which waste, destruction, misuse, and the pestilence which follows, are infinitely more terrible than they are in the material world; but God's whispered messages in the material world tell us that there may be—nay, must be—a divine chemistry, through whose mysterious action we shall some day see a positive good, a quiet beneficence in the place of a festering evil.

Each step in the advance of agricultural science seemed to become more difficult, and perhaps it may continue to do so. My father was not one of those persons who believe that science, or rather man's power of applying it at every fresh emergency, will so keep pace with the increasing necessities of the world as to afford a complete answer to our ever recurring difficulties. He did not think, with certain modern philosophers, that man can perfect his own present existence, and drive away by the aid of science, sickness, disease, poverty, crime, and every existing evil from the land. He availed himself, and continually urged others to avail themselves, of the aids which God has placed at our disposal—powers known or hidden, in the natural world, for the diminution of evil and pain; but he believed in no reign of peace short of the final destruction of the principle, deeply seated in the soul of man, which is the primary source of the perturbation of all beneficent social laws, nor of prosperity short of the advent of the "Desire of all nations." That trouble will block our way, that every matter planted by us will, however, careful we be, "grow up with the unseen seeds of its own decay within it," he was prepared to see. He was a man of a mournful cast of mind; he was a man of progress, nevertheless, sustained by a constant hope.

Even the large importation of foreign manures not being sufficient for increasing needs, chemists began to work more closely at the subject. Professor Johnston, of Durham, was a great benefactor to the North of England. Manufactories of artificial manures sprang up. It was needful that theory and experiment should go hand in hand. On the side of the farmers there was at first some jealousy of the chemists and their theories, and "book-farming" was spoken of with contempt, while the "theorists" were too apt to look on the farmers as a thick-headed race, so long used to be guided by empirical rules that science might knock in vain at their door. But when it was found that a multitude of quacks sprang up, who imposed upon the farmers by their vaunted stuffs for doctering soils, the farmers perceived that they must arm themselves against these by some knowledge of their own, while the true chemists acknowledged the necessity of consulting the long-practised farmer; for, indeed, they knew they could not benefit agriculture by experiments in their own laboratories only; they must do their work with the farmer, under sun and wind, rain and hail, thunder and lightning. When Professor Liebig visited Dilston, he was in the habit of questioning my father in the most keen and eager manner, of his experience making notes of his answers at the time. When my father's conclusions about any matter differed from the chemist's, they would go forth into the fields together, and there the solution of the difficulty would often be found in something peculiar, perhaps to Northumberland, its climate or soil, which Liebig had not taken into account. Liebig was a very pleasant guest. He took much to the children of our family, and had that modesty and simplicity of manner which are so often found in true men of science.

Thorough draining must be next noticed as a great means of advancing agriculture. It was in Scotland that the thorough draining of clay lands was first made a national question. It was Mr. Smith of Deanston who first demonstrated its importance. The subsoil plough succeeded to thorough draining. I have before said that it became apparent from the evidence given before the Committee of Inquiry into Agricultural Distress in 1836, that the only safe foundation for agricultural prosperity was in the growth of an increased produce on a given area. One great object of tillage then was to create an increased available surface within the soil, and the gain was great when by drainage and subsoil-ploughing, fields were made wholesome to a double depth, and stores of nourishment were unlocked below, so that crops which before had to draw their sustenance from 6 or 9 inches of soil, could descend for more than twenty, and find fertilising properties.....

This brings us to the era of improved agricultural implements, and to the extended application of mechanics to agriculture; for mechanical science is as needful to agriculture as to any other of the arts of life, and, indeed, the application of ingenuity in the variety and usefulness of agricultural implements has been very beautiful. I recall the enjoyment which we sometimes had in going out—the whole family—to see a trial of some wonderful new machine, which appeared as if instinct with life, and busily and eagerly intent on fulfilling the special end of its creation; and the interest we took in watching the operations of the clever clod-crushers, pressers, grubbers, drill machines, turnip-slicers, straw-cutters, steam threshing-machines, steam-ploughs, reaping-machines, &c. The management of these complicated tools requires far more intelligence than the simple old method of "following the plough," or handling the sickle and scythe. Mr. Holland, M. P., and Mr. Stratton gave an account of their experience in steam-ploughing at an agricultural meeting at Cirencester in 1859, in which they said they found the intelligence of their workmen greatly increased by the work. —*Agricultural Gazette.*

(*To be continued.*)

HISTORY OF THE HORNED CATERPILLAR AND ITS RESPECTED PARENT—THE VAPORER MOTH.

From Fitch's Insects.

Eating the leaves, in July; a slender caterpillar with pale yellow hairs and tufts and black pencils, its head and two small protruberances on the hind part of the back bright coral red.

In winter, clusters of white eggs and a dead leaf adhering to a whitish cocoon attached to the twigs and limbs.

The American Vaporer moth, *Orgyia leucostigma*, Abbot and Smith.

The term "caterpillar" is applied to a worm which is clothed with hairs; and we commonly associate this term with something that is ugly and repulsive in its appearance. But many caterpillars are far from meriting this prejudice, being in reality objects of much beauty. This is eminently the case with one which may frequently be seen in the month of July upon apple trees, and also in our yards upon rose bushes. We cultivate the rose for ornament; and nature, as it to further our designs, places upon the leaves this neat prim little caterpillar, which is a more delicate, elegant object than the handsomest rose that ever grew. I well remember the first time I noticed one of these caterpillars. It was in the hayfield, in my boy-hood by one of the laborers, who had little taste for any of the beauties of nature—a man of that class of whom the poet sings,

> A primrose by the river's brim
> A yellow primrose is to him—
> And it is nothing more.

In stooping for a handful of grass to wipe off his scythe, his attention was arrested by one of these caterpillars. Taking up the leaf on which it was standing, he was for several moments absorbed in contemplating its bright colours and the artistic arrangement of its elegant plumes. Then as he was laying it down he said to himself, "That is the prettiest thing I ever saw!" Let us not murmur, if the leaves of our rose-bushes are somewhat gnawed and eroded, when they hereby produce for our admiration objects far more beautiful than we look for them to yield.

These *caterpillars* are an inch or more in length, slender, sixteen footed, and have the skin of a cream yellow color with a black stripe along the middle of the back and a broader brown or black one upon each side.