

fulness and high spirits. His looks and voice were in unison with the agreeable insinuation and impressiveness of his conversation and manners. Possessing these attractions,—his lasting possessions,—it was no wonder that at all times Burke found it easy to have whatever associates he liked : and he always chose the best.—*Peter Burke.*

(To be continued.)

Suggestive Hints towards Improved Secular Instruction.

BY THE REV. RICHARD DAWES, A. M.

(Continued from our last.)

XIII.

CHEMISTRY.

The subject of Chemistry is one which may be made both interesting and useful, perhaps more so than almost any other of a secular kind, in the class of schools for the teachers of which these pages are written, whether in towns or in the rural districts.

About two years ago, the subject of chemical agriculture was introduced in this school, with Professor Johnston's Catechism as a text-book, and sufficient apparatus for the experiments required to illustrate it. What has been done and the way in which it has been received, is a sufficient proof, that instruction in this might form an important feature at the larger class of schools in our rural districts, where the teachers are qualified to give it, or where those interested in the school have an inclination to introduce it; this would attract the attention of the farmer as regards his own children, not that I think that is wanted; when the education in our parish schools is in other respects good, they will, in the end, avail themselves of it. The difficulty is in finding qualified teachers, but let them once be properly remunerated, and society made to feel and estimate at its proper value the real worth of a sound practical education, preparing them for the duties of this life as well as for a future existence, this difficulty will cease, and qualified teachers will soon be found: nor is it too much to expect from the most advanced nation in the world, as to its political and social constitution, science, and wealth, that it should grant a liberal allowance to the education of its youth: were it to do so, the gain, even in a pecuniary point of view, would in the end be great, independent of those moral considerations which ought never to be lost sight of.

The first object of the farmer is to produce food for man and beast in the cheapest way he can—to get the most productive crops, at the least possible expense; and although experience is not to be despised, yet assisted by science, much more may be done than without it—this it is difficult to persuade the farmers; some knowledge of manures, they think, may be of service, but beyond the "Muck Manual," in the way of book-learning, very few of them are inclined to go—still they are on the march, and when they see their way, through experiments successfully tried, prejudices will give way; there is something of wisdom in not abandoning a tolerably good plan, unless you have confidence in the one which is recommended being better, and the road to confidence is practical proof.

One of the first questions naturally would be—of what are all these plants composed?—On inquiry, they are all found to consist of two classes of substances, varying with different plants, one of which is volatile, called organic, the other, which remains after combustion, in the form of ashes, and called inorganic—these again are analysed into their separate elements, and it is thus seen what the plant is made up of.

Now, it is evident, that if the seed, after it is sown and germinates, as well as grasses, during their growth, cannot find such substances as they are composed of, the crop must necessarily be an unproductive one, and that in proportion to the deficiency of the substances required. The next question is—

Where are they to find all the things which enter into their composition?—which of them can be supplied by the industry of the farmer?—and which of them must he trust to atmospheric influences to supply?

To this, science gives an answer—the farmer judges from experience—the agricultural chemist would analyse the soil, and find out its separate elements—he knows the elements of the crop he wants to grow, and knowing which of these are to be found in the soil, and for which he must trust to the atmosphere, he would use that kind of manure which would supply the rest—and that such

substances as any particular crop is known to take away, must be supplied in the shape of manure, otherwise the land will be worn out.

A knowledge of the particular substances which a crop of any kind, as wheat, barley, etc., takes out of the ground, and of what is wanted by the crop which is intended to follow would point out a good rotation of cropping; and, in addition to this, knowing the composition of the soil, would lead to a proper economy in not casting useless substances on the land as manure—such substances as did not contain the particular things wanted.

This does not apply merely to grain crops, but to all others; and although long experience may have taught the farmer a right course as to the ordinary crops; yet, take the case of a new plant, a grass, or other plant which is recommended, he is then at a loss as to the soil he ought to try it in; he therefore goes by guess—if he hits upon a favourable soil he pronounces in its favour; if not, it is condemned; and it will only be after a long time, and after many successful or unsuccessful trials and much expense, that it is found out what soil will suit this plant and what will not. Now, here science might help to a speedier and less expensive mode of trying it—burning the plant, examining the ashes, and analysing the soil in which it is intended to be tried, would shew whether they suit each other or not.

Thus, science, with caution, may at once point out a right course, when it would take years of experience to find it out.

Then again, with respect to manures, although a substance thrown on the ground may contain the ingredient wanted, it may not contain it in such a form that the plant can avail itself of it. Here, again, science steps in, and teaches that the nourishment which plants take up by the roots must necessarily be in a fluid form—that they cannot assimilate to themselves any substance in a solid state; although, it may be the very thing they like best, and therefore it will be necessary to use such manures as are soluble in water—by the rains which fall, or which, from exposure to the atmosphere, become so—that after decomposition every animal and vegetable substance returns in one shape or other—the organic parts through the atmosphere in a gaseous form—the inorganic as solid substances thrown upon the ground, for the future nourishment of plants, and through them, of animals.

Also, with respect to the food of animals, chemistry points out what particular food is best fitted for a required purpose; the proximate principles of fleshy matter, such as form the muscles, fat, etc., are formed in the plants; the stomachs of animals dissolve the compound substances into their proximate principles, they circulate through the blood, and are thus assimilated to the different parts of the body.

For instance, the farmer wishes the calf, the lamb, or colt, to become a well-grown animal, to have muscle, bone, and sinew; the cow to give milk which will yield a great deal of butter and cheese, excepting in large towns, where they want quantity and not quality; the ox he wants to feed on such substances as will leave the most of fat on his bones.

In all these cases, from knowing the composition of the different vegetable substances, such as turnips, swedes, mangel-wurzel, different kinds of hay, etc., there is something of a guide as to what plants would be best suited for any particular purpose.

The farmer knows that one grass field is better than another for young stock, for milk, for fattening, etc., which is nothing more than that the grasses in one field are of that kind which have more in them of those substances of which bone, or muscle, etc., is made—in another more of the substance of milk—and in the third of fatty matter; here experience has taught that which science would confirm, if the agricultural chemist were to analyse the grasses which most abound in such pastures.

Calling attention, also, to the influence of light—heat—moisture, etc., in the atmosphere—wet and cold seasons, etc., on vegetation—that a great deal of rain has a tendency on many soils to produce more straw in our cereal crops than dry weather, etc.; in fact, calling the thinking faculties of man more into action in the business of agriculture; and not making it in the same degree that mechanical row one sort of thing which of all other occupations carried on in this country it has hitherto been; and thought to require less of intellect than anything else. Of all occupations it is that which is most natural to man, and that without which we cannot exist.

When a knowledge has been obtained of the simple elements of which vegetable matter is composed, and of the substances, starch, gluten, oil, or fat, and inorganic matter, which a healthy animal ought to derive from its food, it will be found useful and instructive to call attention to the ascertained quantities of each of these in