

Again, the test for $C O_2$ is to run it into lime-water—that is, lime dissolved in water. This done, you will notice that the water has turned white, and, after a time, the white settles to the bottom. This a pretty sure test. Here chemical action took place. The $C O_2$ united with the dissolved lime and formed a substance that would not dissolve, and it went to the bottom.

Ca stands for calcium, and Ca O represents the formation of lime. What you had, then, was $C O_2$ uniting with Ca O, which made $Ca C O_3$ —the white substance, which is the chief constituent of chalk, limestone and marble. Now, you breathe through a tube into lime water, and the same result appears as when you passed $C O_2$ into it—the same white substance, $Ca C O_3$, is formed. Hence you may conclude that you breathe out $C O_2$ as well as $H_2 O$ —in other words, carbonic acid gas and water. (It is doubtful if it may occur to you as a good thing to enter into the manufacture of limestone rock and marble for building and other purposes, by breathing into lime-water.) You thus see that nature tries to get rid of $C O_2$, and you will understand how injurious it is to breathe air containing much of it. Think of the result of badly ventilated rooms, and people living in an atmosphere of their own making!

The oxygen of the air you breathe in is not breathed out, but $C O_2$ and $H_2 O$ instead. Well, what happens it? The fact is that within us chemical action takes place, and the O must have C and H to unite with that, $C O_2$ and $H_2 O$ may be breathed out. Now, where does this C and H come from? Largely from the blood; and how does it get into the blood? Well, if we do not eat we do not keep up the supply of blood. What do we eat, then? Food; and it is largely made up of C and H. Thus, that is how the O gets the C and H with which to unite.

The blood of the system passes to the lungs, where it comes into very close contact with the air at innumerable little vesicles that are the termini of a host of branches of the tube we call the wind-pipe—an arrangement that bears a close resemblance to a tree upside down. Only a very thin membrane separates the air

and the blood; the O of the air passes through to the blood, uniting with C and H, and $C O_2$ and $H_2 O$ passes through and out. Also, some of the O passes along with the blood to the different parts, uniting with used up material, forming $C O_2$ and $H_2 O$, which passes off through the pores of the skin and the lungs. The arterial, or purer blood, will have N O and little $C O_2$ in it; when it returns to the lungs will have much $C O_2$ and less O. And another exchange is made with the air. Chemical action is generally accompanied by heat, light, or electricity. You can understand, then, how the heat of the body is largely derived; why the Esquimaux can live on fat and oil, namely, because fat and oil contain much C and H to unite with O, and greater heat is produced in the action.

These questions I leave you to answer:

Why do persons perspire when they exercise, and some more easily than others?

Why is the appetite increased through exercise?

What kind of food is best for summer use?

In what way does tight dressing effect the healthy action of the system, as to digestion, circulation, respiration and heat?

What about plants? Burnt wood, in the form of charcoal, is largely carbon—C. If plants contain C, whence is it obtained? We know that it is found in $C O_2$ not very strongly united with the oxygen—O; and that there must be a vast quantity of it— $C O_2$, in the air, since all animals breathe it out—limestone and coal, burning, give it off. Something must happen it or the air would get full of it. Nature has a way. In lesson No. 1, pores were mentioned—little holes or sacks connected with the little veinlets of the leaves, which leaves are lungs to the tree or plant. Here the sun heat is sufficient to break up the $C O_2$, the leaves taking it up throw out the oxygen and retain the carbon. See what beauty there is in nature; not only in the great picture, nature, but in its formation. What a dependence one part of nature has upon another. What divine economy, and what evidences of design. Surely there is a supreme intelligence running in all things, through all and above all.