inflicted by the teeth of this lizard? Here in America the evidence would seem to be rapidly leading to the demonstration of the now entertained theory that the saliva of this heretofore much-dreaded reptile is possibly almost entirely innocuous. If it be proven, it is unnecessary to add that it leaves the great order *Lacertilia*, in so far as our present acquaintance goes with it, without a single representative possessed of the power of inflicting a venomous wound by the means of its bite.

R. W. SHUFELDT.

Smithsonian Institution, February 24.

The Recession of the Niagara Gorge.

BEFORE the survey of 1842, the only data for estimating the rate of recession of the Niagara Gorge were the observations of the people of the neighbourhood. Mr. Bakewell, in 1829, "was informed by Mr. Forsyth, the proprietor of the Pavilion Hotel on the Canada side, that during his residence of forty years the Falls had receded forty yards" (*American Journal of Science*, May 1857, p. 85). It is well-known that Sir Chas. Lyell, at the time of his visit to the Falls, came to the conclusion that the rate of recession was not over one foot a year. He based his estimate upon the statement of his guide, that between 1815 and 1841 the American Fall had receded forty feet. Modern investigators, basing their calculations on the surveys of 1842, 1875, and 1883, estimate the recession of the Canadian Fall at from three to five feet per year, and the age of the gorge from seven to ten thousand years (see Mr. Wesson's article in *NATURE*, vol. xxxii. p. 229; and Prof. Wright's "Ice Age in North America," p. 452 *seq.*). A recent American publication, "The Journal of William Maclay," a member of the Senate in the first Congress, 1789-91, brings to light the result of local observation of the recession of the Falls for the thirty years previous to the beginning of Forsyth's observations, which have generally been cited as the earliest. The passage in Maclay's journal reads:—"February 1st [1790]. . . . Mr. Ellicott's accounts of Niagara Falls are amazing indeed. I communicated to him my scheme of an attempt to account for the age of the world, or at least to fix the period when the water began to cut the ledge of rock over which it falls. The distance from the present pitch to where the Falls originally were, is now seven miles. For this space a tremendous channel is cut in a solid limestone rock, in all parts one hundred and fifty feet deep, but near two hundred and fifty at the mouth, or part where the attrition began. People who have known the place since Sir William Johnson took possession of it, about thirty years ago, give out that there is an attrition of twenty feet in that time. Now, if 20 feet = 30 years = 7 miles, or 36,960 feet; answer, 55,440 years." In view of the fact that since 1842 the rate of recession has varied widely, this earlier testimony, so far as it can be relied upon, is especially interesting. It is possible that the observation related to the American Falls, as did that of Sir Chas. Lyell's guide; but there is nothing to indicate it, except that this is about the present rate of recession of the American Fall as calculated by Mr. Wesson. The intelligent attitude and fertile scientific suggestion of Senator Maclay are very remarkable in 1790. It will be remembered that Hutton's "Theory of the Earth" was not published separately till 1795. Maclay seems to have anticipated men of science by many years in proposing to use the recession of the gorge as a scale for measuring geological time. Perhaps even more noteworthy is the unconcern with which he sets down his conclusion that the gorge was over 55,000 years old, at a time when geology was still confined by the narrow and seemingly impassable limits of traditional Biblical chronology. Maclay's informant, Ellicott, was a Government surveyor, and, according to the account of his life in Appleton's "Cyclopedia of American Biography," "he was selected by Washington in 1789 to survey the land lying between Pennsylvania and Lake Erie, and during that year he made the first accurate measurement of the Niagara river from lake to lake, with the height of the falls and the descent of the rapids." This early survey seems entirely unknown to geologists, who all refer to Hall's of 1842 as the first. Ellicott was a man of considerable attainments, a professor in West Point from 1808 to 1820, and the correspondent of European learned societies. He left some published writings, and works still in manuscript. Cannot the data of this survey of a century ago be found? If it proved a careful one, it would double the period of scientific observation of the recession of the gorge, and increase the certainty of any generalization. The map of Evershed's survey of 1883 was published in *Science*,

vol. v. p. 398. In *NATURE*, vol. xxxii. p. 244, Mr. Garbett quotes some interesting observations from the *Gentleman's Magazine*, January 1751, from Kalm's description of the Falls as seen shortly before. Mr. Garbett tries to identify an island that Kalm mentions as intersecting the Falls as Luna Islet. This would give a definite point for calculation. It seems to me that an attempt to test Mr. Garbett's conjecture by the Evershed map must show that it is untenable. If I have understood him, and correctly measured in accordance with his suggestions, the recession of the Canadian Falls will have been about half a mile in the 133 years, or about twenty feet a year. Notwithstanding Kalm's small dimensions, I think he meant Goat Island, for he says the island lies parallel with the river, and Luna Islet prolonged would lie almost at right angles to the river at its lower end.

EDWARD G. BOURNE.

Adelbert College, Cleveland, March 5.

Modern Views of Electricity.

