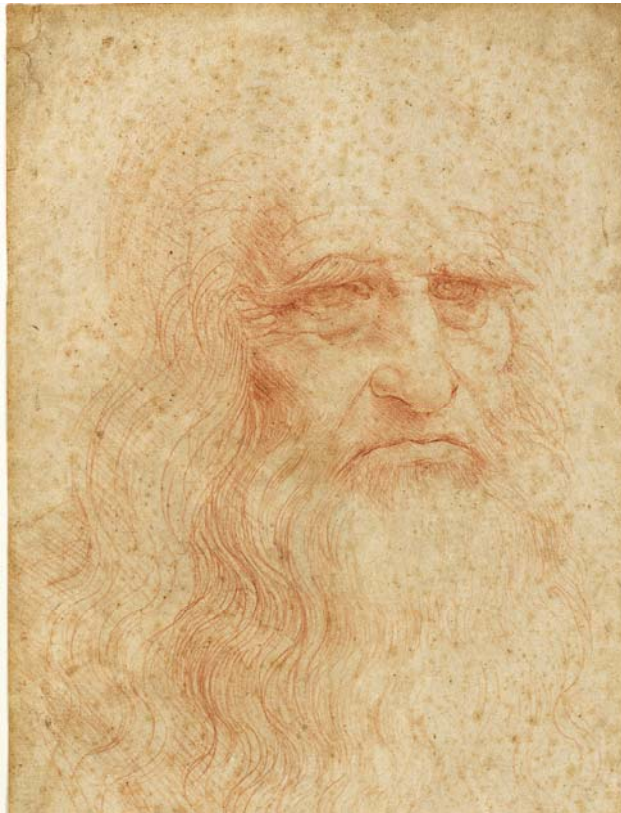


# Leonardo

DA VINCI'S WORKSHOP

Leonardo daVinci's Workshop:



Teacher's Guide

# About the Exhibition

Leonardo da Vinci is a universal genius.

He was, of course, an Italian, but he belongs to a past that is part of the cultural heritage of every person and every nation. He is a singular example throughout history of a man who possessed an enormous talent and excelled not only as a scientist, but also as an artist.

Most of the inventions and machines that he designed can in fact be considered as works of art. In the same context, his artistic works are creations of a master artists' hand as well as the products of a formative scientific brain.

Just as his paintings deserve the kind of investigation to which only today's technology can do justice, so the full extent of his scientific work has yet to be revealed to the public.

The public's knowledge about Leonardo is barely the tip of the iceberg. His manuscripts still conceal hidden secrets and are worthy of pursuit and presentation in new innovative ways. It is the "unknown Leonardo" that L3 explores, discovers and reveals to spark the hidden genius that lies inside all of us.

Leonardo 3 (L3) is the world leader in exclusive exhibitions and publications on Da Vinci's genius. This exhibition is the result of work by our own research team who, for each event, investigates and develops machines that have never been seen before.

This exhibition is "dynamic" not "static". We make extensive use of 3D animations, physical models and interactive software to offer the public a unique level of interaction and a hands on experience of *Edutainment*. As the Master himself taught us-we use visual images to help people understand.

The exhibition presents the work that has been carried out over the last five years by scholars Mario Taddei and Edoardo Zanon. Their main focus has been the interpretation of machines that have never been explored to this degree before; they look to do more than a reinterpretation of the already well know designs.

# Inspire a Whole New Generation of Genius

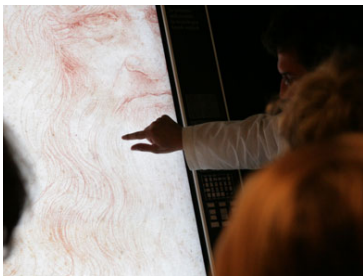
Enter the world of Leonardo da Vinci's Workshop – an immersive, educational exhibition featuring exclusive operative full-scale models and 3D animations of Leonardo's inventions, some never before brought to life.



