

the re-attainment of the original siphon-length depended on the level at which the cut had been made: it varied from 14 to 44 days, with an average of 27 days. The animals operated upon once were kept under observation from 22 to 61 days after the original siphon-length had been re-attained, the average period being 42 days; those operated twice for an average of 34 days; and those three times for 27 days after the last re-attainment of the original siphon-length. In none of the operated animals did any further growth of the siphons take place after the original dimensions had been reached.

After this negative result of the preliminary experiment it seemed useless to try Dr. Kammerer's further operation of removing the gonads from the animals with re-grown siphons, allowing other gonads to regenerate, and then breeding a second generation.

In 1913 it was shown at Naples that abnormally long siphons of *Ciona intestinalis* can be grown by keeping the animals in suspensions of abundant food (*Biol. Centbl.* 1914, vol. 34, p. 429). Were this the reason for the long siphons of Dr. Kammerer's operated *Ciona*, it should have been clear from controls of unoperated animals kept in the same water.

A full account of the work at Roscoff will shortly be published in the *Journal of Genetics*.

H. MUNRO FOX.

Zoological Department, Cambridge.  
October 16.

#### Selective Interruption of Molecular Movements.

I WAS somewhat surprised to see that in spite of Mr. Atkinson's letter, Mr. Fairbourne, in *NATURE* of July 21, still endeavours to maintain his view that the relative gas-pressure in two communicating vessels at equal temperature depends upon the shape of the channel joining them, provided the pressure is sufficiently low. The proper method of treating the question, which of course does not lead to such an extraordinary result, may be found in any textbook on the kinetic theory, and it might have been expected that Mr. Fairbourne, before claiming to prove a paradox of this sort, would indicate in what way the usual treatment is wrong. Instead of doing so he adopts a curious treatment of his own, in which he shows that in certain circumstances more paths lead into one vessel than into the other, without considering that the number of molecules which enter either vessel in unit time depends not only upon the number of such paths but also upon their length. When this is taken into account the usual result is obtained, namely, that the pressure in the two vessels is equal whatever the shape of the channel between them.

F. A. LINDEMANN.

Clarendon Laboratory, Oxford,  
October 15.

#### Effects of Anæsthetics on Plants.

ANÆSTHETICS are known to cause alterations in the permeability of cells to the ions of various salts. It can be shown directly, by using the corolla of *Ipomœa Leavii*, that the permeability of plant cells to carbon dioxide is also altered by anæsthetics.

The corolla consists of two layers of cells only, with thin cuticle, no intercellular spaces, no stomata. The cell-sap contains an anthocyanin, which indicates  $P_H$  (thus avoiding complications due to an added indicator). The buds are pink ( $P_H$  6), changing to full blue ( $P_H$  7.8) as the flower opens, in 30-40 minutes. The blue changes through violet to pink as the flower withers (6-8 hours). Portions of the blue corolla floated on water saturated with carbon

dioxide rapidly turn pink: this change is reversible on removing to plain water.

If discs cut from the corolla are first treated with aqueous solutions (0.04M-0.1M) of chloroform or ether, and then with a saturated solution of carbon dioxide ( $P_H$  5), a time-curve can be constructed, showing the changes in permeability to carbon dioxide induced by varying exposures to the anæsthetics.

The first effect is a marked decrease (often as much as 50 per cent.) in the rate of penetration of carbon dioxide into the cell, the decrease lasting 10-15 minutes; the rate then increases rapidly, reaching 200 per cent. in 40 minutes, and continuing to increase. After 40-50 minutes' exposure to the anæsthetics the tissue becomes irresponsive.

In order to reach the cell-sap the carbon dioxide must pass through (1) the cell-wall, (2) the protoplasm lining the cell-wall. The fact that the cells of the disc change colour simultaneously shows that the carbon dioxide passes freely through the wall. On the other hand, hydrochloric, sulphuric, and acetic acids of the same  $P_H$  as the carbonic ( $P_H$  5) penetrate only from the cut edges of the discs inwards, and not over the whole area. The addition of ether or chloroform to these acids has a similar effect on their rate of penetration into the cell as on carbonic acid. It is therefore concluded that ether and chloroform alter the permeability of the plant cell to carbon dioxide by their action on the protoplasm and not on the cell-wall.

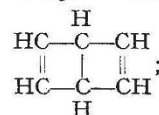
These alterations in permeability to carbon dioxide may affect the *apparent* rate of respiration (measured as carbon dioxide output) under anæsthetics, and a suitable correction may require to be made in such experiments.

E. PHILIP SMITH.

46 Murrayfield Avenue, Edinburgh,  
October 13.

#### Stereoisomerism among Derivatives of Diphenyl.

THE references to Dewar's formula for benzene which are made in the letters of Dr. Turner and Dr. Kenner in *NATURE* of September 22 and October 13 (pp. 439 and 539) raise a point of some importance in regard to the use of symbols in chemistry. Sir William Bragg's work has revealed the fact that the length of the carbon-to-carbon bond is remarkably constant at about 1.5 Å.U. Dr. Turner, however, following the common convention, represents the para-linkage in his formula for diphenyl by a bond which is perhaps twice as long as those joining adjacent atoms in the ring. It is, of course, possible to maintain the normal length of the bond by distorting the benzene hexagon into a quadrilateral, thus,



but there is, I believe, no indication whatever of any such extreme distortion in Bragg's work on the X-ray analysis of crystals of aromatic compounds. This difficulty would not arise if the para-linkage were regarded as indicating only the existence of "free affinities" on the 1 and 4 carbon atoms, or of an electrovalency between them; but so long as this link is treated as a real bond, there does not seem to be any justification for stretching it to an abnormal length, although this is clearly necessary in order to preserve the very well founded idea that the benzene-ring is fundamentally hexagonal in form.

T. M. LOWRY.

The University, Cambridge,  
October 18.