regulated to correspond with between 0.7 and 0.9 per cent. of sodium chloride.

It is strange that the mechanism governing this vital regulation should not have been grasped before. The cells and circulating medium are saturated with colloids, and this amount of 0.7-0.9 per cent. of saline is just the amount the colloids are capable of holding in crystallo-colloidal adsorption. Any more is at once filtered away; any less, and life ceases.

There are many other applications in biology and medicine, but they cannot be treated within the compass of a letter.

BENJAMIN MOORE.

14 Frognal, Hampstead.

The Audibility of Thunder.

It has been stated that thunder is not usually heard at a greater distance than about twelve miles. This may be so during the day, but at night it can frequently be heard at a much greater distance from its point of origin. Some years ago I timed an interval between flash and sound over the sea, and found it to be more than two minutes. During the storm of September 5 last my son, Lieut. F. O. Cave, and I timed an interval by a method of counting seconds often adopted by photographers, with which method we were both familiar; one of us made it 140 seconds, the other 141 seconds. The flash was a particularly bright one; we had previously heard fainter thunder corresponding with less bright flashes, which were presumably a good deal further away.

On the night of October 1-2 a thunderstorm passed up-Channel to the south of this locality; any rainfall must have been beyond the Nab and the Warner lightships, as both lights were plainly visible: their distances are $17\frac{1}{2}$ and $16\frac{1}{2}$ miles respectively if they are in their pre-war positions. With the help of an electric clock, which moves on every half-minute, supplemented by counting seconds, I made one time-interval 120 seconds and another 170 seconds; then with a stop-watch I timed an interval of 189 seconds.

During the storm of October 1-2 the pheasants crowed much more loudly than usual, especially at the early rumbles of thunder, or else the audibility was exceptionally good; probably the latter was the case, as the night was very clear and the air in the valley from which the crowing came would have been colder than the air here, a condition which would probably be favourable for good audibility of sounds coming from the valley, though it would scarcely account for the audibility of the much more distant thunder. It may be worth noting that the false cirrus above the thunder-cloud was lit up by light reflected from the aurora which was extremely brilliant at the time.

C. J. P. CAVE.

Ditcham Park, Petersfield, October 6.

OPEN-AIR NATURAL HISTORY.¹

(1) **M**R. LOVELL'S book is the outcome of years of patient study, and will be welcome to botanists, entomologists, and bee-keepers. It deals with the inter-relations of flowers and insects, especially as regards pollination; it "treats of plants alive and in the midst of their home surroundings"; it justifies the

¹ (1) "The Flower and the Bee: Plant Life and Pollination." By John H. Lovell. Pp. xvii+286. (London: Constable and Co., Ltd., 1919.) Price 10s. 6d. net.

(2) "Insect Artizans and Their Work." By Edward Step. (Hutchinson's Nature Library.) Pp. x+318. (London: Hutchinson and Co., n.d.) Price 7s. 6d. net.

(3) "The Seashore: Its Inhabitants and How to Know Them." By F. Robson. Pp. 111. (London: Holden and Hardingham, Ltd., n.d.) Price 1s. 6d. net.

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author's prefatory remark that "the identification of a species should be regarded merely as an introduction and the beginning of a friendship long to be continued." The book is written with enthusiasm and popularly, but it is a scientific record of personal observations of great interest, and it includes some notes on modern theories which should be carefully considered. It is illustrated with conspicuously successful photographs, which have been taken on panchromatic plates to preserve in monochrome the proper colour values.

Beginning with a short historical sketch, in which tribute is paid to Sprengel, Hermann Müller, and Darwin, the author discusses wind-pollinated flowers, the rôle of hive-bees especially in relation to blue flowers, the humble-bee's favourite flowers which are mostly irregular in shape, the short-cuts taken to the nectaries, the crab-spiders which lurk in flowers and pounce on the insect-visitors, the "oligotropic" bees that rarely visit more than one kind of flower, the predominantly reddish butterfly-flowers like pinks and some Compositæ, the work of nocturnal moths in relation to flowers like evening primrose and honeysuckle, the fly-flowers like *Linnaea borealis* which is visited by the dance-fly (*Empis rufescens*), and those with nauseous odours like the carrion-flower and the skunk-cabbage, the usually injurious visits of beetles, flowers like wild roses, mulleins, and poppies which are visited for pollen, not nectar.

Mr. Lovell discusses the experimental evidence of the value of having conspicuous flowers and of colour-discrimination on the part of bees. In regard to the latter, however, the discussion is inadequate, for no experiments are conclusive that do not distinguish between colour as such and differences in intensity of illumination. A very interesting general chapter deals with the colours of flowers. Of the 4020 flowering plants in north-eastern America, the greens, whites, and yellows number 3001, while the reds, purples, and blues amount to only 1019. The latter are, on the whole, of more recent origin, and have evolved from the others, the selective agency of insects playing its part. In conclusion, the author discusses the value of bees in connection with fruit-growing, and notably in securing cross-fertilisation, the importance of which is very strongly emphasised.

The author has written a fine book on a fine subject, and his treatment should stimulate further study. We wish that he had been able to devote a special chapter to theoretical considerations, for, though he believes in the transmission of acquired characters, in the efficacy of insects as selective agents, in orthogenesis carrying plants beyond the limits of the advantageous, and in the evolutionary importance of crossing, he says tantalisingly little on these subjects. From an observer of Mr. Lovell's experience we should like to hear more.

(2) Mr. Step has written a delightful book on the industries of insects, which he arranges under headings corresponding with human occupations. He directs attention to the interesting fact that