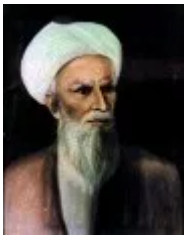
Scientific Method

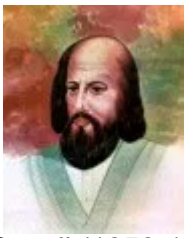
Observation and Scientific Advance

Observation and experiment are the two sources of scientific knowledge. Aristotle was the father of the Greek sciences and has made a lasting contribution to physics, astronomy, biology, meteorology and other sciences. The Greek method of acquiring scientific knowledge was mainly speculative, hence science as such could make little headway during the time of the Greeks.

Al-Haitham (965-1040)



Al-Razi (854-925)



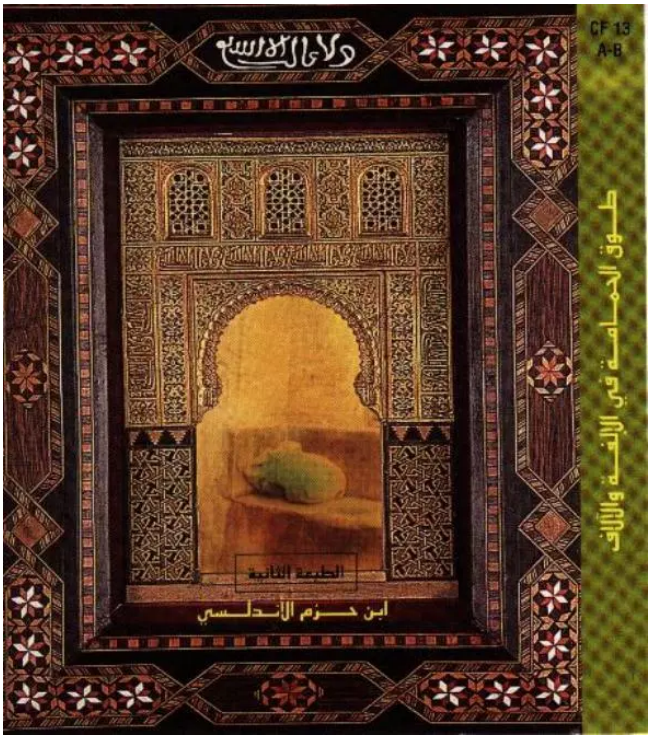
Al-Gazali (1058-1111)

Al-Zahrawi (936-1013

Ibn-Hazm (993-1064)

The Muslims 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. 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. For Muslims, the first word revealed to Prophet Muhammad was "Read." Thus, intellect and religion work together. There are hundreds of verses in the Holy Qur'an inspiring its readers to observe and reflect. Here are some examples:"Behold! In the creation of the heavens and the earth; in the alteration of the night and the day; in the sailing of the ships through the ocean for the profit of mankind; in the rain which God sends down from the skies and the life which He gives there with to an earth that is dead; in the beasts of all kinds that he scatters through the earth; in the ordinance of the winds, and the clouds obedient between heaven and earth;… (here) indeed are signs for people who have sense." Qur'an, 2:64."And do they not see that We do drive rain to parched soil, and produce therewith crops, providing food for their cattle and themselves? Have they not the vision?" Qur'an, 32:27.
"Say: 'travel through the earth and see what was the end of those before you.'" Qur'an, 30:42.
"On earth are signs for those of assured faith, as also in your own selves: will you not then see?" Qur'an, 51:20.
"Say: 'are those equal, those who know and those who do not know?'" Qur'an, 39:9.
"Is this then a fake, or is it you that do not see?" Qur'an, 52:15."Thus God brings the dead to life and shows you His signs: Perchance you may understand." Qur'an, 2:73.Muslims consider the universe a visible sign of God. To understand God's Omnipotence, it is necessary to investigate all the aspects of this universe. This belief was manifested in a wealth of Muslim scientific advances that lead to the formation of the renaissance. George Sarton in his book "Introduction to the History of Science" gave a

