LETTERS TO THE EDITOR.

Osteology of the cormorant.

I WOULD make a couple of corrections to the article on the osteology of the cormorant in SCIENCE for Nov. 16.

First, the occipital style is figured as pointing upwards and backwards, and is spoken of as figured *in situ* for the first time. Having made several dissections of cormorants in past years, I would suggest that the bone is the ossified tendon of some of the extensor muscles of the neck, and that it points backwards, and, if any thing, downwards, as figured by Selenka (Bronn's Thierreichs, Vögel, figs. 5, 6, pl. viii.). As drawn in SCIENCE, it would project through the skin of the nape.

Secondly, the patella is spoken of as very large and as throwing "some light on such birds as Colymbus and Podiceps, where this bone becomes anchylosed with the tibia in the adult;" and Professor Owen is referred to as authorizing this statement. Now, Professor Owen describes the patella as 'co-existing with the long rotular process in the loon' (Comp. anat., ii. 83), and figures it as distinct from the process in fig. 34, *l*. In fact, the rotular process was regarded as the anchylosed patella until the time of Nitzsch. This celebrated ornithologist pointed out the co-existence of an enormous patella and rotular process in Podiceps, and showed the true nature of the process ('Osteogr. beitr. zur nat. der vögel,' Leipzig, 1811, pp. 98–101, pl. ii., figs. 13, 14). In fact, the rotular process of the divers is exactly the same in nature as in other birds, differs only in size, and in no wise represents the *co-existing* patella. In position and function the rotular process resembles the olecranon.

J. AMORY JEFFRIES.

Sense of direction.

Professor Newcomb's paper in SCIENCE of Oct. 26 opens an exceedingly interesting, if not a very important subject. It has exacted of me a good deal of thought, and this capricious sense has been a source of no little annoyance. I should like to give a little of my experience. With me the co-ordinates almost invariably revolve 180°. When a boy, I studied geography, and when at recitation sat with my face to the north. I thus had the whole world mapped out in my mind to correspond with my proper sense of the directions. Soon after this, my father moved to a new home; and there I found, to my great annoyance, that my co-ordinates had revolved 180°. My geography was in the greatest confusion. When I began to travel, I found that the co-ordinates would change in the most unexpected manner, first one way, and then the other. I could not trust my sense of direction.

When I came to Lebanon, I found myself with my original boyhood co-ordinates. I graduated, and went back to Arkansas. Upon my return to Lebanon a few months afterwards, the directions had revolved 180°, and I found myself practically in a new town. I had to learn it all over again; and to-day, if I desire to point to the north, my hand instinctively moves towards the south. In travelling I have found it useful to trust as little as possible to the sense, and be guided by the map. In an extended tour through Europe, I was in the habit of preparing myself, before entering each city, by a careful study of its map, — noting the position of the railway-station, direction of the streets, etc. In this manner I was enabled to control the sense of direction. In only one or two instances did I fail to keep the directions right.

I make two practical suggestions: —

1. Students in geography should always sit with their faces to the north.

2. Travellers should prepare themselves, before entering a new place, by a previous subjective arrangement of the directions they are to find there.

J. I. D. HINDS.

Cumberland university, Lebanon, Tenn.

Synchronism of geological formations.

In SCIENCE of Nov. 16, weekly summary, under above heading, Professor A. Heilprin is reported as having called attention to two conclusions of Huxley's on this subject, and to have maintained, that while the first-mentioned conclusion could be logically disproved, and the second derived no confirmation from the supposed facts, the opinion of the older geologists, that geological contemporaneity is equivalent to chronological synchronism, was therefore probably correct.

Professor Huxley, in his presidential address to the Geological society for 1862, supported the conclusions called in question by reasoning, which, so far as I know, has yet to be shown to be illogical. Neither am I aware, that, during the twenty-one years which have since elapsed, geological or paleontological research has tended otherwise than to maintain the logical basis on which he then rested.

If Professor Heilprin will but do what he is reported to claim can be done, he will earn the gratitude of all other geological students by helping to settle what has proved a vexatious question for the past half-century.

E. NUGENT.

Pottstown, Nov. 22, 1883.

From superstition to humbug.

Your editorial in the Nov. 16 issue of SCIENCE might very appropriately have contained an account of the 'magnetic springs' which underlie this portion of the state of Ohio. From my residence three of these springs may be seen, at one of which a large bath-house has already been erected, where, during the present season, an average of forty patients daily tested the curative effects of the waters. These springs are found along the bank of a small creek and at the base of a valley, perhaps twenty-five feet in depth. The water, which contains less than a sixth of one per cent of iron, is brought to the surface of the ground through an *iron* gas-pipe, and "becomes so highly charged with magnetism that it will impart its properties to a knife-blade." The village of Magnetic Springs, a few miles distant, has several large hotels, all of which are so crowded with guests, that rooms must be engaged weeks in advance. Change of residence, rest, and good nursing have together effected a number of cures, all of which, of course, are ascribed to the magnetic properties of the water. Many of the guests return to their home as disappointed as the little girl, who, after drinking a glass of the water, said, 'I do not feel one particle magnified, and I think these springs are a humbug.'

E. T. NELSON.

Delaware, O., Nov. 22, 1883.

Primitive visual organs.

