

SIR,—While thanking you very heartily for the kind and appreciative criticism of my paper “On the Classification of Birds” which you have published in ‘The Ibis’ for January last, I should like to be permitted to say a few words in reply.

In the first place let me express my satisfaction that you have drawn attention to Dr. Cornay, who undoubtedly deserves all the merit which may attach to the perception of the classificatory value of the palatine bones. As I have taken occasion to explain privately to Dr. Cornay, it was a matter of much regret to me to find that I had overlooked his paper. My only excuse is, that the many ornithologists (yourself among the number) before whom I had the pleasure of placing my notions, not only when they were brought before the Zoological Society, but on other occasions, seemed to be of one opinion as to their novelty, whatever they might think of their truth.

Next I may be permitted to congratulate myself that you go as far with me as you do, and that, whatever you may think of the method I have employed, you agree in what I regard as the most important results of the application of that method.

For I perceive that you make no objection to the division of the Class *Aves* into the three primary divisions or “Orders” of *Saururæ*, *Ratitæ*, and *Carinatæ*, which are wholly based upon osteological characters.

With respect to the second, however, you remark (p. 91), “Therefore the single-headedness of the quadrate is not a distinctive character of the *Ratitæ*; and, indeed, it seems to me very doubtful if any of the other so-called ‘characters’ of the palatal structure are of much greater value in distinguishing between the *Ratitæ* and the *Carinatæ*,” and again (p. 92), “I therefore venture to submit that the palatal structure does not sufficiently furnish Ordinal characters.”

But where have I suggested that it does? In giving the characters of the *Saururæ*, the palate is not mentioned, for the good and sufficient reason, that we know nothing about it, if for no other. And, in the characterization of the *Ratitæ* and of the *Carinatæ*, the vomer and palatines occupy a very subordinate place.

I think that in every complete definition of a natural group

there are two kinds of characters :—1st, those which are *diagnostic* of the group ; and, 2nd, those which are *common* to all its members, and are, so far, characteristic, though they may not be diagnostic. Thus in defining the class *Mammalia*, one does not omit to state that the blood is hot, though the warmth of the blood is not a diagnostic character of that group ; and in attempting to define the *Ratitæ* and the *Carinatae*, characters which are common to all the members of those groups, though they may not be absolutely diagnostic of them, should surely not be omitted.

Further, it must be recollected that the diagnosis of a group may rest not merely on a particular character confined to the group, but on a peculiar combination of characters.

And it may happen that a well-defined group shall not have a single structural feature peculiar to itself, its peculiarity lying entirely in the mode of combination of those features ; so that if each one of the seven characters of the *Ratitæ* which I have enumerated were discoverable in some other animal, but in a different state of combination (if I may express myself chemically), I do not think the goodness of the definition would be interfered with.

I quite agree with you, that “a really natural arrangement can only be made out by taking an aggregate of characters” ; and, practically, I have endeavoured to express this belief by enumerating seven characters for the *Ratitæ* and three for the *Carinatae*.

On the other hand, whatever one’s notions may be about what is philosophical and what otherwise, it is a matter of fact and every-day experience in zoology, that the modifications of a solitary organ will sometimes afford indications of affinity of great value throughout a whole class, or even subkingdom.

What to an *à priori* speculator could seem more unphilosophical and one-sided than to attempt to arrange the *Vertebrata* according to their occipital condyles, or according to the way in which the lower jaw is connected with the skull ? And yet by either of these characters one would be able to assign 999 vertebrate animals out of 1000 to their proper divisions.

Or, again, what can be (theoretically) more open to criticism

than the attempt to classify animals by such a "single character" as that of their molar teeth? And yet, am I wrong in saying that if we happened to have no better guide, the character of these teeth would, in a large proportion of cases, give us a very good idea of the affinities of the monodelphous *Mammalia*?

Under these circumstances I do not feel that it is within my "moral competence" (to borrow a phrase from a distinguished personage) to entertain *à priori* objections to the value of a single character for classificatory purposes. The question must, I think, be argued *à posteriori*, and with reference to each particular case. Teeth may be very good marks of affinity among the *Mammalia*, and very bad ones among the *Reptilia*; but their badness in the latter case will not affect their goodness in the former.

