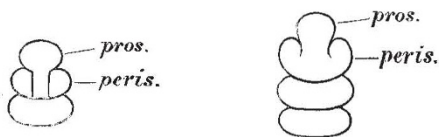


tenon arrangement which distinguishes *Lumbricus* from *Allolobophora*.



The male pore is situated normally on segment 15, but as the papillae which carry the pores are large, they extend over the adjoining segments on either side. Earthworms vary greatly in this respect. Rosa says that spermathecae are absent in this species, a peculiarity which has been noted in worms belonging to several other genera. I have not sufficient material to enable me to confirm or dispute this statement at present. I have counted the segments of three specimens, and found them to be in each instance 106. As the year advances I hope to be able to obtain mature adults for dissection, when it will be possible to give a detailed account of the internal anatomy. Meanwhile the external characters are amply sufficient for distinguishing the worm if the girdle is properly developed, as its nearest British ally (*Lumbricus purpureus*, Eisen) has the clitellum on segments 28 to 33.

Idle, Bradford.

HILDERIC FRIEND.

### The Implications of Science.

WILL you allow me to say something in answer to Mr. Dixon's letter on this subject in *NATURE* of January 21 (p. 272)?

(1) I admit that there is a verbal or symbolic "convention" if two (or more) persons agree to understand any given words or symbols in a way arbitrarily chosen by themselves. But the scope of such convention is exceedingly limited: if people wish to be understood, or even to understand themselves, they must use the same words as others use, and use them in the same sense (except in an infinitesimal proportion of cases). If it is said that the common application and use of current words is a mere convention, the word *convention* is taken in an extremely strained and metaphorical sense, since nothing like an explicit agreement has ever been made. The "convention" as to the use of language is as fictitious as the *social contract* of Locke and Rousseau. But in the one case, as in the other, there is a solid basis of facts, to suit which the hypothesis has been produced. Language has been moulded by thought and feeling, which, in their turn, have been impressed by facts; and it is facts and relations of facts that language seeks to express. As Mill says (in the first chapter of his "Logic") names are a clue to things, and bring before us "all the distinctions which have been recognized not by a single inquirer but by all inquirers taken together." No one, I imagine, would say that a particular case of the impossibility of affirming and denying a given statement, depends "solely on the law of contradiction"; but in the case of any particular assertion, the impossibility, *in that case*, is seen, and to a mind that has reached the generalizing stage, the universal is discernible in the particular. As regards the question of "real propositions," I will not occupy space with quotations, but will only refer to Mr. Dixon's letter of December 10, in which the passages occur which led me to think that he regarded assertions (or denials) of the existence of particular objects as the only "real" propositions.

(2) As regards induction, I agree with Mr. Dixon that the starting point in induction is hypothesis or discovery. But with reference to the rest of the procedure, and its relation to so-called "formal" logic, I differ from him. For I think that an inductive generalization may be set out syllogistically; e.g.,

What has once produced X will always produce X;  
A has once produced X;  
∴ A will always produce X (= all A is X).

If space allowed, I should like to consider the justification for the major premiss, and also to say something about the grounds on which the minor (which indicates the hypothesis or discovery) asserts causation [or concomitance] in a given instance.

(3) Mr. Dixon says: "We do not, in mathematics, conclude a universal proposition from a single concrete instance." But it appears to me that, as far as my own experience goes, in every concrete mathematical proposition which I understand this is exactly what happens; and I do not see how, on Mr. Dixon's

view, mathematical formulæ could ever have been constructed. "A mathematical formula," Mr. Dixon remarks, "does not imply the existence of any instance whatever of its application, any more than a definition implies the reality of the thing defined." But if a definition is always of a *thing*, what more is wanted? The definition is admitted to be of *something*; and what is *something* must, I suppose, exist *somehow*.

(4) I still think that in the passage in Mr. Dixon's letter which I referred to under (4) he is not consistent. For if, as he asserts, the definition of *four* as = 1 + 1 + 1, makes it false to say that *Twice two are four*, this is surely because the *facts* referred to by *four* are no longer what they were when the statement in question was true. If definitions were purely arbitrary, as Mr. Dixon holds, what would prevent my saying that *Four* (1 + 1 + 1) means *twice two* (1 + 1) + (1 + 1)? It is surely only the reference to *things* which makes it absurd—(and, however *four* (4) may be defined, how is *one* (1) to be understood, except by reference to things?).

That words and symbols used intelligibly do, and must, refer to something beyond themselves, seems to me indisputable. If they did not, no assertion of the form *S is P* could ever be made, for the symbol *S* is certainly *not* the symbol *P*. And for *any* statement, of the form *S is P*, to be possible and significant, it is further necessary that *S* and *P* should have *identical* application, but *diverse* signification. If application and signification were the same, we should get *S is S* and *P is P*; if application were *not* the same, we must say, *S is not P*. Hence, no term can ever be taken in *mere* denotation (or application), nor in *mere* connotation (signification); but both *momenta* of each term have to be taken into account in every assertion. If (to take a case given by Mr. Dixon in his "Essay on Reasoning," p. 8) we "define" *metal* as "the list of denotation, iron, copper, tin, zinc, lead, gold, and silver," then *iron*, &c., can only be pointed out by taking some specimen of iron, and saying, *This and all other things which are LIKE it in certain respects*. An absolutely arbitrary denotation can be given only if the *whole* of the objects denoted are severally pointed out; and even then, unless they are labelled, they can only be remembered and identified by means of their *characteristics*; if labelled, by *that* characteristic.

Mr. Dixon objects to my attributing to him the view that "mathematical truths in as far as 'real' are obtained by induction, and are therefore not necessary." But in his letter of December 10 he says:—"For example, the assertion 'Two straight lines cannot inclose a space' is certainly not a 'necessary truth.' Either its terms are defined by connotation, so that its truth depends solely on those definitions, or else its terms are defined by denotation, as representing real things in space; and the truth of the assertion can only be proved by induction from actual experience with those things." In the first case, the truth is arbitrary, not necessary; and in the second case it might conceivably be false, as was shown by Helmholtz." It was this passage which led me to the opinion which I expressed.

Cambridge, January 31.

E. E. C. JONES.

### Vacuum Tubes and Electric Oscillations.

I HAVE not had the advantage of hearing the lecture of M. Nikola Tesla nor of seeing his experiments, but it does not seem out of place to recall the attention of your readers to an article by Dr. Dragoumis in your issue for April 4, 1889, in vol. xxxix. p. 548.

OLIVER J. LODGE.

### THE NEW STAR IN AURIGA.

SINCE our last article was written the weather has continued very bad for astronomical observations. The only new results obtained which have reached us consist of a paper read by Mr. Norman Lockyer at the Royal Society on Thursday last, and an important telegram from Prof. Pickering, which appeared in Wednesday's *Standard*.

We will take these in order. Mr. Lockyer's communication to the Royal Society was dated February 8; it stated that two more photographs, containing many more lines than the former ones, were taken on Sunday night, February 7, and it went on to make the important announcement that "The bright lines K, H, *h*, and G are