

UICL 2302

THINKING OF SCIENCE AND TECHNOLOGY



CHAPTER 1

HUMAN AND THOUGHT



OBJECTIVES OF CHAPTER 1

At the end of this chapter, students will be able to:

1. Explain the development of scientific thinking since the Early Periods
2. Describe scientific thinking in human civilization
3. Analyse the achievements of science and technology in early civilization

SCIENTIFIC THINKING

الإنسان حيوان ناطق

HUMAN IS SPEAKING ANIMAL

EVERYONE THINKS; IT IS OUR NATURE TO DO SO.

1. THE DEVELOPMENT OF SCIENTIFIC THINKING SINCE THE EARLY DAYS

- THINKING OF SCIENCE AND TECHNOLOGY
- DEFINITION OF THINKING
- ISLAMIC AND WESTERN PERSPECTIVE
- HISTORICAL DEVELOPMENT OF THINKING
- THINKING AND DEVELOPMENT OF SCIENCE
- PHILOSOPHY AS A BASIS OF HUMAN THINKING IN WEST

DEFINITION OF THINKING

- ISLAM PERSPECTIVE
 - al-Quran – think, study, research
- WESTERN PERSPECTIVE
 - It has to do with philosophy and the free exercise of reason

ISLAMIC PERSPECTIVE

- In Islam, thorough knowledge and application of critical thinking is highly demanded.
- God's revelations, as the main source of knowledge, do not deny, in any way our brain's functional capabilities.
- The Quran acknowledges the necessity and importance of the brain

DEVELOPMENT OF WISDOM IN WEST: INTELLECT, PHILOSOPHY, LOVE OF WISDOM

- From the term Greek philosophy (φιλοσοφια);
- (philein = “love” + sophia = (wise)
- love wisdom
- love (or passion) and wisdom (knowledge, understanding).

THE GREEK WORD SOPHIA ACTUALLY MEANS

- Any act of intellect or curiosity.
- The questions that follow the rules / discipline are "disciplined inquiry."
- ask a question.
- To understand - ourselves, others, our world, our values and everything around us.
- where to find out.
- The questions that follow the rules / discipline are "disciplined inquiry."
- ask a question.
- To understand - ourselves, others, our world, our values and everything around us.

- Philosophy is an attempt to answer the last question (Bertrand Russell)
- The desire to find the truth
- Actions to achieve the highest good.
- Search for answers to a number of questions that have been around since
- Asking questions is an early attempt at philosophy - Why? Why not?

RELATED TO COMMON SENSE ACTIVITIES: LOVING & AMAZED

- **Philosophy is associated with wonder and awe - with other beings.**
- **Aristotle - wonder is the origin of the desire for wisdom. The sense of wonder does not just appear but results from our thinking and attention.**
- **Human activity that sees something with interest and attention, thinking.**

CONCLUSION OF THE MEANING OF PHILOSOPHY

- **The 4 main elements: wonder, understand words, admit ignorance and love of wisdom are closely related to 4 main elements of philosophy: ethics (how), metaphysics (what), logic (theoretical) and epistemology (what is true).**
- **Heraclitos: philosophy should start with finding yourself before moving to another area.**

PHILOSOPHY

- Philosophy is about gaining a better understanding of ourselves and our world.

STUDY OF PHILOSOPHY

Throughout human history, philosophy has been studied without love and affection as technical knowledge like engineering, mathematics etc.

STATUS OF VALUE IN WESTERN THOUGHT

- Material values alone take precedence over spiritual values aside.
- Authoritarianism — absolute power
- Hedonism-pleasure and delicious
- Utilitarianism-value-use
- Pragmatism — benefits and outcomes
- Relativism — all values in western society are correct and need not follow religious values: Concepts, Central Beliefs, Perception, Ethics, Practice, Truth.
- Subjectivity-versatility, no absolute truth.

