green" extending only along the back. The outer primaries are "white-edged" on their outer webs only, which outer webs in the secondaries become bluish- or pearl-grey. This is also the colour of the middle pair of rectrices, and the outer webs of all the rest except the exterior pair, which, as stated previously, have them white. Both tail- and wing-feathers have black shafts. The cheeks, including the ear-coverts, sides of the neck and breast, are bright yellow; abdomen and under tail-coverts yellowish-white. Irides dark brown; legs and claws light verditer-blue; soles of the feet yellowish; bill jet-black. Dimensions:—

	Length.	Wing.	Tail.	Tarsus.	Bill.	Gape.	Extent.
June 2, 1866, A.	5·5	3	2·25	·6875	·4375	..	8·75
June 29, 1866, B.	5·375	2·875	2·2	·6875	·375	·5	8·5

This last specimen I shot in a walnut-tree at Annandale. The species is not nearly so common as *Parus monticolus*.

649. Machlolophus spilonotus. Black-spotted Yellow Tit.

Darjeeling collection, 1862. One specimen.

650. Melanochlora sultanea. Sultan Yellow Tit.

Obtained at Kyodan, Salween River, Burmah, August 14th, 1865. Length 7; wing 3·875; tail 3; bill at front barely ·25; tarsus 8·75, nearly; extent 11. Irides dark brown; bill greenish-black. It occurs in small parties in heavy tree-jungle, and is very noisy. (*Cf.* P. Z. S. 1866, pp. 551, 552.)

[To be continued.]

IX.—*Remarks on* Prof. Huxley's *proposed Classification of Birds.*

By The Editor.

Owing to the very liberal arrangements under which they may be procured, the 'Proceedings of the Zoological Society' are so generally accessible to the readers of 'The Ibis' that, in conducting this Journal, my predecessor and I have usually deemed it a work of supererogation to occupy its pages with notices of the papers contained in the 'Proceedings'—valuable and interesting though they almost always are. Looking, however, to

the importance of Professor Huxley's elaborate researches into the Classification of Birds, mentioned in a former number (Ibis, 1867, pp. 254, 255), the results of which, as communicated by him to the Zoological Society, have lately been published*, I deem it incumbent upon me to depart from the practice of which I have spoken, and specially to direct the attention of ornithologists to the essay in which that eminent zoologist, with his accustomed perspicuity, sets forth his views on the subject.

As on several points I regret to say I cannot agree with Prof. Huxley, I feel that it will be only fair to preface these remarks by giving a bare outline of the paper in question; for there may be some readers of this Journal who have not generally the opportunity of seeing the 'Proceedings;' but I would beg such persons (and I believe they are few in number) to seize the earliest occasion of consulting the original, in case I should in these remarks accidentally and unintentionally misrepresent the opinions therein contained.

After briefly recapitulating the principal characters possessed in common by *Aves* and *Reptilia*, causing them to be regarded by Prof. Huxley as forming one primary group of Vertebrates†, to which he has applied the name *Sauropsida*, and, again, the characters which distinguish Birds from Reptiles, he proposes to divide the former, the class *Aves*, into three orders:—(I.) Saururæ, Häckel; (II.) Ratitæ, Merrem, and (III.) Carinatæ, Merrem.

The Saururæ are represented, so far as our knowledge goes at present, by the marvellous *Archæopteryx* only; and being doubtless all extinct, we may here dismiss them from our consideration.

The Ratitæ comprehend the Struthious birds, and differ from all others in the combination of several peculiarities. The sternum has no keel, and ossifies only from lateral and paired

* "On the Classification of Birds; and on the Taxonomic Value of the Modifications of certain of the Cranial Bones observable in that Class." By Thomas H. Huxley, F.R.S., V.P.Z.S. Proc. Zool. Soc. 1867, pp. 415–472.

