Report on the recent Progress and present State of Ornithology. *By* H. E. Strickland, *M.A., F.G.S., &c.*

Introduction.

The object of this report is to give a sketch of the recent progress, present state, and future prospects of that branch of zoology which treats of the class of Birds. As the chief, indeed the only method by which this study can be developed into a science, consists either in describing and depicting the character and habits of this class of animals in *books*, or in preserving and arranging the objects themselves in *museums*, I shall review in succession the progress which has been made in these two departments of the subject, and shall conclude with a few remarks on the *desiderata* of ornithology.

In treating of the bibliography of ornithology, however, it is not necessary to go into much detail respecting the works of older date than about fifteen years ago. The ornithological works of the last and the earlier part of the present century are well known to most naturalists, and the reader will find ample and for the most part just criticisms respecting them in Cuvier's 'Règne Animal,' vol. iv., Temminck's 'Manuel d'Ornithologie,' Swainson's 'Classification of Birds,' and his 'Taxidermy and Bibliography,' Wood's 'Ornithologist's Text Book,' Wilson's article *Ornithology* in the 'Encyclopædia Britannica,' Rev. L. Jenyns's 'Report on Zoology,' 1834, Burmeister's article *Ornithologie* in Ersch and Gruber's 'Encyclopädie der Wissenschaften,' and other sources. I shall therefore only give such a cursory notice of some of the earlier writers on ornithology as will serve to introduce the more legitimate subject of this report.

It may perhaps surprise those who are not very conversant with the subject to be told that ornithology is in a less advanced state than many other departments of zoology. Persons who are accustomed to regard "stuffed birds" as constituting the most usual and most attractive objects of a public museum, will not readily admit that the various species of Mammalia, Fish, Insects, Mollusca, and even Infusoria, are more accurately determined and more perfectly methodized than the class of Birds. Such is however the case, and although in the last few years ornithology has certainly made a very marked progress, yet it is still considerably in the rear of its sister sciences.

This backward condition of ornithology must be attributed in great measure to the pertinacity with which its followers during many years adhered to the letter instead of to the spirit of Linnæus's writings. In this country the venerable Latham, who for half a century was regarded as the great oracle of ornithology, persisted so late as 1824 in classifying his 5000 species of birds in the same number of genera (with very few additions) as were employed by Linnæus for a fifth part of those species. The consequence was that many of the genera in Latham's last work contain each several hundred species, frequently presenting the most heterogeneous characters, and massed together without any, or with only very rude, attempts at further subdivision. Shaw's 'General Zoology' was, in a great measure, a servile copy of Latham's 'Ornithology,' and these two works formed for many years almost the only text-books on the subject. On the continent meanwhile, those who were not disciples of Linnæus, transferred their allegiance to Buffon, and often exceeded that author in their contempt for systematic arrangement and uniform nomenclature.

Cuvier, indeed, as early as 1798, had sketched out an improved classification of birds in his 'Tableau Elémentaire de l'Histoire Naturelle,' repeated with

amendments in his 'Anatomie Comparée' in 1800. The main features of his arrangement correspond with that which he afterwards adopted in his 'Règne Animal.' About the same period also, Lacépède published a system, arranged on a new plan and containing the definitions of several new genera. Another outline of an improved ornithological system was published in 1806 by M. Duméril in his 'Zoologie Analytique.' But these attempts at progress seem to have been made before the scientific world was able to appreciate them, and several years elapsed before their influence was generally felt.

The logical and accurate Illiger was the next who endeavoured to introduce sounder principles into ornithology; his admirable 'Prodromus Systematis Mammalium et Avium,' published in 1811, after long years of neglect, has now become an almost indispensable handbook to the studier of Mammals and Birds. But this young reformer died at an early age, and ornithology again relapsed under the drowsy sway of the Linnæan and Buffonian schools.