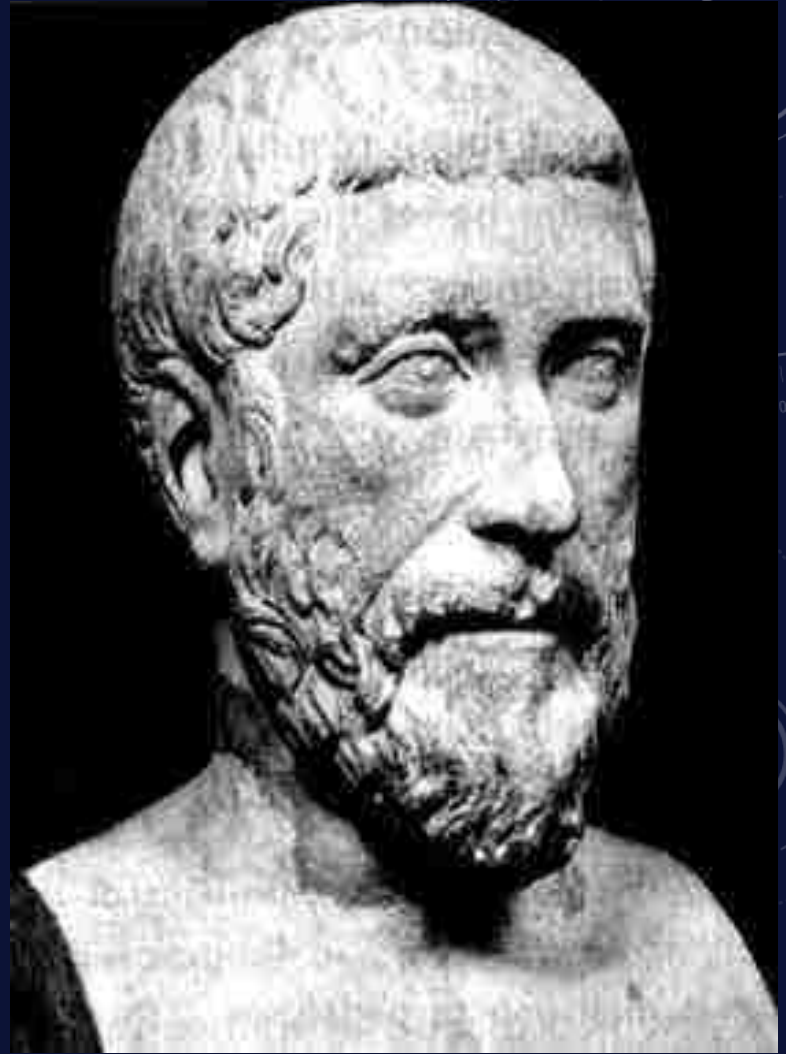
SPIRITUAL VALUES

- Religious value
 - Theism, its importance
- Moral value
 - The value of secession and rejecting religion
 - The value of asceticism but not rejecting religion
 - Responsibility
- Esthetical value
 - Art is sacred
- Scientific value
 - High and separate from religion
 - Prioritize science and fight evil

WHEN THE PHILOSOPHY START?

Introduced by Pythagoras

- "Philosopher" replaced the word "sophist" (from *sophoi*), which was used to describe "wise men" .



17

Pythagoras (582 BC – 496 BC,

The background is a dark blue gradient with several faint, light blue circular patterns. These patterns include concentric circles, dashed lines, and arrows, suggesting a technical or scientific theme. A prominent feature is a large circular scale with numerical markings from 150 to 260, increasing in increments of 10. The scale is partially visible, with the numbers 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, and 260 arranged along its arc. The main title is centered in a bold, yellow, sans-serif font.

2. SCIENTIFIC THINKING IN HUMAN CIVILIZATION

1. HINDU THOUGHT: THE BOOK OF UPANISHADS

- **More philosophical thinking.**
- **The question of the Great Spirit,**
- **the principles of karma, moksha, samsara are becoming more and more dominant.**
- **Human life is associated with samsara.**
- **The process of rebirth**
- **The eternal freedom of moksha**
- **The whole process of separating yourself from samsara and achieving this moksha is called a dharma that must be fulfilled by each individual.**

UPANISHAD

- Eternal freedom is achieved through:
- by means of the clan which means liberation by means of science.
- Karma-marga is another approach that emphasizes liberation through doing, which is to do good
- Bhakti-marga is an approach by which spirituality and godly devotion are enhanced.

2. CHINA: KUNG FUNG TZE

- There is a philosophy
- MORAL VALUE TECHNOLOGY
- NOT RELIGION
- PRINCIPLES Five Relationships
- FOLLOW AS A MARRIAGE MARK

FIVE RELATIONSHIP PRINCIPLES

1. GOVERNMENT & PEOPLE
2. Father & Son
3. HUSBAND AND WIFE
4. BROTHERHOOD AND SIBLINGS
5. FRIENDSHIP

3. ISLAMIC PHILOSOPHY & THOUGHT

- Resources and foundations
- Naqli (revelation)
- Intellect
- Hierarchy
- Primarily a source of revelation
- The mind gets second place
- Methods and scope of thought
- Free and limited

THE BASIS OF ISLAMIC THOUGHT

- The role of the Prophet as caliph
- Knowledge is given
- Starting civilization early - Qabil and Habil
- Surah al-Alaq -
- read - learn - mention the name of God-research -
in relation to science

3. THE ACHIEVEMENTS OF SCIENCE AND TECHNOLOGY IN EARLY CIVILIZATION

- ❖ The following civilizations influenced the development of science in the Arab / Islamic world;
- ❖ Mesopotamia - Sumeria, including Ur (discovered around 4000 BCE), Uruk, and Babylon.
- ❖ Ancient Egypt - Civilization of Ancient Egypt (ca. 3000 BCE to 300 CE).
- ❖ Greek Legacy - The most prominent Greek civilization of 600 BCE-529 CE.
- ❖ Civilizations around the Arabian Peninsula before the advent of Islam such as Mada'in Salih in Saudi Arabia and the Ma'arib Dam in Yemen.

