

at considerable expenditure of time and trouble, gave me much desirable information concerning the objects of my visit previously to my departure from England, and also many valuable hints and suggestions during the preparation of these notes. I also owe my thanks to Mr. John Baker for advice which proved of much assistance to us, and for his communication mentioned above.

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XL.—*On the Arrangement of the Families constituting the Order Passeres.* By ALFRED R. WALLACE.

THE Passeres, as now restricted, constitute nearly three fourths of all known birds. They are wonderfully uniform in all essential points of structure, while presenting endless modifications in external form; and the points of resemblance and of difference between the several families are so numerous and conflicting that their classification still remains an almost insoluble problem. As an example of the wide difference of opinion on this point, we may contrast the views of two recent authors. Dr. Carus, in his 'Handbuch der Zoologie,' divides the Passeres into twenty-eight families, while Professor Sundevall, in his 'Methodi Naturalis Avium Disponendarum Tentamen,' has no less than 107; and there is often the widest divergence in the succession of the groups in these two systems. Eminent authors also differ widely as to the position of a large number of genera, those which are held by some to be quite unrelated being united by others in the same family. For a long time the Tyrants of America were united with the Shrikes of the Old World, while such an acute ornithologist as the late Prince Charles Bonaparte confused and intermingled the genera of Timaliidæ and Pycnonotidæ.

The characters which have been generally used by systematists in defining the families of Passeres are the form of the bill, the scutellation of the tarsi, and the varying proportions of the toes and wing-feathers; but most of these are subject to great variation in closely allied forms, and, with the exception perhaps of the second, do not aid much in determining the affinities of the various families towards each

other. The form of the sternum has proved to be of the greatest importance in separating from the Passeres several groups which did not properly belong to it, and we may now (since the Humming-birds, the Swifts, and the Todies have been separated from it) consider the limits of this great Order to be pretty well determined. But within those limits this character is of little service, owing to the great uniformity of structure that prevails throughout the whole series of Passerine families. An important step was made when it was observed that a number of South-American groups differed from their Old-World analogues in wanting certain vocal muscles; and when it was found that there were corresponding external characters in the wings and feet, the separation of these families as a natural series became generally accepted. But there are great objections to the use of characters drawn from the fleshy parts of birds. It is only in comparatively few instances that they have been accurately observed; and they are for this reason of little use to the naturalist who possesses even the most extensive collection of skins and skeletons. Owing to the paucity of observations, we are also unable to determine how far the character in question is a constant one; and there is reason to believe that the larynx, the intestines, and the other internal soft parts are liable to much modification, even in closely allied forms. In order to be practically useful, the characters on which genera, families, and groups of families are founded must, whenever possible, be drawn from those parts which can be examined in every well-preserved skin, supplemented in critical cases by a reference to the *sternum*, the *cranium*, or other parts of the skeleton.

Now it is found that the Passeres with imperfect singing apparatus are also characterized by having wings with 10 primaries, the first of which is almost always fully developed, or very little shorter than those which immediately follow it; whereas all other Passeres have either 9 primaries only, or, if 10, have the first distinctly reduced below its proportionate size, and often so small as to be rudimentary and functionless. But although the character of the first primary quill was thus

found to accord with a striking anatomical feature, and to mark out an important natural group of families, it was not applied to the more extensive series of families which remained, and whose arrangement has continued to this day in a most unsettled state. Hardly any two ornithologists agree as to the order in which these families most naturally follow each other; and even in the most recent classifications the peculiarities of the first primary are deemed of so little importance that birds which markedly differ in this respect are sometimes placed in the same or in adjacent families or, even, genera. After repeated attempts, during many years, to group naturally the families of Passeres, I have recently come to the conclusion that variations in the number and development of the primary quills indicate deep-seated affinities, and furnish the best, because the most simple and practically convenient, means for the further subdivision of this extensive Order. The fact that similar peculiarities of wing-structure run through whole series of families which are undoubtedly related, is a clear indication of the importance of these characters; and we shall, I think, find that if we follow them out cautiously, and give due weight in doubtful cases to other proofs of affinity, we shall be led to a grouping of this vast and complex mass of birds which avoids many of the difficulties that have hitherto beset their classification, and accords in a remarkable manner with the main features of their geographical distribution.

