

which will amply repay the technologist who consults it.

In conclusion we may add that this little book, though far from being "complete," or exhaustive of any one subject it treats of, is yet compiled with great care and discrimination by the Editor, and will be found of much value by those unable to consult larger treatises or original papers.

C. G.

*Il Potenziale Elettrico nell' Insegnamento Elementare della Elettrostatica.* Per A. Serpieri, Prof. di Fisica nella Università e nel Liceo Raffaello di Urbino. (Milano, 1882.)

THIS treatise is an elementary exposition of the theory of the Potential in its application to Electrostatical Phenomena. It is founded, as we learn from the preface, on the author's lectures at the Raphael Lyceum of Urbino; and is intended for the use of the Lyceums and Technical institutes of Italy. It is well known to all who interest themselves in such matters that a promising young school of physicists has recently been springing up in Italy, and that those who wish to be abreast of their time can no longer neglect the Italian scientific literature. If the treatise of Prof. Serpieri may be taken as a fair specimen of the scientific instruction given in the secondary schools of Italy, it is clear that this harvest of physicists is due in no small degree to careful sowing.

The work deserves its title of Elementary, inasmuch as nothing is demanded of the student beyond a knowledge of elementary geometry and algebra, and a slight acquaintance with trigonometry. The author is mistaken, however, in supposing that an elementary treatment of electrical theory has not hitherto been attempted; for the English work of Cumming, published some six years ago, is almost identical in its aims with his own. Although Cumming's treatise is an excellent one in many ways, we cannot help thinking that the Italian one is better fitted for the purposes of elementary instruction. Prof. Serpieri appears to us to have happily kept the middle way alike between poverty and redundancy of matter, and between excess of mathematical and excess of merely experimental detail.

In the first four chapters are developed the relation between potential and charge, and the theory of lines of force and equipotential surfaces. The fifth, sixth, and seventh chapters contain the theory of capacity, of electrostatic induction, and of the measure of potential. The eighth chapter contains a short sketch of the centimetre-gramme-second system of units, now universally adopted in accordance with the decision of the Electrical Congress at Paris; farther details on this all-important matter are given in one of the appendices, and a considerable number of numerical examples is provided to familiarise the student with the practical use of the system. The last seven chapters are devoted to the theory of condensers. Not only is the theory explained in a simple and interesting way, but abundance of experimental results and numerical illustrations are given to enable the learner to judge how far the mathematical theory represents the actual facts. The account of the experiments of Villari on the heat developed in the electric spark under various circumstances is interesting, and would probably be new to most English readers.

The main fault we have to find with Prof. Serpieri's work is that he has a tendency to cite second-hand authorities where it would have been quite as easy, more instructive for his youthful readers, and *more just* to give the original sources. Again, why of all the results concerning specific inductive capacity should he quote (p. 69) those of Gordon only, which have been precisely the most questioned, and why on the same page should the results of Boltzmann for the specific inductive capacity of gases not be coupled with the name of their author?

## LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

### Hovering of Birds

IN your last number I observe an interesting letter on the "Hovering of Birds," by Mr. Hubert Airy. In that letter he refers to an opinion which I have expressed, that this "hovering" cannot be accounted for by the mere supporting agency of an upward current of air. The writer quotes this opinion as it was expressed in a letter to you (*NATURE*, vol. x. p. 262). But he does not seem to have read the fuller explanation which I have given on this subject in Chapter III. of the "Reign of Law." To that chapter I must refer your correspondent for an explanation, which shows that hovering can be, and is perpetually accomplished under the ordinary conditions of horizontal currents of air. It is very commonly performed (especially) by the whole tribe of Terns, or sea-swallows, over the surface of the sea, where there are no hills or mountains to deflect aerial currents from the usual horizontal course.

Mr. Airy himself uses words which indicate that this agency of upward currents is quite superfluous. He says: "It is easy to see that a bird, with the exquisite muscular sense that every act of flight demands and denotes, might so adapt the balance of its body, and the slope of its wing-surface to the wind, as to remain motionless in relation to the earth." He prefaces these words by these others: "given such a slant upward current." But no such "gift" is needed. The bird has only to slope his wing-surfaces to the current, and precisely the same effect is produced as if the current had been otherwise "sloped" upwards against a horizontal wing-surface. Mr. Airy's own letter contains an excellent explanation of this correspondence.

