

*Da Vinci*  
INVENTIONS  
AN INSPIRATIONAL EXHIBITION

# EDUCATION PROGRAM

## ELEMENTARY AND MIDDLE YEARS

### TEACHER'S GUIDE

*“In the normal course of events many women and men are born with remarkable talents; but occasionally, in a way that transcends nature a single person is marvelously endowed by heaven with beauty, grace and talent in such abundance that he leaves other men far behind. Everyone acknowledges that this was true of Leonardo da Vinci.”*

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# 1

## INTRODUCTION & OVERVIEW OF THE EXHIBITION

Welcome to *Da Vinci – Inventions*. We do hope your students enjoy our celebration of one of the greatest minds that has ever lived. The exhibition is designed to be interactive, entertaining and educational for wide student exposure and application. Importantly, the exhibition has been designed and created around the fascination of Leonardo, and to appeal to all student levels (Elementary, Middle and Senior Year Levels).

With its origins in Italy, and over 10 years in the making, this international exhibition showcases the genius of Leonardo da Vinci in many fields of study, inventions and commissioned projects.

The purpose of this guide is to help teachers prepare and maximize the experience students will have whilst at the exhibition, and more importantly, to ensure there is a sustained and lasting learning experience for students. In this guide teachers will find a range of tasks and activities which can be utilized by student's pre, during and post the exhibition itself, while providing teachers with background information to help familiarize the subject matter and learning opportunities.

In brief the components of the exhibition include:

- Large scale machine inventions, many interactive, crafted by modern day artisans in Italy. The machines are based on the artisans' meticulous and lengthy studies into Leonardo's codices.
- Facsimiles of a fascinating collection of codices.
- Reproductions of Leonardo da Vinci's amazingly accurate and detailed anatomical drawings.
- Reproductions of famous Leonardo da Vinci art.
- The Battle of Anghiari preparatory drawings.
- Exclusive animations about the famous Vitruvian Man, Last Supper, and Sforza Horse sculpture.

The name of Leonardo da Vinci as an artist has been celebrated for nearly 500 years. However, not until recently has the world come to know of Leonardo the inventor, philosopher, scientist and scholar. He was a man who made the universe his field of study, passionately dedicating himself to the pursuit of knowledge in anatomy, mechanics, civil engineering, military, biology, mathematics and physics.

Leonardo's manuscripts testify to his finished experiments; starting with a basic need for solutions, he ingeniously solved problems. He is credited with designs and inventions – from the late 1400's to early 1500's – of many modern day flying machines, automobile, military tank, SCUBA, the cog wheel, and even the controversial bicycle. His designs are extraordinarily close to the actual workings of modern machines as we know them today.

The exhibition cuts across many subject areas and educational disciplines and is carefully structured around the following themes:

- About Leonardo da Vinci
- Leonardo's Life and Times and the Renaissance era
- Codices
- Father of Flight
- Hydraulics and Aquatic Machines
- Physics and Mechanical Principles
- Civil Machines
- Instruments of Music, Optics and Time
- Military Engineering
- The Battle of Anghiari drawings
- The Last Supper animation
- The Vitruvian Man animation
- The Sforza Horse sculpture animation

Leonardo da Vinci set out to learn everything there was to know. His approach to learning was one of observation and experience. He was not an educated man, so everything he learned was self-taught with a relentless passion for perfection. Students will see and experience how Leonardo used this approach to everything he did. He dared to innovate and challenge the prevailing accepted thinking and customs of his day, often at great personal risk. This discipline and approach to thinking is crucial in today's world where innovation, change and progression are central ingredients for sustained success and problem solving in science, industry, technology and medicine.

This is not an exhibition of original works by Leonardo da Vinci. Such an exhibition of original pieces would not be possible to put together. Leonardo left this world very little and what he did leave is for the most part in permanent exhibits, or too fragile to travel and to exhibit.

What we do offer are high quality reproductions in the principal areas of his inventions work and study. This is an exhibition that has been carefully designed and constructed to appeal to a wide cross section of learning disciplines, allowing students to research and discover for themselves the genius of one of the world's greatest minds.

Students will leave the exhibition inspired and with a deeper appreciation of the genius of Leonardo da Vinci, arguably the greatest mind who has ever lived!

