

## **DEVELOPMENT IN PHYSICAL SCIENCES: PROCESS AND ROLE OF MUSLIM SCIENTISTS**

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### 1. SCIENTIFIC CURIOSITY

Man has always been curious to know the nature of things existing around him and to learn about the events taking place in the universe. The preliminary information which he could obtain from keen observation of the sequence of events taking place before him and the correlation which he could make between the 'expectations' and the 'observations' gave birth to the earliest logical thought. Thus is the pre-historic 'science' the existence of 'spirits' was postulated to account for the things which occurred without apparent cause. Later this was called 'mythology' and was superseded by philosophy which took its roots in Greece about 25 centuries ago. With increasing confidence in human intellectual prowess attempts were made to determine the 'absolute truth' by finding explanations to all observations. He even tried to find out the purpose of this existence and the rationale behind the creation of the 'known worlds'. Answers to the questions such as "Why is the world the way it is? What is the significance of life and death? Was there any beginning of this universe? What will be the end of everything around us?" were sought. However, any satisfactory answers to these questions remained elusive.

### 2. KNOWLEDGE IN "SMALL STEPS" INSTEAD OF "BIG STRIDES"

At a much later stage an important change took place in the very process of 'finding the truth'. It was realized that instead of finding the 'whole truth' one should subdivide

the problem into subsections and then to examine them in parts. Instead of asking questions such as "What is matter? What is life?" it was thought to be more useful to ask ourselves practical questions such as "What are the properties of matter? What is the cause of flow of blood in our bodies? What is the system of the movement of planets?" etc. The main difference between the old and new modes of seeking knowledge was, therefore, not to ask 'generalized questions' but to look for the explanation of a limited group of observed phenomena. The basic change in this very mode of seeking knowledge produced extremely encouraging results. Answers to many intriguing questions were found and the whole process of the advancement of science got a fresh impetus and a new era in the development of scientific thought began. The process of scientific investigation became more penetrating and the insights became deeper and more comprehensive. This became possible only because 'the scientific truth' was sought in 'small steps' and not in 'big strides'.

### 3. SOME IMPORTANT DEVELOPMENTS IN PHYSICAL SCIENCES

From the existing scientific literature a number of important developments can be cited which took place in major branches of Physical Sciences. Here, we recall only a few of them.

We start with the unification of "celestial mechanics" and "terrestrial mechanics". In the past, it was thought that the laws which govern dynamics of the heavenly bodies were different from those which control the movement of objection on the earth. The process of finding the "partial truth" produced the "whole truth" in stages and unified the

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celestial mechanics and the terrestrial mechanics. This was possible only due to a blend of astronomy, mathematics, and physics. The above mentioned results could not be obtained by using any one of these sciences separately.

A very important concept was introduced by Einstein's famous theory of relativity, which transformed Newton's three dimensional picture of the universe to a four dimensional one. It united time and space, showed the equivalence of mass and energy and the similarity of inertial and gravitational fields. Other examples of unification include the case of electricity and magnetism and the unification of electromagnetic force with the weak nuclear force.

"Quantum Mechanics" is one of the most revolutionary ideas of Modern Science. According to it there are limits in the application of classical concepts and that these limits are codified by the famous "uncertainty principle". The 'revolutionary' concept of wave-particle duality or 'complementarity' is worth mentioning in this connection.

The twentieth century saw the discovery of a new range of phenomena namely, nuclear transformation, radioactivity, fission, fusion, etc. The transmutation of elements brought about by nuclear reactions opened up the possibility of tapping unprecendent amount of energy through sustained fission chain reaction. Fusion is taking place naturally in the centres of the stars, where the temperature is high enough to initiate such nuclear reactions. The stars (including our sun) keep shining due to fusion, a process of great significance in physics. Another very important discovery based upon physics, mathematics, and astronomy is related to the steady expansion of the universe and the 3 K microwave background. These discoveries were instrumental in formulating a plausible theory of the genesis of universe i.e. the big bang theory. The age old dream of understanding the nature of matter

is also nearing realization as witnessed by the tremendous development in elementary particle physics.

#### 4. PHYSICAL SCIENCES: FUNDAMENTAL RESEARCH AND APPLICATIONS IN THE MUSLIM WORLD

Now we would like to touch upon, very briefly, the controversial topic of basic and applied research. In our opinion it would not be wise to neglect/reject basic research altogether. There should be a carefully determined balance between the basic and applied sciences. It is today's basic research upon which depends the tomorrow's technology. It would have not been possible for us to produce computers of modern age without Al-Khawarizmi's work on algorithm and algebra. Similarly, modern technology of transistor, lasers, atomic reactors, etc. could not be developed without the deep understanding of the basic physical processes responsible for their development. Let us say that modern technology cannot be developed without a solid base in the basic/fundamental research behind these technologies. There are numerous other necessities to be fulfilled in order to raise the scientific standards of the Muslim communities. Last but not the least, the significance of proper science teaching should be fully realized. The love of learning and the zest for scientific enquiry is imbued in the students at a very early stage if the teacher is himself sufficiently motivated.

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