The next effort in advance was made in 1817, when Cuvier, having previously arranged the Paris Museum according to his own views of the natural system, embodied the results in the 'Règne Animal.' In the ornithological portion Cuvier was anticipated by Vieillot, who having access to the galleries of the museum, is charged with having appropriated the labours of Cuvier by attaching names of his own to the groups there pointed out. Be this as it may, the 'Analyse d'une nouvelle Ornithologie Elémentaire' of Vieillot, and the ornithological portion of the 'Règne Animal' of Cuvier, contain many new generalizations based upon highly important but previously neglected structural characters, and their publication indicated a vigorous effort at transferring the subject from the domain of authority to that of observation.

Temminck, who in his 'Histoire des Pigeons et des Gallinacés,' 1813–15, had introduced several new generic groups into the Rasorial order, published in the second edition of his 'Manuel d'Ornithologie,' 1820, the outline of a general system of ornithology, containing many important additions to the arrangements of Cuvier and Vieillot.

The method of De Blainville, completed in 1822, deserves notice, from his having introduced as a new element of classification the structure of the sternum and of the bones connected with it. The distinctive characters thus deduced are now generally admitted as forming valuable auxiliaries in the search after a natural arrangement.

The improved methods of classification, thus originated on the continent, made a gradual but slow progress into this country. Dr. Leach seems to have been the first British naturalist who duly appreciated the labours of Cuvier, and in the concluding volumes of Shaw's 'Zoology,' published under his superintendence, the new generic groups of the continental authors were successively introduced, and engrafted upon the stock of Linnæus and Latham. Dr. Horsfield also entered thoroughly into the spirit of the reformers of zoology, and in his valuable memoir on the Birds of Java in the Linnæan Transactions, vol. xiii., he adopted the arrangements of Cuvier and of Leach, with many excellent additions of his own. Dr. Fleming's 'Philosophy of Zoology,' 1822, also contributed to render the naturalists of Britain familiar with the improved systems of the Cuvierian school.

The late Mr. N. A. Vigors gave, in 1823, a great impulse to the study of ornithology by his elaborate memoir in the Linnæan Transactions, vol. xiv., on 'The Natural Affinities that connect the Orders and Families of Birds.' This treatise abounds with original observations and philosophical inferences, but unfortunately they are applied in support of a theory which the most

careful inductions and the most unprejudiced reasonings of subsequent naturalists have shown to have no claim to our adoption as a general law. Without entering further upon the *vexata quæstio* of the "Quinary System" than as regards its application to ornithology, I may remark that if we can show that this supposed universal principle fails in its application to any one department of the animal kingdom, it loses its character of universality, and a presumption is raised against its truth even as a *special* or *local* law. The quinary system in fact includes several distinct propositions, the truth of any one of which does not imply that of the remainder. First, it is laid down that all natural groups, if placed in the order of their affinities, assume a circular figure; secondly, that these circles are each subdivided into *five* smaller circles; thirdly, that two of these are *normal*, and the remaining three *aberrant*; and fourthly, that the members of any one circle represent analogically the corresponding members of all other circles. I shall have occasion to recur to these points in speaking of Mr. Swainson's writings, and at present will merely remark, that the application by Mr. Vigors of these novel and singular doctrines to the class of birds contributed in no small degree to the advancement of ornithological science; for however erroneous a theory may be, yet the researches which are entered upon with a view to its support or refutation invariably advance the cause of truth. Alchemy was the parent of chemistry, astrology of astronomy, and quinarianism has at least been one of the foster-parents of philosophical zoology. Another debt of gratitude which we owe to the quinarians is the broad and marked distinction which they were the first to draw between AFFINITY and ANALOGY—between agreements in *essence*, and agreements in *function* only and not in essence, the one constituting a *natural*, and the other an *artificial* system. And although their foregone conclusions sometimes led them to mistake the one for the other, yet by their clear definitions on the subject they enabled others to detect the errors which in such cases they could not see themselves*.