# 2

## PREPARING TO VISIT THE EXHIBITION

Central to the exhibit are the amazing machine models, some life-size, some scaled, each constructed meticulously by the artisans according to Leonardo da Vinci's innovative drawings and notes. The machines have been built using mostly materials that were available in 15<sup>th</sup> Century Italy, and using the common techniques of the time. Many are also interactive, allowing students to touch and feel them, move handles and pull levers, thus giving a unique opportunity for self discovery. Each machine is also accompanied by a facsimile of the relevant drawing with Leonardo's notes and explanatory text.

There is clear signage indicating which exhibit items can be touched by students, and which cannot.

Prior to coming to the exhibition we would recommend that students receive an overview of the diversity and significance of Leonardo da Vinci's talents, work, and disciplines. Key for students touring the exhibition is to get a real understanding and appreciation for the breadth of Leonardo's talents and reach. The activity sheets provided will help students gain an in-depth understanding and put his work into historical context – he lived 500 years ago, when there was no internet, mobile phones, cars, planes, calculators, i-pods, or even push bikes!

### **School Tour Policies:**

The sensitive and delicate nature of this exhibition requires the enforcement of very specific rules and policies in order to maintain the integrity and high quality of the museum experience for each school. School groups must be chaperoned by adults, with at least one adult for every 10 students.

The following are prohibited inside the Exhibition without exception:

- No Cell Phone Usage
- No Food or Beverage
- No Easels (though sketching is permitted if pad is hand held)

### **School Arrival and Exhibition Procedures are as follows:**

The Teacher Overviews provide a summary explanation of exhibition content and facts about Leonardo da Vinci. This ensures teachers have a firm grasp of the subject matter and how this will relate to educational outcomes. It also allows teachers to have enough familiarity to confidently brief students before and during the exhibition and plan suitable activities.

# 3

## DA VINCI – INVENTIONS FAST FACTS FOR TEACHERS

This exhibition has been 10 years in the making. The models of Leonardo's machine inventions have been hand crafted by Italian artisans from *Museo Leonardo da Vinci* in Rome.

### ITALY IN THE 15<sup>th</sup> CENTURY

Florence and Italy during Leonardo's lifetime were a difficult and dangerous place to live.

- Florence was ruled by the Church and the ruling class including the Medici Family.
- Any thinking outside what was taught or believed by the Church was considered witchcraft or heresy. People were encouraged to conform to the teachings of the Church, its beliefs and values.
- This era is known as The Renaissance Era (a time of rebirth and massive cultural upheaval which lead to huge advancements in music, art, science and education, which challenged the conventional wisdom and thinking of the time).
- Florence is considered by many historians to be the birthplace of The Renaissance Movement.
- War and violence was common and Warlords ruled districts in a violent and possessive manner.
- Public executions were common.
- Males dominated every aspect of life, whilst women lived a subservient existence.
- Life expectancy for the poor was short, and outbreaks of the Plague still killed thousands every year.

Leonardo was born April 15 1452 in the town of Vinci. He was the illegitimate son to a notary, Ser Piero, and a peasant woman, Caterina. He lived with his father and step mother until the age of 14 when he was apprenticed to one of the most esteemed artists of his day – Andrea de' Cioni, known as Verrocchio in Florence. Leonardo did his apprenticeship from 1466 to 1476. He worked with other famous painters in this workshop such as Perugino and Botticelli. From 1476 Leonardo set off in his quest to learn everything there was to know. He was not the typical educated person of his times. He did not learn Greek or Latin, or learned from books. Instead, he learned through the power of observation and experience, a trait he applied in everything he did for the rest of his life. His way of recording what was happening in his world was to draw and sketch.

Here are some facts on what is known about Leonardo from research:

- He was a tall man standing around 6 feet and 6 inches.
- He was left handed.
- He was a vegetarian, and as a young man he often purchased caged birds just to release them from captivity.
- He was a pacifist, even though he designed some of the most horrific killing machines for the military.
- He had an insatiable curiosity to learn everything there was to know.
- He wrote in mirror image, from right to left.
- He was fascinated his entire life with nature and especially birds and the concept of flight.
- In order to achieve his thirst for knowledge he needed money, hence his constant search for patrons or commissions which would help pay for his living, studio and apprentices.
- He was never a rich man. Many pages in his codices have scribbled budgets where he was calculating to make ends meet.
- His friends included Machiavelli and Botticelli.
- He and Michelangelo were fierce rivals and despised each other.
- He aimed to perfect his art to reflect the image and the soul of his subjects.
- There are very few fully authenticated art works of Leonardo da Vinci on display around the world and for some reason as a rule he did not sign his paintings.
- He was often employed to produce stage shows with special effects and fireworks.
- Two years before he died he suffered a stroke which affected the right side of his body.
- Much of what Leonardo started he never finished. This became one of his biggest criticisms by his critics and academics.

