

Many other kinds of trypanosome inhabiting the blood of cattle and horses and other large animals are known in Africa (several have recently been described from Central Africa) and other parts of the world, which cause disease. One, called *T. vivax*, is carried by the tsetse-fly in Central Africa, and attaches itself to the inside of the fly's proboscis, where, apparently, it multiplies. It was at first thought to be the sleeping sickness kind, but is not so. It is carried by the fly to the blood of cattle. Another in India and Burma (called *T. Evansii*) is very like Bruce's trypanosome of the fly-belts of Africa. It causes a distinct disease called "surra" in camels, horses, and elephants, but no special fly is known as its carrier. Probably several blood-sucking flies serve it in this way. In South America another is known causing great mortality among horses, but no special fly has been discovered as associated with it. Another in North Africa causes a disease of horses and camels called "dourine."

The view has been put forward by Professor Minchin that these numerous disease-producing trypanosomes, which contrast with the harmless rat trypanosome, are newer varieties—so to speak, "enterprising" races—of previously harmless species which have effected a lodgment in new hosts which are not yet "adjusted" to their presence. The well-adjusted, old-established trypanosome has but one kind of animal as its host, and none of those I have mentioned, even the ill-adjusted disease-producers, excepting the *Trypanosoma Gambiense* of sleeping sickness, can live in man. When the newer disease-causing races or species of trypanosome have killed off the more susceptible individuals among their new hosts, a race of the host-animals must necessarily be produced indifferent to, or tolerant of, the chemical substances produced by the trypanosomes which at present act upon them as deadly poisons. But the making of the immune race takes time and much sacrifice of life.

The clothes-louse of man has been shown experimentally to be the carrier of the microbe of typhus fever (gaol-fever), and the common bed-bug is believed to be the usual carrier of the spiral filamentary bacterium (*Spirillum*) which causes relapsing fever in Eastern Europe. In Africa a microbe causing relapsing fever is car-

ried by a mite or acarus, which inhabits the earth-floor of huts used as human habitations. The mites are peculiar as hosts of disease-causing microbes in that they often (if not invariably), when they have taken in a microbe of the kind, which multiplies inside them, pass it on to their own, as yet unborn, young, so that it is the second generation of the mites which spreads the disease. This has been especially studied and ascertained in the case of minute non-motile pear-shaped parasites (*Piroplasma*) allied to, but not identical with, Trypanosomes. Some of these cause devastating cattle diseases in Africa, and are all the more difficult to check or eradicate owing to their infecting the young of the acarus or mite which first sucks them up from the diseased cattle. The young acari thus infected serve as intermediate hosts, live on the open ground, and become widely dispersed, and eventually attach themselves to healthy cattle and infect them with the minute disease-producing microbes. A not uncommon Indian fever called "Kala Azar," as also the disease known as "Delhi sore," are produced by two kinds of these minute pear-shaped, non-motile microbes, which, when cultivated (and probably when taken into the body of insects), develop a lashing hair or flagellum, and swim with corkscrew-like movement of the body, resembling in this respect a Trypanosome. The carrier and intermediate host of these microbes is believed to be a bug, but not improbably certain sand-flies play that part.

The most interesting discovery of late years in these matters is that of a Trypanosome which is found living and multiplying in the gut of the enormous bug common in country houses in Brazil and other parts of South America. The bug is known by the name *Conorhinus megistus*; it is as large as a stag-beetle, and is marked with red splashes on its black body. A friend of mine came across these unpleasant creatures in a room where he slept up-country in Paraguay. At night he saw on the ceiling what he thought was a decorative design, consisting of oval black patches. In the morning he was suffering from "bites," and saw that each black patch on the ceiling was now swollen (by his own transferred blood) to the shape and size of a large ripe grape. Dr. Chagas has discovered that these gigantic bugs pass the