EXAMPLES OF EARLY CIVILIZATIONS: MADA'IN SALIH, MADINAH, ARAB SAUDI



Mada'in Saleh (Arabic: **مدائن صالح** The City of Prophet Saleh as), also called Al-Hijr (sandy hill), is an ancient city located in the northern region of Hijaz (now Saudi Arabia), located about 25 km north. Al-'Ula city. In ancient times the city was inhabited by the Tsamud and Nabatea and was known as Hijr.

MA'ARIB, YAMAN



The dam was built by an ancient Yemeni architect who was very knowledgeable in development. It is a giant dam that can hold water between two mountains with an average capacity of millions of gallons a day. The water can be used in times of need such as planting and daily use. With this dam, all villages, orchards and vegetation in the lowlands can be protected from the frequent floods that occur during the rainy season.

MA'RIB, YAMAN

- Weaknesses of the Kingdom of Saba 'caused him to be unable to maintain and repair them. Eventually, the giant dam was damaged and could no longer withstand the flood waters and the rain, especially the flood called "Sailul Arim" (great flood) which is recounted in the Quran (surah Saba verse 16).
- Sailor Arim has brought life to Yemen so profoundly. The Yemeni people had to share the northern part of the Arabian Peninsula, as huge floods hit and devastated their country. This is what caused the collapse of the Kingdom of Saba 'and the rise of the Himyar Kingdom.

MESOPOTAMIA



**Mesopotamia
The Land Between Two Rivers**



MESOPOTAMIA CRADLE OF CIVILIZATION

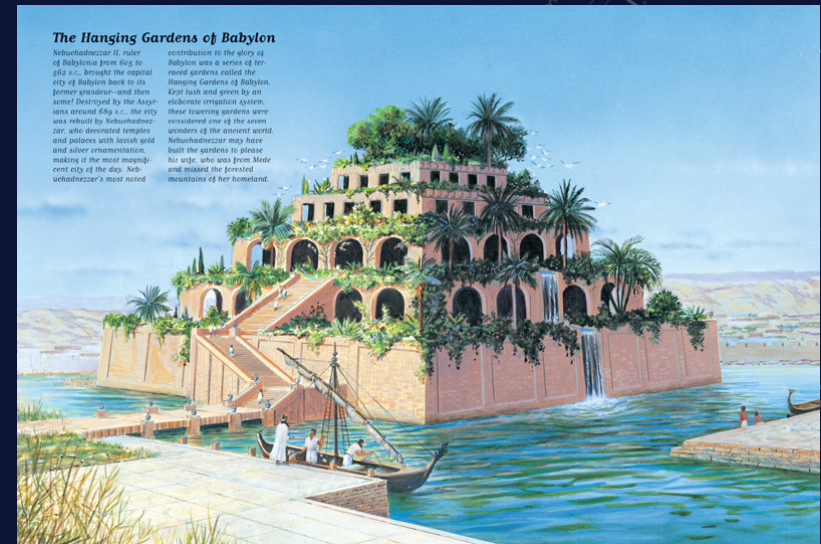


SCIENCE DURING MESOPOTAMIA

- Sumerians, including Ur (founded in 4000 BCE). While Uruk and Babylon were founded in 600 BCE it was the largest city at that time and ruled by King Nebuchadnezzar II.
- Science and technology achievements:
- Cruise Ship
- Wheel Creation
- Use of Standard Size in scales
- Hamurabi Code
- An interesting video on Mesopotamia:
https://www.youtube.com/watch?v=UI0zUReqiKo&list=PLldJhDrrCYeUqF8_tXgcEIRE_a99iiU0N

THE HANGING GARDENS OF BABYLON

- Also known as the Semiramis Hanging Garden and is one of the Seven Wonders of the World.
- Built by King Nebuchadnezzar II (604-562 BC), son of Nabopolassar who ruled the Babylonian Empire and resulted in the end of Mesopotamian civilization under King Hammurabi (1792-1750 BC).
- Located about 50 kilometers south of Baghdad, Iraq on the east bank of the Euphrates River.