† Lectures on the Elements of Comparative Anatomy. London: 1864 (pp. 219–244).

centres; the axes of the scapula and coracoid have the same general direction; certain of the cranial bones have characters very unlike those possessed by the next order—the vomer for instance being broad posteriorly, and generally intervening between the basisphenoidal rostrum and the palatals * and pterygoids; the barbs of the feathers are disconnected; there is no inferior larynx; and the diaphragm is better developed than in other birds.

The *Ratitæ* are divided into five groups: the first contains the genus *Struthio*, the second *Rhea*, the third *Casuarius* and *Dromæus*, the fourth the *Dinornithidæ*, and the fifth the *Apterygidæ*. These five groups are separated by very trenchant characters, principally osteological, afforded not only by the cranial bones, but by many parts of the skeleton.

The Carinatæ comprehend all other existing birds. The sternum possesses more or less of a keel, and ossifies, except possibly in the genus *Strigops*, from a median centre as well as from lateral paired centres. The axes of the scapula and coracoid meet at an acute, or, as in *Didus* and *Ocydromus*, at a slightly obtuse angle, while usually the vomer is comparatively narrow, and allows the pterygoids and palatals to articulate directly with the basisphenoidal rostrum.

"In this order the bones which enter into the formation of the palate are disposed in four different modes, which may be called respectively the Dromæognathous, Schizognathous, Desmognathous, and Ægithognathous arrangement." The group of birds characterized by these different forms of palatal arrangement are accordingly regarded as so many Suborders.

With respect to their palatal structure the *Dromæognathæ* have a very great resemblance to the *Ratitæ*; but the keeled sternum of the *Tinamidæ*, the family which alone constitutes this Suborder, and the small angle formed by the articulation of the scapula and coracoid, lead Prof. Huxley to leave them among the *Carinatæ*.

* Following the practice of most anatomists, Prof. Huxley throughout terms these bones "palatine," a word which appears to me to be formed from *palatium*, while the adjectival derivative of *palatum* would, I imagine, be "palatal."

The *Schizognathæ* include a large assemblage of birds belonging to the Cuvierian Orders *Gallinaceæ*, *Grallæ*, and *Palmipedes*. In this Suborder the vomer, though of variable size, always tapers to a point anteriorly, while behind it embraces the basisphenoidal rostrum between the palatals; but neither these last nor the pterygoids are borne by its posterior divergent ends. The maxillo-palatals are usually elongated and lamellar; they unite with the palatals, and, bending backwards along their inner edge, leave a fissure between the vomer and themselves. Except that the birds composing this Suborder are said never to possess more than one pair of muscles in the lower larynx, no other common characters are assigned to them. Six groups are distinguishable, which Prof. Huxley names respectively, (1) *Charadriomorphæ*, (2) *Geranomorphæ*, (3) *Cecomorphæ*, (4) *Spheniscomorphæ*, (5) *Alectoromorphæ*, and (6) *Peristeromorphæ*.

The remaining groups of *Grallæ* and *Palmipedes*, the *Accipitres*, the *Scansores*, the *Syndactylæ*, most of the *Fissirostres*, and *Upupa* form the Suborder *Desmognathæ*. In these birds the vomer is either abortive or so small that it disappears from the skeleton. When it exists it is always slender, and tapers to a point anteriorly. The maxillo-palatals are united across the middle line, either directly or by the intervention of ossifications in the nasal septum. The posterior ends of the palatals and the anterior of the pterygoids articulate directly with the rostrum. No other positive common characters seem to be possessed by the birds of this Suborder, which is divided into seven groups as follows:—(1) *Chenomorphæ*, (2) *Amphimorphæ*, (3) *Pelargomorphæ*, (4) *Dysporomorphæ*, (5) *Aetomorphæ*, (6) *Psittacomorphæ*, and (7) *Coccygomorphæ*.

Between this and the next Suborder, at present uncertain whether he should refer them to either, but, if so, inclining to the latter, Prof. Huxley temporarily places, under the name of *Celeomorphæ*, the Woodpeckers and Wrynecks.

