then introduced, and the spinning continued. Two per cent agar was used for particles less than 20 mμ in diameter and 1 per cent for those less than 60 mμ in diameter.

The assumption of free entrance and motion of the particles in these dilute gels appears to be justified so long as the particles in question are present in sufficiently high dilution, as is the case with most biological agents. With higher concentrations, however, the sedimentation may be hampered by a phenomenon related to the 'blocking' of filters. Therefore—working with serum for example—in spite of the small particle size, 1 per cent agar has been used. That adsorption plays no role in the effects obtained has been controlled by mincing the agar layer in the supernatant: the gel-free filtrate shows again the initial concentration.

The sedimentation in the very thin liquid layers used appears to be quite normal, and the calculation of the rate of sedimentation requires no elaboration here.

When the sedimentation equilibrium is established, the value of k, equivalent to $\frac{N}{RT} \cdot V(\sigma-\sigma_1)g$, in Perrin's equation can be calculated from the measured average concentration, C_S, in the liquid layer, and C_W the average concentration in the whole system, liquid plus gel.

Now

$$C_S = \frac{1}{x_1} \cdot \int_0^{x_1} C_0 \cdot e^{kx} \cdot dx,$$

where x_1 = thickness of liquid layer.

x_2 = thickness of gel layer.

C_0 = equilibrium concentration when $x = 0$, that is, at the surface of the liquid.

$$C_W = \frac{1}{x_1+x_2} \cdot \int_0^{x_1+x_2} C_0 \cdot e^{kx} \cdot dx.$$

Hence

$$\frac{ek x_1 - 1}{e^{k(x_1+x_2)} - 1} = \frac{x_1}{x_1+x_2} \cdot \frac{C_S}{C_W}, \qquad (1)$$

(x_1+x_2) being considered very small compared with the radius of rotation.

If $e^{kx_1} \gg 1$, then the solution of equation (1) is with good approximation.

$$k = \frac{1}{x_2} \cdot \ln \cdot \frac{x_1+x_2}{x} \cdot \frac{C_W}{C_S}.$$

Otherwise the solution can be made very simple by arranging that $x_1 = x_2$, or that $x_1 = x_2/2$.

Working with the smallest bacteriophage, *S*13, for example, drops of 60–80 per cent in the concentration of the supernatant were found using 2·5 c.c. liquid and a centrifugal force of 10,000 × gravity, in 2–3 minutes time. This leads to a sedimentation constant of about $s = 5 \times 10^{-12}$. The 'molecular weight'—about $2\text{–}3 \times 10^6$—obtained for this phage from the estimation of the sedimentation equilibrium using centrifugal forces of 2,500–10,000 × gravity is in good agreement with the value derived from the sedimentation rate.

In experiments made with Dr. Elford on Type I-pneumococcus anti-serum (horse), 60–70 per cent of the antibody was spun down in thirty minutes (force, 20,000 × gravity); the drop in the total protein content determined refractimetrically was about 30 per cent. No further change was obtained by continued spinning. The calculation from this equilibrium leads to a value of about 4×10^5 for the 'molecular weight' of the antibody (corresponding to the globulin fraction of largest particle size). This confirms previous results obtained by Elford and his collaborators by filtration[1], and recent findings on concentrated purified antibody preparations using air-driven[2] and Svedberg centrifuges[3].

Besides the examples mentioned, the new method is being used in collaboration with Drs. Elford, Galloway and Andrewes for the purification of viruses and for the estimation of the specific gravity of viruses and bacteriophages. Some of the results have been mentioned at the Second International Congress for Microbiology. A more detailed account will be given later.

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[2] J. Biscoe, F. Herčík and W. G. Wyckoff, *Science*, **83**, 602 (1936).
[3] M. Heidelberger, K. O. Pedersen and A. Tiselius, NATURE, **138**, 165 (1936).

Regeneration in Arachnida

DURING last year I noticed that Harvestmen (Opiliones) do not regenerate lost legs when they moult, and this summer I have determined that they do not regenerate pedipalpi either. It seemed possible that this surprising deviation from a general character of the Arachnida might be related to the contrast between the length of the limbs and the shortness of the cephalothorax, within which it would be impossible to develop a leg long enough to be useful when exposed by ecdysis, and that, if this were so, the same peculiarity might be shown by spiders with very long legs. A specimen of the spider *Pholcus phalangioides*, sent to me by Dr. W. S. Bristowe, has just cast its skin and shows no trace of a new leg to replace one which I removed four weeks ago.

Such failure to regenerate is, I think, a previously unrecorded feature among Arachnida, and it is intended to repeat the investigation with other spiders, such as *Phyllonethis* and *Tetragnatha*, which also have long legs.

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Chromosome Number of *Eucalyptus globulus* and *Eucalyptus Johnstoni*

WE have endeavoured to determine the chromosome numbers of certain species of *Eucalyptus*, using radicles, root tips and anthers. Although clear-cut mitotic figures were obtained with radicles and root tips, consistent with one another under different conditions of fixation and staining, we were not successful in determining the chromosome number with certainty, owing to the tendency of the chromosomes to remain attached to each other throughout the cycle.

Greater success was achieved with pollen mother cells, although here also the above tendency was to some extent troublesome. Diakinesis gave the most unambiguous results, but checks were obtained with metaphase I and anaphase I.