EGYPT

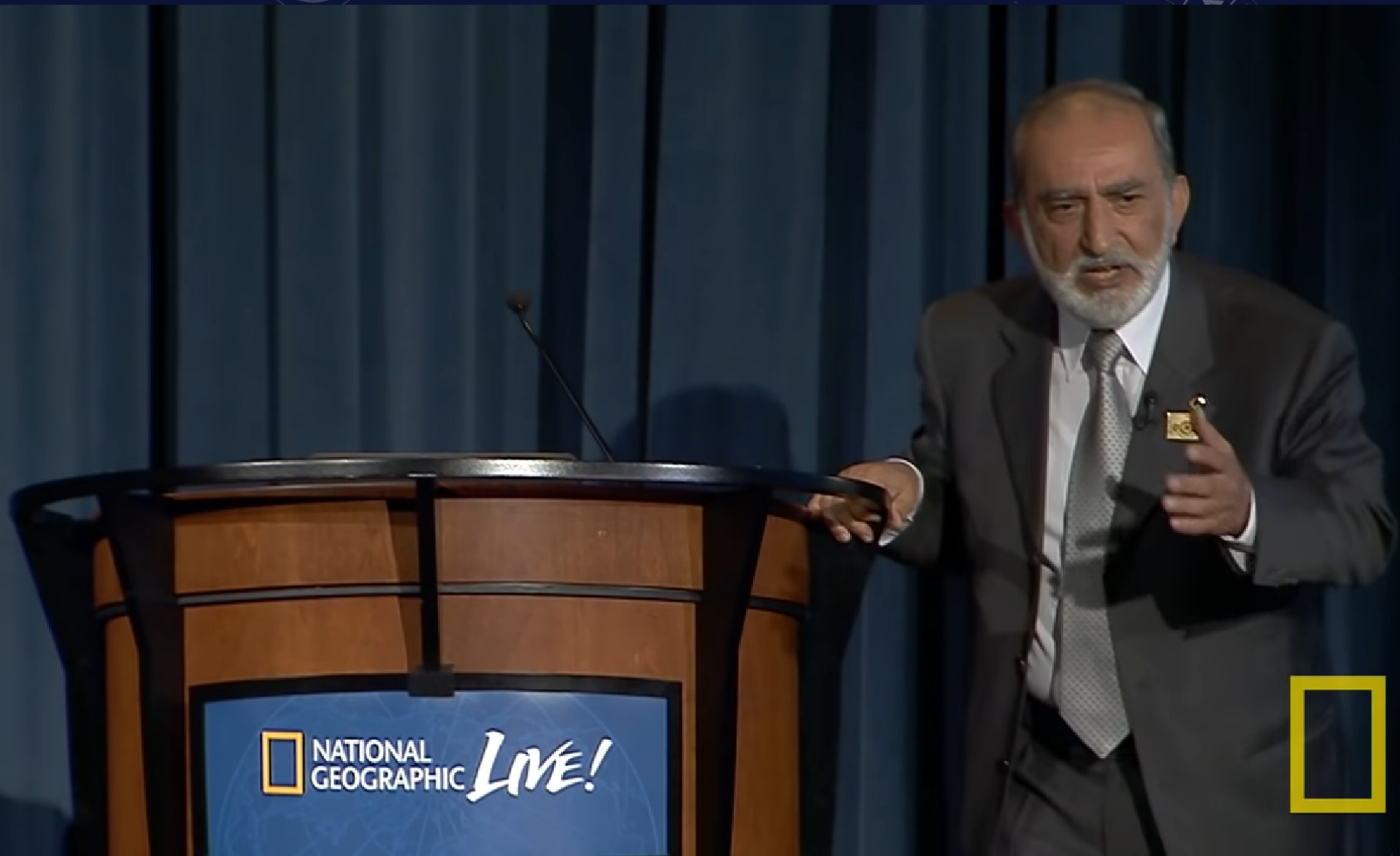
- Ancient Egypt (ca. 3000 BCE to 300 CE) was founded by the Mesopotamians.
- Science and Technology Achievements:
 - 365-day solar calendar
 - Sun Hour (Sundial)
 - Water clock
 - Medicine
 - Papyrus as a writing material (paper)
 - Number System
 - Pyramid