His final years were spent in Paris at a residence next to King François I. The King gave him the title of *First Painter, architect, and mechanic of the King*. The King left Leonardo to do as he pleased, which meant he did no painting except to finish off some work on the Mona Lisa. He spent most of his time arranging and editing his scientific studies. He died on May the 2<sup>nd</sup> 1519.



# 4

## ABOUT LEONARDO, HIS LIFE & TIMES

### (Pre Exhibition Task)

#### Teacher Overview:

These activities are designed specifically for students as an introduction to Leonardo da Vinci, and to provide some linkage to pre exhibition preparation.

#### Task Sheet

- Who was Leonardo da Vinci?
- When was he born, when and where did he live?
- What is the Renaissance Period, what is special about it?
- Detail what life was like in Italy during the 15<sup>th</sup> Century. Who was important and who ruled Italy?
- List some of the things Leonardo invented during his lifetime.
- What are some things he invented that we see and use today?

#### Activity

In a small group, get together and invent something which we do not have today, but would be common in our world in 300 years. Describe who would use the invention, and what current problem it solves. Draw a picture of it, outlining its design features and how it works.

# 5

## DA VINCI ALPHABET & HIS CODICES

### Teacher Overview:

Leonardo da Vinci wrote using a special kind of shorthand that he adapted for himself. He used "mirror image writing", writing from right to left. Some believe this was his patent to help protect his ideas, others believe it was his way of teaching himself to write with a quill without smudging the pages. Only when he was writing for other people did he write in the normal direction. In the main he preferred to use a blood or rust colored ink and often wrote in special codes swapping numbers and letters, thus inventing his own shorthand writing style.

Leonardo's thoughts, inventions and observations are found in his handwritten manuscripts, of which over 6000 pages survive. Leonardo da Vinci's notebooks probably started out as just a way for him to improve the quality of his paintings. Somewhere along the line, however, the books became more than that. They became a record of his life-long fascination with nature and his genius for invention. After his death, his notebooks fell into the possession of his favorite apprentice Francesco Melzi, who held onto them and kept them safe until his own death in 1579. Melzi heirs had less respect for the material, however, and sold pages off to collectors or gave them away to friends.

In 1630 Pompeo Leoni, a sculptor in the Court of the King of Spain, got hold of much of the material and tried to organize it by subject. This unfortunately resulted in the books being taken apart and the original order, which might have told us much about Leonardo's thinking, was lost. Each of the new books created by this process was a **Codex**. Presently there are ten known codices containing Leonardo's sketches. Over time most of the notebooks have found their way into various museums, archives or libraries around the world. Only one is in private hands, owned by Bill Gates. Two were totally unknown until 1966 when they were found by chance in the National Library of Madrid.

Clearly the notebooks were written for Leonardo's own personal use. If you were able to read through them you will see a range of entries including "to do lists", budgets for the week, sketches of people's faces, notes of his thinking at a particular time, mixed with his designs and inventions.

**Task Sheet:**

- Locate one of Leonardo's notebooks. Look at what is written and how Leonardo wrote. See if you can write like Leonardo did. On a piece of paper write three or four lines, starting from the right hand side of the page, moving to the left.
- What is special about Leonardo's writing? On your piece of paper try and write some words like Leonardo did in his Mirror Writing.
- Where are his notebooks today?

**Activity:**

Using only a piece of paper and pencil go study and observe one of Leonardo's inventions in the exhibition. Try and put as much detail as possible in the drawing along with any thoughts, notes on how it should work, just as Leonardo would have.

# 6

## INTRODUCTION TO HIS MACHINES

### CIVIL MACHINES & IDEAL CITY

#### Teacher Overview

##### His Machines:

No field of endeavor or discipline is untouched by the hand of Leonardo, be it manufacturing, farming, transport, marine, aviation, construction, and let's not forget medicine, art, or military. It is from Leonardo's notebooks that our Italian artisans have researched, interpreted, designed and recreated the machines on display, a feat in itself. Each model has been constructed directly from the pages of his codices. The machines are the result of fine craftsmanship. The artisans have in the main used materials readily available in the 15<sup>th</sup> Century including wood, cotton, brass, iron, canvas and chord.