In 1824 Vieillot presented a new edition of his system, with but slight alterations, in his 'Galerie des Oiseaux,' and in the following year Latreille proposed another arrangement, which however differs very little from that of Cuvier as finally left by him in the second edition of his 'Règne Animal,' 1829. The celebrity of its author caused the latter work to be speedily

* The distinction between affinity and analogy is as yet but imperfectly established on the continent, or at least the terminology employed is very vague. French writers continually use the term *analogie* to express what we call *affinity*, a defect in their scientific language which they might easily remedy by making use of the word "*affinité*," and by restricting *analogie* to its true meaning. The same inaccuracy also exists in the language of geologists, British as well as foreign, when they speak of the *recent analogue* of a fossil, meaning thereby that recent species which has the strongest affinity to the extinct one. They might term it with more propriety the *recent affine*. A similar alteration would also introduce greater precision into the terminology of comparative anatomy. The parts which in different groups of animals are *essentially equivalent*, though often differing in function, are commonly termed *analogous members*, but it would be more correct to call them *affine members*, and to restrict the term *analogous* to those organs which resemble in function *without being essentially equivalent*. Thus the *tooth* of Monodon, the *nose-horn* of Rhinoceros, the *intermaxillaries* of Xiphias, and even the *rostrum* of a Roman galley, all perform a similar function, and are therefore *analogous* organs, but the relation between the weapon of offence in Monodon and the masticatory teeth of other Mammalia is an agreement in essence but not in function, and is therefore not an *analogy* but a real *affinity*. There is yet a third kind of relation between organic beings which does not deserve the name of *analogy*, but which may be simply called *resemblance*, consisting of a mere correspondence in form, but not in function or essence, such as the *resemblance* between *Murex haustellum* and a Woodcock's head, between *Ophrys apifera* and a Bee, &c., a relation which is in every sense *accidental*, though the advocates of the quinary theory have often regarded it as a true analogy.

translated into other languages, and it soon became the text-book for classification in most of the museums of Europe. The 'Règne Animal' will ever remain a monument of the industry of Cuvier and of his extraordinary powers of generalization, but it would be vain to expect that all parts of so vast an undertaking should be equally perfect, and it is therefore no matter for surprise that the class of birds, which do not seem to have been a favourite branch of Cuvier's studies, should present many defects in their arrangement. Certain it is that, not to mention many proofs of haste in the citation of species and of authors, the series of affinities is in this work often rudely broken or arbitrarily united. In his arrangement of birds Cuvier seems to have too closely followed the old authors, in adopting an isolated character as the basis of his classification, a practice which inevitably leads to arbitrary and artificial arrangements. He places, for example, the *Tanagers*, *Philedons*, and *Graculæ* in the midst of the *Dentirostres*, *Dacnis*, *Coracias* and *Paradisea* among the *Conirostres*, *Sitta* and *Tichodroma* among the *Tenuirostres*, *Furnarius* in *Nectarinia*, &c. Many of these defects were pointed out by Prince C. L. Bonaparte in an admirable critique published at Bologna in 1830, entitled 'Osservazioni sulla seconda edizione del Regno Animale,' and which is an indispensable appendage to Cuvier's work. Another valuable accompaniment to the 'Règne Animal' is the series of plates published by Guérin under the title of 'Iconographie du Règne Animal de Cuvier.'

This slight preliminary sketch of the progress of ornithological classification has now conducted us to a period when it becomes necessary to enter into greater detail.

I propose, as far as I am able, to notice all the more important ornithological works which have been published since 1830, and which have contributed to bring the subject to its present state, not indeed of *perfection*, but what is more interesting to those engaged in it, of *progress*. I must however regret, that from the difficulties of obtaining access to many rare continental publications, especially to the almost innumerable annals of scientific societies, this attempt at a general survey of the subject will unavoidably be somewhat incomplete. I shall of course pass over such works as are devoid of *scientific* merit, as well as those mere compilations, which from their want of any new or original matter tend only to diffuse and not to advance the science.

In entering on so large a field it becomes necessary to subdivide the subject, which may be treated of under seven heads, viz.—1. General systematic works. 2. Works descriptive of the Ornithology of particular regions. 3. Monographs of particular groups. 4. Miscellaneous descriptions of species. 5. Pictorial Art as applied to Ornithology. 6. The Anatomy and Physiology of Birds, and 7. Fossil Ornithology.