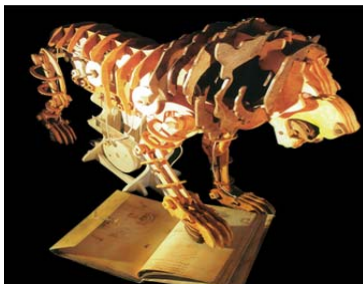
Touch screen panels allow users to turn pages from his actual and most important notebooks and view them as 3-dimensional models.



Utilizing modern interactive technology, visitors can view 360° images and 3D reconstructions of some of Da Vinci's most innovative machines and understand how they work.



Leonardo's most important paintings viewed through innovative and avant-garde technologies where one can witness, better understand and appreciate the genius of Da Vinci for the first time.



Visit hands-on stations with fully built out physical wooden models including a build-it-yourself Da Vinci Bridge.

# Leonardo DaVinci

The illegitimate son of a 25-year-old notary, Ser Piero, and a peasant girl, Caterina, Leonardo was born on April 15, 1452, in Vinci, Italy, just outside Florence. His father took custody of the little fellow shortly after his birth, while his mother married someone else and moved to a neighboring town. They kept on having kids, although not with each other, and they eventually supplied him with a total of 17 half sisters and brothers.

Growing up in his father's Vinci home, Leonardo had access to scholarly texts owned by family and friends. He was also exposed to Vinci's longstanding painting tradition, and when he was about 15 his father apprenticed him to the renowned workshop of Andrea del Verrochio in Florence. Even as an apprentice, Leonardo demonstrated his colossal talent. Indeed, his genius seems to have seeped into a number of pieces produced by the Verrocchio's workshop from the period 1470 to 1475. For example, one of Leonardo's first big breaks was to paint an angel in Verrocchio's "Baptism of Christ," and Leonardo was so much better than his master's that Verrocchio allegedly resolved never to paint again. Leonardo stayed in the Verrocchio workshop until 1477 when he set up a shingle for himself.

In search of new challenges and the money, he entered the service of the Duke of Milan in 1482, abandoning his first commission in Florence, "The Adoration of the Magi". He spent 17 years in Milan, leaving only after Duke Ludovico Sforza's fall from power in 1499. It was during these years that Leonardo hit his stride, reaching new heights of scientific and artistic achievement.

The Duke kept Leonardo busy painting and sculpting and designing elaborate court festivals, but he also put Leonardo to work designing weapons, buildings and machinery. From 1485 to 1490, Leonardo produced a study on loads of subjects, including nature, flying machines, geometry, mechanics, municipal construction, canals and architecture (designing everything from churches to fortresses). His studies from this period contain designs for advanced weapons, including a tank and other war vehicles, various combat devices, and submarines. Also during this period, Leonardo produced his first anatomical studies. His Milan workshop was a veritable hive of activity, buzzing with apprentices and students.

Alas, Leonardo's interests were so broad, and he was so often compelled by new subjects, that he usually failed to finish what he started. This lack of "stick-to-it-ness" resulted in his completing only about six works in these 17 years, including "The Last Supper" and "The Virgin on the Rocks," and he left dozens of paintings and projects unfinished or unrealized. He spent most of his time studying science, either by going out into nature and observing things or by locking himself away in his workshop cutting up bodies or pondering universal truths.

Between 1490 and 1495 he developed his habit of recording his studies in meticulously illustrated notebooks. His work covered four main themes: painting, architecture, the elements

of mechanics, and human anatomy. These studies and sketches were collected into various codices and manuscripts, which are now hungrily collected by museums and individuals.

Back to Milan... after the invasion by the French and Ludovico Sforza's fall from power in 1499, Leonardo was left to search for a new patron. Over the next 16 years, Leonardo worked and traveled throughout Italy for a number of employers, including the dastardly Cesare Borgia. He traveled for a year with Borgia's army as a military engineer and even met Niccolò Machiavelli, author of "The Prince." Leonardo also designed a bridge to span the "golden horn" in Constantinople during this period and received a commission, with the help of Machiavelli, to paint the "Battle of Anghiari."