##### Civil Machines:

Leonardo was an inventor, dreamer, and innovator. Leonardo worked on many engineering projects, inventing machines to make tasks more efficient, such as lifting hoists for heavy materials, cranes, drills, and excavators for construction and development.

##### Ideal City:

Flooding, illness, poor sanitation, and invasion threatened and plagued Florence and Milan throughout Leonardo's lifetime. So he set out to design a city which would help solve some of these problems.

##### Task Sheet:

- Can you locate any machines which we use today as a means of transport?
- What machines can you locate that are used in construction today?
- Can you locate a machine which helps measure distance? Describe how did this machine works.
- Why did Leonardo design his Ideal City?

##### Activity:

In a small group get together to design and draw, and then build your Ideal City. Remember you will need to think about where people will live, roads, pathways, shops, schools, security, access to water and anything else you think relevant. You will need to present your Ideal City and explain its key elements.

# 7

## FATHER OF FLIGHT

### Teacher Overview:

Right from an early age Leonardo was fascinated with birds and flight. This is one area of his work where he actually built and experimented with some of his designs. While studying and observing how birds flew, Leonardo began to study and research the science and principles of wind, air, and atmospheric pressure. His early work in the area of flight focused on his belief that humans could replicate the movements of birds. Later through his anatomical research he realized that humans would never have the upper body strength to fly, so he turned his attention to the art of gliding.

### Task Sheet

- Leonardo was fascinated with birds and insects and how they flew. Can you find any of his sketches of birds on display? If you can, when were they drawn?
- Can you find an invention that is designed like bird wings? Draw one of these. Which bird do you think inspired Leonardo to design this?
- Locate Leonardo's Parachute. Draw its shape. Do you think this would work and be safe? Why do you think this? Has it ever been trialed?
- Can you find an "aerial screw?" How did it work? What flying machine would eventually use these similar principles some 400 years later?

### Activity:

Either on your own or in pairs, design a new flying machine we will be all using in the year 2407. Think how it would fly, where the pilot would sit, how we would take off and land, and how to ensure it is aerodynamic and safe.

# 8

## MILITARY ENGINEERING

### Teacher Overview

Leonardo da Vinci had to grapple throughout his life with a deep personal clash of values. He was a pacifist by nature, but in his need to maintain and earn a living and support his workshop and apprentices, Leonardo had to accept paid commissions. That's why on at least three occasions he worked for and received generous commissions from some of the most feared and ambitious warlords of the time:

- From 1482 to 1499 – Ludovico Sforza, Duke of Milan.
- From 1501 to 1506 – the feared and much hated Cesare Borgia, the son of Pope Alexander VI.
- In 1506 he returned to Milan to work for Maximilian Sforza.

During each of these periods Leonardo designed many machines of war. As a pacifist this did not sit well with him, but he was also pragmatic enough to realize he required money to pursue his true passion, his scientific research and designs. Warfare in Leonardo's time was still particularly bloody and required much close hand-to-hand combat, resulting in horrific injuries. His military designs were not conventional for the time, the tank, machine gun, long range missile launches (modified cannons and catapults) and chariots were all designed to inflict maximum injury to the enemy, but at the same time preserve and protect the users.

### Task Sheet:

- What were some of the machines Leonardo designed for war? What was unique about them?
- How many barrels did his Three-registered Gun Machine have and how did it work?
- How were horses protected in Leonardo's designs?
- Which military machine could be called the Trojan Horse of its time? How did it work?

### Activity:

Have a close look at Leonardo's Tank. What is similar and what is different from today's tanks? Outline whether you think this design of a tank would have successfully worked? If yes, why? If not, what changes would you make to ensure it did work? What animal do you think Leonardo used for his design inspiration?

# 9

## AQUATIC & HYDRAULIC MACHINES

### Teacher Overview:

Much of Leonardo's work in Milan and Florence was concentrated around his continual work with aquatic and hydraulic principles. He looked at innovative ways of dealing with key issues of the time such as how to raise and drain water (Archimedes Screw) to reduce the threat of flooding which played havoc with both cities. He was fascinated with the movement of water all his life. One of his major projects was to attempt to divert the Arno River in order to link Florence with the sea.

