

established by recent researches on gaseous conveyance of electricity and vacuum-tube phenomena. This, however, is a large subject, and cannot yet be regarded as by any means satisfactorily understood; though everything points to the fact that gases transmit currents by atomic convection, *i.e.* electrolytically.

(2) When copper touches zinc, the previous state of equilibrium is disturbed, and a fresh equilibrium is set up, into which dielectric strain in the surrounding insulator enters as a prominent component. Attack of the zinc, and continuous progression of electricity, are precisely what then tend to occur, being only prevented by the insulating character of the medium. Permit it to conduct, and the whole at once becomes a Voltaic cell on closed circuit.

(3) If the potential of a metal is defined as Sir W. Thomson defines it, *viz.* as the potential energy of a unit charge in the air close to the metal, the statement quoted from p. 111 must of course be modified; but if, as I venture to hold, it is more convenient to define the potential of a metal as the potential energy of a small unit charge in or on the metal itself, the statement involves no difficulty, and is, I believe, true. An intrinsic step of potential exists between each metal and the air in contact with it, which step is constant for each metal and calculable from thermo-chemical data; if therefore by metallic contact two metals be forced to the same potential, it at once follows that a slope of potential is set up in the air from one to the other. This is the very thing observed in all static Volta experiments, and has been cursorily stated as if it were a difference of potential between the metals themselves.

I think Mr. Burbury will find this quite clear if he does me the honour to read the complete argument; but if he still perceives a difficulty, I shall be much interested in hearing from him further.

OLIVER J. LODGE.

#### Attractive Characters in Fungi.

It is to be hoped that the interesting discussion on the colours and attractive characters of fungi may induce someone, with the requisite time and patience, to undertake a study in this rich field of investigation, which has scarcely been entered. In a paper published in the *Annals of Botany* (vol. iii., No. 10, May 1889) it is shown that among the Phalloidei the coloration, odour, and contrivances for the attraction of insects for the dispersion of the spores are as remarkable as those possessed by many Phanerogams for cross-fertilization. Among 1288 species of fungi, other than Phalloids, tabulated from Bulliard's "Champignons de la France," Tulasne's "Fungi Hypogæi," and Cooke's "Agarici," the proportion of those with inconspicuous colours is about 73 per cent., while among the Phalloids the proportion is under 2 per cent.; 90 per cent. of the latter being either red or white. According to Köhler and Schubler, as quoted by Balfour, the proportion of inconspicuously coloured flowers, among 4197 species tabulated, is about 4 per cent., the proportion of red and white being slightly over 50 per cent. Seventy-six per cent. of Phalloids have functionally attractive odour, and only 9.9 per cent. of flowers; and 18.6 per cent. of these fungi have rayed or stellate forms, so common among flowers—a shape which I have shown by measurement and experiment to be that which gives the maximum conspicuousness at moderate distances (*i.e.* within the range of insects' vision) with the minimum expenditure of material. In *Coprinus*, where the spores become immersed in black and frequently very fetid fluid, some species appear to resemble certain composite flowers which are visited by large numbers of flies, and Dr. Haas has found glucose in the hymenial fluid. There are reasons to suppose that the fœtor developed by *Phallus* may be due to the secondary action of putrefactive bacteria.

From analogy it is probable that the colours and many of the characters in other groups are not adventitious, but have been selected to aid in the preservation of the species; *e.g.* the *Pezize* are even more brilliantly coloured than the Phalloidei, and have the hymenial surface and spores freely exposed, and many small forms (*Amanita*, *Mycena*) are beautifully coloured, and grow in places where insects abound. In other cases the colours are no doubt protective by inducing resemblance, or by conspicuousness, as in many brightly-coloured poisonous forms (procryptic and aposematic colours of Poulton). I would suggest that in some cases the glutinous character referred to by Mr. Worthington Smith and Dr. Cooke may be protective against the attacks of animals, as insects and slugs. Of hundreds of specimens of *Phallus impudicus* which I have examined, I never

found the gelatinous layer eaten through by slugs, although the spongy stem after emergence from the volva is frequently so eaten, and numbers of *Agarici* and other forms not so protected are attacked by insects and slugs. It is known that the mucoid secretion of slugs tends to protect them from the attacks of birds and ants, and other enemies.