Four types of wing are distinctly recognizable among the Passeres. First and most numerous are those with 10 primary quills, the first of which is greatly reduced in size; then we have the American series, in which the first primary is well developed; and a small Old-World series, in which it is rudimentary; and lastly a series in which the first primary is aborted, and which thus possesses only 9 primaries. These differences may be tabulated as follows; but it is found most convenient to arrange them in the order of the appended numerals, as we thus pass most easily from one series to the other, and that order best accords with existing arrangements:—

PASSERES.

10 primaries . . . . .	}	1st primary well developed . . . . .	(4)
		1st primary reduced . . . . .	(1)
		1st primary rudimentary . . . . .	(3)
9 primaries . . . . .		1st primary being absent . . . . .	(2)

We commence with the extensive series of families possessing 10 primaries the first of which is neither rudimentary nor fully developed, but is almost always markedly small, weak, narrowed, or shortened, compared with those which immediately follow it. Our Thrushes, Warblers, and Crows are examples of this series, which consists of twenty-one families of preeminently Old-World birds. Only one of these families is peculiar to America; and that one (Vireonidæ) shows a transition to the Mniotiltidæ in the following series by having the first primary sometimes rudimentary, or even absent. Only a few other families of this series occur in South America; and only two of them, the Turdidæ and Troglodytidæ, are well represented there. The following is a list of these families :—

Series A. *Typical or Turdoid Passeres.*

Wing with 10 primaries, the first always more or less markedly reduced in size.

- |   |                     |
|---|---------------------|
| 1. Turdidæ.   | 11. Oriolidæ.       |
| 2. Sylviidæ.  | 12. Campephagidæ.   |
| 3. Timaliidæ.   | 13. Dicruridæ.      |
| 4. Cinclidæ (incl. <i>Henicurus</i> and <i>Eupetes</i> ). | 14. Muscicapidæ.    |
| 5. Troglodytidæ.  | 15. Vireonidæ.      |
| 6. Certhiidæ.   | 16. Pachycephalidæ. |
| 7. Paridæ.  | 17. Laniidæ.        |
| 8. Leiotrichidæ.  | 18. Corvidæ.        |
| 9. Phyllornithidæ.  | 19. Paradiseidæ.    |
| 10. Pycnonotidæ.  | 20. Meliphagidæ.    |
|   | 21. Nectariniidæ.   |

It will be observed that in this series of families every one has undoubted affinities with some others placed near it, according to the views of all those naturalists who have freed themselves from the trammels of the old *rostral* system. But

when we look to the next series of families, having only 9 primaries, we find that there still exists the greatest diversity of opinion as to their true position. Every modern ornithologist, without exception, has attempted to intercalate them among the families of the first series, in some cases even incorporating them into one or other of those families, owing to superficial resemblances. In this series the first of the nine primaries is always fully developed, and often very long; and this well-marked character is found to group together a set of families which have in many cases acknowledged affinities for each other, but which offer the greatest difficulties when we attempt to locate them naturally among the families of the first series. They have also a well-marked geographical aspect, being as characteristic of the New World as the preceding series is of the Old. Four out of the ten families are exclusively American; one is peculiar to the Sandwich Islands, and has strong affinities to an American family; three others are as well represented in America as in the Old World; while the only one totally absent from America (*Dicæidæ*) is typically Australian—that region which has the most affinity to the Neotropical. I now give a list of these families, and will then briefly remark on their affinities:—

Series B. *Tanagroid Passeres.*

Wing with 9 primaries, the first of which is fully developed and usually very long.

