

UICL 2302

Thinking of Science & Technology

**Scientific Thinking of Muslim Scholars;
Muslim Scientists Methods of Research**

The al-Islam, or the Muslim world, stretched over three vast continents, from Toledo in Spain, through Arabia, Indonesia to China and as far south as East Africa. It reached its peak in the 12th Century under the Abbassids.

ies in the Middle East and Spain became global centres of culture, trade and learning. That atmosphere of tolerance and creativity stimulated groundbreaking Muslim advances in medicine, engineering, philosophy, mathematics, astronomy and architecture, to explore the map below to see what happened where - and when?

Gothic Rib Vaulting
1000
The principle of the rib vault was first used in the 11th century in the choir of Durham Cathedral in England.

Surgical Instruments
1000
The first metal surgical instruments were made in the 10th century in the Islamic world.

Explorer
1000
The first recorded use of a compass was by the Chinese in the 11th century, but it was the Muslims who first used it for navigation.

Foundations of Sociology and Economics
1000
The first recorded use of a balance scale was in the 10th century in the Islamic world.

Blood Circulation
1000
The first recorded use of a heart model was in the 10th century in the Islamic world.

Painted Arch
1000
The first recorded use of a painted arch was in the 10th century in the Islamic world.

Camera Obscura
1000
The first recorded use of a camera obscura was in the 10th century in the Islamic world.

First Globe
1000
The first recorded use of a globe was in the 10th century in the Islamic world.

Water Raising Machine
1000
The first recorded use of a water raising machine was in the 10th century in the Islamic world.

Horseshoe Arch
1000
The first recorded use of a horseshoe arch was in the 10th century in the Islamic world.

Chemistry
1000
The first recorded use of chemistry was in the 10th century in the Islamic world.

Crystallization
1000
The first recorded use of crystallization was in the 10th century in the Islamic world.

Puppets
1000
The first recorded use of puppets was in the 10th century in the Islamic world.

Al-Nuri Hospital
1000
The first recorded use of a hospital was in the 10th century in the Islamic world.

House of Wisdom
1000
The first recorded use of a library was in the 10th century in the Islamic world.

Rubik's Cube
1000
The first recorded use of a Rubik's cube was in the 10th century in the Islamic world.

Distillation
1000
The first recorded use of distillation was in the 10th century in the Islamic world.

Soap-making
1000
The first recorded use of soap-making was in the 10th century in the Islamic world.

Algebra
1000
The first recorded use of algebra was in the 10th century in the Islamic world.

Coffee
1000
The first recorded use of coffee was in the 10th century in the Islamic world.

Castles
1000
The first recorded use of castles was in the 10th century in the Islamic world.

Muslim Heritage

MUSLIM SCIENTISTS AND THEIR INVENTIONS



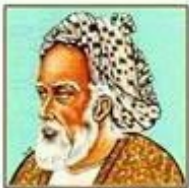
THE MESSAGE OF ISLAM
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MUHAMMAD IBN
MUSA AL-KHWARIZMI



THABIT



OMAR KHAYYAM



THABIT IBN QURRA



ABU BAKR AL-RAZI



JABIR IBN HAIYAN



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IBN AL-BAITAR



ABU NASR AL-FARABI



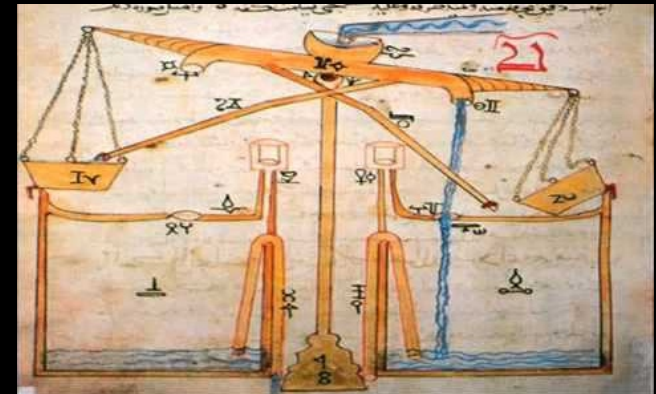
AL-BATTANI

- The real importance and value of methods of research were only discovered in Europe after the Middle Ages in the 18th and 19th centuries when the fundamentals of scientific evolution were being introduced.
- Thence forward the Europeans made use of philosophy and science and paid much attention to Islamic thoughts.
- They then replaced the old methods of comparison and intellectual deductions by a new method of practice and experience. Later on, they achieved wonderful results and discoveries that we witness today.