About 1503, Leonardo reportedly began work on the "Mona Lisa." On July 9, 1504, he received notice of the death of his father, Ser Piero. Through the contrivances of his meddling half brothers and sisters, Leonardo was deprived of any inheritance. The death of a beloved uncle also resulted in a scuffle over inheritance, but this time Leonardo beat out his scheming siblings and wound up with use of the uncle's land and money.

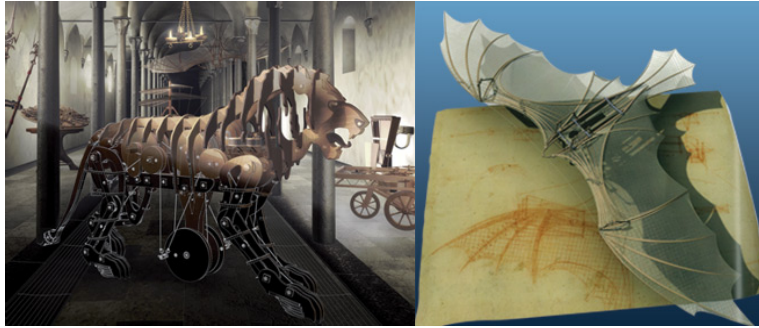
From 1513 to 1516, he worked in Rome, maintaining a workshop and undertaking a variety of projects for the Pope. He continued his studies of human anatomy and physiology, but the Pope forbade him from dissecting cadavers, which truly cramped his style.

Following the death of his patron Giuliano de' Medici in March of 1516, he was offered the title of Premier Painter and Engineer and Architect of the King by Francis I in France. His last and perhaps most generous patron, Francis I provided Leonardo with a cushy job, including a stipend and manor house near the royal chateau at Amboise.

Although suffering from a paralysis of the right hand, Leonardo was still able to draw and teach. He produced studies for the Virgin Mary from "The Virgin and Child with St. Anne", studies of cats, horses, dragons, St. George, anatomical studies, studies on the nature of water, drawings of the Deluge, and of various machines.

Leonardo died on May 2, 1519 in Cloux, France.

# Machines and Models



Students will be introduced to ten models presented in both digital and physical forms.

Some of these models are:

**Mechanical Lion**-In 1515, Leonardo built a mechanical lion that was brought to Lyon to impress Francis I, the king of France. Written testimonies, recount that Leonardo had designed this mechanical automaton in the shape of a lion that walked on its own, came to a stop and released lilies from its chest. The tribute to the king of France had been commissioned by the governor of the city of Florence, who'd chosen it as a symbol of nobility and strength, and perhaps also because the whole event took place in the city of Lyon. The lilies contained within the lion offered as a gift were symbols connected to both Florence and France.

**Harpichord-Viola**-The folio 93r of *Codex Atlanticus c. 1493-95*, is devoted to the study of a very complex musical instrument that has never seen the light of day until now. While there's no record of whether or not Leonardo ever made a physical version of it, the detailed nature of these drawings implies that he may very well have built a prototype. The folio is almost entirely drawn in sanguine (a red colored crayon) and is missing its left hand side. In fact, the marks in the left margin are cut in half and therefore incomplete. This missing part has not yet been identified among the manuscripts that we know of today.

**Robot-Knight**- Folio 579r of the *Codex Altanticus* contains many confusing subjects. The Leonardo 3 research center has brought the several mechanisms on the page to light: pulleys, a drum, a clockwork system, some gears, various mechanisms, a helmet and a coupling for battle armor. By analyzing the details and crossing them with the information and notes hidden in other Leonardo codices, we arrived at the hypothesis of the torso of an artificial soldier that can beat its hands against its chest when the central wheel is set in motion. The same clues show that many other reconstructions of the soldier are mistaken and that this, some 500 years later, is the most detailed study of Leonardo's robot ever completed.

**Self Propelling Cart**-This famous drawing of a self-propelling cart is a complex model for an automaton, a machine to provide theatrical effects. The device can move by itself. The drawing at the top of the folio 812r of the *Codex Atlanticus* is an unfinished first draft. In the center of the manuscript is the view of the machine from above. The vehicle can be programmed and is wound up by the main springs; the “crossbows” are auxiliary springs and the small lower wheels from the escapement mechanism. The details surrounding the central drawing are studies of braking systems and fixtures for the auxiliary systems. This design works and in 2004 the L3 laboratories proved it by building the first prototype model in the world.