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|------------------------|------------------------|
| 1. <i>Motacillidæ.</i> | 6. <i>Ampelidæ.</i>    |
| 2. <i>Mniotiltidæ.</i> | 7. <i>Hirundinidæ.</i> |
| 3. <i>Cœrebidæ.</i>    | 8. <i>Tanagridæ.</i>   |
| 4. <i>Drepanidæ.</i>   | 9. <i>Fringillidæ.</i> |
| 5. <i>Dicæidæ.</i>     | 10. <i>Icteridæ.</i>   |

The *Motacillidæ* do not come well in series A; and there has been no general agreement as to their location. The *Mniotiltidæ* and *Cœrebidæ* are so closely allied that good ornithologists differ as to where some of the genera (e. g. *Dacnis*, *Certhiola*) are to be placed; yet they cannot be arranged with their supposed allies in the first series without widely separating them. The *Drepanidæ* of the Sandwich Islands, very

properly distinguished from the Meliphagidæ by Dr. Sclater, follow naturally here. The Dicæidæ, consisting of the genera *Dicæum*, *Zosterops*, *Pardalotus*, *Prionochilus*?, and one or two others, has always been a subject of discord, the four genera above named having been placed in the most diverse families. *Pardalotus*, for example, has been placed in the Laniidæ by G. R. Gray, in the Ampelidæ by Bonaparte, near the Leiotrichidæ and Paridæ by Jerdon, and as a distinct family near the Mniotiltidæ by Sundevall, who, however, puts *Prionochilus* far away among the Pycnonotidæ. The wing-structure, form, and habits of the three first-named genera bring them naturally together in this place; and *Dicæum* is certainly very close to the Tanagrine genus *Euphonia*. *Prionochilus* is a great puzzle. It possesses a minute first primary, which favours Sundevall's view of its position; but it agrees so very closely in the peculiar form of the bill and general appearance with some species of *Dicæum* and *Pardalotus*, that I cannot bring myself to separate it from them, although I acknowledge it to be an awkward anomaly in this series of families. I may here notice that the species which I described as *Prionochilus aureolimbatus*, from Celebes (P. Z. S. 1865, p. 477), has only nine primaries, and must thus be placed in *Dicæum* or *Pachyglossa*, with which latter genus it very closely agrees. I therefore cannot follow Dr. Sclater (*anteà*, p. 3) in making *Pachyglossa* a synonym of *Prionochilus*. The Dicæidæ are typically Australian, but have spread over the Oriental and even to the Ethiopian region. We next come to the Ampelidæ, which have also been a source of much confusion, having been placed next the Laniidæ, Pycnonotidæ, or Leiotrichidæ by various authors. They have been generally recognized as allied to *Pardalotus*; and indeed that genus might perhaps come into this family rather than in the last. The colouring of some of the *Pardaloti* approximates to that of *Ampelis*. The Hirundinidæ are undoubtedly very isolated; yet they assort as well in form and plumage with the Ampelidæ and some genera of Tanagridæ as with any other families that can be named, while they have the advantage of agreeing with this series in the essential features of wing-structure. The next family,

the Tanagers, have affinities both with the Mniotiltidæ, Fringillidæ, and Dicæidæ, while they have no close resemblance to any family of either of the other series. The Fringillidæ and the Icteridæ naturally follow, and complete the series. The latter seem to be an extreme development of the American Fringilline or Tanagrine stock, and to have no immediate affinity to the Old-World Starlings, which they represent in a parallel group, just as the Mniotiltidæ represent the Warblers.

The third set of families we are able to separate consists of four only, characterized by possessing ten primaries, as do the typical Passeres, but with the first rudimentary and functionless. Some species belonging to other series closely resemble these; but the character never prevails throughout an entire family as it does here. This series is not very well marked; but as it best follows Series B, it is advisable to keep the families which constitute it apart. These are all Old-World groups, not possessing a single representative in the Neotropical, and but a solitary species in the Nearctic region.

Series C. *Sturnoid Passeres.*

Wing with 10 primaries, the first of which is rudimentary.