Now let me apply all these considerations to the subdivisions of the *Carinatae*, in which alone, let me remark in passing, have I ascribed a prepotent virtue to palatine characters. In the case of the *Schizognathæ*, I must look upon your objections as a mere unconscious dissembling of affection; for is it not certified under your hand (p. 92)?—

"That the majority of the forms united by Prof. Huxley under the title *Schizognathæ* are in reality very nearly allied, will be denied by no ornithologist, I believe, who thinks for himself."

And again (p. 93):—

"Now on all these points, except one, I had already arrived at opinions closely resembling those of Prof. Huxley, but quite independently of any considerations of the bones of the palate."

Could I ask for better evidence, that the schizognathous skull marks a great natural division of birds as well as, for example, the doubly crescentic molar pattern marks a Ruminant?

In the face of the pleasure that such valuable confirmation of the essential validity of my views gives me, I will not complain of the paragraph which follows—though I do think that any one who discovered that certain molar teeth are characteristic of the whole of the *Ruminantia*, might reasonably feel a little hurt in his mind if you told him that you had arrived at the

conclusion that they were all one group by studying their horns and hoofs, and that the introduction of these troublesome "characters, drawn from the dental arrangement" might "rather have the effect of complicating and rendering obscure what was simple and clear enough without."

All I can say is, that if you will point out what character, other than the palatine, is common to the assemblage of birds in question, I shall welcome the discovery as the very reverse of a complication or obscuration of ornithic taxonomy.

Before leaving the *Schizognathæ*, however, I am bound to observe that I do not deserve the credit you are kind enough to give me in one matter (page 92, note). I have found, since my paper was written, that Lherminier, long ago, and more recently Mr. Parker, have strongly insisted on the relationship between the Gulls and the Plovers.

To sum up, I have endeavoured to show:—

1st. That the *Schizognathæ* form a very natural assemblage,—a position which I understand you to admit.

2nd. That the schizognathous structure of the palate is common to, and diagnostic of, all the members of this very large assemblage, with the exception of a very few species belonging to the genera *Crax* and *Dicholophus*. This position also is not disputed on your part.

3rd. Nothing else approaching the nature of a common, still less of a diagnostic character for this great group has yet been discovered.

I assume that you will assent to this proposition also. And, in that case, I really do not see what foundation is left for the rejection of the group *Schizognathæ* as a primary subdivision or suborder of the *Carinatæ*.

I think as much could be said on similar grounds for the *Dromæognathæ*, the *Ægithognathæ*, and the *Desmognathæ*, though it must undoubtedly be admitted that the four natural assemblages* of birds which compose the last-named suborder

* That is to say, 1. the *Chenomorphæ*, *Amphimorphæ*, *Pelargomorphæ*, *Dysporomorphæ*; 2. the *Aetomorphæ*; 3. the *Psittacomorphæ*; and, 4. the *Coccygomorphæ*.

are far less closely united together than those which make up the division of the *Schizognathæ*.

