

Upon the whole, however, we have ended by reaching a much more satisfactory state of agreement than seemed possible when we began. For Prof. Lankester now says he deems it "certain that some cases must sometimes occur in which the selection-mean is larger than the birth-mean," and that as regards such cases I have his "full concurrence in stating that the cessation of selection leads to dwindling." And as he previously agreed that cessation of selection leads also to a loss of shape and disintegration of structure, the only question that remains between us is as to whether there are any cases in which completely developed organs cease to present variations of size below the standard of full efficiency, and therefore will remain unaffected by the withdrawal of the selection by which they were evolved. But this is a question which does not vitally affect the *principle* of panmixia; and it only remains to add that I do fully "reciprocate" what he has said as to there being "no ill-feeling between us."

GEORGE J. ROMANES.

Photo-electric Impulsion Cells.

BEFORE publishing in detail the results of many experiments on the generation of electricity by the action of light falling on certain sensitive substances, I wish to make known a result which seems to be of a most remarkable character.

In this communication I shall give merely enough information to enable a reader to understand the special result which I desire now to make known.

The photo-electric cell which I employ consists of a small glass tube, represented in the figure, filled with an alcohol; two metallic plates, P and Q, are immersed in the liquid; each

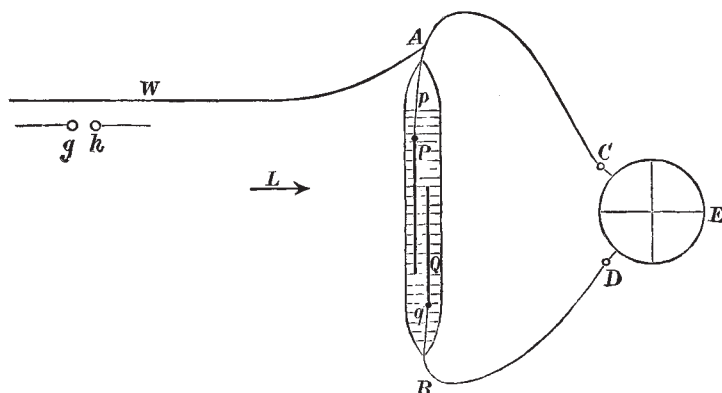


plate is connected with a platinum wire which may either be soldered to the plate or passed through a small hole in the plate and pinched tightly to it; these wires pass through the ends of the glass tube and are sealed into it. The poles of the cell are A, B, and these are connected with the poles of a quadrant electrometer (Clifton's form of Thomson's).

The plate P is sensitized by a peculiar process, the mere publication of the details of which would not enable a reader to make it successfully. The publication of the process is therefore reserved for a future occasion. The plate Q is quite clean—not sensitized to light. The cell is fixed vertically in a clamp (not represented in the figure). When the cell is of the "impulsion" kind, what happens is as follows. Daylight (represented by the arrow L) being allowed to fall on the sensitive plate P, the spot on the scale of the electrometer moves, and after a few seconds comes to rest, indicating an electromotive force varying with the intensity of the light, its amount for such diffused daylight as we have at present (May 10) at noon being between $\frac{1}{2}$ a volt and $\frac{3}{4}$ of a volt—which is, I submit, a surprisingly great magnitude. On the withdrawal of the light, the deflection falls, and there are means of rapidly getting rid of the deflection without injury to the cell. Either before or after this deflection caused by light ceases, let a slight tap (sometimes inaudible) be given to the base or clamp in which the cell rests, and then results a remarkable change in the cell. *It is no longer sensitive to light.* This insensitive state is indicated by a rapid return motion of the spot on the scale; it is merely indicated by this motion, there being no necessary connection between this motion and the insensitive state, for if the cell were now left for some time

(perhaps an hour or so) in the dark, the disturbing E.M.F. of the cell would vanish, and there would be nothing to tell us that the cell remains insensitive; but that it is really still in the insensitive state we find at once on again exposing it to light. Another gentle tap given to the clamp, or the stone table on which the whole apparatus rests, will restore the sensitive state; and so on indefinitely, the sensitive and insensitive states following each other and being produced, in the case of many such cells, with great ease.

These results I found a long time ago, and they have been seen by or communicated to several scientific friends. From the first, I maintained that the results are due to an alteration of the molecular state of the sensitive surface, or of the layer of contact of this surface with the liquid, and that in one arrangement of the molecules the light energy can be taken up electrically, while it cannot be so taken up in the other. In my first experiments the plates were tightly pinched to the platinum wires—not soldered, as soldering endangered the sensitive layer—and the obvious objection was made that "loose contacts" were unsatisfactory. I have several results, however, which dispose of this objection even in the case of very loose contacts; but I may set the matter at rest by saying that I have been able to make soldered junctions, and with them to obtain the results.