Islamic Scientists' Methods of Research

What is Methods

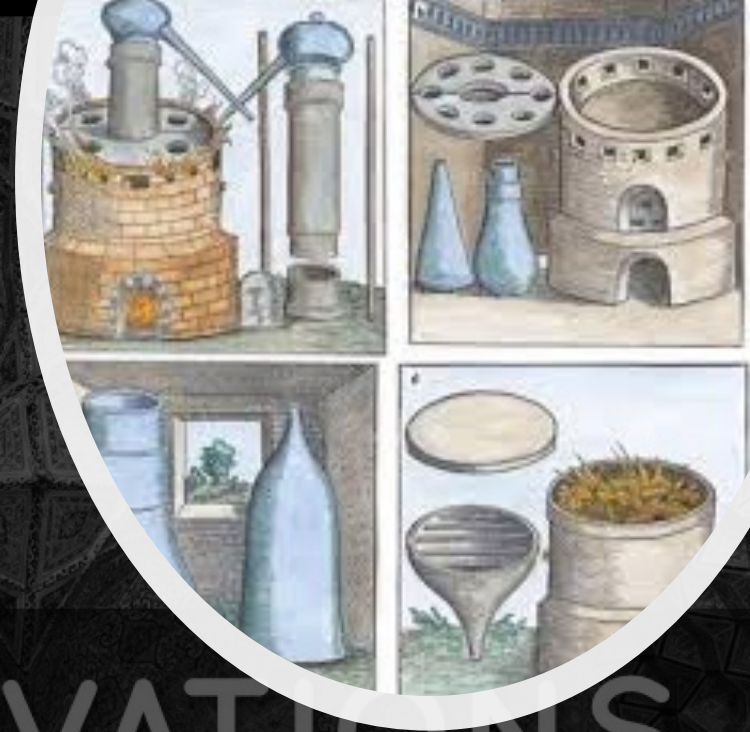
- Generally speaking, a method is defined as a collection of means and ways of the feasibility of an aim and scientific method is the one which makes an exploration achievable.