tribute to an array of Muslim scientists who at the roots of this scientific revolution during the Middle Ages, he said:“It will suffice here to evoke a few glorious names without contemporary equivalents in the West: Jabir ibn Haiyan, al-Kindi, al-Khwarizmi, al-Fargani, al-Razi, Thabit ibn Qurra, al-Battani, Hunain ibn Ishaq, al-Farabi, Ibrahim ibn Sinan, al-Masudi, al-Tabari, Abul Wafa, ‘Ali ibn Abbas, Abul Qasim, Ibn al-Jazzar, al-Biruni, Ibn Sina, Ibn Yunus, al-Kashi, Ibn al-Haitham, ‘Ali Ibn ‘Isa al-Ghazali, al-zarqab, Omar Khayyam. A magnificent array of names which it would not be difficult to extend. If anyone tells you that the Middle Ages were scientifically sterile, just quote these men to him, all of whom flourished within a short period, 750 to 1100 A.D.”



It is absolutely wrong to assume that experimental method was formulated in Europe. Roger Bacon, who, in the west is known as the originator of experimental method, had himself received his training from the pupils of Spanish Moors, and had learnt everything from Muslim sources. The influence of Ibn al-Haitham on Roger Bacon is clearly visible in his works.

Europe was very slow to recognize the Islamic origin of her much advertised scientific (experimental) method. In his book, “The Making of Humanity,”Briffault states,

“It was under their successors at the Oxford School that Roger Bacon learned Arabic and Arabic science. Neither Roger Bacon nor his later namesake has any title to be credited with having introduced the experimental method. Roger Bacon was no more than one of the apostles of Muslim science and method to Christian Europe; and he never wearied of declaring that the knowledge of Arabic and Arabic science was for his contemporaries the only way to true knowledge. Discussions as to who was the originator of the experimental method……are part of the colossal misrepresentation of the origins of European civilization. The experimental method of Arabs was by Bacon’s time widespread and eagerly cultivated throughout Europe….Science is the most momentous contribution of Arab civilization to the modern world, but its fruits were slow in ripening. Not until long after Moorish culture had sunk back into darkness did the giant to which it had given birth, rise in his might. It was not science only which brought Europe back to life. Other and manifold influences from the civilization of Islam communicated its first glow to European life.

For although there is not a single aspect of European growth in which the decisive influence of Islamic culture is not traceable, nowhere is it so clear and momentous as in the genesis of that power which constitutes the permanent distinctive force of the modern world, and the supreme source of its victory-natural science and the scientific spirit..,

The debt of our science to that of the Arabs does not consist in startling discoveries or revolutionary theories; science owes a great deal more to Arab culture, it owes its existence….The ancient world was, as we saw, pre-scientific. The astronomy and mathematics of Greeks were a foreign importation never thoroughly acclimatized in Greek culture. The Greeks systematized, generalized and theorized, but the patient ways of investigations, the accumulation of positive knowledge, the minute methods of science, detailed and prolonged observation and experimental inquiry were altogether alien to the Greek temperament.

Only in Hellenistic Alexandria was any approach to scientific work conducted in the ancient classical world. That spirit and those methods were introduced into the European world by the Arabs.”‘

In his outstanding work “The Reconstruction of Religious Thought in Islam,” Dr. M. Iqbal, the poet of Islam writes, “The first important point to note about the spirit of Muslim culture then is that for purposes of knowledge, it fixes its gaze on the concrete, the finite. It is further clear that the birth of the method of observation and experiment in Islam was due not to a compromise with Greek thought but to prolonged intellectual warfare with it. In fact the influence of Greeks who, as Briffault says, were interested chiefly in theory, not in facts, tended rather to obscure the Muslim’s vision of the Qur’an, and for at least two centuries kept the practical Arab temperament from asserting itself and coming to its own.”

Thus the experimental method, reason and observation introduced by the Arabs sible for the rapid advancement of science during the medieval times.