suction of the gas in question through the portion of the eggshell (B-2). The passing gas is measured in an especially designed micro-gas meter (C) and a constant predetermined vacuum is maintained by an adjustable self-controlled monometer (E), operated automatically by electricity.

The volume of gas which passes through the portion of eggshell is read in cc./min./sq. cm. The data are obtained from the table of calculated and corrected values obtained after measurement of the curvature of eggshell by a special micrometric spherometer (Fig. 2).

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A METHOD FOR THE PREPARATION OF FOSSILS

IT is a common practise of paleontologists, when preparing fossil shells, to cement the specimen to be cleaned in plaster of Paris, thereby insuring rigidity and stability against the strain of cleaning. This method is particularly useful in cleaning delicate shells otherwise too fragile to allow complete freeing from their matrix. There is a distinct disadvantage, however, in the use of plaster of Paris because it forms a permanent base concealing one surface of the fossil shell from view.

While preparing Paleozoic star-fishes, echinoids and brachiopods for study, the writer found paraffine to be much more desirable than plaster of Paris as a support for the fossil during cleaning. The advantage of paraffine over plaster of Paris is its easy removability from the cleaned specimen, so that a free valve or star-fish, etc., is obtained as a result of the cleaning. After the matrix has been cleaned from one surface of the fossil, the specimen is cemented in wax poured into a box or other container, with the cleaned surface down in the wax. The matrix is then worked off the opposite surface, leaving a completely cleaned specimen embedded in the wax. For greater rigidity, the specimen and its paraffine base can be cemented in plaster. After cleaning, the plaster is broken away from the wax base and the paraffine dissolved away by xylol or cotton soaked in xylol for very delicate shells. In this way a number of Paleozoic star-fishes of all sizes have been freed completely from their matrix, and many rare and new brachiopod shells have been cleaned internally and externally.

The method has proved useful in preparing such delicate structures as the loops of the Terebratulidae. The loop is exposed on one side, then wax is poured on this exposed surface of the loop. This gives a rigid base which will allow working the matrix away from the loop from the other side. Dissolving the paraffine leaves a free loop.

In order to prevent the paraffine from softening during the cleaning, which is commonly carried out near a strong, hot light under a binocular microscope, it is frequently necessary to plunge the embedded specimen into cold water. As long as the wax is kept cool and stiff it is quite as safe a bedding medium as plaster of Paris. It is sometimes desirable to perform the entire cleaning process under water. Besides keeping the wax stiff, this has the advantage of making a strong contrast between shell and matrix.

By the above method it is possible to secure the interior of either valve of brachiopods in which both valves are in conjunction. The particular valve desired is cemented in the paraffine base. Then the valve whose interior is not wanted is ground away and cleaning of the desired valve progresses.

In making preparations such as those described above, the dental engine is very useful, but for the most delicate work against the shell, needles sharpened to a chisel edge are the best tools.

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SPECIAL ARTICLES

THE UTILIZATION OF ADSORBED IONS BY PLANTS[1]

RESTRICTED Brownian movement of ions is one of the great differences between a nutrient solution and a natural soil. In culture solutions the nutrient ions are free to move (diffusible), while in soils they are "adsorbed" on colloidal particles, fixed in crystals and thus exist under conditions of constraint.

In the study of the liberation of adsorbed ions by the plant itself it is necessary that at the outset the nutrient ions be present in adsorbed form only. Otherwise the free ions in the liquid phase could replace the adsorbed elements (ionic exchange)[2] and the problem would approach a mere nutrient solution experiment. Soybean plants were grown in systems containing but *one nutrient ion* (calcium), which for purposes of comparison was either free in solution or adsorbed on colloids or fixed in the interior of crystals.

EXPERIMENTAL METHOD

(a) *Free calcium ions in the soil solution.* Ca-acetate and $CaCl_2$ are very soluble. $CaCO_3$ furnishes Ca ions according to the CO_2 content of the system.

(b) *Adsorbed Ca ions on colloids.* Prolonged electrodialyses of soil colloids removes all free and adsorbed

[1] Missouri Agricultural Experiment Station, Journal Series No. 329.

[2] H. Jenny, *Jour. Phys. Chem.*, 36: 2217–2258, 1932.