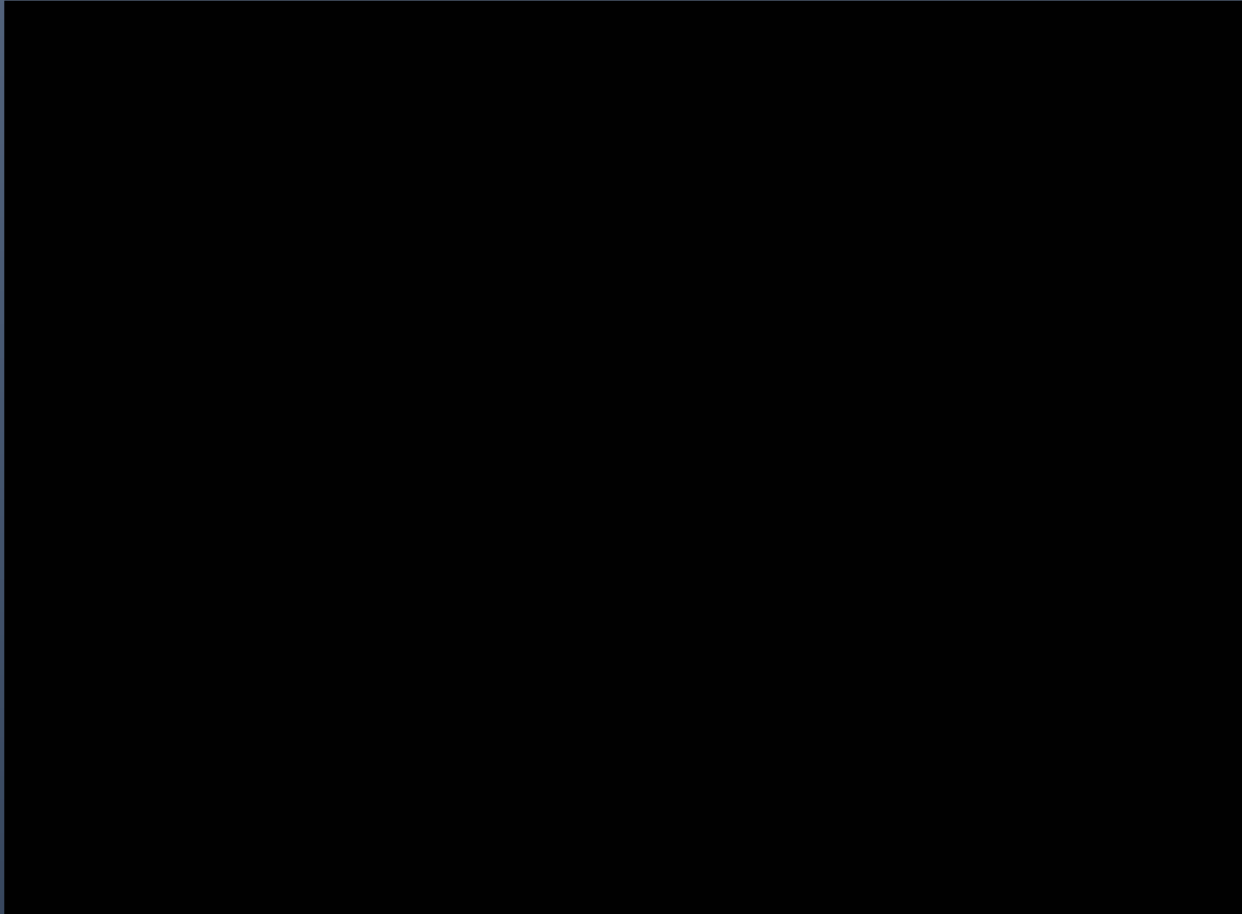
Methods used by Muslim Scholars

- Methods of Thinking
- Method of Experience
- Experimental Methods

ISLAMIC INNOVATIONS
SCIENCE AND TECHNOLOGY



Science and Technology in the Islamic World

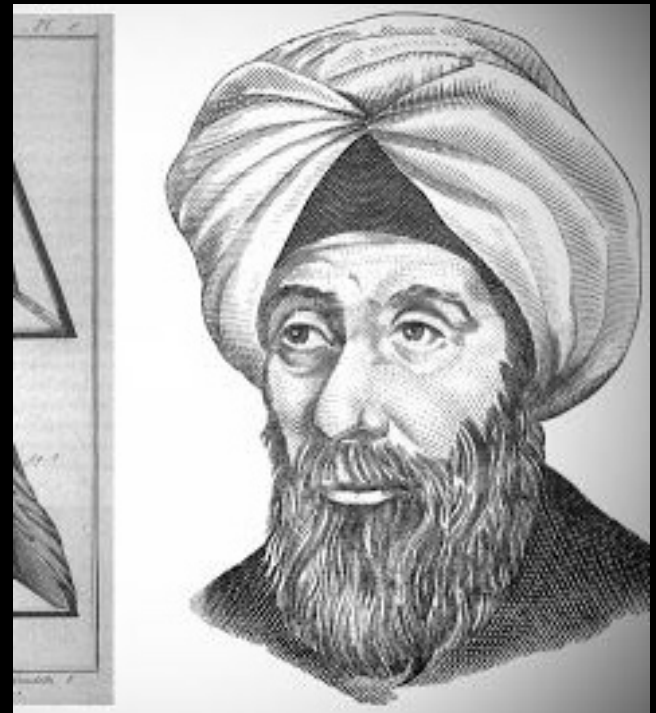


Golden Age of Islam

- <https://www.youtube.com/watch?v=K5XKjk0-hCo>
- This video shows a summary for science and technology's expansion in the Muslim world during the Middle Ages.
- <https://www.youtube.com/watch?v=2FAWAbGDxGA&t=12s>
- History of the Islamic Golden Age | Religion, Science, & Culture in the Abbasid Empire