- |              |              |
|--------------|--------------|
| 1. Ploceidæ. | 3. Artamidæ. |
| 2. Sturnidæ. | 4. Alaudidæ. |

The Alaudidæ form a transition from the preceding series, where they would perhaps be as well placed, the first primary being in some genera rudimentary and of varying size, in others quite absent; and this agrees with their affinity to some forms of Fringillidæ (the Buntings), which has been pointed out by many ornithologists. The Ploceidæ form a parallel development with the Fringillidæ, as do the Sturnidæ with the Icteridæ. The Artamidæ have been the subject of much discussion. They have been placed with the Swallows, the Shrikes, the Drongos, or the Orioles; but no one has observed their resemblance to the Starlings. Yet, as regards general form, the colour and character of the plumage, and the peculiar bill and nostril, they do certainly resemble some Starlings, especially the anomalous *Scissirostrum*. The form

and structure of the wing is very similar to that of the Sturnidæ, while it is quite unlike that of most of the other groups near which they have been placed. We may consider them, therefore, to be a short-legged Hirundine modification of the Sturnoid type.

We now come to a final series of ten families, characterized by possessing ten primaries, of which the first is typically fully developed and very long, although it is exceptionally so much reduced as to resemble its condition in some forms of Series A. But in these cases no difficulty arises, since the majority of the family to which these birds belong possess the typical form of the series. This form is highly characteristic of the New World, to which seven of the families are exclusively confined. The other three, of small extent, are Australian and Oriental.

Series D. *Formicarioid Passeres.*

Wing with 10 primaries, the first well developed and typically long.

- |                     |                  |
|---------------------|------------------|
| 1. Menuridæ.        | 6. Tyrannidæ.    |
| 2. Pteroptochidæ.   | 7. Cotingidæ.    |
| 3. Dendrocolaptidæ. | 8. Pipridæ.      |
| 4. Formicariidæ.    | 9. Eurylæmidæ.   |
| 5. Pittidæ.         | 10. Phytotomidæ. |

About the American members of this series there is now little difference of opinion; but the three Old-World families have been the subjects of much discussion. The short-winged Pteroptochidæ would seem, at first sight, to be better placed near the Troglodytidæ, in the Turdoid series, but for their close affinity to the Formicariidæ. Yet although the first primary is short, it is always broad and about two thirds the length of the second. In the Wrens, with which these birds were formerly placed, the first primary is much narrower as well as shorter. The Australian Menuridæ must be kept close to these, as they have no other near allies. The Pittidæ are still classed near the Thrushes by Professor Sundevall; but they seem much better placed near the Formicariidæ, with which their wing-structure more nearly agrees. The Eurylæmidæ have generally been located near *Coracias* among the



Picariæ, which is certainly wrong; while Sundevall unites them in the same family with *Rupicola*, near to which genus they must undoubtedly be placed in a natural arrangement.

Now, taking the four series of Passerine birds as here arranged, we find a marked and very curious distinction between the American, and especially the typical Neotropical, fauna and that of all the rest of the globe. Of the thirteen families which are altogether confined to the New World, all but one have the prevailing character that the first quill in the wing is well developed in proportion to those which immediately succeed it; and this is the case whether there are nine or ten primaries in all. In the Old World, on the contrary, we find the prevailing character of the wing to be, that the first quill is either distinctly rudimentary, or very much reduced in size proportionally to the succeeding quills; so that out of twenty-nine families which are especially characteristic of the Old World, no less than twenty-two have this character. It is further to be noted that the seven Old-World families which have the first quill fully developed (including those with nine as well as those with ten primaries) are all of them of comparatively small extent and little varied in structure. These facts render it almost certain that the characters drawn from the condition of the first two primaries, here made use of, are really of great permanence, and therefore of high classificatory value; for if they had been less stable, and liable to frequent change from family to family and from genus to genus, it is contrary to all probability that they should present themselves with such an approach to uniformity in whole series of allied families confined to the Old and the New Worlds respectively.

