

Mathematical—treating of quantity.
Physical—treating of matter and its properties.
Biological—treating of the phenomena of life.
Anthropological—treating of the life of man.
Theological—treating of the Deity.

In this essay I purpose confining my remarks more particularly to those sciences which treat of matter and its properties, in other words to what is popularly known as Natural Science.

In the progress of human knowledge, a science in its earliest and simplest form, is usually a mere collection of observed facts, as for example the Egyptian's knowledge of the movements of the heavenly bodies. The next step is to correlate or generalize these facts, forming a system like that of Ptolemy or Copernicus; the next, to formulate these generalizations as laws, as Kepler did, and the last, to proceed to some principle or force accounting for these laws (usually by the aid of mathematical analysis) as was done by Newton in his theory of universal gravitation. Thus it is usual to regard Natural History as dealing merely with the description and classification of phenomena, whereas Natural Philosophy seeks accurate quantitative knowledge of the relations between causes and effects. Many subjects of study must first pass through the natural history stage before they attain the natural philosophy stage; the phenomena being observed and compared for many years before the quantitative laws which govern them are disclosed.

The *Physical Sciences* treat of dead matter, of energy apart from vitality, and include

{ Astronomy, Physics, Chemistry, and the Physical portions of	{ Geography, Geology, Meteorology, Mineralogy.
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Considered as *Sciences of Energy*, they may be classified as the sciences of

Mass-Energy	{ Astronomy, Mechanics, Kinetic theory of gas
Molecular Energy	{ Heat, Electricity,
Atomic Energy	- Chemistry,
Ethereal Radiant Energy	{ Light, Heat, Electromagnetism.

Physical science deals with the whole of nature's wide domain and views it as a scene of restless activity. Some of the subjects with which it has to deal have been indicated already; but like the banyan tree many of its branches have taken root and developed trunks rivalling the parent stem to such an extent that they may be conveniently separated from it, as e.g. *Astronomy*, *Chemistry*, *Biology*.

Astronomy investigates the motions, magnitudes, and distances of the heavenly bodies; as well as the laws by which their movements are directed and the ends they are intended to subserve in the "fabric of the universe." In all ages, astronomy has engaged the attention of the poet, the philosopher, and the divine, and it furnishes the most extensive example of the connection of the physical sciences. In it are combined the sciences of number and quantity, of rest and motion. In it we perceive the operation of a force which is mixed up with everything that exists in the heavens or on the earth; pervades every atom; controls the motions of animate and inanimate beings, and is as sensible in the descent of a rain drop as in the motion of the earth around the sun.

Physics, or *Natural Philosophy*, investigates and measures the conditions and properties of matter as discovered by direct observation and experiment, and deduces the laws connecting those conditions and properties. It has to deal with