In 1500 Venice was in major conflict with Turkey. Leonardo went to the ruling Venice Council with a bold plan to convince them to commit to an unconventional strategy to sink the Turkish fleet via a war under water. He submitted his drawings of a submarine, aqua lung and a range of aquatic military devices. The Council dismissed his plans as unworkable but did employ Leonardo as an engineer, to devise a system of moveable floating barricades to protect the city from attack.

### Task Sheet:

- Look for designs that were intended to be used for underwater purposes. What are they?
- Can you find any machines which were designed to go on top of the water?
- Can you find a machine which was used to raise water? Who is it named after?
- Try and locate two types of bridges. What was different about them and what were they used for?

### Activity:

Look at Leonardo's emergency bridge. Describe how it works and why it does not require any nails or ropes. Locate some pieces of wood and build a replica bridge without using any nails, rope or glue.

# 10

## INSTRUMENTS OF MUSIC, OPTICS & TIME

### Teacher Overview:

Leonardo was creatively very talented. He was an accomplished musician, singer and actor, and produced many spectacular stage plays which were renowned for their special effects. Leonardo's time pieces are of particular interest. He was fascinated with the measurement of time and the challenge for accuracy and continuity. His work explores and links many scientific disciplines into his time machines: physics, mechanics (springs, weights and gears), geometry and carpentry.

Leonardo considered music second only to painting among the creative arts. He applied mechanical theory and acoustic observations in his designs for new instruments including the portable piano, double flute and mechanical drum.

He was also interested in optics, especially the effect of light, reflection, shadows and magnification. This led him to designing a range of mirrors, spotlights and special lenses which could be applied across a range of disciplines including his art work, stage productions and astronomy interests.

### Task Sheet:

- Can you locate three of Leonardo's musical instruments? How are they different from normal instruments?
- Can you find an invention which has eight sides and you can see forever? What is it? What is its purpose?
- How does Leonardo da Vinci's clock differ from the ones of today?

### Activity:

Pretend you are Leonardo da Vinci and you want to invent a new musical instrument. Design and draw this instrument, clearly labeling how it would be used. What would it sound like? Why have you designed it?



# 11

## PHYSICS & MECHANICAL PRINCIPLES

### Teacher Overview:

If asked, Leonardo would refer to himself as an engineer. According to Leonardo, once the workings of human and natural organisms are known, they can be reproduced into machines. Through observation Leonardo would study every day problems and look for solutions. In particular, he would focus on labor saving, speed and efficiency principles. Not that he knew it then, but this was exactly the thinking and rationale behind the industrial revolution which was to come some 200 years later. In fact, today Modern industry rely on technological advancements and innovation to improve efficiency, increase speed and reduce costly production times and errors in order to stay competitive.

Many modern machines and devices have links in some way, shape or form to Leonardo's principles. Leonardo believed that mechanics was the key to understanding the world. In his work in this area he pioneered the understanding of gears, cranks, pulleys, ratchets and levers, which lead to inventions such as flywheels, ball bearings system, coil spring, transformation of motion and eccentric cam.

In many of the machines on display students will be able to interact and touch the machines, and observe and experience how one form or motion can be transferred to another form, using the principles above.

### Task Sheet:

- Can you locate a machine which uses gears? How does it work?
- Locate a machine which uses ball bearings. What is their purpose? In what everyday machines are they used today?
- Can you locate a machine which you would need to change a car tire? What is it?
- Can you find a machine which might have been used by blacksmiths? What is it? Why would they use it?

### Activity:

Find your favorite machine which would have helped dramatically reduce the amount of man power required to do a task. Draw it like Leonardo would have done in his notebook, and use clear labels and arrows showing how the machine works.

# 12

## ANATOMICAL STUDIES

### Teacher Overview:

It is in this area of study, the conviction and courage of Leonardo really stand out. At this time the Vatican denounced any unholy practice, such as the cutting up of bodies. Indeed, they considered Leonardo's work bordering on witchcraft and heresy, especially as his notes were written in what was considered a *strange scripture*, his mirror image writing. The Vatican eventually forced Leonardo to stop this practice around 1512, and much of his 200 sketches were lost, only to be rediscovered many years after his death.