I WILL reply to the last paragraph of Dr. Lodge's letter in *NATURE* of March 19 (p. 463) in his own language. I have no objection to contemplate a piece of isolated zinc surrounded by straining oxygen atoms, each negatively charged. And on the hypothesis that such atoms exist, I have no difficulty in realizing the depression of potential of the zinc, nor do I fail to appreciate the momentary transfer of electricity accompanying the sudden approach of the crowd of oxygen atoms when contact is made between the zinc and copper.

If we assume that atoms of oxygen have a negative charge, and if we further assume that, whether or not actual chemical combination takes place, they are attracted by zinc, and in a less degree by copper, then I admit that we have, on Dr. Lodge's principles, a consistent explanation of certain facts, viz. that, in an oxidizing medium at zero potential, isolated zinc has potential -1.8 volts, and isolated copper has potential -0.8 volt, and that, when metallic contact is made between them, both assume a common potential -1.3 volts. So far I understand, and with only slight modification can accept, the theory developed in "Modern Views."

But I cannot, on this hypothesis, account for the slope of potential assumed (p. 111) to explain the aluminium needle experiment. Suppose the zinc and its contiguous air film to be exactly inclosed by a surface S. There is then within S an excess of negative electricity. Dr. Lodge says it is wholly on the oxygen atoms within the film, and not on the zinc—which statement I accept. Then, at every point in external space we have lines of force converging towards S, as to any negatively charged body—that is, a slope of potential downwards towards S, and at all points not too distant this will be appreciable. When contact is made with the copper, the excess of negative electricity within S is diminished, and the slope of potential at any external point is diminished in the same proportion.

Another, and, I think, quite distinct view which Dr. Lodge seems disposed to entertain is, that the atoms (or molecules) of oxygen within the air film on the surface of the zinc, without having any actual charge, are polarized—that is, have one pole positively and the other negatively charged, and present the negative pole to the zinc. So that the zinc is inclosed in a shell exactly analogous, *mutatis mutandis*, to a closed magnetic shell with its negative face inwards. I admit that such an arrangement, could it exist, would possess the properties attributed by Dr. Lodge to the air film. It would have no influence at any external point, and would give a negative potential to the inclosed zinc. But a difficulty arises *in limine*. To polarize the atoms in this manner, or to arrange them in this manner if independently polarized, requires work to be done. And from what source is the energy derived, no actual combination taking place between the atoms in question and the zinc?

S. H. BURBURY.

Mud Glaciers of Cromer.

BETWEEN Cromer and Trimmingham, it is well known, the cliffs are largely made up of boulder clay and chalky loam, in the contorted drift. The lower part is, generally speaking, composed of more compact boulder clay, while the upper portion, sand and loam, is eroded backwards more rapidly by constant slipping; this slacks by the action of rain and springs, and becomes a feeding-ground for a number of mud-streams, which creep down the gulleys or fall as mud-avalanches over the

cliffs of the more resistant boulder clay below. This coalesces, and forms mud glaciers, and flows outwards upon the sands. The ends spread out, and assume the convex form usual with ordinary glaciers. The edges are crevassed longitudinally by being stretched open by the more rapid central currents, while the centre is well crevassed in the process of fanning out. The largest stream measured 60 feet across the fan, where it would be about 12 feet deep as far as exposed above the sands, for it sinks some distance into it, with a front of 6 feet.

Its slow advance causes the sand upon the shore in front to pucker into folds or convolutions, which crack, and large flakes or cakes of sand are pushed forwards in a slanting direction over those in front.

Every tide obliterates these marks and inequalities, but the distance the flanges of these flakes overlap between each tide indicates a movement of about 5 or 6 inches every twenty-four hours.

Here we have no fracture and regelation, or molecular disturbance in the exact sense of ice movement, yet the forms and currents are so similar, that with a slight covering of snow it would be difficult or impossible to detect any difference between mud and ordinary ice streams.

The convolutions and overlapping of the sands in front may not be without its value when studying the forms of the contorted drift, where folding is frequent, and the sliding of one bed over another apparent from the frequent repetition of the same bed in a vertical section. The slanting and concentric laminæ so frequently seen in our boulder clays, inclosing beds of stratified sands and gravels, may also, in some cases, be explained by the running down and overspreading of reconstructed boulder clay in a similar way to the mud-streams of Cromer, where it can be seen now in progress.

Sutton Coldfield.

WILLIAM SHERWOOD.

On Frozen Fish.

DURING the last few weeks there have appeared in NATURE several letters containing extraordinary statements of the vitality of fish that have been frozen in ice. I have just found in a quaint old book—the "Anatomy of Sleep"—two further statements on this subject, and have therefore extracted them, thinking that they might prove of interest to readers of NATURE. The first statement is quoted by the author (Dr. Binns) from Franklin's "Journey to the Polar Seas," p. 248:—"The fish froze as fast as they were taken out of the net, and in a short time became a solid mass of ice; and, by a blow or two of the hatchet, were easily split open, when the intestines might be removed in one lump. If, in the completely frozen state, they were thawed before the fire, they recovered their animation. We have seen a carp recover so far as to hop about with much vigour, after it had been frozen six-and-thirty hours."

