second part of the third volume of Lacroix's well-known "Mineralogie de la France," is the announcement that the fourth and last volume is now in press. This monumental description of French minerals, the first part of which appeared in 1893, will therefore soon be complete. The present part, printed eight years after the first part of volume 3, deals largely with the carbonates, of which calcite naturally takes the largest share. Starting in with the description of the French occurrences of brucite and hydrocuprite, the nitrates are taken up (10 pages), to be followed by the carbonates. These make up the bulk of the part before us, and the volume is concluded with an appendix to the carbonates (whewellite and mellite), an appendix of twelve pages and the index to volume 3. The description of calcite extends over about 170 pages and is illustrated by 267 crystal drawings and photographs. Then follow descriptions, replete with crystal drawings, of the other rhombohedral carbonates; giobertite (magnesite), mesitite and pistomesite, siderite, dialogite (rhodocrosite), smithsonite, dolomite and ankerite. The descriptions of these rhombohedral carbonates cover nearly 250 pages, or over half the book. Of the orthorhombic carbonates the description of aragonite is very full and richly illustrated. Then follows witherite, strontianite and cerussite. A detailed description of ctypéite is given and it is evident that Lacroix still holds ctypéite as a third modification of $CaCOo_3$, distinct from calcite and aragonite, basing his determination on the optical properties. Hydrozincite, aurichalcite, malachite, dawsonite and bismuthite follow. The description of chessylite (azurite) is naturally very full, there being 56 illustrations of chessylite from the classic locality at Chessy. Descriptions of phosgenite, thermonatrite, natron, trona, nesquéhonite and hydromagnesite close the volume. In the appendix may specially be noted the descriptions of barytocalcite, bernonite of Adam (Tableau minér., 1869) identified as a variety of evansite, calcite (additional description), cristobalite and leesbergite (optically homogeneous). A page of errata to the first part of volume 3 is given.

WALDEMAR T. SCHALLER

Yorkshire Type Ammonites. Edited by S. S. BUCKMAN. Pt. I., pp. i–xii, *i–ii,* plates i–xi, and descriptions 1–8. London, William Wesley & Son. 1909. Price 3s. 3d. each part.

The Jurassic ammonites of Yorkshire to the number of about 150 species were long ago described by Young and Bird and by Martin Simpson in a number of publications issued from 1822 to 1855, with a second edition of one of Simpson's works as late as 1884. Young and Bird's descriptions were inadequate and only a part of them were accompanied by poor figures. Simpson's species were published without illustrations. Fortunately nearly all of the type specimens have been preserved and Mr. Buckman is doing paleontology a real service in the present work by publishing faithful reproductions of excellent photographs (by J. W. Tutcher) of the types. The original descriptions are reprinted and are supplemented by descriptive notes and comments by the editor, who also assigns the species to the numerous genera and families that are now recognized and contributes discussions of the genera represented.

The work will be issued in about sixteen parts, each of which will contain about twelve to sixteen plates. The published first part gives figures of eleven species belonging to the genera *Amaltheus, Uptonia, Platypleuroceras, Harpoceras, Agassiceras, Oxynoticeras, Harpoceratoides* and *Pseudolioceras.* It is evident that the work when completed will be indispensable to paleontologists who have to deal with Jurassic and especially Liassic ammonites.

T. W. STANTON

SPECIAL ARTICLES

ON THE INCREASED PERMEABILITY OF SEA URCHIN EGGS FOLLOWING FERTILIZATION

IN SCIENCE for July 22, 1910, McClendon has shown that the permeability of the egg to ions is greater after fertilization. He used an electrolytic method. We wish to set forth observations made during this summer, which indicate that the increased permeability is not confined to ions alone, and that it is more or less specific for various substances.

1. Certain intravitam stains were taken more quickly and in larger amounts by fertilized eggs than by unfertilized. *Toxopneustes* eggs, both fertilized and unfertilized, were placed in a weak solution of methylene blue for three to ten minutes. The former were always more deeply stained. The difference was striking. That this was not due to the greater oxidative activity of the fertilized eggs was shown by staining unfertilized eggs and then fertilizing part of them. These stained eggs developed normally to swimming larvæ and preserved nearly the same color as the unfertilized eggs of the same lot and treatment. Unless very deeply stained before fertilization they never approached the degree of color of eggs fertilized before being stained, both lots having been exposed to the dye for the same length of time.

It was observed that, while the mature unfertilized eggs stain faintly, immature eggs with large germinal vesicles stain even more deeply than fertilized eggs. It seems that the process of maturation leads to lessened permeability to certain substances, and it may be that fertilization restores the permeable character necessary for the exchanges lying at the basis of cell division.

The eggs behave toward the stain dahlia as toward methylene blue. Bismarck brown and neutral red, however, stain unfertilized *Toxopneustes* eggs the same as fertilized.

