indurated. The St. Peter's sandstone afforded similar facts. In one case the cavities over the exposed surface had a lining of quartz crystals, while the rock a few inches below had the common friable character. The effects were connected in some way with weathering processes. In some cases of the kind the silica may have come from the decomposing action of percolating acid waters on feldspar grains sparsely disseminated through the rock.

Over the cold bottom of the ocean some silicates have been formed. Among them are masses or concretions of bronzite, a silicate of magnesia and iron related to pyroxene, and small crystalline groups of Phillipsite (Christianite). At depths of 2200 fathoms and over, the pressure on the bottom is 5000 to 12,000 pounds to the square inch; and this may favor the production of silicates, where the siliceous parts of Sponges, Diatoms, or Radiolarians abound, with the results of the decomposition of volcanic dust and pumice. Another silicate of common occurrence, forming in shallow water as well as in deep, is the green-sand called glauconite, a hydrous silicate of iron and potash.

Chemical Work of Living Organisms.

Respiration in animals, and also in plants, is a means of introducing oxygen from the air to carry on processes of oxidation among the elements in the structure, and the *excretion of carbonic acid* is one prime result. The *growth* of green plants, however, depends on a deoxidation process, the carbonic acid of the air being decomposed in the sunlight by the green coloring-matter (chlorophyll) of the plant, its carbon forming the food of the plant and its *oxygen being set free.* Plants of the Fungus division (Mushrooms and the Microbes) are not green (have no chlorophyll), and cannot get their food directly from the carbonic acid in the air. The chemical work of life of most geological importance, apart from the making of coal and related products, is that carried on by the lower plants; and only this is here briefly considered.

Plants, and especially the lower Cryptogams, contribute chemically to geological change through their roots or the fibers with which they come in contact with rocks. The acidity of roots is often very decided, as is manifest from the furrows they make in the surfaces of stones, and especially in limestones. Roots of plants germinated in sand over a slab of marble leave an imprint on the marble. Professor Storer observes that "it is to be noted that this action by chemical corrosion through the roots is incessant and continuous." The lichen *Stereocaulon Vesuvianum*, which grows on rocks, and among them on Vesuvian lavas, affords one ninth its weight of ash; which from one Vesuvian specimen, according to Roth, contained silica 46·41, alumina 19·67, Fe_2O_3 6·88, FeO 4·17, magnesia 5·23, lime 10·53, soda 2·02, potash 4·09 = 99·00. For other analyses, see page 75.

The microbes, or Bacteria, are at the bottom in much of the world's chemistry. They do not get food from carbon dioxide, but, like true Fungi, find it in other compounds: for example, those consisting of carbon, hydrogen, and oxygen, as sugar, starch; or those containing these elements and nitrogen, etc., as albumen, muscle, or even a mineral sulphate; they taking the part of the compound required for food, and leaving the rest to