T. WEMYSS FULTON.

20 Royal Crescent, Edinburgh, January 10.

#### The Morphology of the Sternum.

MY friend Prof. T. J. Parker has in these pages (Dec. 11, 1890, p. 142) lately recorded the existence of a sternum in the shark *Notidanus indicus*. The anterior of the two cartilages which he figures has been already described by Haswell (Proc. Linn. Soc. N.S.W., vol. ix., part 1); and, in view of Parker's conclusions, it is interesting to note that he speaks of it (p. 23) as "temptingly like the presternal," but that "the presence of such an element in the skeleton of any group nearer than the Amphibia seems to preclude this explanation." That the Amphibian sternum is for the most part, if not wholly, a derivative of the shoulder-girdle, there can no longer be a question; and, although the researches of Goette leave us in doubt concerning the hypo (post-omo) sternum, they show that that can be no derivative of the costal apparatus. Working anatomists will realize in Parker's application of Albrecht's terminology the expression of a fundamental difference between the sternal skeleton of the Ichthyopsida and Amniota. The researches of Goette, Hoffmann, Ruge, and others, show the sternum of the higher Amniota to consist of a greater costal portion and of lesser ones, chief among the latter being the episternum or interclavicle. They suggest (especially if Hoffmann's assertion that the precoracoid or clavicular bar is, in Mammals, primarily continuous with the spine of the scapula) that the interclavicle may be, throughout, the vanishing vestige of the coracoidal sternum of the Ichthyopsida. The latter would appear, therefore, to have been replaced in time by the more familiar costal sternum, derivative of the hæmal arches (ribs); and, this being so, might we not boldly, and with advantage, go a step further than Parker has done, and distinguish between a coracoidal *archisternum* of the Ichthyopsida, and a hæmo-coracoidal *neosternum* of the Amniota? If this be conceded, the characters referred to must be incorporated in our diagnoses of the two great types named.

G. B. HOWES.

South Kensington, January 12.

#### Stereoscopic Astronomy.

THE following exquisite test of the delicacy to which astronomical photography has attained may be interesting. In Admiral Mouchez's "Photographie Astronomique" (1887)—a small book, and cheap—are eight photographs of Jupiter, by the M.M. Henry, taken on April 21, 1886. Several are at intervals of only three minutes in time. What with the large red spots, the irregularities of the two belts, and white spots on the upper belt, there are quite details enough to enable the eye to perceive the solidity of the planet, in a stereoscope, if the earlier picture is submitted to the right, and the later to the left eye. Reversing the order of the pictures gives a puzzling effect, which, with a little practice, is seen to be hollowness instead of solidity. But the mind resents this true result, and so gets puzzled.

To satisfy myself that I was not, on the other hand, misled by the wish to see solid, I put the matter to the proof by asking a friend to shuffle the photographs, and submit any two to me in the stereoscope without either of us knowing which they were, or in which order they were placed. After recording my judgment, "solid" or "hollow," on each pair, the times and order of place were ascertained and recorded. I found that I was able, after twenty trials, not only to say whether two images taken three minutes apart were rightly or wrongly placed in the stereoscope, but I could guess in any case with some accuracy what the interval was before either of us knew it. This, of course, was only possible by familiarity with these particular images.

W. J. H.

Lawn-Upton, Littlemore, January 17.

#### Mock Sun.

LAST evening, about five minutes after five o'clock, I observed that a cloud in the south-west was strongly illuminated from below. As the sun had set more than half an hour, and considerably more to the south, I was surprised by the degree of