All other existing birds—and of course incomparably the largest number of species—are placed in the Suborder *Ægithognathæ*, which comprehends the Order *Passeres* as restricted by the latest ornithologists, together with a few other forms which do not seem to arrive at the full Passerine perfection. These are

divided into two groups, (1) *Cypselomorphæ*, and (2) *Coracomorphæ*—the latter being further separable into two smaller groups, left unnamed, but the one (i.) divisible according to the laryngeal structure into (α) *Polymyodæ*, (β) *Tracheophonæ*, and (γ) *Oligomyodæ*, and the other (ii.) containing the genus *Menura*, which, so far as known at present, must stand alone. In the birds of this Suborder generally, the vomer is a broad bone, abruptly truncated in front, deeply cleft behind, and embracing the rostrum of the sphenoid between its forks. The maxillo-palatals are slender at their origin but expanded at their posterior ends, which do not unite either with each other or with the vomer. The anterior part of the nasal septum is frequently ossified; but this ossification is not united with the vomer. This structure is, according to Prof. Huxley, substantially repeated in the great majority of these birds, with some minor modifications which, he suggests, are characteristic of the natural subdivisions of the group. Thus, for example, *Menura* possesses no ossified maxillo-palatals at all; and *Tyrannus*, *Cephalopterus*, *Chasmorhynchus*, *Pteroptochus*, and *Gymnorhina* also differ, more or less, from the normal Passerine birds in the structure of their maxillo-palatals.

Such, then, is the briefest possible outline of the principles of Prof. Huxley's proposed arrangement. Want of space alone precludes me from entering further into details; and I trust I am not open to the imputation of any unfairness in stopping here. Prof. Huxley deserves, I conceive, the warmest thanks of all ornithologists for the manner in which he has endeavoured to lay before us what he believes to be a really sound system of classification in place of those exceedingly irrational and unsatisfactory schemes with which we have hitherto had to be contented. He has, I know, come to the subject without bias of any kind; and the importance which in his eyes is now assigned to characters exhibited by the palatal bones, was unpremeditated by him, and has forced itself upon him as his investigations proceeded*. I cannot pretend to have laboured on the subject anything like so diligently as Prof. Huxley,

* See 'Journal of Anatomy and Physiology,' No. II. May 1867, pp. 369–371.

though I have made a special study of some parts at least of the osteology of birds for the greater part of my life; and I have not had at my disposal anything like the rich store of material to work upon which he has enjoyed. It may, therefore, seem very presumptuous in me to declare the divergence of my opinion from that of an anatomist so justly entitled to respect; but I must confess that, agreeing on the whole with many of the results at which he has arrived, it is with special reference to the supposed importance of these palatal characters that I am most inclined to differ from him.

The opinion has before been more than once laid down in this Journal, that a scheme of classification, composed solely with reference to one character, will never lead us to a true comprehension of the system of Nature. On one occasion this opinion was put forth with special allusion to the proposed classification of Dr. Cornay, of Rochefort, though in the passage to which I refer ('Ibis,' 1860, p. 325), that gentleman's name was not mentioned—a classification entirely based, as Prof. Huxley's chiefly is, on the modification of the palatal structure*. It is, perhaps, significant that, when this classification was fully published, Dr. Hartlaub made on it some remarks which, without occupying space by here translating them, are exactly in accordance with the opinion just above enunciated, while he termed Dr. Cornay's attempt "unphilosophical and one-sided" (Bericht, u. s. w. 1847, pp. 2–5). Now I am not going so far