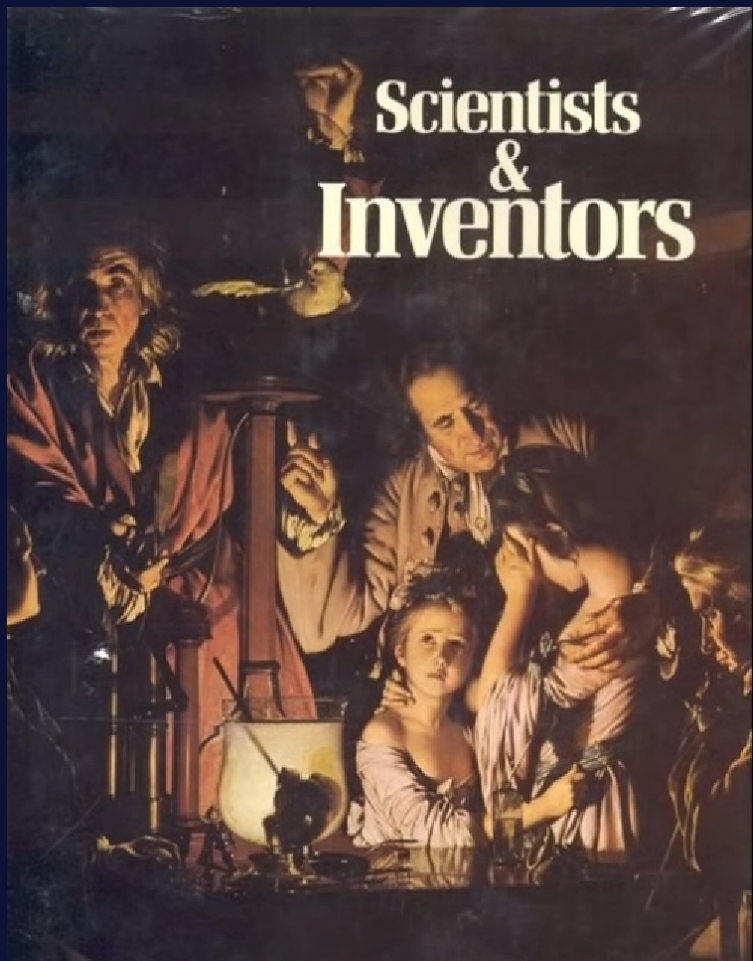
THE ABANDONMENT OF GREEK CIVILIZATION

Greek civilization reached its peak in
600 BCE-529 CE



<https://www.youtube.com/watch?v=879kqbx9rqc>

Scientists & Inventors



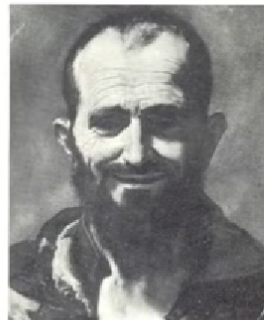
The People who made Technology from Earliest Times to Present Day

Archimedes

c287-212 BC

A mathematician first, an inventor second, Archimedes was probably the greatest scientist of the ancient world. His formulation of the law of buoyancy, known today as Archimedes' Principle, and his work on the lever and the pulley were important contributions to basic scientific discoveries.

Born in Syracuse, the Greek colony on the island of Sicily, Archimedes lived and worked there all his life except for a few years of study in Alexandria. He made his best-known discovery on buoyancy as the result of his friendship with Hieron II, ruler of Syracuse, who often turned to the mathematician for advice and guidance. On one such occasion Hieron had bought a gold crown from a local goldsmith. Hieron doubted the goldsmith's honesty and wanted to be sure the crown was made from pure gold. He asked Archimedes to check the gold content without damaging the crown in any way. Archimedes spent several days considering the problem, but could not seem to solve it. Then one afternoon as he stepped into a full bathtub, he was suddenly aware of a wash of bathwater overflowing the sides. On thinking about this, Archimedes realized that the amount of water displaced from the bath was equal to the volume of his own body entering it. This was the answer to his dilemma. If he immersed Hieron's crown in water and measured the volume displaced, he would know the volume of the crown. To determine whether



14

Johannes Gutenberg

1400-1468

Printing from movable type is an invention that changed the world, yet little is known of its German inventor, Johann Gutenberg. It is not even certain which of the first printed books in the western world were by his hand, although the famous 42-line Bible, produced around 1455, was undoubtedly his work. His method of mechanical reproduction of printed matter was so viable that no important change was made for some 500 years.

What Gutenberg did was to develop a mold of an individual letter, an alloy that melted at low temperature and solidified without distortion, and a press that borrowed features from those used in wine making, paper making, and book-



binding. He also adapted an oil-based ink from the paint mediums known to early Flemish artists. His invention enabled the printer to make words of the individual letter molds, range them in even lines, and lock many lines together into a form. Paper was then pressed down on the inked form to produce thousands of copies of one page. The type could be separated and stored for reuse. This system owed nothing to the printing methods developed earlier in China and Korea, which had none of Gutenberg's special features and which in any case he could not have known about. It is also more adaptable than the system credited to Laurens Janszoon Coster, a Dutch church official who is said by some to have invented movable type about 30 years earlier.