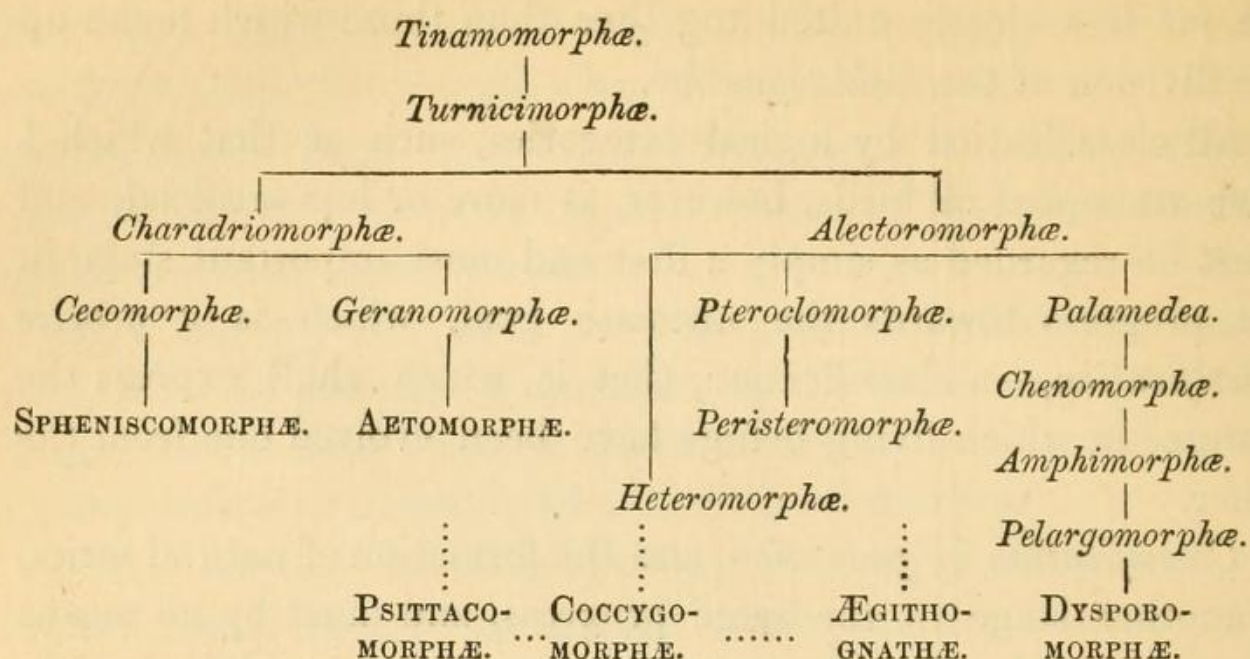
All classification by logical categories, such as that which I have attempted in birds, however, is more or less artificial, and must be regarded as simply a first and most important stage in the progress towards the ultimate goal, which is a *genetic classification*,—a classification, that is, which shall express the manner in which living beings have been evolved one from the other.

Classification by gradation, and the formation of natural series, is another stage in the same progress, and must by no means be confounded, as it often is, with the ultimate result—though, in all probability, it represents a true genetic classification more nearly than any other arrangement can do.

I believe that the broad outlines of such a gradational classification of Birds may be sketched out with tolerable accuracy, even though the details may have to be a good deal modified by subsequent research. Thus I take it to be demonstrated that the *Tinamomorphæ* are those carinate birds which approach nearest the *Ratitæ*; and I think it may be shown that the great majority of the *Carinatae* fall into one or other of four series, which diverge directly, or indirectly, from the *Tinamomorphæ* as a common centre.

Thus *Turnix* leads from the *Tinamomorphæ* to the *Charadriomorphæ*; and from the latter, two series start—the one commencing with the Gulls and ending in the highly modified Penguins, the other commencing with the Bustards and Cranes, and ending in the highly modified *Aetomorphæ*. On the other hand *Turnix* leads to the *Alectoromorphæ*, which is also the starting-point of two series—the one commencing in *Palamedea*, including the *Chenomorphæ*, *Amphimorphæ*, *Pelargomorphæ*, and culminating in the highly specialized *Dysporomorphæ*; the other beginning in *Syrrhaptes* and passing on to the *Peristeromorphæ*.

These series would stand thus, the names of the most differentiated groups being in capitals:—



I do not think that any one who will examine the facts will be disposed to doubt that this scheme nearly represents the affinities of the groups in question. The great difficulty is to determine the relations of the *Coccygomorphæ*, *Psittacomorphæ*, and *Ægithognathæ* to these; and I have ventured to indicate those relations only in the most doubtful and hypothetical fashion.

Ever yours very faithfully,

T. H. HUXLEY.

On Thursday, the 11th of June, a paper was read before the Royal Society, describing the osteology of *Pezophaps solitaria* from the bones which, as we last year mentioned, were obtained from Rodriguez by Mr. Edward Newton. At the same time a beautifully mounted skeleton of the Dodo, and two (supposed to be male and female) of the Solitaire were exhibited. These were put together by Mr. J. W. Clark, the able and energetic Superintendent of the Museums of Zoology and Comparative Anatomy in the University of Cambridge, where the specimens are deposited.