**Great Kite**- The *Codex on Flight* (preserved in the Royal Library of Turin, in Italy) represents the most advanced and organic state of Leonardo’s studies on flight. The genius from Vinci drew inspiration for his work from his direct observation of the flight of the kite bird. He has left us with several drawings and designs for flying machines, especially in the *Codex Atlanticus* and *Manuscript B*. Yet it was long believed that this was not the case for the *Codex in Flight*, which was puzzling considering its title.

**Aerial Screw**-The drawing on folio 83v of *Manuscript B* is one of Leonardo’s most famous because it has long been believed to represent the first helicopter in history. In actuality, however, it’s nothing of the sort. Instead, it represents an experimental design for an “aerial screw” used to verify air’s fluid nature. Theoretically, this consistency of air would allow the “screw” to push against it and spin upwards off the ground.

**Mechanical Bat**-One of the most advanced of Leonardo’s designs for a flying machine is found in the *Codex Atlanticus*. The instructions for building it are on a page full of sketches that are difficult to understand. It’s an enormous mechanical bat almost 65 feet wide. The shape of the wings and the number of sections are exactly like those of a bat. The pilot’s place is in the center of the machine. The wings are covered in a square-mesh net that is used to secure the canvas and to allow air to pass through when the wings are folded upwards. Leonardo suggests using linen canvas, properly water-proofed, then sewn and fixed to the net as well as to the wooden struts (which are soaked in water to make them pliable). The tail is used to give stability to a machine that could in fact be used as a glider.

**Multi Cannon Gunship**-This is the first page of the *Codex Atlanticus*. The drawing on the upper part of the pages is a multi-cannon gunship (viewed from above) with 16 barrels and a complex central mechanism, probably for moving and turning the “armored gunship” on the water. The sketches below suggest other details of the gunship such as a series of oars. There is a significant number of components used to build the *Multi-Cannon Gunship*. Among the many variations for this machine, Leonardo also designed a shield cover to protect the sailors during navigation and battle.

**Codex Atlanticus-folio 855r** – A river flows from top to bottom. There are three projects of *Swing Bridges*. The first bridge has a peg mechanism and the large wheels on the right enable it to rotate. In the center there is a plan for an arched bridge that turns on a central pivot. It is a counterbalanced on the right by a case of stones and turns by winches set on the riverbank.

**Codex Atlanticus-Folio 238r**-The *retractable Bridge* was designed to stop unwanted visitors from gaining access to a villa, most probably the residence of the French governor of Milan, Charles d'Amboise. By means of a complex mechanism, this bridge can move half the length of its walkway back towards the villa.

**Codex Altanticus-Folio 69r**-At the top of the manuscript Leonardo has drawn, above a river, a *Self-Supporting Bridge* built of wood logs or wood pieces of equal size. The bridge, probably intended for military use, remains standing without any kind of fastening, thanks to the ingenious technique of interlocking joints.

# Paintings and Drawings

## Drawings

The Royal da Vinci Commission was founded in Rome in 1905. In 1919, on the fourth centenary of Leonardo's death, the commission established its first major project; publishing all of Leonardo's manuscripts and drawings in a series of books and booklets. The first fruits of this labor appeared in 1923 with the publication of the first volume of the *Codex Arundel*.

Publications of the drawings in chronological order began with the first booklet in 1928, followed by others in 1930, 1934, 1936, 1939, 1941 and 1949. These reproductions were made directly from Leonardo's original drawings and are of outstanding quality and historical importance.

In this exhibition we have chosen to present a selection of 24 of the plates produced by the Royal da Vinci Commission. Since Leonardo was at once an inventor, a scientist and an artist, we believe that in an exhibition devoted primarily to his machines, it is important to recall his role as an artistic genius.