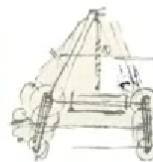
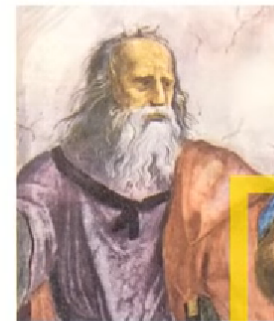
16

Leonardo da Vinci

1452-1519

Of all the intellectuals of the Renaissance period, Leonardo da Vinci probably came closest to its ideal of the Universal Man. He was as much at home in the worlds of science and natural phenomena as he was in the worlds of art and philosophy. However, while his status as one of the greatest figures in art history is beyond question, his role in the field of science is far more controversial. He possessed one of the most inventive and ingenious minds ever, but his practical influence on the progress of science and technology was minimal.

Anyone who studies Leonardo's notebooks today feels an instant flash of recognition as they come across sketches and carefully annotated drawings that relate directly to technological advances of the present century. During his lifetime, however, Leonardo made no attempt to publish his findings or inventions, and at his



death his numerous papers were left to a favorite pupil. In time these papers were dispersed and lost sight of in private libraries and collections. As a result they remained generally unknown for several centuries, and Leonardo's obvious tech-

Below left: Leonardo depicted as Plato in Raphael's *The School of Athens*.

Center: design for an "aerial screw" wagon with two driving axles, in effect a motorcar.

Below right: Leonardo rarely tested out his designs in practice. This model of a car driven by springs, built much later according to his specifications, actually functioned as an automobile.

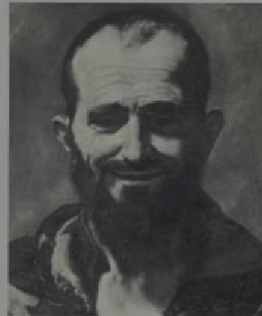
Scientists & Inventors

The People who made Technology from Earliest Times to Present Day

Archimedes c287-212 BC

A mathematician first, an inventor second, Archimedes was probably the greatest scientist of the ancient world. His formulation of the law of buoyancy, known today as Archimedes' Principle, and his work on the lever and the pulley were important contributions to basic scientific discoveries.

Born in Syracuse, the Greek colony on the island of Sicily, Archimedes lived and worked there all his life except for a few years of study in Alexandria. He made his best-known discovery on buoyancy as the result of his friendship with Hieron II, ruler of Syracuse, who often turned to the mathematician for advice and guidance. On one such occasion Hieron had bought a gold crown from a local goldsmith. Hieron doubted the goldsmith's honesty and wanted to be sure the crown was made from pure gold. He asked Archimedes to check the gold content without damaging the crown in any way. Archimedes spent several days considering the problem, but could not seem to solve it. Then one afternoon as he stepped into a full bathtub, he was suddenly aware of a wash of bathwater overflowing the sides. On thinking about this, Archimedes realized that the amount of water displaced from the bath was equal to the volume of his own body entering it. This was the answer to his dilemma. If he immersed Hieron's crown in water and measured the volume displaced, he would know the volume of the crown. To determine whether

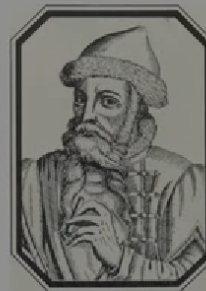


14

Johannes Gutenberg 1400-1468

Printing from movable type is an invention that changed the world, yet little is known of its German inventor, Johann Gutenberg. It is not even certain which of the first printed books in the western world were by his hand, although the famous 42-line Bible, produced around 1455, was undoubtedly his work. His method of mechanical reproduction of printed matter was so viable that no important change was made for some 500 years.

What Gutenberg did was to develop a mold of an individual letter, an alloy that melted at low temperature and solidified without distortion, and a press that borrowed features from those used in wine making, paper making, and book-



binding. He also adapted an oil-based ink from the paint mediums known to early Flemish artists. His invention enabled the printer to make words of the individual letter molds, range them in even lines, and lock many lines together into a form. Paper was then pressed down on the inked form to produce thousands of copies of one page. The type could be separated and stored for reuse. This system owed nothing to the printing methods developed earlier in China and Korea, which had none of Gutenberg's special features and which in any case he could not have known about. It is also more adaptable than the system credited to Laurens Janszoon Coster, a Dutch church official who is said by some to have invented movable type about 30 years earlier.

16

Leonardo da Vinci 1452-1519

Of all the intellectuals of the Renaissance period, Leonardo da Vinci probably came closest to its ideal of the Universal Man. He was as much at home in the worlds of science and natural phenomena as he was in the worlds of art and philosophy. However, while his status as one of the greatest figures in art history is beyond question, his role in the field of science is far more controversial. He possessed one of the most inventive and ingenious minds ever, but his practical influence on the progress of science and technology was minimal.