1. *General Systematic Works.*

Lesson, who in 1828 had published a useful little 'Manuel d'Ornithologie,' based chiefly upon Cuvier's classification, brought out in 1831 a more extended work, entitled 'Traité d'Ornithologie.' This book, which professes to enumerate all the species of birds in the Paris Museum, is upon the whole a very unsatisfactory performance, presenting all the marks of great haste and consequent inattention. Many professed new species are named without being described, others are described without being scientifically named; no measurements are given, and the descriptions are often so brief and obscure, that it is impossible to determine a species by their means. The work, nevertheless, contains the definitions of many new generic groups which are now adopted into our systems, and M. Lesson is therefore entitled to the credit of

these original generalizations. The classification followed in this work is very complex, and in some of its portions very artificial, the genera being arrived at through a numerous and irregular series of successive subdivisions, founded in many cases upon arbitrary and isolated characters. Perhaps the most valuable portions of the work are the generic definitions, which are worked out with greater care than the specific descriptions.

Professor Eichwald gave a synopsis of the class of birds with brief descriptions of the Russian species in his 'Zoologia Specialis,' Wilna, 1831. Prefixed to it is a good general *resumé* of the characters, external and internal, of the ornithic class.

The arrangement of birds proposed by Wagler (Systema Amphibiorum) and by Nitzsch (Pterylographia) have not yet fallen under my inspection.

In 1831 the Prince C. L. Bonaparte published his 'Saggio di una Distribuzione Metodica degli Animali Vertebrati,' exhibiting a system of ornithology, of which he had previously given a sketch in the 'Annals of the Lyceum of New York,' vol. ii. 1828. As this arrangement seems in its main features to approach more nearly to the system of nature than any contemporary method, it will be worth while to enter into some detail respecting it. The author divides the class of birds in the first instance into *two* great groups or subclasses, *Insessores* or perchers, and *Grallatores* or walkers, the first including the orders *Accipitres* and *Passeres*, and the second the *Gallinæ*, *Grallæ*, and *Anseres*. Most other zoologists, from the time of Linnæus to the present day, unconsciously prejudiced by the size, rapacious habits and celebrity of the birds of prey, have attached too much importance to their characters, and have made them into one of the primary divisions of the class *Aves*. But on an unbiassed estimate of their characters it will appear that the *Accipitres* form merely a division of the great group of Perchers, agreeing with them in all essential points of organization, and not differing more than some of the subdivisions of the perchers do from each other. It was therefore a justifiable act to lower the *Accipitres* from the lofty place which they had long occupied, and to subordinate them to the *Insessores*. I even think that the learned author might have gone a step further, by making his subclass *Insessores* to consist of *one* order, *Passeres* only, while the *Accipitres* would stand on a level with his *Scansores* and *Ambulatores*, as a tribe or subdivision of *Passeres*.

The primary division of all birds into *perchers* and *walkers*, though professedly based on the position and development of so unimportant an organ as the hind-toe, and therefore liable at first sight to be termed arbitrary and artificial, is yet confirmed by so many other important and coextensive characters to which the structure of the hind-toe serves as an external indication, that we cannot doubt of this arrangement being conformable to nature. No person acquainted with the difficulty of defining the larger groups of zoology, will, of course, expect logical exactness in the application of these or of any other set of characters to the orders of ornithology. But allowing for such exceptions as occur in all zoological generalizations, it is certain that by this arrangement two great groups of birds are pointed out, the one arboreal, with perching feet, monogamous, constructing elaborate nests, and rearing a blind, naked, and helpless offspring; while the others are terrestrial, with ambulatory feet, frequently polygamous, displaying no skill in the form of their nests, and producing young which are clothed and able to see and to run as soon as hatched.

The classification of Vertebrata, which Prince C. L. Bonaparte sketched out in the above work, is further developed in a paper which he communicated to

the Linnæan Society (Transactions, vol. xviii.). The diagnostic characters of all the families and subfamilies are here worked out with elaborate exactness, as they are also in his 'Systema Ornithologiæ,' published in the 'Annali delle Scienze Naturali di Bologna,' vols. iii. and viii. In these latter esays the author introduces several modifications, the most important of which is, that he removes the *Psittacidæ* from the other *Scansores*, and places them as a separate order at the commencement of the system, before the *Accipitres*. This arrangement, which was first proposed by Blainville, is grounded on the curvature of the beak, the presence of a cere, and the reticulation of the tarsi, which are supposed to connect the *Psittacidæ* and *Accipitres*. I must be allowed however to differ from this opinion, as the Parrots appear to me to be much more closely allied to the other *Scansores*, with which they are usually classed. In the nature of their food, the prevailing red and green colours of the plumage, the structure of the tongue in some genera (*Trichoglossus*), and of the beak in others (*Nestor*, &c.), they seem really allied (though somewhat remotely) to the *Rhamphastidæ*, and through them to the *Bucconidæ* and *Picidæ*.