* I believe I had the pleasure of first calling Prof. Huxley's attention to the researches of this gentleman; but I myself having become oblivious of them, I was unable to do so until after the publication of the paper I am now criticising. Dr. Cornay made known the results of his investigations to the French Academy of Sciences, January 15th, 1844. An abstract of his communication is to be found in 'L'Institut' for January 17th of that year (vol. xii. p. 21), which is briefly mentioned by Prof. Wagner in the volume of 'Reports on Zoology' published by the Ray Society (p. 278). Another extract from it is contained in the 'Comptes Rendus' for the same year (vol. xviii. pp. 94, 95); and the paper itself was published in full, three years later, in the 'Revue Zoologique' for 1847 (pp. 360–369), the first portion having, it is there said, already appeared in the 'Journal des Découvertes' (vol. i. p. 250). Dr. Cornay also seems to have addressed a "*Projet*" on the same subject to the French Academy, January 24th, 1842 (R. Z. 1842, p. 14).

as this. Those who disagree with Prof. Huxley most, of whom I am certainly not one, will hardly think the first of these opprobrious epithets applicable to anything he writes; and after what I have above said I cannot be supposed to imply that the last is. Still, on broad grounds, I believe Dr. Hartlaub is in the main right, and that, as I expressed myself in the discussion which took place after the reading of Prof. Huxley's Paper, a really natural arrangement can only be made out by taking an aggregate of characters. It is, of course, very easy to object that it is difficult to obtain such an aggregate of characters; but to this I would reply that, if it were not so by the nature of the case, the desired arrangement would undoubtedly have long since been discovered.

But having thus declared my general belief on the subject, I should like to consider more specially the application of Prof. Huxley's principles. The distinctive characters of the *Ratitæ* and *Carinatæ*, as given by him, are obviously divisible into two categories—those which are absolutely peculiar to their respective Orders, and those which are not. Now those which are not peculiar are, of course, decidedly inferior to the others in value: they are, indeed, characters which are not diagnostic, and can only in a restricted sense of the word be termed "characters" at all. What then are these doubtful "characters"? Why, the very ones drawn from the structure of the bones of the palate. Prof. Huxley himself most candidly admits this. "The Dromæognathous birds are represented by the single genus *Tinamus*, which (as Mr. Parker has shown) has a completely struthious palate;" or, to pass from general to special observations, we read of the *Ratitæ*:—"The upper, or proximal, articular head of the quadrate bone is not divided into two distinct facets," which, of course, is perfectly true; but then, further on, of this same *Tinamus* we have, "The head of the quadrate bone is single, as in the Struthious birds." 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*. On the other hand, what a contrast is afforded by the remaining

characters adduced by Prof. Huxley! They are worthy of the name — the mode of ossification of the sternum, the direction of the axes of the coracoid and scapula, even the presence or absence of their respective processes, though this last point is not quite so satisfactory as might be. I therefore venture to submit that the palatal structure does not sufficiently furnish Ordinal characters.

Let us now examine the Suborders. 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, disregarding what his predecessors have written, and looking only to the facts of the case. No unbiased person who has ever made even a cursory examination of a Sandpiper and a Plover, and is acquainted with the peculiarities attending their mode of reproduction, will doubt that they belong to one and the same indivisible group; and no one who has ever compared the skeleton of a bird belonging to that group and of a Gull, will hesitate to declare that there is an intimate relationship between them. So far, then, my own investigations lead me to agree entirely with Prof. Huxley, and I am extremely glad to find that opinions I have long entertained now receive the confirmation of his high authority*. In like manner I see with pleasure that he considers (as I have done) the Bustards to be intermediate between the true Plovers and the Cranes; and I suspect that his assignment of places between the Cranes and the Rails to *Psophia* and *Rhinochetus* is an excellent suggestion. But then the Rails, in my opinion, lead directly to the true *Gallinæ*, which he is inclined to consider are more nearly reached from the normal "split jaws" by way of the Plovers and *Turnix*. However, perhaps this point is immaterial; provided we arrive at the true *Gallinæ* at last, the exact route we take is a matter of less consequence. That the Pigeons