Anyone who studies Leonardo's notebooks today feels an instant flash of recognition as they come across sketches and carefully annotated drawings that relate directly to technological advances of the present century. During his lifetime, however, Leonardo made no attempt to publish his findings or inventions, and at his

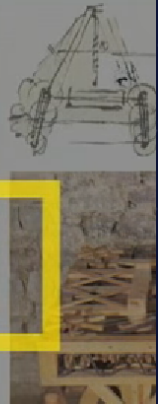


death his numerous papers were left to his favorite pupil. In time these papers were dispersed and lost sight of in private libraries and collections. As a result they remained generally unknown for several centuries, and Leonardo's solutions to many

Below left: Leonardo depicted as Plato in Raphael's *The School of Athens*.

Center: design for an "aeronaute" wagon with two driving axes," in effect a motorcar.

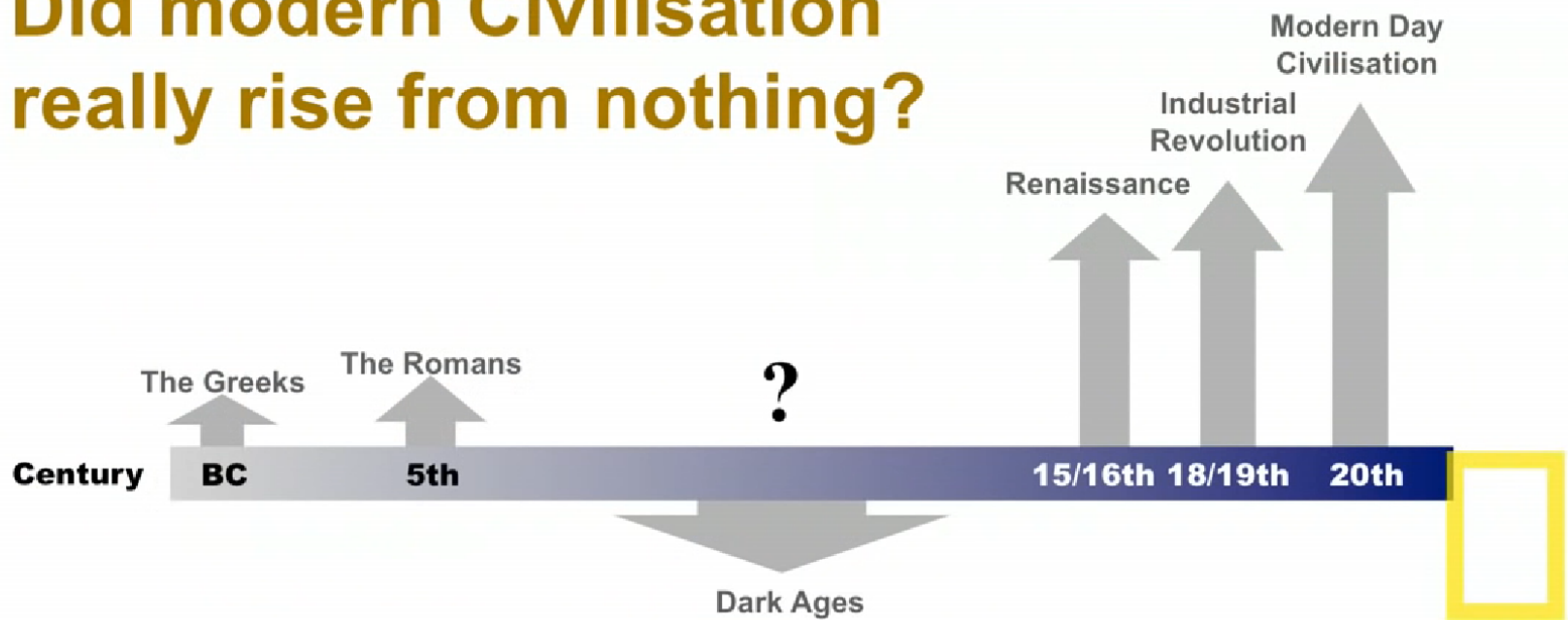
Below right: Leonardo rarely tested out his designs in practice. This model of a car driven by springs, built much later according to his specifications, actually functioned as an automobile.



