

injection in a similar way, and so on for several months until the animal is no longer affected by the injections of the most virulent cultures, or until complete immunity has been produced.

Blood is now drawn from the animal under the strictest precautions as to contamination from the air, or in fact any source, as the slightest contamination destroys the efficacy of the serum. It is then allowed to separate into serum and clot; the serum is then drawn off under the same strict precautions and placed in tubes for use. Thus is this remedy prepared.

This serum contains the germicidal constituent we have already mentioned, possessing the power of destroying the diphtheria bacilli when introduced into the circulation of a diphtheria patient.

Disappointments have been met with in this treatment. It, to be successful, must be carried out with the strictest antiseptic precaution. Every thing used must be carefully sterilized. A hypodermic syringe is prepared especially for this purpose. The treatment must be as careful as the preparation of the serum. The dose given has no relation to age, but depends upon weight of patient, the gravity and stage of the disease. The dose usually given for curative action is 20 cc., and for prophylactic action about 10 cc.

From the complexity of detail in the production and the administration of this serum, the neglect of the apparently simplest point may produce disappointing results and the failure laid at the door of the serum, which is due to an unexperienced or careless administrator. In all cases bacteriological examination of the throat should be made to verify the diagnosis.

A SILENT FORCE IN NATURE.

We hear so much of the baneful results produced by some classes of those minute specks of vegetable protoplasm called bacteria, that we are apt to forget the beneficent work performed by the great mass of them. On the one hand we have the pathogenic or disease-producing class, against which humanity holds a deep grudge for the ills it has suffered; but on the other stands the non-pathogenic, the great portion of whose work at least is kindly in the highest degree. There is not a leaf that falls to the ground but would lie

there a waste and unproductive thing were it not for the action of some of these bacteria upon it, which feed on its organic elements and transform them again into inorganic substances, ready to afford nutriment once more to the living plant from which the leaf had fallen.

Bacteria, in fact, serve to transform inert organic matter into inorganic substances. They are nature's general scavengers, being the active workers in the processes of decay, putrefaction and fermentation, although it would seem that some of these terms should be changed, for the decay of the dead leaf is really its transformation from an inert state into one in which it again becomes useful as a food, and so all-important.

This transformation, or *mineralization*, in most cases, commences only after the death of the organic substance, whether vegetable or animal, and most microorganisms are capable of attacking this dead protoplasm only, but some have the faculty of attacking living protoplasm also. Bacteria are again divided into two classes, as follows: First, those that, in the process of decomposition they bring about, are capable of taking up their oxygen from the air; and second, those that are able to so break up the organic molecules, that not only do they themselves take up oxygen from the organic matter on which they are feeding, but they allow it to be handed on to the products to which they give rise. This decomposition or re-arrangement is called the process of nitrification or the conversion of the nitrogenous elements into ammonia, nitrous and nitric acids, carbonic acid and water. The terms, oxidation or mineralization, may be used to describe the same process.

The first class of bacteria spoken of are called aerobic, and are found on the surface of the soil and in the superficial layers where air is present. These, in the process of oxidation of the organic matter, derive their oxygen from the air about them. The second class are called the anaerobic, and are found specially in the deeper layers of the soil. They, wresting the oxygen from the oxygen-containing bodies that come down to them from nearer the surface, carry the process of decomposition a stage further and complete it, so that life in the soil after a certain depth becomes impossible through lack of nutrition. This depth is usually placed at twelve feet, but it varies of course