

sorbed. The fats and starches went on, and they were acted upon by the various juices and absorbed in turn. It was all very simple! Now, however, it is known that the process is far more complex, and that many changes are passed through before the food is really absorbed by the body, or ready for forming bodily tissue.

Starches can not be absorbed by the body as such. They must first be converted into a sort of "glucose." This can not be done in an acid medium; hence the necessity of chewing all such foods very thoroughly, so that they may be converted in the mouth by means of the saliva. Proteids are largely dissolved by the acid, gastric juice of the stomach. Fats and starches complete their digestion in the bowels. The fats are here made into a sort of soap—an emulsion—and in that condition they are absorbed by the blood, carried to the lungs, and finally grabbed up by the hungry tissue-cells, to make live bodily matter.

Most of the changes that are undergone in the process of digestion are now understood, and it has been found that they are chiefly chemical in character. The changes and reactions are numerous and marvelous, but they can be followed. From the moment when food is put in the mouth until it reaches the bodily cell, as nourishment for it, these changes can be followed and in large measure understood. But when this food material is converted into living matter—when it forms the body—no one can tell what takes place, nor have we the slightest idea of the changes necessitated in bringing this result to pass.

The food seems in some way "vitalized"—as though endowed with life from the living cell, and then that it forms part of it. But the mechanism which brings this to pass can not be comprehended. We are face to face with the problem, "What is life?" We may, in truth, call it "The miracle of digestion."

INSECT CARRIERS

By SIR RAY LANKESTER, K.C.B., F.R.S.

The little insects which we call gnats and mosquitoes are not only responsible through their representative, the *Anopheles*, or spot-winged gnat, for one of the most widely-spread diseases, viz., malaria, but in addition to this and to the serious irritation set up by their poisonous stabs or "bites" (a result in which microbes have no part, the irritating poison being produced by the gnat itself), they may casually introduce, by mere adherence of blood or dirt to their stabbing organs, other disease-causing microbes to which they are not the necessary and established intermediate hosts.

There is one other kind of gnat besides the *Anopheles* which is known to be the necessary and special host to a most terrible disease-causing microbe. That gnat is the *Stegomyia* of the east coast of tropical America, and the disease is the deadly yellow fever, or "Black Jack." The microbe is taken up by the gnat when sucking the blood of yellow fever patients and conveyed to healthy men. But it has to

remain twelve days in the gnat before it can be passed on. It must undergo some changes and multiplication in the body of the *Stegomyia* gnat, yet—and this is at first sight an astounding fact—it has never been seen! Scientific faith and the evidence of things unseen is here our guide. Experiment has conclusively shown that the "germ" of yellow fever is taken up by the gnat, and is carried by it after a lapse of twelve days, but not earlier. Some day we shall probably see this germ, and ascertain its form and behavior. At present it is not known. Nevertheless, yellow fever has been entirely abolished within the last ten years in many tropical cities by assuming its existence and preventing the gnat from carrying it!

Of the screw-like trypanosomes, which infest the blood of man and animals and frequently cause disease, the commonest is one which is often found in the blood of the common sewer rat. It was discovered thirty years ago by a distinguished young Army surgeon, Dr. Timothy Lewis (who