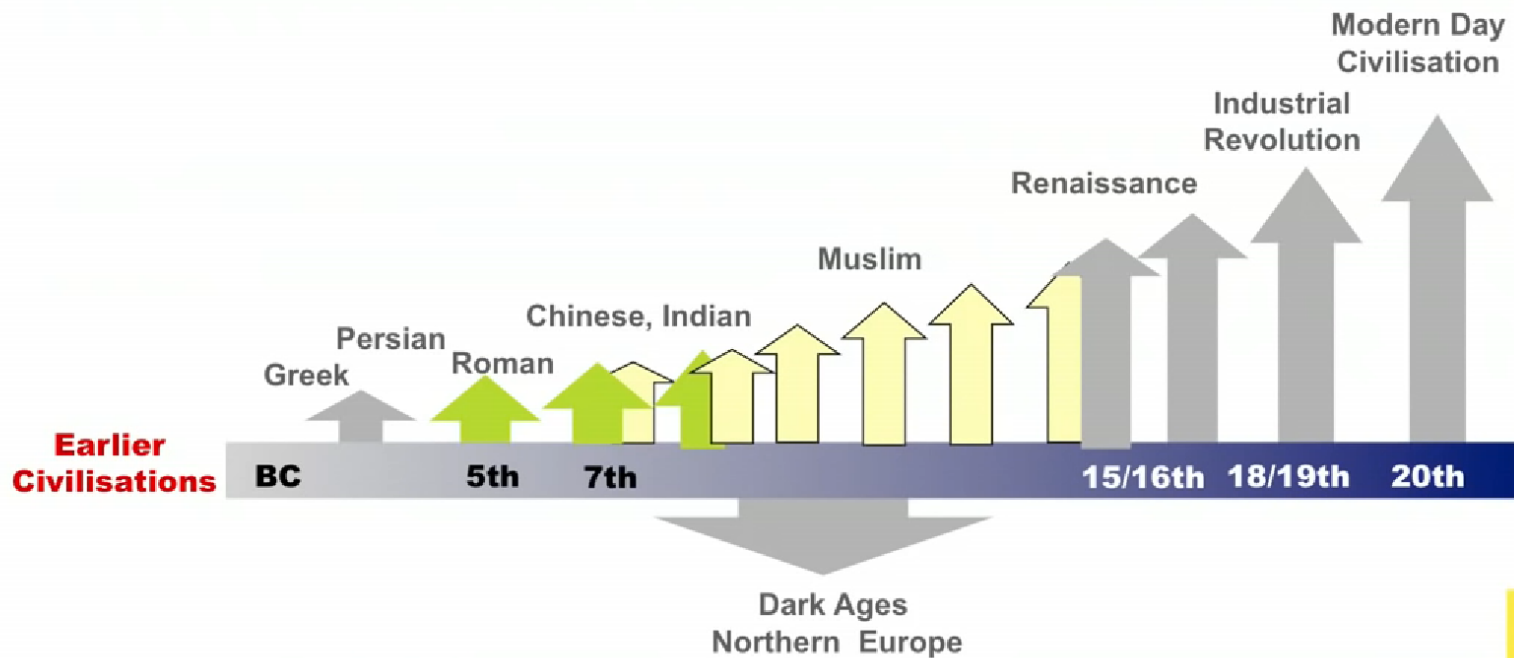
History of Science and Civilisation as taught by many education systems



Did modern Civilisation really rise from nothing?



History of Science and Civilisation as **should be** taught:



- Famous Inventors _ Biography Online.html
- <https://www.biographyonline.net/scientists/inventors.html>

The top of the list is not surprising; Franklin, Edison and Bell. These are men who'd we all probably think of first when ask about great inventors. But as you go down the list, its becomes interesting and the names less famous. So we played a game; Can you name what these inventors are most famous for?*

1. [Benjamin Franklin](#) (1706-1790)
2. [Thomas A. \(Thomas Alva\) Edison](#) (1847-1931)
3. [Alexander Graham Bell](#) (1847-1922)
4. [Leonardo da Vinci](#) (1452-1519)
5. [Nikola Tesla](#) (1856-1943)
6. The Wright Brothers
[Orville Wright](#) (1871-1948)
[Wilbur Wright](#) (1867-1912)
7. [Guglielmo Marconi](#) (1874-1937)
8. [Robert Fulton](#) (1765-1815)
9. [Samuel Finley Breese Morse](#) (1791-1872)
10. [Eli Whitney](#) (1765-1825)
11. [Philo Taylor Farnsworth](#) (1906-1971)
12. [R. Buckminster \(Richard Buckminster\) Fuller](#) (1895-1983)
13. [Margaret E. Knight](#) (1838-1914)
14. [Steve Jobs](#) (1955-2011)
15. [Elijah McCoy](#) (1844-1929)
16. [William Kamkwamba](#) (1987-)
17. [Henry Ford](#)(1863-1947)
18. [Howard Hughes](#) (1905-1976)
19. [John Harrison](#) (1693-1776)
20. [James Watt](#) (1736-1819)
21. [Steve Wozniak](#) (1950-)
22. [Lewis Howard Latimer](#) (1848-1928)
23. [George Washington Carver](#) (1864-1943)
24. [Clarence Birdseye](#) (1886-1956)
25. [Jan Ernst Matzeliger](#) (1852-1889)

*We're not going to give you the answer. That would be too easy. We suggest you research them at your local library!

But what about library inventors? Well, at OCLC, we of course, are rather taken with [Melvil Dewey](#) and his Dewey Decimal System. So we'll give him honorable mention here.