I now come to the special point which is the occasion of this communication. A few days ago I was investigating the effect of static charges communicated to the plates on the sensitive and insensitive states, and in the course of these experiments I found that if a Voss machine, not in any way connected with the cell or the electrometer, was worked in the room while the cell was in the insensitive state, the moment a spark passed between the poles of the Voss, the insensitive state was altered to the sensitive, whether the cell was connected with the electrometer or not. Finally, I found that the best method of showing the inductive effect of the spark is to connect an insulated wire, W, apparently of any length, to either pole (A in the figure) of the cell, and to place the poles, g, h, of the Voss near the wire (a distance of several feet will do with a spark about half an inch long). If g and h are two or three feet from any part of the wire W, a spark about one-eighth of an inch long suffices to change the cell from the insensitive to the sensitive state.

The effect is not one on the electrometer, nor is it due to sound, and I have repeated the results with several cells many scores of times before people interested in them. At present I am endeavouring to produce by electro-magnetic induction the reverse change, viz. that from the sensitive to the insensitive state; but, although such must apparently be possible, I have not yet succeeded.

The sudden alteration of the insensitive to the sensitive state is produced in a most marked manner by the spark of a Hertz oscillator at as great a distance as the laboratory room in which I work allows. This distance is usually only about eight or ten feet, but I observed the change effected occasionally when the oscillator was at a distance of some thirty feet or more. In this latter case, however, the action was interfered with by the unavoidable presence of wires along the walls, &c., intervening between the Hertz and my impulsion cell.

If the cause to which I have assigned the change from the photo-electrically insensitive to the photo-electrically sensitive state of the cell is the true one, it is impossible to avoid the speculation that impulsion results of this kind may be very common in the economy of Nature; and that the mode in which solar energy is taken up by plants may be affected, and even altered in kind, by sudden electro-magnetic disturbances. The effect of a Hertz oscillation is, indeed, not confined to an alteration of a plate from the insensitive to the sensitive state; for I have cells in which if the sensitive plate is, on exposure to light, electrically negative to the back plate, a Hertz oscillator at a distance will reverse the relation when the plate is again exposed to light.

GEORGE M. MINCHIN.

Royal Indian Engineering College, Cooper's Hill,
May 10.

P.S.—While the above communication was going through the press, I made an experiment which renders it almost certain that in the impulsion cells the results are due to the formation of some

oscillating layer at the surface of the sensitive plate. Being anxious to keep the alcohol in the cell (which in this instance was closed by a ground glass cap), I sealed the cell into a glass tube through the extremities of which the wires of the cell passed. The effect of the disturbance thus resulting was that no amount of tapping the support of the cell would change it from the sensitive to the insensitive state, although before being thus treated it was sensitive to the most minute disturbance. I suspected, however, that after some hours the liquid and the plate would again enter into the peculiar relation on which the impulsion results depend, and so it turned out—after three hours the cell could be rendered insensitive by taps and sensitive by the inductive effect of a Voss machine. The platinum wires were soldered to the plates. I see that the distances at which I found the Hertz oscillator effective in influencing the cells were greater than those above stated; but I have not been able to renew work with the oscillator, which belongs to Mr. Gregory, who removed it for exhibition at the Royal Society's meeting.

May 16.

Bison not Aurochs.

I AM glad that Mr. Lydekker accedes (*NATURE*, May 15, p. 53) to the correction of which I had pointed out the need. But the "vulgar error"—if the Editor will allow me to use a phrase made classical nearly 250 years ago by Sir Thomas Browne—is of more ancient date than my friend seems to suppose; and Dr. Gadow has kindly referred me to Prof. Wrzesniewski's "Studien zur Geschichte des polnischen Tur," published in May 1878 (*Zeitschr. für wissenschaftl. Zoologie*, xxx. pp. 493-555). Therein will be seen reduced copies of the engravings in an edition of Herberstein's "Rerum Moscoviticarum Commentarii" (Basileæ: 1571), giving a figure of each of the animals. The first is inscribed

VRVS SVM, POLONIS TVR, GERMANIS AVROX :
IGNARI BISONTIS NOMEN DEDERANT.

Over the second may be read

BISONS SVM, POLONIS SVBER, GERMANIS BISONT :
IGNARI VRI NOMEN DEDERANT.

