fat jointly; but if Boussingault, Dumas, and the French school be right, then we must consider each article of food under the three heads of flesh, fuel, and fat distinctly. There is one point, however, certain—the importance of warmth. Wherever fat comes from, there is no doubt that both fat and flesh are wasted from the production of beef in an animal frame suffering by excessive cold. The substance of an animal pining from cold evaporates with the breath, as the spirit would pass from wine in an uncorked bottle. The comfort of our stock, therefore, is in unison with their master's profit. As to their food, practice, as Boussingault himself, no mean chemist, frankly says, "has got the "start of theory; and I own," he adds, "with perfect humility, that I think its con-"clusions are in general greatly to be pre-"ferred." Still, animal chemistry has made great advances, and does at least *explain* much. Of vegetable chemistry as much can scarcely be said. In the words of its able exponent, the late Dr. Fownes, speaking at the premature close of his labors, "The chemistry of vegetable life is of a very high and mysterious order, and the glimpses occasionally obtained of its general nature are few and rare."

It seems at first strange that the chemistry of the lower form of life should be more backward than of the higher—that vegetable nutrition should be darker than animal; but Liebig's discoveries afford us a reason. Animals, he has proved, find much of their substance ready made in the vegetables which they consume. Besides, animals and vegetables belong both to organic chemistry. The two substances are, as it were, of the same realm, subject to the same laws. But vegetables have the task of transmuting the dead elements into living matter. They bridge the gulf between the mineral and the organized world. Now, this union has not yet been effected between the two kinds of chemistry. In mineral, or, more correctly, inorganic chemistry, if we can decompose a substance, we can generally also compose it. If we can sever water into its two gases, we can form water again by uniting those gases. But we cannot deal so with oil: we can only unmake it; we cannot form it anew, by blending its elements. That task is left to the hidden powers working in plants. Again, ammonia, the very substance we prize so highly and purchase so dearly, is compounded of two gases, very common and very attainable; for one of them, hydrogen, forms one-ninth of all water, and the other, nitrogen, three-fourths of the very air that we breathe. Yet, because organic chemistry cannot put together these two gases, in which all nature lives, and so form ammonia, our ships are compelled to double Cape Horn and fetch guano from the Pacific Ocean. If, then, we cannot compound the simplest organic substance, by mixing its two or three lifeless constituents in our vessels, being thus confessedly ignorant of the laws under which they combine, what wonder that we should be unable by any chemical reasoning to perform the same task in the garden or in the field? It seems reasonable, therefore, that we should earlier scan the laws of vegetable than of animal nutrition; understand, that is, the food of beasts sooner than the food of plants.

The mineral theory hastily adopted by Liebig has broken down; no other has taken its place Our best authority, Mr. Lawes, has established certainly so much, that of the two active principles in manure, ammonia is specially suited to corn, phosphorus to turnips, and that turnips, are *probably* benefitted by the woody matter of straw. But vegetable chemistry, having no fixed truths of her own as to the sources from which plants derive their food, or the mode in which they appropriate it, is not advanced enough to lay down laws for farming, or sit in judgment on its established practices. Except Liebig's suggestion for dissolving bones with acid, and Sir Robert Kane's for using flax-water as manure, I know no agricultural process arising out of chemical discovery. The more we value the labors of agricultural chemists—the more warmly we look forward, as I do, to their future progress through the patient examination of existing practice, which is itself the accumulated and varied science of ages, the more we should discourage undue expectations of immediate advantage. It is a great mistake to suppose that men can be made farmers by teaching them doubtful chemistry. But are we, therefore, to abandon agricultural chemistry because it is yet doubtful, and has not yet brought forth more fruit? Rather let those who are able cultivate it the more diligently by careful experiments, that, step by step, we may reach more certain knowledge hereafter. No one, meanwhile, can doubt the high value of Mr. Lawes's experiments in the field, or Mr. Way's researches in the laboratory. I should not have said so much, but that the public are sometimes led, by a false estimate of chemistry, to undervalue our real progress in other sciences, as in mechanics, and to overlook the true knowledge of our practical farmers. Before we pass to these, however, I must endeavor to do justice to our advance in what seems the most uncertain of all sciences.

TULLIAN GROWTH OF WHEAT: A WORD IN SEASON.

Many of your readers will recall the correspondence that has lately appeared in the *Gazette* o the Tullian theory of growing wheat year after year upon the same land, and without manure, simply by means of preparatory deep trenching and annually digging between the rows of the growing wheat. There is so much in the principle