* I have not before seen, so far as I can remember, this relationship maintained by any systematist; and to Prof. Huxley belongs, I imagine, the credit of first placing the fact of its existence on record. As stated above, I have long believed in it, and last year I pointed it out to my audience in an elementary lecture on birds, delivered at Cambridge, 30th November, 1866.

also come into this group hardly requires to be said. On another matter, the alliance between the Gulls and the Auks, I have much pleasure in stating that I have become a convert to Prof. Huxley's views. This I am quite ready now to admit, though not on the precise grounds he advances. To the Auks, the Divers and Grebes may be akin; but I have some rather strong doubts remaining as to the Penguins. 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. I accordingly maintain, without entering into any longer disquisition on the subject, that this very natural group, to which the name *Schizognathæ* is now applied, does not require to be defined by characters drawn from that part of the bird's structure. On the contrary, I cannot help feeling that the introduction of characters drawn from the palatal arrangement may rather have the effect of complicating and rendering obscure what was simple and clear enough without. Even the character which should be distinctive, according to the meaning of the name given by Prof. Huxley, is, on his own showing, not entirely so. In *Dicholophus*, a form at present, as it appears to me, of uncertain position, we read, "the internasal septum is ossified to a very slight extent, and the maxillo-palatine processes may meet in the middle line." If *Dicholophus*, then, is to be placed, as Prof. Huxley places it, among the *Schizognathæ*, the "character" drawn from the existence of a fissure between the maxillo-palatals can scarcely apply to it. A stronger case perhaps is afforded by *Crax*, which no one will doubt belongs to the *Gallinæ*, and therefore must come in here. *Crax* has its maxillo-palatals uniting anteriorly in an ossified nasal septum. It is impossible, I think, with this last exceptional instance before us, to regard the intermaxillo-palatal fissure as a true "character." Accordingly, then, the *Schizognathæ* (as I trust I have succeeded in showing) cannot be strictly defined by their palatal characters; and if not strictly defined by them, surely it would be better to leave such "characters" alone. Yet these *Schizognathæ* are certainly one of the most natural groups among the Suborders proposed by Prof. Huxley; and if palatal characters fail us in them, much more will they fail us

elsewhere. I therefore think it will be unnecessary for me to trouble my readers with examining in like manner the remaining Suborders of *Desmognathæ* and *Ægithognathæ*. It would be very easy to show that similar exceptions are found in them; indeed Prof. Huxley has supplied them all ready to hand. Whether it is owing to the individual structure of his own palate, I do not know; but in what proceeds from it there is always one and the same unvarying character observable. He says what he has to say in the plainest words possible, and he brings forward those facts which tell against his own views as readily as those which support them. To my shame I must say it, I have been here ploughing with his heifer, turning against him the very arms upon which he has wrought.

But, again, in the groups into which his Suborders are divided, how hard it is for Prof. Huxley to draw real characters from the palatal arrangement! The *Charadriomorphæ* seem, it is true, very homogeneous in this respect; but in the next group, the *Geranomorphæ*, we have *Grus antigone* alone rejoicing in the possession of basipterygoid processes, while, among the *Cecomorphæ*, *Procellaria gigantea* enjoys a similar privilege. Was it consciousness of this peculiarity which made that Antigone

> "—— contendere quondam
> Cum magni consorte Jovis; quam regia Juno
> In volucrem vertit;"

or do sailors nowadays recognize from this feature in the latter an affinity between it and the *Anserinæ*, and so call it "Mother Cary's Goose"? But seriously, do these special exceptions look as if such small modifications of cranial structure were of the highest value in classification? Surely it would be more agreeable to reason, when we find hints of a relationship between *Podargus* and *Cancroma*, and of "a singular superficial resemblance" which exists between the palate of certain Finches (*Loxia* and *Coccothraustes*) and the *Psittaci*, to consider such likenesses analogical, and to ascribe them to modifications resulting from somewhat similar methods of taking food—an explanation which would serve also to explain the similarity said to exist in this respect between the *Cypselidæ* and *Hirundinidæ*.