The notice of Dr. Sharp's communication made before the Academy of natural sciences of Philadelphia, in No. 42 of SCIENCE [397], on the habits and on the peculiar visual organs of Solen ensis and S. vagina, between and at the base of the short tentacular processes along the external edge of the distal part of the siphons of these animals, reminds me that I have observed similar habits in other marine animals, and that possibly we may infer that similar

visual cells exist in these cases. I now call to mind the cases of Ostrea and Serpula. When the former has its purplish tentacles extruded from between its valves, and the latter its crown of cirri extended from its tube, if the hand is made to move rapidly over the water in the aquarium in a strong light, so as to cast a shadow upon these organs, both these animals appear to be sensitive to the movement, and independent of any jars or vibrations. The oyster, under these circumstances, at once retracts its sensitive mantle-border; the worms, their cirri.

Upon examining the end of the siphon of Mya arenaria, lines of pigment are found about the bases of both the inner and outer circlets of tentacles, and the upper end of the siphon is pigmented for about an inch, both inside and outside. On the outside, however, there are scattered low, minute, pigmented papillae just under the epidermis and in the pigmented layer or true skin covering the siphon. The questions now arise, What is the nature of these organs? and do not the habits of Ostrea, as above described, justify us in expecting to find rudimentary end-organs on the mantles and siphons of mollusks, answering the purpose of eyes, as appears to be the case in the instance of Solen? Mya, like Solen, in life has normally the end only of the siphon exposed: and visual powers, developed to a certain degree, would therefore be useful to the animal; for, when the siphon is extended above the level of the sand, there are several fishes with mouths and teeth well suited to nip it off, and which would doubtless actually take advantage of the helpless clam, if it could not appreciate their approach.

I find fishes much more sensitive to sudden vibrations established in the water in which they live than to shrill or grave sounds made in the surrounding air near by. This may be due to special powers of perception which they may possess on account of the development of the singular end-organs of the lateral line.

The study of dermal, terminal nerve-endings, modified as more or less specialized sensory apparatuses throughout the different groups of the animal kingdom, is bound to yield many important results in the near future, in addition to what is already known; and the writer is glad that the matter has been taken up by such competent hands. JOHN A. RYDER.

Nov. 27, 1883.

Probable occurrence of the Taconian system in Cuba.

Last year, while making two excursions across the mountains of eastern Cuba, between Baracoa and the southern coast, I had an opportunity to make some observations on the geological structure of these mountains. The rocks composing this end of Cuba fall naturally into three distinct groups, as follows: 1. Ancient, and for the most part coarsely crystalline, basic eruptive rocks; 2. Older stratified rocks, slates, schists, and limestones; 3. The post-tertiary limestones or elevated coral-reefs.

The eruptive rocks form the main mass of the mountains at most points. They appear on the shore in some places, and seem to be almost the only rocks found at greater distances than five or ten miles from the coast. The older stratified rocks occur principally in two irregular belts running parallel with the coasts, and lying one on either side of the great eruptive belt: hence they are found mainly on the flanks of the mountains. The stratified rocks, especially along their contact with the eruptives, are penetrated by numerous irregular masses and dikes of the latter. But that they are all older than all the eruptives is improbable, since the eruptives are themselves evidently of several distinct ages.

So far as I have observed, the stratified rocks are all alike unfossiliferous; and in consequence the precise determination of their stratigraphic positions is a difficult problem. I am satisfied, however, that some of them are widely separated in time. The newer beds, consisting chiefly of fissile slates, soft sandstones, and impure earthy limestones, are probably equivalent to the secondary and tertiary strata of San Domingo and Jamaica. These uncrystalline sediments occur chiefly on the northern slope of the mountains, and, although much disturbed and undulating, rarely exhibit high dips.

But on the south side of the dividing-ridge, or summit, I crossed a belt six to eight miles wide, reaching almost to the coast, of highly inclined crystalline schists. The stratification is usually distinct, the strike being parallel with the coast, or east-west. The schists are generally greenish, and are both hydromicaceous and chloritic. Associated with the schists are several immense beds of white crystalline limestone. The limestone undoubtedly belongs to the same series as the schists, and is often micaceous.

These rocks bear a strong resemblance to the Taconian system of western New England, and are essentially identical with the great series of semi-crystalline schists and limestones of Trinidad and the Spanish Main which I have elsewhere correlated with the Taconian.

The published reports on the geology of San Domingo and Jamaica show that the geologic structure of those islands is essentially similar to that of eastern Cuba. In each case there is a prominent axis of old eruptive rocks, flanked on either side by schists, slates, limestones, and other sedimentary formations, and by elevated coral-reefs. In San Domingo and Jamaica the eruptives are not wholly basic, but much granite occurs; and the metamorphic schists, which appear to be similar to those of Cuba, have been generally confounded with the cretaceous beds. I predict, however, that more careful study will show that they are distinct and vastly older, and that the Greater Antilles are similar in composition and structure to the southern coast of the Caribbean Sea, including the Spanish Main and Trinidad, except that the coral-reefs and the eruptive rocks are wanting in the latter region. We owe the coral-reefs largely to the great vertical movements of the Greater Antilles in recent times; and the eruptive rocks are but a continuation westward, and the older and more eroded portion, of the great Caribbee belt of volcanic rocks which begins a hundred miles north of Trinidad, and ends in Cuba, being about fifteen hundred miles long.

W. O. CROSBY.

THE RESTORATION OF ANCIENT TEMPLES.

The Parthenon: an essay on the mode by which light was introduced into Greek and Roman temples. By JAMES FERGUSSON, C.L.E., D.C.L., LL.D., etc. London, *Murray*, 1883. 8+135 p., 60 illustr., 4 pl. 4°.

ONLY a small portion of this book is devoted to the wonderful edifice from which it is named. It is in the main a reiteration of peculiar views concerning the lighting of ancient temples, — an amplification of theories advocated thirty-