Methods used by Muslim Scholars: Methods of Thinking

- Before the new period of science, the methods which were used by scientists were mostly the methods of comparison and of intellect. They attempted to solve all matters and problems, whether philosophical, mathematical, physical or concerning astronomy, within the framework of reasoning and logic and they believed all these matters could only be determined in this way.





Methods used by Muslim Scholars: Method of Experience

- Method of Experience
 - By using this method scientific theories can be proved or disapproved, because it includes close observations and repetitive experiments, therefore a definite result can be achieved. In this way usually an experiment is repeated several times, under different conditions. For example, to know whether heat is the main factor in the expansion of a piece of metal, a scientist can repeat the experiment on different metals, such as iron or copper, and can prove that the main cause of expansion in metals is heat.

The methodology of Muslim Scientists

•Scientific Method

- 1. the recognition and formulation of a problem
- 2. the collection of data through observation
- 3. experiment
- 4. the formulation of hypothesis
- 5. the testing
- 6. the confirmation of the hypothesis formulated

•Logic / Reasoning

- 1. Induction
- 2. Deduction

•Induction

- An instance of reasoning from a part to a whole, from particulars to generals, or from the individual to universal.

•Deduction

- It is used for deriving a conclusion by reasoning. The deductive method is a method of reasoning which yields concrete conclusions on particulars which are deduced from general principle, or yields theorem which is deduced from the postulated definitions.

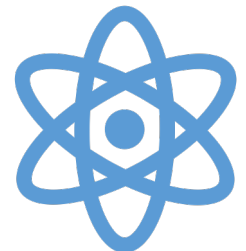
Method of observation and description

Experiment and testing method

- The Arabs who were more realistic and practical in their approach adopted the experimental method to harness scientific knowledge.
- Observation and experiment formed the vehicle of their scientific pursuits; hence they gave a new outlook to science of which the world had been totally unaware.
- Their achievements in the field of experimental science added a golden chapter to the annals of scientific knowledge and opened a new vista for the growth of modern sciences.

Methods used by Muslim Scholars: Method of Experiment

- How The Method of Experiment Was Founded In The 17th Century?
 - In the Middle Ages, the Church had tremendous power in Europe. Scientific research and discussions and in fact reading any reports of scientists of that era was totally forbidden by Church leaders throughout Europe.
 - It was also forbidden to reason and discuss, and they wanted human beings to forget that they possessed brains and intellects, and wanted them to convince themselves only by what they could find in the divine book and what they could comprehend with their external senses. But even through this restricted way, science made itself known.
 - The searchers of the truth thought it was better just to observe nature and its effects. This occupation was not forbidden by the church leaders and therefore was not dangerous.
 - They observed how the matters in nature worked and there was no harm to the church in counting the stars.



Islamic Scientists' Attention to the Experimental Methods

- Europe was proud to have introduced the experimental method and presented itself as the founder of this method. However, the history of science has shown that Europe is indebted to Muslim scientists for this honour. Muslims were the first scientists to develop and apply this method.
- After translating and publishing books on different subjects, the Muslims realised that experimentation and observation was a much better method of discovering the facts.
- An important aspect of the teachings of Baghdad University was the way of reasoning which was generally based on scientific principles, and correct observations of events and happenings with reasons confirming the results of experiments.

- Europe's scientific advances during the Dark Ages (5th to 15th century) were handicapped.
- The narrowly dogmatic view of some conservative churches that led to the sentencing of Galileo was responsible for this setback. Unlike the teachings of some church in removing reason from the equation of belief, observation, reason and intellect are integrated into the fabric of the Islamic belief.

Wrap up: History of the Islamic Golden Age Religion, Science, & Culture