## Paintings



The Last Supper (also known as The Cenacle) is painted in tempera and oils on two preparatory chalk layers over plaster. The painting measures 181,1 x 346,4 in (460 x 880 cm) and was executed between 1494 and 1497. In his letter of 8 February 1498 dedicating his treatise "De divina proportione" to Ludovico the Moor, Luca Pacioli refers to it as already finished. The Cenacle is the greatest of Leonardo's paintings and the only one of his frescoes to have survived. It depicts the scene of the Eucharist at the moment when Christ says, "One of you shall betray me". Judas feels he is being accused. St. James the Great is stunned and throws his arms wide; beside him, St. Philip clutches his hands to his breast. St. Peter leans forward impulsively, while in front of him, Judas steps back, looking guilty. At the far right of the table, from left to right, St. Matthew, St. Thaddeus and St. Simon's agitated gestures express their bewilderment and incredulity. In the center, Christ is portrayed with his arms open on the table. The scene takes place in a virtual area that extends the walls of the supper room. The

added virtual light coming from the left corresponds to the real light in the room, which in fact has windows in the left-hand wall.



The Mona Lisa shows a woman with a thoughtful expression and a slightly smiling mouth. The painting, in oils on poplar wood, measures 30,3 x 20,9 in (77 x 53 cm). It was executed between 1503 and 1506. It is the principal attraction of the Louvre in Paris. The woman is probably Mona Lisa Gherardini, a courtesan from a country family of minor nobility, who lived around the end of the 15th/beginning of the 16th century.

"La Gioconda" is another matter entirely. It is not the painting by Leonardo da Vinci, but something dreamt up by the Press. "La Gioconda" – "the playful woman" – is the symbol of the Louvre, so greatly venerated and sought after that no one really looks closely at the painting. Much has been said about the smile and the unlikely mysteries it is supposed to hide, but these are nothing to do with this superb portrait of a lady.

### **Leonardo 3, Virtual Paintings Project**

About the paintings of the genius.

Imagine history and culture seeing in a different way. "Leonardo\_3" is an exposition that shows history and culture using advanced digital techniques. Ancient environments and objects are rebuilt, becoming digital. Turn back time, in the Milan Castle in the 1500: you can visit Leonardo Da Vinci laboratories and all his machines. 360° images, virtual tours, reconstructions of machines with exploded schemes, interactive software to understand how machines work. "Leonardo\_3" conveys you to the historical settings, objects, instruments and laboratories in which the most important technological inventions in the development of human history were conceived. The first, fundamental step is a virtual reality visit to the laboratories of Leonardo da Vinci, starting at the Sforza Castle in Milan. The whole presentation is achieved through the use of state-of-the-art computer graphics created from our research of authentic historical sources; all the reproductions, from the most famous objects such as "Leonardo's Wings" to the most minute details are based on and are faithful to careful historical reconstructions. The public can now see with their own eyes, places that no longer exist; this is a new way of presenting history in a visual format. There are not only the inventions everyone has heard about, but also the smallest details that are often overlooked, yet so extremely important.

# Codices

The manuscripts and codices that are included in our exhibit are:

## **Manuscript B**

Manuscript B is the earliest of Leonardo's bound manuscripts, with the *Codex Trivulzianus*.

It contains drawings and notes relating to a range of subjects, the most famous of which concern mechanical inventions for flight, such as the so-called helicopter, a submarine, and architectural studies with designs for churches based on centralized plans.

There are also designs for engines of war with which Leonardo had hoped to win Ludovico Sforza's favor.

Originally together with the *Codex Ashburnham I*, this notebook comprised of 50 double folios or 100 pages with an additional five loose sheets. The original binding now contains 84 folios.

## **Codex on Flight**

As suggested by the name, this manuscript deals primarily with the flight of birds, which Leonardo analysed closely in his efforts to build a mechanical flying machine. Here the mechanics of flight, air resistance and the effects of wind on the wings and flight of birds are all considered in great detail.

This codex consists of 13 pages out of an original 18 and was originally part of *Manuscript B*.

## **Codex Atlanticus**

With 1750 drawings on 1119 pages, the Codex Atlanticus is the largest and most amazing collection of Leonardo's manuscripts. The actual Codex Atlanticus is not available to the general public and is kept in the secure vault room of the Pinacoteca Ambrosiana (a few yards from Milan cathedral).