The second statement is quoted from Isaak Walton ("Complete Angler," p. 257), who "quotes Gessner for the fact of some large breams being put into a pond, which was frozen the next winter into one mass of ice, so that not one could be found, and all swimming about again when the pond thawed in the spring," which phenomenon seemed to Walton "a thing almost as incredible as the resurrection of an atheist."

Dr. Binns further quotes, from the *Quarterly Review*, a statement which goes to show that *mosquitos* have been frozen on to the surface of a lake in the evening, and thawed again by the morning sun into animation. I should like, therefore, to inquire, firstly, whether there are any records of cold-blooded vertebrates other than fish being thus frozen and recovered to life; secondly, whether any such thing is known of the invertebrates, such as Mollusca, Echinodermata, and Vermes; and thirdly, whether this reported freezing and subsequent recovery of insects can be confirmed? In connection with this last class, I ought perhaps to mention that caterpillars have, I believe, been reported to recover animation after being frozen.

March 27.

F. H. PERRY COSTE.

On the Presence of a Sternum in *Notidanus indicus*.

I HAVE just found that the omosternum of *Notidanus*, described by me in a recent number of NATURE (vol. xliii. p. 142), was originally described by my friend Prof. W. A. Haswell, of Sydney, who, in his paper "Studies on the Elasmobranch Skeleton" (Proc. Linn. Soc. N.S.W., vol. ix., 1884), has the following passage:—

"The shoulder-girdle is remarkable for the presence in the middle ventral line of a distinct four-sided lozenge-shaped car-

NO. 1118, VOL. 43]

tilage let in to the arch, as it were, in front. This is a condition which I have not observed or seen described in any other form; it does not seem to occur either in *Heptanchus cinereus* or in *Henanichus griseus*. The intercepted cartilage is temptingly like a presternal, but the absence of such an element in any group nearer than the Amphibia seems to preclude this explanation."

Dr. Haswell gives no figure of the shoulder-girdle, but from the above description it would appear that the post-omosternum was absent in his specimen.

T. JEFFERY PARKER.

Dunedin, N.Z., January 27.

Cackling of Hens.

I HAVE recently published the following letter in the *Field*; but not having so far received any answer to the question which it presents, I should like to republish it in your columns, in order to ascertain whether any ornithologists to whom I have not already applied may have any information to give upon the subject.

GEORGE J. ROMANES.

Christ Church, Oxford, March 28.

Cackling of the Hens of Jungle Fowl.

"Can any of your readers inform me whether or not the hens of the wild jungle fowl (*Gallus bankiva*) cackle after laying their eggs, in the manner of their domesticated descendants? I cannot find any literature upon the subject; but if wild hens do cackle in the jungle, surely somebody must have heard them. Mr. A. P. Bartlett informs me that, when confined in shrubberies of the Zoological Gardens, they do not cackle; and, therefore, if nobody has ever heard them do so in a state of nature, we may fairly infer that the instinct is a product of domestication. If this should turn out to be the case, it would be a somewhat remarkable fact, and would, moreover, lead to the further question whether there are any parts of the world where domesticated poultry do not cackle."

Wood's Holl Biological Lectures.

A REVIEW of some lectures given by American naturalists at the Wood's Holl Laboratory appeared in your columns on March 19 (p. 457), signed with the initials "R. L." As there are statements made in that review for which I should much regret to be held responsible, I beg you to allow me to prevent any mistake which might arise from the similarity of the reviewer's initials to my own, and to state that the review was not written by me.

E. RAY LANKESTER.

Bembridge, I.W., March 30.

New Comet.

AT 9 p.m. on Monday, March 30, I picked up a bright, round nebulous object in Andromeda which I could not identify. I soon found it in rapid motion to the south, and its cometary nature was therefore placed beyond a doubt.

The position of the object is approximately R.A. 14°, Decl. 43° north, and its motion is carrying it quickly towards the sun, so that it becomes important it should be immediately observed for place and its orbit computed. It will probably disappear in two or three weeks.

At 4.30 on the morning of Tuesday, March 31, the new comet was very distinctly visible, though the gibbous moon was shining brightly at the time.

At the end of the present week the comet will be near β Andromedæ, and a little sweeping in the region of this star will almost certainly reveal it, for it is too conspicuous to be overlooked even in a comparatively small telescope.

Bristol, March 31.

W. F. DENNING.

THE ASTRONOMICAL CONGRESS.

OUR readers will be glad to know that the invitations issued by Admiral Mouchez to the Directors of the various Observatories interested in prosecuting the photographic chart of the heavens have met with a very ready response. It is confidently expected that this Congress will be the last that will be found necessary, and before the astronomers have separated it is hoped that the scheme will have received its final shape, and that no important detail will have escaped attention.

The English contingent is represented by the Astronomer-Royal, Dr. Gill from the Cape of Good Hope, Mr. Plummer from Oxford, Captain Abney, and Mr.