This paper is well worth reading from the amount of curious information to be found in it. I have been able to consult only one copy of this work, of an earlier edition indeed, for it was published at Antwerp in 1557; but it does not contain these figures, though the passages quoted by the Polish Professor of course occur (*ff. 117 verso et seqq.*). The figures are not remarkable for beauty, and if anyone were to call them caricatures I should hardly complain; but they are certainly of interest, and that of the Urus, which I think I have seen copied elsewhere, is perhaps the only approach to an original representation extant. If so it deserves to be better known. Allow me to remark that this is not the first time that I have noticed this error. I did so many years ago in a little pamphlet "On the Zoology of Ancient Europe" (p. 14), published by Messrs. Macmillan in 1862; and I may add that any visitor to the Museum of Zoology of this University may see therein a skeleton of the Aurochs and of the Bison, as well as of the American "Buffalo"—all standing side by side.

ALFRED NEWTON.

Magdalene College, Cambridge, May 18.

Sudden Rises of Temperature.

IN *NATURE*, vol. xli. p. 550, it is stated that sudden rises of temperature of large amount in Great Britain "are more frequent and more extensive in amount than sudden falls—the reverse to what obtains in India." There appears to be a somewhat similar condition of affairs in North America. Extremely sudden and large rises of temperature attend the warm Chinook winds, as they are called, which occur over the western part of the continent, but are unknown further east. Equally pronounced are the sudden falls of temperature in the eastern half of the country popularly termed "cold waves."

M. A. VEEDER.

Lyons, N. Y., May 7.

Coral Reefs, Fossil and Recent.

IN Dr. von Lendenfeld's communication to *NATURE* of May 8 (p. 30), occurs the following:—

"Dr. Murray goes on to say . . . and an isolated atoll rising precipitously, perhaps 10,000 feet from the sea-bottom, will be

formed." And again—"and far less will it enable an atoll rising 10,000 feet or more from the bottom of the sea . . ."

I cannot think that the author quoted has committed himself to any such figures as these, but if either he or Dr. von Lendenfeld can tell me where to find such a formation in existing seas, I shall be obliged; as I have sought in vain for instances yet known of any slopes that could be called "steep" descending to more than 4000 feet or so, while *precipitous* slopes are unknown to me beyond 1200 feet; and these are, so far as I know, very exceptional.

While I am writing on this subject, I should be glad if anyone would explain how, on the assumption that atolls are formed during subsidence, it comes about that, while the outer slopes descend to great depths, the depth of the largest lagoons inclosed is generally confined to about 45 fathoms, and in one or two cases to 60 fathoms, but is never more. Why should not the lagoon of an atoll twenty or thirty miles in diameter, which rises steeply from depths of 200 or 300 fathoms or more, have a depth of at any rate 100 fathoms, allowing for the most extravagant amount of silt from the *débris* of the rim.

W. J. L. WHARTON.

Doppler's Principle.

A COMPLETE solution of the questions about which your correspondents are puzzling themselves has been before the public for some ten years in several successive editions of my "Deschanel." It occurs in the last paragraph of the chapter entitled "Numerical Evaluation of Sound," and is as follows:—

"Let the source make n vibrations per second. Let the observer move towards the source with velocity a . Let the source move away from the observer with velocity a' . Let the medium move from the observer towards the source with velocity m , and let the velocity of sound in the medium be v .

"Then the velocity of the observer relative to the medium is $a - m$ towards the source, and the velocity of the source relative to the medium is $a' - m$ away from the observer. The velocity of the sound relative to the source will be different in different directions, its greatest amount being $v + a' - m$ towards the observer, and its least being $v - a' + m$ away from the observer. The length of a wave will vary with direction, being $\frac{1}{n}$ of the velocity of the sound relative to the source. The

length of those waves which meet the observer will be $\frac{v + a' - m}{n}$,

and the velocity of these waves relative to the observer will be $v + a - m$; hence the number of waves that meet him in a second will be $\frac{v + a - m}{v + a' - m} n$."

The three quantities a , a' , m may of course be either positive or negative.

J. D. EVERETT.

5 Princess Gardens, Belfast, May 17.

THE SHAPES OF LEAVES AND COTYLEDONS.¹

ATTEMPTS to explain the forms, colours, and other characteristics of animals and plants, though not new, were until recent years far from successful. Our Teutonic forefathers had a pretty story which explained certain characteristics of several common plants.

Balder, the God of Mirth and Merriment, was, characteristically enough, regarded as deficient in the possession of immortality. The other divinities, fearing to lose him, petitioned Thor to make him immortal, and the prayer was granted on condition that every animal and plant would swear not to injure him. To secure this object, Nanna, Balder's wife, descended upon the earth. Loki, the God of Envy, attended her disguised as a crow (crows at that time were white), and settled on a little blue flower, hoping to cover it up so that she might overlook it. The flower, however, cried out "Forget-me-not, forget-me-not" (and has ever since been known under that name). Loki then flew up into an oak and sat on a mistletoe. Here he was more successful. Nanna carried off the

¹ Lecture delivered at the Royal Institution on April 25, by Sir John Lubbock, Bart., M.P., D.C.L., F.R.S., &c.