in such a manner as to take from the agriculturalist only a portion of the increase arising from its labours; for, if he have no surplus over his immediate wants, there will remain to him neither the means of improving his modes of cultivation, nor of supporting his family with comfort; neither will it be possible for him to renew his stock of domestic animals, nor to augment their number. Any government which does not leave to the farmer a great part of the profits proceeding from his harvests, soon puts a stop to the production of them, and thus realizes the fable of the goose with golden eggs.

By encouraging improvements in agriculture, and favoring the increase of production, government enriches the agriculturist less than its own revenues; since by these means the quantity of taxable matter is increased, and the right of government recognised under all its forms, whether the article produced be employed in its crude state for domestic use, or whether it furnish the workshop of the artisan with the materials of his handicraft.

EXTRACTS FROM A LECTURE,

DELIVERED BY PROFESSOR JOHNSTON, BEFORE THE HIGHLAND SOCIETY, AT THE LAST MEETING IN EDINBURGH.

Professor JOHNSTON commenced the lecture by observing, that an impression had long existed in the minds of many persons connected with agriculture, that various departments of science, particularly chemistry and geology, were capable of being applied to it in such a way as to improve the cultivation of the land. But the difficulty was for such persons to answer distinctly the question which was frequently put by practical agriculturists. What can science do for agriculture? Now he appeared there to endeavour to answer that question. Science may impart a practical money benefit to the cultivation of the land, either by enabling farmers to raise larger crops with more certainty and of better quality, or by teaching them how land, previously of little value, may be made capable of raising better crops, which crops again will tend to produce a greater quantity of produce of another description, that is beef and mutton. In illustration of the subject which he had chosen for his lecture, a multitude of subjects presented themselves, and the difficulty was how to select a number of topics which were connected together in their nature, and might be bound up by their common form in their memories. Perhaps the best course for him to follow with such an object would be to take up the seed when it is first put into the ground, and to follow it through its different processes of development till it arrived at maturity. With regard to the selection of seeds they were all aware what an important matter it was, and how much depended upon it; but it was only chemists who could understand the scientific causes of these differences. They also knew that seeds would grow on one kind of soil, while they refused another kind; now the reason of this could only be cleared up by chemical examination of the soil and of the seed. It was a common practice to steep the seed before it was sown, for the purpose of destroying the eggs of minute insects, which injured the plant as they grew up. That might be one effect; but another effect of the steeping was chemical; and that effect was seen in the greater luxuriance of the crop. When the seed was put into the ground, it sent forth a little sprout in its germination. Connected with this there was a beautiful chemical process. It must be understood that there were two substances which were important parts in the composition of every plant—sugar or starch, and gluten or albumen. Both of these were in the seed in a solid state; but when the plant began to germinate, it was necessary that these substances should become soluble, to be sent from the seed to the stem. Now, it was remarkable, that at the root of every stem, just where it joined to the seed, there was a substance called *clear stars*—and this substance, according to a well-known chemical process, renders the starch and the gluten soluble, and thus enables it to ascend the stem of the young plant, in proportion as it is required for nourishment. Accordingly along with it, there would always be detected, by a microscope, a portion of the gluten and the starch in a soluble state. So soon as the plant reaches the surface, it expands into a leaf. Up to this time, it lives at the expense of the seed; but as soon as it reaches the air, it lives at the expense of the air. All plants require three substances, or *rather four—oxygen, hydrogen, nitrogen,* and carbon. These substances are only known in the form of gases. After explaining the nature and properties of those gases, he proceeded to say that the plant derived from the air a large portion of carbonic acid; and to obtain that supply, it spread out its leaves in every direction, thus sucking in the carbon from the atmosphere. As there was comparatively only a small portion of carbonic acid in the atmosphere, it might be supposed that the vegetable kingdom would extract the whole; but by a wise adaptation of Providence, which connected together the animal and vegetable kingdoms, it was provided that the same gas which was so greedily inhaled by plants was that which was thrown off as noxious by animals. A full grown healthy man threw off at every breath he took 25 ounces of carbon; a horse and a cow each would throw off about 4 pounds; so that in this way a constant equilibrium was maintained. *Another ingredient in the composition* of plants was nitrogen, which existed in large proportions in the atmosphere; but the plants did not derive their nitrogen from the air, but rather from the manures applied to them. The knowledge of this fact was of the utmost importance in regard to the application of manures to the soil. Well, the plant had now got above the surface of the ground, and had thrown out its leaves.

At this stage it was usual in many parts of the country—he believed not very common in this district—to apply to what was called a top-dressing. When a crop of oats, beans, or turnips, came up of a sickly character, the farmer sprinkled over it a quantity of common salt, or gypsum, or nitrate of soda, or mixtures of these; and in the course of a single day, the plant would appear to be altogether renovated. What was the precise chemical effect produced in this case, they had not yet been able clearly to make out; but they could trace it to some extent. He then mentioned the estates of Mr. Alexander of Southbar, and Mr. Fleming, of Barrochan, Renfrewshire, as places where a great effect had been produced by the application of these top-dressings. He then came to the turnip. *It was necessary for the safety of the turnips, that* they should rush up as it were, and throw out their leaves quickly. Now this was a condition of things totally new; and it was only by knowing all the plant required that they could obtain this rapid rushing up of the turnip crop. In connection with this subject, he might mention a curious fact. A farmer could tell by the odour that was exhaled whether the turnips were coming up healthy or not. He (Professor J.) had often endeavoured to detect this odour; but he could not—it required a long experience in practical farming to enable a man to do so. But upon the cause of this odour, so delicate to the sense, chemistry threw a beautiful light. All plants in growing throw off certain substances, which were unnecessary for them at that particular stage. It is that exudation of substances which causes the odours in question; and it is the same principle that causes the odours to delight us so much in *the sweet-smelling flowers in the garden or the green house.* Let them observe what a beautiful arrangement it was, that while Nature, or rather the Lord and Governor of Nature, caused the plant to throw off those substances which were unnecessary or even unwholesome to itself, it threw them off in a manner which was agreeable and delightful to man; thus, even in the most trifling and minute circumstances, providing for our comfort and gratification. Nothing could be more beautiful than the exhibition of the wisdom and beneficence of the Deity, as exhibited in this arrangement. Then, with regard to the proper time for cutting down the crop when ripe, that could only be ascertained by an examination of the straw and other parts. He then referred to the failure of the potato crop, and stated it to be the result of very extended observation, that potatoes, when full ripe, contained more starch than