Cannes, France, January 29

ARGYLL

WITH respect to Mr. Hubert Airy's interesting note (vol. xxvii. p. 294), I beg to say that I have very often seen the kestrel hovering over the perfectly level meadows of Middlesex with obvious ease, where no undulation of the ground could possibly affect the currents of air. Of the twelve instances Mr. Airy enumerates, I see only six refer to hawks (species undetermined), so this fact must be taken into consideration; the conduct of rooks and crows under such circumstances seems to me to come under quite a different category from that of hawks, and in some instances gulls, thus "prospecting" for their prey. Mr. Airy does not ignore this aspect of the question, but I think that by confusing objective with subjective "hovering" he complicates his theory.

HENRY T. WHARTON

39, St. George's Road, Kilburn, N.W., January 27

### Action of Light on India-rubber

IT may be in the recollection of some of your readers, that in 1876 I pointed out that the deterioration of ebonite surfaces was due to the combined action of light and air. Some time afterwards it was remarked to me that our laboratory (an old greenhouse) was too light, and as a result all our india-rubber tubes would rapidly deteriorate. This led me to submit some pieces of ordinary black india-rubber to the same treatment as the ebonite in the former experiments. On October 11, 1879, four pieces of caoutchouc connector of 5 mm. internal diameter were taken, two were placed in test-tubes plugged with cotton-wool, and the remaining two inclosed in hermetically sealed tubes. One of the sealed tubes, and one of those plugged with cotton wool were placed in a dark drawer, and the other pair in the laboratory window, with a north aspect, and in such a position that they were not under the influence of direct sunlight in the summer. To-day the specimens were examined. Both the sealed tubes were found to be slightly moist inside, and on opening them an organic odour, like that of an india-rubber shop, was perceived. The caoutchouc which had been exposed to air and light, was covered with a thin brown coating, and on being bent this coating cracked; the end which had been most exposed to the light was rather brittle, and could not be stretched

without splitting. The other three specimens were unaltered. All four specimens were slightly acid to test paper, but the quantity of acid was too small to be determined.

Mareck (*Chem. News*, xlvii. 25, from *Zeitschr. für Anal. Chem.* xxi.), has lately recommended the preservation of caoutchouc tubes, by keeping them in water when not in use. This is, no doubt, efficacious in consequence of the exclusion of air.

Cooper's Hill, January 22

HERBERT MCLEOD

#### A Possible Cause of the Extinction of the Horses of the Post-Tertiary

A TRAVELLER in the Park region of northern Colorado, and the central portion of Wyoming, fifteen years ago, could not fail to notice the immense numbers of skulls and other bones of bison in districts at that time no longer frequented by these animals. Scattered specimens were to be seen in all directions, some of them bearing marks of bullet and knife which left no doubt as to the agent of destruction. Others were to be found in numbers in localities which suggested that they had been surprised by death while seeking shelter from the weather rather than the human destroyer. In such cases, tumbled and mixed by the scavengers, they were thickly strewn over small areas, and the contour of the surface often was such as to bring them closer together with the movement of water or soil. When asked the cause of the wholesale slaughter, the reply of the natives was almost invariably "the hunters killed a great many, but the most died in the deep snow and cold weather some twenty-five years ago."

The great losses experienced by the cattle men of the Medicine Bow and Elk Mountain region, only a couple of winters ago, are too recent to have been forgotten. The next spring and summer the unfortunate owner found the carcasses of his cattle in positions similar to those occupied by the bands of bison. In small parties they had huddled in sheltered basins or nooks, and some, upheld by the snow through the winter, were still on their feet. Since then these "bone yards" have become similar in appearance to those of earlier date.

Last summer the kindness of Prof. Agassiz enabled me to make some discoveries in the Mauvaises Terres of the eastern slope of the Rocky Mountains which vividly brought to mind the pockets full of recent skeletons. Sections in the Post-Tertiary beds here and there disclosed groups or herds of fossil horses (*Equus*) in circumstances so similar as to leave no alternative to the conclusion that the same causes had filled the bone basins in the olden and in most recent time.

Stripped of the strata above them, the contour of the surface would have been similar, and the old-time Coyotes in their feasting had evidently brought about an equal amount of confusion in the remains. About the time of the deposition of these fossils the horses became extinct. *Why* is still an open question. Such evidence as was gathered there has led to the belief that, in that region at least, occasional "cold waves" of days—perhaps weeks in duration, which deep snows caused, or were the principal causes of the extermination of the horses. Other causes that may be suggested are these: lack of water, and an extended glacial period. A consideration of the character of the deposits, the drainage of the mountains at the time, the absence in these beds of proof of a glacial period affecting them since, and the continued existence in the same locality of other creatures, somewhat less sensitive to the cold, would seem to be sufficient objections to their acceptance. The tradition of the Indians, that there is a winter of terrible destruction to the animals once or twice in the lifetime of a man—say once in about forty years—appears to be confirmed by the testimony of the whites. A few degrees or a few days added to the measure of the "wave," or "blizzard," and a few inches added to the depth of the snow would suffice to sweep the herds from the pastures. Weather of this character is a possibility every winter in the Bad Lands, though we hardly expect it. Apparently the rocks contain evidence of such weather in post-Tertiary times. And it may not have differed so very much from that we are having to-day.