Leonardo saw the body as a wonderful, compact machine capable of achieving a range of movements. He dissected and drew the bodies of more than thirty men and women of all ages in order to understand the function, proportion and mechanics of the body. This practice was forbidden by the Catholic Church and eventually he was banned from doing any further research.

Leonardo would closely observe and record the effects of age and emotion on the physiology of people, in particular the effects of rage. In fact, it is widely reported that it was Leonardo who first discovered atherosclerosis, or hardening of the arteries. Today's medical profession has links back to Leonardo da Vinci with his precise groundbreaking anatomical drawings, his physiological investigations, and his research into the effects of ageing.

### Task Sheet:

- Have a close look at Leonardo's Anatomical drawings and write down at least 5 things he did draw:
  - 1
  - 2
  - 3
  - 4
  - 5
- How would he have drawn these pictures? What would he have had to do?
- Why was he drawing pictures of the body? What was he hoping to find out?

### Activity:

Draw a picture of the human body, or some part of the human body, and try and label as many items as possible in a Leonardo da Vinci manner.

# 13

## RENAISSANCE ART & LEONARDO

### Teacher Overview:

For over 400 hundred years Leonardo da Vinci's enormous fame rested on his achievements as a painter through a handful of works. These are regarded as some of the supreme masterpieces ever created.

One of the distinguishing features of the Renaissance art was its trend towards realism. To that end, painters developed new techniques, studying light, shadow, and, famously in the case of Leonardo da Vinci, human anatomy. Leonardo, Michelangelo and Raphael are three artists from this era who have become legends. All three shared life and times together.

Leonardo da Vinci's paintings are famous for a variety of qualities and innovative techniques he used, including:

- the laying on the paint
- his detailed knowledge of anatomy
- the use of light, botany and geology
- his interest in the way humans register emotion in expression and gesture
- his innovative use of the human form
- his use of the subtle gradation of tone.

There is much debate in the art world over which paintings are entirely by Leonardo, and which simply have his hand in the picture. Leonardo was so busy with all his pursuits, that he would often get bored or find it difficult to finish anything in a timely manner; but the demands of patrons and customers often meant he would need to get others to finish his work. To complicate matters more, for unknown reasons Leonardo would seldom sign his work. His distinctive style, eye for detail, and innovative techniques, however, often made it easy to identify a painting as his.

Leonardo was a perfectionist when it came to his art, constantly revising and touching up his works of art over long periods of time. He would study characters for hours, even days, researching and aiming to capture their every mood and emotion. He believed art was a blend of science, mathematics, experimentation and observation.

### Task Sheet:

- Have a look at the art on display. Which is your favorite picture and why?
- Can you find the Last Supper? What particular moment does it show? Who are the people in the picture? Why is it considered a master piece? Where is the original located?
- Can you locate a picture of a man with one head, four legs and four arms? What is it called? What is special about the picture? When was it drawn? What are some of the principles of proportion?

### Activity:

Draw yourself as the Vitruvian Man on a large piece of paper. In your drawing list some of the key principles of proportion, which apply to all people, and clearly label these on your drawing.

# 14

## THE BATTLE OF ANGHIARI DRAWINGS

### Teacher Overview

The Republic of Florence decided to create an Assembly Hall for their most important political committee, the "High Council". The majority of the construction work had been completed shortly before 1500 and it was decided it should include two large wall paintings. It was planned that two important victories from recent Florentine history should be depicted: the Battle of Anghiari and the Battle of Cascina.

It was decided the two most highly esteemed Florentine artists of the age, Leonardo da Vinci and the younger Michelangelo, would be commissioned to paint these wall paintings.

The up-and-coming Michelangelo (twenty-seven at the time), and the established master, Leonardo, had formed a severe dislike for each other and Leonardo seemed to consider painting alongside Michelangelo a personal challenge. Michelangelo, for his part, called Leonardo, "the lyre-player from Milan". This was destined to be the battle of the Titans, with a third young artist popping in occasionally to review progress. This artist was Raphael, who was about 21 at the time.

Both artists set to work, one aiming to outdo the other. Both used different techniques and approaches to the artwork (Leonardo attempting a plaster approach). However, while both pictures were still incomplete, a huge storm damaged the Assembly Hall's walls, and despite frantic attempts both paintings were damaged irreparably, and as a consequence destroyed.

