

"the science of the laws of matter and motion, so far as it is necessary to the construction of machines which, acting under those laws, answer some purposes in the business of life," such as the culture and manufacture of crops; *pneumatics*, "that branch of physics which treats of air, and the laws according to which it is condensed, rarefied, or gravitates;" *hydraulics*, that branch of hydrodynamics which treats of fluids in motion, and in particular of the conveyance of water through pipes and channels; *electricity*, which endeavours to determine "the operations of a principle of very wide influence through nature;" a cause which is, and perhaps can be no otherwise conceived, than as a highly attenuated form of matter existing in different substances, and passing from one to another, with various effects, among such bodies as can be excited to give or to receive it," *optics*, by which the laws of light, as affecting vegetation by the influence of colour, are investigated; and *heat*, which by diffusing itself through neighbouring substances, gives to every object its existing form. By the aid of chemistry, "the manufacture of manures may be expected to continue to improve the supply of manure further augmented and cheapened, and the development of the resources of the soil thereby hastened and increased." Of the branches of natural history, the most useful to agriculturists are, "*meteorology*, the science of the atmosphere and its phenomena;" *botany*, "which treats of the structure, functions, properties, habits, and arrangement of plants;" and *zoology*, as restricted to the natural history of quadrupeds and insects. The branches of the medical science useful to agriculturists are *comparative anatomy*, which treats of the structure of the bodies of animals as compared with that of the body of man; and *zootomy* which treats of the structure and explains the principles of the art of healing the diseases of the domesticated animals.

Viewing the general aspect of these sciences as presented to the agricultural pupil, in the definitions just given of them, he must at once observe the advantages he would derive by studying them. It is well observed by Sir John Herschell that, "between the physical sciences and the arts of life there subsists a constant mutual interchange of good offices, and no considerable progress can be made in the one, without of necessity giving rise to corresponding steps in the other. On the one hand, every art is in some measure, and many entirely, dependent on those very powers and qualities of the material world which it is the object of physical inquiry to investigate and explain." It is evident that most farming operations are much affected by external influences. The state of the weather, for example, regulates every field operation, local influences modify the climate very materially, and the nature of the soil generally determines the kind of crop

that should be cultivated. Now the pupil should desire to become acquainted with the causes which give rise to those influences, by understanding the laws of nature which govern every natural phenomenon. The science which investigates those laws, is called *Natural Philosophy*, which is divided into as many branches as there are classes of phenomena occurring in the earth, air, water, and heavens. Those who being unerring in their operation, admit of absolute demonstration; and the science which affords the demonstration is called *Mathematics*. Again, every object, animate or inanimate, possesses an individual character, so that it can be identified, and the science which makes us acquainted with its characteristics, is termed *Natural History*. Farther, every object, animate or inanimate, is a compound body made up of certain elements, of which *Chemistry* makes us acquainted with their nature and combinations. The pupil thus sees how suitable those sciences are to the explanation of the phenomena around him, and their utility will be the more apparent to him, the more minutely each science is investigated.

#### THE HONEY-BEE

The honey-bee belongs to the genus *Apis*, and is also the only one of that family that is gregarious with us throughout the year. Its history and economy have been studied in all ages; and though an exotic to us, it is met with in almost all climates, both in a wild and domestic state. When it was introduced into this country has not been ascertained. It is not indigenous, and this may account for its being less hardy than the humble bee, and not so lively an insect as the wasp. It is frequently at home, while they are busily employed abroad, both early and late. A complete colony of bees consists of three kinds—queens, drones, and workers; but strictly speaking, of only two; that last being only females in an undeveloped state. Their number in a strong colony amounts to many thousands; they are of a light brown colour, but become darker with age, and have dull tarnished wings. On their hinder legs they have strong curved hairs for holding the pollen or dust, which they collect from the anthers of flowers. Their usual term of life seems to be about a season, or six months; their places are quickly filled up by the increase of young bees; which are of a light colour when first hatched. These vary a little in size, which may be caused by the irregular size of the cells in which they are bred; which is observable in the case of small drones which happen to be reared in workers' cells. This difference in size has led some of our leading writers to consider that there are different sorts of bees for various occupations; but we ascertain with Golding, that working bees are "ser-