

conditions, and the impossibility of obtaining the cell sap without contamination and chemical change—we must perforce congratulate ourselves on finding such a satisfactory organism for study.

Certain principles which appear to govern accumulation in *Valonia* are so simple that they have been embodied in models in which potassium chloride enters until its chemical potential inside becomes several times as great as outside. (This depends on the bubbling of carbon dioxide through the artificial sap to imitate its production by the living cell.) Such increase in chemical potential involves an expenditure of energy, which comes from chemical reactions (as it does in the cell).

Some of these principles play an important role in other organisms. Future research must reveal the extent of their application.

<sup>1</sup> Osterhout, W. J. V., *Ergebnisse der Physiol.*, **35**, 967; 1935.

<sup>2</sup> Steward, F. C., *NATURE*, **135**, 553; 1935.

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ONLY minor comments are necessary to the reply of Dr. Osterhout, which is devoted mainly to the question of injury to *V. macrophysa* by ammonium chloride.

Even if the ammonia experiments are free from the suspicion of injury, the fact still remains that the subsequent movements of *potassium* and *sodium* neither necessitate a distinction between ions and molecules nor are they in the direction usually associated with accumulation.

In order to evade the unfortunate implications of the results with respect to sodium, Dr. Osterhout implies that a difference between the 'control' and 'ammonia' groups which, on the data given, is clearly significant, is after all not real. This difference, whether due to injury or not, is certainly in a direction not in accord with the theory and cannot be dismissed, because of the behaviour of cells (unpublished) which were not strict controls for this experiment<sup>1</sup>.

Since injury "in the summer time", even at Bermuda, to *V. macrophysa* by ammonium chloride is now acknowledged, readers will scrutinise even more carefully any crucial experiments which involve this salt, and, no doubt, demand more precise

designation than the vague terms 'summer' and 'winter', of the seasonal variations which can be tolerated and the limits of internal concentration which differentiate an 'injurious' from a 'beneficial' effect (it is stated<sup>2</sup> that injury occurs in the Bermuda material at a concentration "less than 0.3M".)

However, the major problem is not the applicability of the theory to the absorption of ammonia, or even its ability to explain the secondary effects which this substance produces on the distribution of potassium and sodium, but rather its generalisation to embrace the initial accumulation of all electrolytes, even the alkali halides.

To the discussion of the effects of external reaction, in so far as they test the theory, Dr. Osterhout contributes two observations although he does not answer the more searching criticisms. One denies that the theory derived any of its support from its undoubted ability to explain qualitatively the behaviour of cells in a medium equally acid as the sap, and the second insists that vague, unspecified "secondary" effects obscure the direct effects of external hydroxyl ion concentration which the theory demands. A theory which, already heavily weighted with hypothesis, fails to satisfy a direct test and can only be retained by resort to such vague assumptions would be better abandoned.

Clearly, one cannot conclude from the work on *Valonia* that the simple mechanism suggested will explain adequately the general facts of salt accumulation by cells<sup>3</sup>. Dr. Osterhout may dismiss the metabolic processes which accompany rapid salt accumulation in storage tissue by regarding them as abnormal chemical activity; but if so, he must also be prepared to eliminate as "abnormal" some of the most fundamental attributes of actively growing cells which, in roots and developing leaves (aquatic and otherwise), are now known to be as intimately concerned with salt accumulation as in the cut storage tissues. The theory of "thermodynamic potentials of free base" and its subsidiary hypotheses is completely inadequate as an explanation of the behaviour of any or all of these systems.

If this discussion emphasises that the problem is still an open one, it may not have been in vain.

<sup>1</sup> A. G. Jacques and W. J. V. Osterhout, *J. Gen. Phys.*, **14**, 309; 1930.

<sup>2</sup> W. C. Cooper and W. J. V. Osterhout, *J. Gen. Phys.*, **14**, 124; 1930.

<sup>3</sup> F. C. Steward, *Ann. Rev. Biochem.*, **4**, 527; 1935.

## Progress of Building Research\*

THE work of the Building Research Board embraces the products of such a wide range of industries and touches so closely upon the lives of the people that any description of its work is not only of scientific value but is also of importance to the industries directly and indirectly concerned, while at the same time the record is a serious contribution to the material side of social improvement. In this last connexion, it is interesting to note in the annual report for 1934, recently issued, that the Board's resources for research and inquiry have been

\*Department of Scientific and Industrial Research. Report of the Building Research Board, with the Report of the Director of Building Research, for the Year 1934. Pp. x+174+14 plates. (London: H.M. Stationery Office, 1935.) 3s. 6d. net.

placed at the disposal of a departmental committee appointed by the Ministry of Health to report on materials and methods of construction suitable for working-class flats.

In the search for fire-proof materials, officers of the Building Research Station have worked in close co-operation with the Fire Offices Committee in the design of the laboratory for fire resistance tests at Elstree (*NATURE*, Dec. 21, p. 996). The need for data on the transmission of sound through the fabric of a building has led to the provision at the Research Station, in conjunction with the National Physical Laboratory, of facilities for full-scale tests on floors and to the setting up of a special Sub-Committee on Sound Transmission. The problem of impact noises