-sky research, of no use to anybody of his time, but it was a correct start along the road to understanding cardiac twist, which is now one of the hottest topics in understanding heart failure. Intrigued by the way that the aortic valve opens and closes to ensure blood flows in one direction, Leonardo set about constructing a model by filling a bovine heart with wax. Once the wax had hardened, he recreated the structure in glass, and then pumped a mixture of grass seeds suspended in water through it. This allowed him to observe little vortices as the seeds swirled around in the widening at the root of the aorta. As a result, Leonardo correctly posited that these vortices helped to close the aortic valve. Yet because he never published his far-sighted research, this remained unknown for centuries. There was only reference to Leonardo da Vinci. There are two extraordinary things about that: But Leonardo pushed these two things further than anybody else. He was the supreme example of an anatomist who could also draw, or of an artist who was also a very skilled dissector. It was the union of these two skills in a single figure that made Leonardo unique. If you would like to comment on this story or anything else you have seen on BBC Culture, head over to our Facebook page or message us on Twitter.

Chapter 9 : Leonardo da Vinci, Anatomist | The Getty Iris

Leonardo da Vinci: Anatomist gathers 90 of these seminal drawings, contextualized in a discussion of their anatomical significance. Accompanying the books is an iPad app, presenting pages of Leonardo's notebooks in magnificent high resolution.