both daughter cells. In contrast, division of type *B* cells produced two viable daughters which resulted in exponential growth until such time as all cells of the clone died. When an immortal or normal nucleus was implanted into spanned cytoplasm, all the amoebae were spanned and, moreover, all were converted to type *B* behaviour regardless of whether the recipient cytoplasm was type *A* or *B*. Transfer of a spanned nucleus to a normal cytoplasm, however, produced type *A* spanned amoebae. One conclusion here is that a spanned nucleus normally confers stemline behaviour on its descendants, while a spanned cytoplasm normally induces an exponential growth pattern. Small injections of spanned cytoplasm into normal amoebae also induced a finite life span in the recipient and a similar effect followed injections of cytoplasmic supernatant from spanned amoebae. So far, conversions have been in one direction only, and Muggleton and Danielli have been unable to convert amoebae from the spanned state to the immortal state. Finer analysis of this system is an exciting prospect. In particular, the bimodal behaviour of spanned clones is indicative of a complex "spanning" phenomenon. Cell life span itself may be under the control of a higher order mechanism, with which we are not yet familiar, or may be the resultant of an accumulation of errors in DNA replication which inactivates part of the genome. This latter may be analogous to the "fault-load" hypothesis of Szilard or Hayflick's proposed "multi-hit, multi-target" phenomenon.

Flow of Blood

from a Correspondent

A SYMPOSIUM on Haemorheology and the Microcirculation was held at the Royal College of Surgeons on February 10, under the joint sponsorship of the British Society of Rheology and the British Microcirculation Society.

Undoubtedly the main contribution was in the field of the biophysics of blood flow in the smallest vessels. The mathematics involved was usually simplified for the benefit of the members of the audience who were principally concerned with practical applications to clinical diseases, but the solution of the equations involved often required the use of a computer. M. J. Lighthill provided an analysis of the behaviour of a deformable pellet, such as a blood cell, which has a resting maximum diameter just too large for it to pass through a small tube, such as a capillary, without deformation. He predicted the existence of a thick film in which there must be a substantial leak-back from one "bolus" to another. If the velocity is reduced, such a film becomes very thin so that the red cell's motion temporarily "sticks" or "seizes up". This type of behaviour may often be observed in the smallest capillaries in the living circulation, but it does not account for the deformations of the cells that are recorded by high speed photography. S. R. Montgomery described the behaviour of large simple rigid models of the shape of resting red cells and showed that their motion is essentially unstable unless "pores" are made in their centre corresponding to about one-tenth of their leading surface area. A mathematical analysis of pulsating flow was provided by J. H. Gerrard in the case of flow driven by simple pistons. In these circumstances the axial velocity is less than that nearer the wall of the tube. E. W. J. Mardles examined the behaviour of simple liquids containing a meniscus, flowing at very low shear rates in narrow channels, and showed that the resistance of this meniscus must be very great if the channel is less than 10 microns in diameter. Although this is the mean diameter of the larger capillaries, it is not yet certain how these conclusions, which might apply to the plasma, would also apply to the blood cells. It has been suggested that fibrinogen in the plasma is responsible for giving whole blood its non-Newtonian characteristics, but D. N. Walder, J. P. A. Weaver and A. Evans, using a cone-and-plate viscometer, showed that the wide range of variations in fibrinogen level that normally occurs in patients with different diseases does not seem to have any physiological effect except perhaps at very low shear rates; discussion on this was controversial. The effect of cryoglobulins in human plasma was discussed by R. B. Whittington and J. Harkness, and R. Pringle showed the results of interesting observations in patients with Raynaud's disease who had abnormal blood viscosities and flow cessation pressures. The latter phenomenon was treated in a different manner by C. G. Caro, T. H. Foley and M. F. Sudlow, who provided interesting data on the effect of altering the transmural pressure in normal human subjects. The elastic behaviour of the wall of "living" blood vessels was considered by D. J. Patel and D. L. Fry. J. L. Corbett and S. H. Milton showed that dye studies on the vascularity of experimental skin flaps in animals demonstrated considerable species variability, and B. A. Warren and M. C. Davey illustrated the ultrastructure of platelets and fibrin by means of electron photomicrographs.

The symposium as a whole served to bring together workers in previously unrelated disciplines and it is hoped that the resulting introductions will foster closer relationships between these people. Physicists, hydraulic engineers and rheologists would learn much of the problems of microcirculation if they were able to see living tissues and high speed photographs of blood cells in motion, and the more clinical research workers have much to learn of the methods and parameters needed before the solution of those problems is likely to yield to mathematical analysis.

Pituitary Hormone Actions

from our Medical Biochemistry Correspondent

ALTHOUGH the pituitary gland is often described as the "conductor of the endocrine orchestra" because of the way in which pituitary hormones have stimulatory effects on many other endocrine glands, the way in which pituitary hormones act on their target tissues is not completely clear. Three recent papers have shown that some pituitary hormones seem to have direct effects on some enzymes concerned with carbohydrate and fatty acid metabolism. These effects might be responsible for their action on the metabolism of distant tissues.

Bornstein and co-workers (*Biochim. Biophys. Acta*, **156**, 31; 1968) have isolated from anterior pituitary extracts two polypeptide fractions which they have named Ac-P and In-P. Ac-P accelerates fatty acid synthesis from acetate in liver slices. In-P inhibits fatty acid synthesis in liver slices and homogenates and the soluble fraction after separation of the homogenate particles. In-P has also a strong inhibitory