As neither of the two artists completed their works, we only know of their projects through documents and sketches that have been associated with the project. Leonardo's caricature sketches capture vividly the terror and aggression of soldiers through the fighting, and the ferocity of infuriated horses. He spent a great deal of time studying the movements of animals and researching faces, recording them in sketch form in preparation for painting them on the giant walls of the Assembly Hall.

### Task Sheet:

- Who were the two artists asked to paint two battles?
- Where were the paintings going to be positioned and why?
- Look at the Battle of Anghiari drawings and write down who is in the pictures (people and animals). What do you think is going through their minds?

### Activity:

Get a large sheet of paper and sketch your own Battle of Anghiari, with the faces of soldiers, large horses and other animals. Try and capture how they would have been feeling in the heat of the battle.

# 15

## DA VINCI QUESTIONS & RESEARCH ACTIVITIES

1. **Where was Leonardo Born? Make a photocopy of his birth place from a map of the world and color the area.**

**A:** 15 April 1452 in Anchiano, near Vinci, Tuscany, Italy.

2. **What information can you give about Italy and Florence around the time Leonardo was born? Did people follow a religion? Was it a peaceful place to live?**

**A:** Florence and Italy during Leonardo's lifetime was a difficult and dangerous place to live.

- Florence was ruled by the Church and the ruling class including the Medici Family.
- Any thinking outside what was taught or believed by the Church was considered witchcraft or heresy. People were encouraged to conform to the teachings of the Church, its beliefs and values.
- This era is known as The Renaissance Era (a time of rebirth and massive cultural upheaval which lead to huge advancements in music, art, science and education, which challenged the conventional wisdom and thinking of the time).
- Florence is considered by many historians to be the birthplace of The Renaissance Movement.
- War and violence was common and Warlords ruled districts in a violent and possessive manner.
- Public executions were common.
- Males dominated every aspect of life, whilst women lived a subservient existence.
- Life expectancy for the poor was short, and outbreaks of the Plague still killed thousands every year.

3. **What is known about Leonardo's mother? What was her name?**

**A:** She was a young peasant woman named Caterina. She wasn't married to Leonardo's father. She eventually married a lime burner, moved to a neighboring village and had five more children.

4. **What information can you provide about Leonardo's father?**

**A:** He was a local lawyer and notary, named Ser Piero. Leonardo's father married four times and had eleven children.

5. **What formal education did Leonardo receive whilst growing up? What was his approach to learning which he applied throughout his life?**

**A:** Nil, he was self taught. Through observation and experience.

6. **What was the name of the famous painter who invited Leonardo to be an apprentice in his studio?**

**A:** Andrea del Verrocchio.

- 7. Where and when did Leonardo die and what was his only painting on his possession?**  
**A:** France, Paris, May the 2<sup>nd</sup> 1519 in the arms of King François I. He had the *Mona Lisa* with him.
- 8. How tall was Leonardo and what do we know about him?**  
**A:** He was tall (about 6'6"), left handed, a vegetarian, and a homosexual. He was a pacifist.
- 9. Leonardo during the course of his anatomical work commenced the first early research on what common disease? What did he surmise it was caused by?**  
**A:** Atherosclerosis (hardening of the arteries), caused by age and stress.
- 10. In 1499 Leonardo leaves Milan and his job working for Ludovico Sforza. Why?**  
**A:** Milan was invaded by the French army and he was forced to leave.
- 11. How old is Leonardo when he arrived in Venice?**  
**A:** Leonardo was 48 years old.
- 12. What is threatening the stability of Venice and how can Leonardo's designs helped?**  
**A:** An invasion by a fleet of Turkish war ships threatened Venice. Leonardo had designs for a crack team of divers who can sink the fleet of ships. The invention of SCUBA is evident here, where Leonardo envisaged divers to walk the sea bed unnoticed, using self-contained underwater breathing apparatus (SCUBA) and lay harm to the enemy ship's hull.
- 13. How old is Leonardo when his begins work on the canal project of the River Arno and what problem is he solving with his canal project and who has commissioned him?**  
**A:** Leonardo intended on building a system of canals that would make the Arno River navigable from Florence to the sea. He was 52 at the time.
- 14. Why did Leonardo move from one employer to another so frequently?**  
**A:** In general because he received a paid engagement from employers, but rarely completed the work, frustrating his employers to the point of them not renewing contracts with him. Leonardo also grew tired of people who did not understand the magnitude of his "additional discoveries" and new knowledge, thus leaving little room for compatibility in the long term.
- 15. How many are Leonardo's manuscripts and where are they generally kept? Which one is in private hands and who owns it?**  
**A:** There are 10 codices held in museums and galleries around the world. One, Codex Leicester, is owned by Bill Gates.
- 16. Whom is the Vitruvian Man sketch by Leonardo da Vinci named after? What is the theory of divine proportions?**  
**A:** It was made as a study of the proportions of the (male) human body as by the Roman architect Vitruvius, who wrote that in the human body:
- a palm is the width of four fingers
  - a foot is the width of four palms
  - a cubit is the width of six palms
  - a man's height is four cubits (and thus 24 palms)
  - a pace is four cubits