The Suborder which Prof. Huxley has treated most in detail

is that of the *Aetomorphæ*, equivalent to the *Accipitres* of Cuvier, and to the *Raptores* of most ornithologists. Herein he gives us an entirely new arrangement of the families composing it, to which I must briefly advert. Leaving the *Strigidæ* as they were, he breaks up the usually recognized family *Vulturidæ*, and taking out the Vultures of the New World, *Cathartes* and *Sarcorhamphus*, makes a family of them by the name *Cathartidæ*; while he combines the Vultures of the Old World, *Neophron*, *Vultur*, *Gyps*, and others, with the ordinary *Falconidæ* in one family, bearing the designation of *Gypaetidæ*, and erects the genus *Gypogeranus* into the fourth family of the Suborder under the name *Gypogeranidæ*. Except that I have some suspicions as to the real affinity of the *Strigidæ* with the rest of what are commonly called "Birds of Prey," I see no objection to this proposal; and I am quite ready to admit that the differences observable in the cranial structure of the Vultures of the Old World and those of the New are, when taken with the other characters cited, sufficient to justify the separation. So far as I know (but my knowledge, I must say, is only at second hand), there is no appreciable divergence in the habits of scavengers on either side of the Atlantic; the modifications which exist, therefore, cannot in this case be ascribed to any such cause as I suggested a few lines previously; and I am certainly not going to refuse some importance being attributed to slight cranial characteristics. To me it appears that every part of a bird's structure, to say nothing of every peculiarity in its mode of life, may, under certain aspects, throw light upon its affinities, and consequently on its real position in the System of Nature. For a long time I deemed the coracoid bone to be the most characteristic in the ornithic skeleton—not that I ever wished to rest a system of classification entirely upon that basis. I have not yet quite divested myself of this idea, though when, rather more than two years since, I first became acquainted with the form of the coracoid in *Didus*, a form so utterly unlike any other of which I know, my theory received a somewhat rude shock, which has lately been renewed on finding that in *Pezophaps*, unquestionably a close relative of *Didus*, the coracoid exhibits little, if any, of the same form, as I hope shortly to make generally known. But this fact merely corroborates the

belief I have previously expressed, that it is only from the consideration of an aggregate of characters that we can expect to reach our goal, and that we are on no account to be discouraged in our attempts to attain our *ultimus finis* by the difficulty of the task.

Professor Huxley informs me he is still continuing his labours on the *Sauropsida*; and I am sure all will be glad to hear it. I have not dwelt upon the *Coccygomorphæ*, the proper division of which certainly presents as difficult a problem to solve as any group does. For the present they are left in four groups, separated by the external characters of their feet, the first and last of which groups are formed respectively of the *Coliidæ* and *Trogonidæ*; the second contains the *Musophagidæ*, *Cuculidæ*, *Bucconidæ*, *Rhamphastidæ*, *Capitonidæ*, and *Galbulidæ*; while the third is made up of the *Alcedinidæ*, *Bucerotidæ*, *Upupidæ*, *Meropidæ*, *Momotidæ* and *Coraciidæ*. Prof. Huxley, however, seems to think that it may hereafter be desirable to separate these four groups still more widely, and in that case would retain the title *Coccygomorphæ* for the second.

I here close these remarks, many of which I well know are far from being adequate to the subject. I would fain hope that the classification I have dared to criticise will obtain the closest attention of ornithologists; and there is, of course, plenty more to be said about it. Though I have ventured to impugn some of the main principles on which the scheme is founded, I am not at all sure that it may not at last be generally adopted; but even if such be not the case, I am quite sure it will not be the least of the services rendered to science by the present occupant of the Hunterian Chair.

Magdalene College, Cambridge,
16 December, 1867.

X.—*Notices of Recent Ornithological Publications.*

1. English.

The promised translation of Nitzsch's 'Pterylographie,' which we some time ago announced (Ibis, 1865, p. 118), has at length