Another consideration in favour of the correctness of the divisions here marked out is, that the best modern ornithologists are nearly in agreement as to the mutual relations of the families in Series A, C, and D respectively; but in the attempt to intercalate the families of Series B among the others, there has been as marked a diversity of opinion; and although the relations of several of these families to each other have been admitted, no bond of union has been detected among

the whole series. This bond of union, I maintain, is found in the total abortion of the first primary quill; and although in the case of some of the families we may not see any other character to unite them, this should not militate against giving due weight to a structural peculiarity which is found to be absolutely constant throughout all the species of several extensive families, and to confirm, in many cases, the conclusions which ornithologists have arrived at from other characters. It is therefore the separation of the families constituting the "Tanagroid Passeres" as a distinct group which forms the main feature of my proposed arrangement, and in which its chief value (if any) is to be found.

As it is not always possible to determine the number of the primary quills without injuring the specimen, and not possessing duplicates of many of the requisite forms, I have in general taken the statements of Professor Sundevall to be correct. He has devoted himself for many years to the special study of the details of external form and structure in birds, and in the work already quoted has, in most cases, given the number of the primaries and the nature of the first quill. But (as I think, very unfortunately) he has only occasionally given weight to this character in his classification, which depends mainly on the varieties of scutellation of the tarsi. This latter character can hardly have the high value he gives it, since it leads to such unnatural combinations as Larks and Hoopoes, *Todus* and *Pipra*, *Irrisor* and *Epimachus*—errors due in great part to his refusal to give any weight to purely anatomical characters. Yet in many respects his classification is a great advance on most of those which have preceded it, since it defines every group by clear external characters, which, if not always of the value he assigns to them, will be of great service to future workers at the classification of birds.

The foregoing systematic sketch has been arrived at after often renewed attempts at a natural arrangement of Passeres, for the purposes of a work, on the Geographical Distribution of Animals, on which I have been some time engaged. The conclusions now set forth seem to me more satisfactory than

any before attained, either by myself or others. They are the result of following out a simple principle of classification whose partial application has been long accepted; and they possess, I think, the merit of introducing some intelligible order into the most extensive of all the natural groups of birds, and the one whose complex and divergent affinities have always been a source of the greatest perplexity to systematists. I now submit my proposed arrangement to the kind consideration of ornithologists as one well suited for practical use until a more generally acceptable one is arrived at. In passing judgment on it, I beg them to bear in mind that I do not set up the "first primary" as an infallible guide to be blindly followed, but only as a *clue* by means of which we may sometimes extricate ourselves from the labyrinth of doubtful Passerine affinities in which we so often lose our way.

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XLI.—*Dr. A. B. Meyer's Ornithological Discoveries in New Guinea.* By P. L. SCLATER.

BEGINNING in February last, Dr. Adolf Bernhard Meyer has made a series of communications to the Imperial Academy of Sciences of Vienna upon the ornithological results of his recent expedition to New Guinea. Of these, altogether six in number, we have lately received the full text, abstracts of them having previously come to hand. In the first of these\* Dr. Meyer describes seven new species:—(1) *Ægotheles dubius*, from the Arfak mountains (perhaps = *Æ. albertisi*, Scl.); (2) *Todopsis mysorensis*, from Mysore; (3) *Chrysococcyx splendidus*, from the Arfak mountains; (4) *Ailurædus arfakianus*†, from Atam; (5) *Orthonyx novæ-guinææ*, from the Arfak mountains; (6) *Talegallus jobiensis*, from Jobi; and (7) *Megapodius geelvinkianus*, from Mysore. Dr. Meyer also

\* "Ueber neue und ungenügend bekannte Vögel von Neu-Guinea und den Inseln der Geelvinksbai (erste Mittheilung) von Dr. Adolf Bernhard Meyer," Sitz. d. k. Akad. der Wiss. vol. xlix. 1. Abth. (Feb. 1874).

† I examined a skin of *Ælurædus*, from Atam, in Sign. D'Albertis's collection, but could not distinguish it from *Æ. melanotis*.