- the length of a man's outspread arms is equal to his height
- the distance from the hairline to the bottom of the chin is one-tenth of a man's height
- the distance from the top of the head to the bottom of the chin is one-eighth of a man's height
- the maximum width of the shoulders is a quarter of a man's height
- the distance from the elbow to the tip of the hand is one-fifth of a man's height
- the distance from the elbow to the armpit is one-eighth of a man's height
- the length of the hand is one-tenth of a man's height
- the distance from the bottom of the chin to the nose is one-third of the length of the head
- the distance from the hairline to the eyebrows is one-third of the length of the face
- the length of the ear is one-third of the length of the face

**17. Who did Leonardo leave his manuscripts and instruments to?**

**A:** His pupil, Francesco Melzi.

**18. Where was Leonardo buried?**

**A:** He was buried in the town of Amboise in the cloister of the church of Saint Florentine.

# 16

## THE DA VINCI CHALLENGE

### FOR SENIOR, ELEMENTARY & MIDDLE YEARS

Here are 10 challenges for students to do while at the exhibition:

- 1) Can you locate 10 Leonardo da Vinci inventions which are commonly in use today? You will need to record the design invention and its codex number (which are on the explanation panel).

Leonardo's invention and Codex number	Today's use
1)	1)
2)	2)
3)	3)
4)	4)
5)	5)
6)	6)
7)	7)
8)	8)
9)	9)
10)	10)

- 2) What is the common link of Milan (Italy) and Grand Rapids (USA) to Leonardo da Vinci? What is it they both have?
- 3) What is the height of a man in both cubits and palms?  
  
Cubits =  
  
Palms =
- 4) Who was hired along with Leonardo da Vinci to create two huge wall frescos in Florence's City Parliament, the Palazzo della Signoria? What were the frescos of? Who was doing what?
- 5) Explain what the *Vite Aerea* is. What is its name in English? What is this the forerunner to? What children's game is this design linked to?
- 6) What is 55 X 40 cm and can be found in the Czartoryski Museum in Krakow, Poland?



7) Locate the following and complete the table, recording the appropriate codex, codex number or machine number

<i>Codex</i>	<i>Codex Number</i>	<i>Machine Name (English)</i>
	F. 1 R.	
		Flying Wheels
	F. 54 R.	
	B, F. 28 R.	
		Automatic Blocking Mechanism

Answers:

Question	Answer
1	Individual answers.
2	The Horse Sculpture replica.
3	Cubits = 4; Palms = 24.
4	Aerial Screw, forerunner to the helicopter, and game children played then was 'Whirligigs'.
5	Atlanticus                      F. 1 R.                      Odometer Madrid I                         F. 114 R.                  Flying Wheels Arundel                         F. 54 R.                    Ogival Bullet Manoscritto B                 F. 28 R.                    Mirrors Room Madrid I                         F. 12 R.                    Automatic Blocking Mechanism

# 17

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Museum of Science, Boston <http://www.mos.org/sln/Leonardo/>

Museum of Science and Industry, Chicago:

[http://www.msichicago.org/scrapbook/scrapbook\\_exhibits/leonardo/index.html](http://www.msichicago.org/scrapbook/scrapbook_exhibits/leonardo/index.html)

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**Researched and Developed By:** Grande Exhibitions

Elizabeth Willis: B.A (Hons), Dip Lib, MA History

David Stewart: B Ed, Grad Dip Sp Sc, MBL

Bruce Peterson: B Ed

Rob Kirk: B.A (Hons)