to give a reason for what you see before you, than to be compelled to say that you do not know, or what is worse, expose your ignorance by attempting to give an explanation utterly at variance with the truth.

No. 18.—Silicon.

Thus far we have examined the principal elements oxygen, nitrogen, hydrogen and carbon, which abound in all vegetable and animal matter as well as in the mineral kingdom. We propose now to examine those elements which go towards making up our soils, and see how far we can build up a soil from the different elements.

Silicon is the most abundant element in nature. About one-sixth of the globe is composed of it. Pure silicon does not exist in nature, but combined with about equal parts of oxygen it forms the substance known under the names of quartz, sand and flint. Pure white sand is composed of silicon and oxygen. We shall make use of the word silex as the most convenient term. When silex is crystalized it forms a six-sided prism terminated by six-sided pyramids. In this form it is called quartz. Suppose now you pulverize in a mortar one of these crystals, you will have a pure white sand, the base of your soils. You may pulverize it as long as you please, and it will be harsh to the fingers and gritty between your teeth. It can be dissolved only by one acid, the fluoric, at common temperatures. If you mix it with potash, lime or soda, it will melt in a powerful furnace, and form glass. This is your common window glass. In the language of chemistry your glass may be called silicate of potash. The different kinds of glass depend upon the purity of the materials, and the use of oxides of the metals for the purpose of giving them different colors.

The most interesting point for you to remember about silex is the fact that silex enters into the composition of your wheat, corn and other vegetables. But silex must first be in a state of solution before it can become food for plants; and how can it be accomplished, for pure water will not dissolve it, as you already know. But let us take a round about way for reaching the truth in this case. Suppose we take a trip to Arkansas. We shall find there some springs that have silex in solution in the water. This is brought about by the potash in the water, which in a state of solution attacks the silex and dissolves a portion of it. When this comes in contact with moss on the banks of these springs, it covers it with a coating of this silex so that it is actually petrified. You have seen an agate used in jewelry. It is composed of stripes of different colors. Suppose now a pebble should receive a coating of this silex; this would form one stripe; now suppose another layer of silex of a different color should surround the pebble, you would have another stripe, and so on, till the pebble might be as large as your hand. If now this pebble were sawed through and polished you would have a fortification agate. Chalcedony, jasper, opal, bloodstone and cornelian, are essentially the same thing. They are generally harder than glass, and will scratch it, which artificial jewelry will not do. They are also colder to the tongue than the artificial gems, as they are better conductors of heat. They are therefore called siliceous minerals.

Now it is in this way that silex is rendered soluble as food for plants. The plant has no power to effect this, but the potash and waters in the soils can dissolve enough for the use of plants. The ratan, bamboo, and sugar-cane have a complete crust of this element. The scouring rush, stalks of Indian corn, rye and wheat, must have it so as to support the plant. The moss and litchens on the rocks are composed largely of this element and potash.

Suppose now you had a soil of pure white sand, do you think you could raise anything on it? If you can find a plant of pure silex, it might do so, provided the silex may be in a state of solution. But it would be like the desert of Sahara—an ocean of sand. Silex forms about 60 per cent. of our granite soils. Barren sand hills contains something as high as 90 per cent. of sand, while clay land contains much less than 50 per cent. In our next we will see if we can add anything to our soil by which to make it productive.

CHLORINE.*

This element was discovered by Scheele in 1774 If you should take a saucer and put into it a little common salt, some black oxide of manganese, and then pour on sulphuric acid, slightly diluted with water, a gas would pass off which you would ascertain to be very difficult to breathe. This is chlorine. Common salt is composed of chlorine and sodium, the metallic base of soda; the latter being the oxide of sodium. By adding together the ingredients mentioned, the following exchange of elements occurs:

Chloride of Sodium.	Chlorine.....	Chlorine.
	Sodium.	
Sulphuric acid.....		Sulphate of Soda.
Bixoxide of Manganese.	Oxygen	
	Protoxide of Manganese	Sulphate of Manganese.
Sulphuric acid.....		

The sulphates of soda and manganese remain in the vessel, while the chlorine, left free, escapes in the form of a gas. You may then infer where it exists in nature, as it is one of the elements of common salt. It is a remarkable element in several respects. Cold water absorbs large quantities of this gas, while warm water does not. It is extremely suffocating when breathed, and it is poisonous. Unlike the other gases which we have described, it can be seen of a greenish-yellow color. It can also be condensed by pressure into a liquid, and on exposure to cold it forms crystals of a yellow color. A test for chlorine is made by dipping a feather in ammonia, and if chlorine be present, it will form a white cloud of chloride of ammonium.

A most remarkable property of chlorine is its power of bleaching substances where moisture is present. A half century ago the good housewife bleached her cloth in the sun; now it is done by chlorine. It would cost you much more than it does, if the chemist had not discovered chlorine.

* The former article on Chlorine, page 180 (selected), gave a process for making Hydrochloric acid gas in mistake, so we have had the article re-written.