2. Eggs treated with hypertonic salt solution to induce parthenogenetic development, returned to sea water and then stained with methylene blue were more deeply colored than the untreated control. Great variations in stainability were found in the same lot of eggs treated as above. Those eggs which took the deepest stain were found to be the ones which divided soonest and developed best. Treatment of unfertilized eggs with weak acetic acid followed by return to sea water to induce artificial membrane formation was found also to increase the permeability of the eggs to methylene blue.

3. If fertilized and unfertilized eggs stained equally with methylene blue were placed in an Engelmann chamber and a current of hydrogen passed over them, the unfertilized became pale sooner than the fertilized. This may have been due to the less oxidizing (greater reducing) power of the former.

If after both sorts of eggs became colorless in the hydrogen, air was readmitted to the chamber, no difference could be detected in the time required by the two sorts of eggs to become blue again. We are inclined to interpret this as indicating that fertilized and unfertilized eggs are equally permeable to oxygen.

4. If a large mass of *Arbacia* eggs was fertilized in a small volume of sea water and allowed to settle, the water was always found to be slightly colored with the egg pigment. This was never observed in similar suspensions of unfertilized eggs treated in the same way except as to the addition of sperm. Some or all of the eggs on fertilization must lose pigment. Microscopic examination showed some fertilized eggs less deeply pigmented than others. This loss of pigment in fertilized eggs seems to be due to their greater permeability to their own coloring matter.

5. One[1] of us showed last year that following fertilization there was an increase in the ability of the egg to catalyze hydrogen peroxide. It was suggested that this might be due to an increase in permeability, and some experiments were detailed confirmatory to this view. The experiments tried this summer have shown that any treatment which increased the catalase action of the unfertilized egg also increased its stainability by methylene blue. We therefore believe that the greater catalytic activity of fertilized eggs is an expression of their greater permeability.

6. If weak iodine solution was added to equal amounts of fertilized and unfertilized eggs in separate dishes and starch was added a few moments later, it was found that the iodine had disappeared entirely from the sea water surrounding the unfertilized eggs, while the water surrounding the fertilized eggs still gave abundant evidence of the presence of iodine. The difference was very striking.

[1] Lyon, *Amer. Jour. of Physiol.*, XXV., p. 199, 1909.

We have not studied the matter sufficiently to hazard an explanation. The simplest working hypothesis would be that the difference observed is an expression of the greater reducing activity of the unfertilized eggs. It may be imagined, however, that the iodine is disposed of in the unfertilized eggs by the lipoids of the plasma membrane. In the fertilized eggs these lipoids may be redistributed or otherwise changed in the membrane, and this change in the lipoids may lead to the increase in permeability to certain substances. This supposition would tend to bring our iodine experiments into relation with the other observations on permeability.

E. P. LYON
L. F. SHACKELL

FISHERIES LABORATORY,
BEAUFORT, N. C.,
July 26, 1910

A PECULIAR HEAT PHENOMENON

THE phenomenon described here was discovered unexpectedly in connection with a lecture experiment on vapor pressure. An inverted barometer tube A is arranged so that the space above the mercury is filled with water and water vapor. A glass tube B surrounds the barometer and allows steam to enter at the top, surround the barometer, and pass out at the bottom. As the vapor is warmed by the steam, it increases in pressure and pushes the mercury down.

The incoming steam does not pass immediately through the tube, but works its way gradually downward, its progress being noted by the condensation on B. The mercury column follows the condensed steam line regularly until it is depressed about 12 cm., when it begins to oscillate. Thus, if B represents the lower end of the condensed steam, the oscillations take place symmetrically on either side of B between E and F, the distance EF being from 2 to 4 cm. In the meantime, the steam line progresses steadily downward; the oscillations following it closely and becoming more rapid and of less amplitude until they finally cease near the bottom of the tube.

The action is a close approach to that of a Carnot's engine. The substance goes through a complete cycle during each oscillation, absorbing heat at steam temperature and giving it out to the cold tube below B. It becomes cooled also by the work it does in expanding. It is then pushed back up the tube from below,

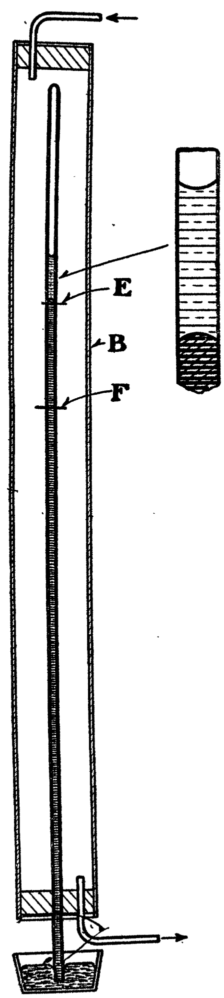

FIG. 1

its pressure being less than when expanding because its temperature is less. Therefore more work is done during expansion than contraction. The indicator diagram is probably of the form shown in Fig. 2.

The oscillations of the mercury column would tend to stop when the tube below B be-