concentration of A at the place in question. The total amount of reaction in the reaction space will be

$$kc \int c' dv$$

taken over the whole reaction space, and does not depend upon the magnitude of this space, provided that the condition is fulfilled that the molecules of A react predominantly in the gas phase. The integral $\int c' dv$ (measured in appropriate units) defines the number N of atoms of A in the reaction space. In the stationary state,

$$n = kN.$$

The velocity constant k may therefore be calculated if n and C are known and if at the same time the number N of molecules of A present in the reaction space in the stationary state, can be measured.

Another way in which the method may be regarded is that the life period of the molecules of A in the reaction mixture is found as the ratio of N to n , and that the velocity constant of the reaction is given by

$$k = \frac{1}{Lc}$$

where L is the life period at a known concentration (c) of the reaction partner B .

The main point, experimentally, is the determination of the stationary number N , which can be based on various principles. When A is a metal vapour, the absorption of the resonance line provides a very accurate means of measuring N . The principle has been realised for sodium vapour on this basis by L. Frommer, partly in collaboration with H. v. Hartel. The results are in the course of publication.

Another case that has been worked out is that when A is atomic hydrogen. The number N is measured here by adopting the method used by Harteck and Geib¹ of observing the transformation of admixed parahydrogen. This work, by Miss E. Cremer and J. Curry, is also in the course of publication.

It appears that the method has, when the detection of A is sensitive, a very wide applicability. Collision efficiencies ranging from 1 to 10^{-15} should be capable of measurement.

M. POLANYI.

Victoria University,
Manchester.
Oct. 20.

¹ *Z. phys. Chem.*, (B), 15, 116; 1931.

Calcium and the Resistance of *Nereis* to Brackish Water

Procerodes (Gunda) ulvae is a euryhaline platyhelminth which is able to withstand daily changes from sea-water to fresh-water in its estuarine habitat thanks to the calcium content of the fresh-water. In fresh-waters lacking calcium the worm absorbs water, loses salts, and dies¹. Similarly the permeability to water of the cell membrane of sea urchin eggs is greater in the absence of calcium².

Nereis diversicolor is a euryhaline polychaete. When transferred from sea-water to brackish water its weight at first rises, then falls, and the worm survives³. Its stenohaline relative *N. cultrifera* treated in the same way swells, does not afterwards shrink, and it then dies⁴.

I have tested the influence of calcium on the resistance of *N. diversicolor* to immersion in brackish

water by comparing the changes in its weight when placed in diluted sea-water and in artificial sea-water of the same density but lacking calcium. The work was done at Roscoff.

Fig. 1.

Fig. 1 gives the results of three typical experiments. Curve a shows the initial increase and subsequent decrease in weight in 17 per cent sea-water, due to absorption and loss of water. Curve b shows the rapid initial and slow subsequent gain in weight in 17 per cent sea-water lacking calcium. In this experiment calcium was added 25 hours from the beginning (at X) with a consequent rapid fall in weight. Curve c shows the weight changes of a third individual in 17 per cent sea-water. At the end of 21½ hours (at Y) the animal was transferred to calcium-free 17 per cent sea-water, with the result that its weight rose again almost to its previous maximum.

It is clear that for *Nereis diversicolor*, as for *Procerodes*, resistance to immersion in brackish water depends on the presence of calcium in the environment. The action of other ions is now being investigated.

W. G. ELLIS.

Zoology Department,
University of Birmingham.
Oct. 18.

- ¹ Pantin, *J. Exp. Biol.*, 8, 63, 73, 82; 1931.
² McCutcheon and Lucke, *J. Gen. Physiol.*, 12, 129; 1928.
³ Schlieper, *Z. vergl. Physiol.*, 9, 473; 1929.
⁴ Beadle, *J. Exp. Biol.*, 8, 211; 1931.

Transfer of Fixed Nitrogen from Bacterium to Host in Soy Bean

THE two principal theories advanced to explain the transfer of fixed nitrogen from bacterium to host in the bacterial symbiosis of the Leguminosae are, first, that transfer results from digestion of bacteria by host enzymes, and secondly, that it arises from an excretion by the bacteria, into the host cytoplasm, of a part of their fixed nitrogen.

No previous investigator appears to have examined the quantitative features of transfer. In the present work, inoculated soy bean plants have been cultivated under conditions precluding any access to external sources of combined nitrogen. Adequate samples of the population were taken at frequent intervals throughout the life history of the host, and on each occasion the nodules were removed and estimations