binocular dissecting microscope under which the specimen may be held as described above. In the males of *T. confusum* the middle and hind femora also have pits though these are much smaller and more difficult to see than those of the front femora and usually contain only 2–4 hairs.

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[1] Brindley, *Ann. Ent. Soc. Amer.*, **23**, 751 (1930).
[2] Good, Tech. Bull. U.S. Dept. Agric., No. 498, 3 and 36 (1936).
[3] Park, Gregg, and Lutherman, *Physiol. Zool.*, **14**, 397 (1941).

Mitosis in Amœbæ

THE life-histories of four large, free-living amœbæ have been worked out here; one, namely, *Amoeba lescheri* n.sp. not yet published. But except for *Amœba dubia* (Schaeffer) in which Sr. Bernardine (Dr. L. A. Carter) discovered it in 1913, mitosis had until recently not been demonstrated. In fact we doubted its occurrence.

Pending the publication of a full account of mitosis in these amœbæ and of the whole life-cycle of *A. lescheri* (n.sp.), we should like to state here that we have now also discovered the phenomenon of typical mitosis in the binary fission of (1) *Amœba proteus* γ (= *A. proteus* (Schaeffer); (2) *Amœba discoides*; and (3) *Amœba lescheri*.

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Flow of Liquids in the Critical Region

IN experiments on the flow of water in a long copper tubing, it was found that the inlet pressure must be maintained free from disturbances to the highest degree possible if flow in the critical region is to be analysed. When extraneous disturbances were eliminated, the flow in the tube falling between Reynolds' numbers 1,000 and 5,000 was found to fall into three distinct classes, all of which were different from both the viscous and the turbulent regimes. Strictly speaking, only the regime existing between 2,200 and 2,500 Reynolds' numbers in the present system showed the ordinarily accepted criteria of critical flow. Nevertheless, as both the regions between 1,000 and 2,200 and between 2,500 and 5,000 fall outside the laws of either viscous or turbulent regimes, they are treated here as 'pre-critical' and 'post-critical' regimes.

In the accompanying graph, the corrected head lost per unit length of pipe is plotted against the average linear velocity of the water in the pipe, for values of Reynolds' numbers ranging between 240 and 2,800 approximately. It is seen that there are four distinct sections of the curve.

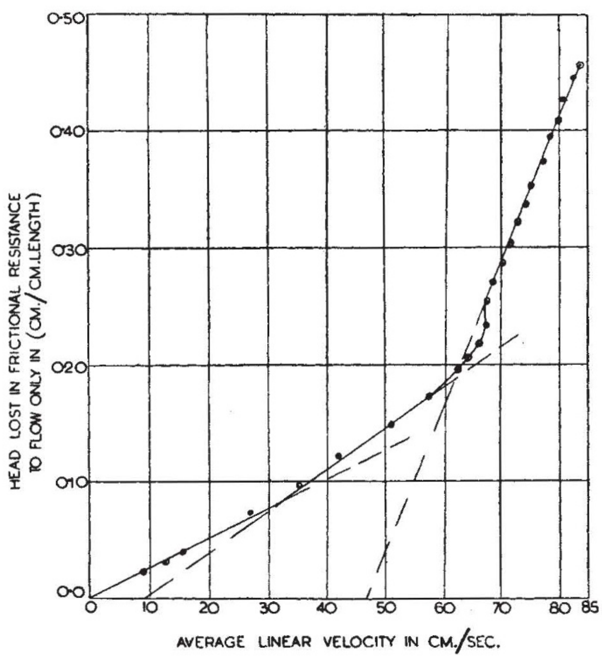
(1) Up to *circa* 1,000 Reynolds' numbers, the ordinary straight line of the viscous regime obtains, characterized by (*a*) passing through the origin, and (*b*) by its slope being governed solely by the viscosity of the fluid in so far as the properties of the fluid are concerned.

(2) Between 1,000 and 2,200 Reynolds' numbers approximately, a second straight line obtains. This straight line differs from the first in that (*a*) it does not pass through the origin; (*b*) it has a higher value for its slope than the first line.

(3) Between Reynolds' numbers of 2,200 and 2,500 approximately, the curve rises almost vertically upwards in the direction of the pressure loss. It is in this and the following region that it becomes essential to eliminate all disturbances from the entry. As mentioned above, strictly speaking this is the critical region.

(4) Between 2,500 Reynolds' numbers and about 5,000, above which the curve shows a definite curvature characteristic of the turbulent regime, there is yet another straight line. The graph goes up to 2,800 only, but other experiments showed that curvature begins above 5,000. This straight line again does not pass through the origin, and it has a steeper gradient than both the viscous and 'pre-critical' lines.

Another important point in connexion with these



lines, which is not evident from the graph, is that in the critical region a change of 25 per cent in the viscosity of the flowing water appeared to have no effect on the position or slope of the lines, especially the 'post-critical' curve. Of course, the viscosity is of paramount, but indirect, importance, in that it influences the type of regime obtaining in the pipe.

Thus, it appears that the classification of flow as viscous, critical and turbulent is an over-simplified system. In unpublished work carried out in this Department and to which reference has already been made[1], it became evident that when flow is at extremely low rates, in a medium of high specific surface, such as might obtain in the flow of fluids through porous strata in oil, gas or water production, then the law of frictional resistance due to flow did not follow the laws of the viscous regime. In other words, a 'sub-viscous' or 'pre-viscous' regime of flow appears to exist. Flow then adopts the viscous regime when the velocity is increased, and as is seen here, passes through an intermediary type of flow before it enters the critical regime. Before entering the fully turbulent type of flow, it passes through