S. GARMAN

Cambridge, Mass., U.S., January 12

#### Suicide of Scorpions

SPEAKING of scorpion suicide, Mr. G. J. Romanes in his "Animal Intelligence" writes: "Still I think that so remarkable

a fact unquestionably demands further corroboration before we shall be justified in accepting it unreservedly" (p. 225). Some years ago I made some experiments and observations on a smaller and a larger species of scorpion found on the Cape Peninsula. I am unable to ascertain the specific names; the smaller are found beneath the bark of decaying tree-stumps, the larger, which often weigh upwards of seventy grains, are found beneath stones and ant-balls. I have recently resumed these experiments and observations. The conclusion I come to is that neither of these species have any suicidal instinct. Only in one case have I found, after death, any sign of such a wound as the sting might inflict; in this case, though one of the tergal plates showed a large irregular fracture, the wound did not seem a fresh one, and was dry and apparently skinned over; in this case, too, though I watched the death of the scorpion (caused by the gradual application of heat to the bottom of the glass vessel in which the creature was inclosed), I was not able to detect anything like the act of suicide. I will now briefly describe the nature of my experiments.

1. Condensing a sun-beam on varicous parts of the scorpion's body. The creatures always struck with the sting round, across, and over the heated spot, and seemed to try and remove the source of irritation.

2. Heating in a glass bottle. As this admits of most careful watching, I have killed some twenty or thirty individuals in this way. The creatures very commonly pass the sting over the body as if to remove some irritant. The poison exudes from the point of the sting and there coagulates.

3. Surrounding with fire or red hot embers. I first took a newspaper, moistened a ring about a foot in diameter with alcohol, and placed a scorpion within the ring. The paper was, by this time, ignited. He walked without hesitation through the fire, and tried to make his escape. I made a ring of red-hot wood-embers, and placed a scorpion in the middle. He pushed his way out, displacing two of the embers. I made a better fire-wall, and put him in the middle again. He crept over the embers. I placed him in the midst of a ring of embers on the flat and much-heated stones of the fire-place. He crept over the embers again, but this time got baked before he could escape.

4. Placing in burning alcohol. I placed a layer of an eighth of an inch of alcohol in a shallow vessel, lit the alcohol, and placed the scorpion in the midst of the burning spirit.

5. Placing in concentrated sulphuric acid. I moistened the bottom of a large beaker with a very thin layer of concentrated sulphuric acid, and put in a scorpion. The creature died in about ten minutes. (I have also tried other strong acids, a concentrated solution of sodium hydrate, and a potassium cyanide solution.)

6. Burning phosphorus on the creature's body. I placed a small pellet of phosphorus near the root of the scorpion's tail, and lit the phosphorus with a touch of a heated wire. The creature tried to remove the phosphorus with its sting, carrying away some of the burning material.

7. Drowning in water, alcohol, and ether.

8. Placing in a bottle with a piece of cotton-wool moistened with benzene.

9. Exposing to sudden light. I have not tried special experiments as to this point, but have, on turning over an ant-ball, suddenly exposed a scorpion, hitherto in complete or almost complete darkness, to the full glare of South African sunshine.

10. Treating with a series of electric shocks.

11. General and exasperating courses of worry.

I think it will be admitted that some of these experiments were sufficiently barbarous (the sixth is positively sickening) to induce any scorpion who had the slightest suicidal tendency to find relief in self destruction. I have in all cases repeated the experiments on several individuals. I have in nearly all cases examined the dead scorpion with a lens. My belief is that the efforts made by the scorpion to remove the source of irritation are put down by those who are not accustomed to accurate observation as efforts at self-destruction. On one occasion I called in one of my servants to watch the death of a scorpion by gradually heating it in a glass bottle. The creature at once began moving its sting across and over its back, upon which my servant exclaimed, "See it is stinging itself." I do not wish to imply that all the cases of alleged scorpion suicide are merely instances of careless observation. All I wish to do in this note is to record my individual experience, and to state clearly that after making a series of observations as carefully as I could