Using the technique of high resolution digitalization, the 100 most fascinating manuscript pages have been reproduced and collected into an interactive book, allowing the pages to be turned and examined directly – something never before available to the public. As well as the ability to zoom in on details with a totally new clarity of enlargement, the three-dimensional animations of the main drawings make it possible for the viewer to easily see how the mechanisms work.

**The interactive stations** in the exhibition allow access to the virtual *Codex Atlanticus* through plasma screens and video projections. Another exciting display in the exhibition is the physical reconstruction in wood and iron of the "Multi-cannon Gunship", which is the drawing that appears on the very first page of the *Codex Atlanticus*. Naturally, this machine can also be viewed more closely at dedicated interactive stations.

# New York State Learning Standards

Mathematics Science and Technology

Grades K-12 Content Standards 1, 2, 4, 5, 6

Social Studies:

Grades K-12 Content Standard 2- World Histories

The Arts: Visual Art

Grades K-12 Content Standards 2 ,3 ,4

## New Jersey

### Core Curriculum Content Standards

Mathematics Science and Technology: Grades K-12

Content Standard 8.1

Social Studies: Grades K-12

Content Standard 6.2

The Arts: Visual Grades K-12

Content Standards 1.2, 1.4

# Connecticut

## Content and Performance Standards

Social Studies: Grades K-12  
Content Standards 3,8,9

The Arts-Visual Arts Grades K-12  
Content Standards 1, 3, 4, 6

## Workshops at the Exhibit

When you book your visit to DTSX you can also book any of these additional workshops to do with your class. The workshops can be tailored to all ages and grade levels.

### Build a Bridge:

Students will take what they did in the exhibition and make a smaller scale bridge using the Da Vinci manuscripts. These bridges the students will be able to take with them.

### Design a Robot:

Students will design their own Robot based on what they learned in the Exhibit. The students will use large paper and design the plans for the robot. Mapping out all of the parts they would need and, then putting them in order so that they can build their robot. It will be much like the computer screens they saw next to the models. We will identify all the parts that it takes to make the robot work.

### Memory in Motion:

From memory (no going back in the exhibit, and only a little help from us) the students will use building materials to build their very own flying machine. Then we would see how far it can fly.

### Paint by Knowledge:

Students will participate in a game about the symbols in the paintings of Leonardo; they will try to crack the code to reveal what work we are discussing. What they will take away from this workshop is a key to looking at paintings. They will have the secret code to decipher various works of art.

## Classroom Lessons

These you can do before or after your visit to *Leonardo da Vinci's Workshop*

### **Lesson 1:** Student notebooks

Have your students keep their own notebooks of inventions they would like to see come to life.

Then have them pick one that they would like to build. Say they can build one but it has to be able to be built using materials like- Popsicle sticks, glue, scissors, fabric, pipe cleaners and other easy craft materials.

Have them build the invention and then write a paragraph about what it does and how it will help them or the world as a whole.

### **Lesson 2:** Learn more about Leonardo

Have your students gather information about Leonardo; find out what he is famous for. Have each of the students come up with 10- true or false questions about him. When you visit the exhibit, see what the results of the true/false are.

Some resources are:

Books-Vasari- Lives of the Artists, Leonardo da Vinci for Kids by Janis Herbert, Getting to know the World, Greatest Artists: DaVinci by Mike Venezia.

### **Lesson 3: Reading and Machines**

Have your students pick one of their favorite books. Have them look in the book for clues, to build a machine or an invention. Fairy Tales with various animals and creatures would work. Science Fiction novels would also work. Even more popular books such as the Twilight series could work. Have them use their imagination and do what Leonardo did, create a machine from text.

**TO BOOK YOUR GROUP TICKETS AND EDUCATIONAL WORKSHOP CONTACT GROUP SALES  
BOX OFFICE 800.223.7565 / 212.398.8383 OR VISIT US ON THE WEB AT  
BESTOFBROADWAY.COM**

