

FIGURE Alveolata: Ciliophora. The pellicle of Paramecium.

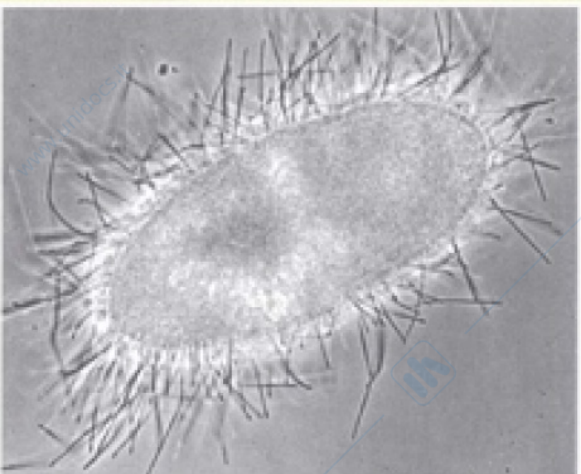


Fig. Trichocysts extruded by Paramecium.

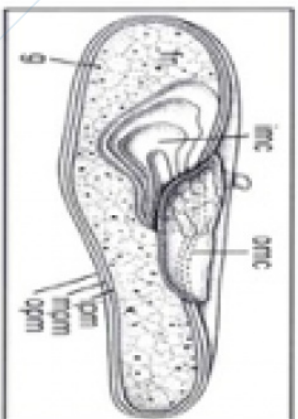
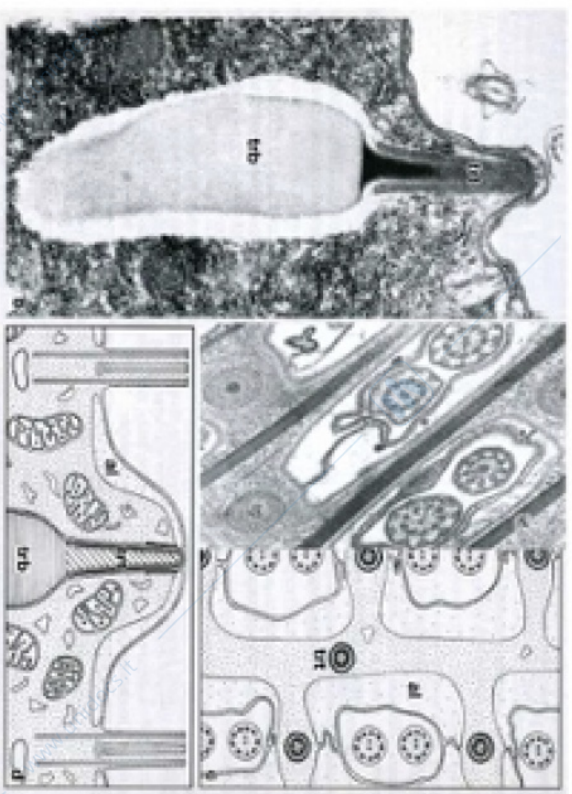


Fig. Reconstruction of an epoplast from a membrane of *Plasmodium falciparum*. The plastid is surrounded by three membranes (outer, middle and inner plasma membrane = om, mm, im) and possesses outer and inner membrane complexes (omc, imc). The inter-



Trichocysts in Paramecium resting stages in transverse section (a) and longitudinal section (b) and in corresponding schemes (c, d). al = alveolus, c = cilium, K = kinetosomal fibre, trb = trichocyst body, trt = trichocyst tip

Movement in a Fluid Medium

Swimming animals and protozoa are subjected to two sources of water resistance, or drag—pressure drag and viscous drag. Pressure drag refers to the difference between the pressure at the front end (higher pressure) of a forward moving organism and that at the rear end (lower pressure). Streamlining reduces pressure drag. Viscous, or adhesive, drag results from the tendency of the water molecules, which are electrostatically polar, to stick to each other and to surfaces. A swimming organism is coated with a layer of nonmoving, adhering water molecules that, in turn, adhere to other water molecules. As the distance from the organism's surface increases, molecules steadily shear off until the full velocity of the current is attained. There is thus a coatlike boundary layer of nonmoving and slower moving water surrounding a flagellum or cilium, indeed around the entire protozoan cell or multicellular animal. This principal of aqueous viscosity is equally applicable to fluid moving within a tube and accounts for the peripheral resistance of blood circulating through blood vessels.