An arrangement of the chief families and genera of birds, with definitions of their distinctive characters, will be found in the 'Elémens de Zoologie,' by M. Milne Edwards, 1834 (2nd ed. 1837), and in similar introductory works by Oken and Goldfuss.

Professor Sundevall published a new classification of birds in the 'Kongl. Vetensk. Acad. Handlingar,' Stockholm, 1836. He divides them into two large groups, nearly corresponding with the *Insessores* and *Grallatores* of the Prince of Canino. He agrees with Mr. Swainson in attaching a real importance to the analogical representation of groups, but appears not to insist on their numerical uniformity.

Mr. Swainson had, in 1831, given a sketch of his ornithological system in Dr. Richardson's 'Fauna Boreali-Americana,' but as his plan is more fully developed in the 'Classification of Birds,' forming part of Lardner's 'Cyclopædia,' published in 1836-37, we will confine our attention to the latter work. Of all the authors who have followed the quinary arrangement, Mr. Swainson has carried it to the greatest extent, having in various volumes of Lardner's 'Cyclopædia' endeavoured to apply it not only to the whole of the *Vertebrata*, but also to the *Mollusca* and *Insecta*. In speaking of Swainson as a *quinarian* author, it should be explained that he divides his groups in the first instance into *three*, but as one of these is again divided into *three*, these last, with the two undivided groups, make up the number *five* (see 'Geog. and Classif. of Animals,' p. 227). His method is therefore only a modification of the quinary theory, originally propounded by MacLeay and further developed by Vigors. In following Mr. Swainson into the details of his method, we miss the philosophical spirit and logical though not always well-founded reasoning of the two last-named authors. Firmly wedded to a theory, he is driven, in applying it to facts, to the most forced and fanciful conclusions. Compelled to show that the component parts of every group assume a *circular* figure, that they amount in the aggregate to a *definite number*, into which each of them is again subdivisible, and that there is a system of *analogical representation* between the corresponding members of every circle, which forms the sole test of its conformity to the natural arrangement, we need not wonder at the difficulties with which our author is beset; and we may certainly admire the ingenuity with which he has grappled with the Protean forms of nature, and forced them into an apparent coincidence with a predetermined system. I need not follow out the details of this Procrus-

tean process, having already treated of it elsewhere ('Ann. Nat. Hist.' vol. vi. p. 192). With all its faults the 'Classification of Birds' is a very useful elementary work, containing numerous details of structural characters, and many just observations on the affinities of particular groups. A large number of new genera are here defined, although many which Mr. Swainson considered to be new had been anticipated by continental authors, with whose writings he was unacquainted.

Although the quinary theory, properly so called, has made but little progress beyond the British Islands, yet there is a school of zoologists in Germany whose doctrines are of a very similar character. The most eminent of these authors is Oken, who has explained his ideas on classification in several of his detached works, as well as in that valuable periodical the 'Isis,' and who communicated an outline of his theory to the Scientific Meeting at Pisa in 1839. We find in his system the same arbitrary assumption of premises, the same far-fetched and visionary notions of analogy, and the same Procrustean mode of applying them to facts, which distinguish the writings of Swainson. He professes to deduce as a conclusion, what is in fact the *à priori* assumption on which his whole theory is based,—that the animal kingdom is analogous to the anatomy of man, that is to say, that each of the organs which, when combined in due proportion, constitute the human body, are developed in a predominant degree in the several classes of animals, which represent those organs respectively. This doctrine is far too fanciful to stand the test of common sense, but it is certainly very ingenious, and we may admit that *se non é vero é ben trovato*. The subkingdom *Radiata* he considers to represent the egg, *Mollusca* the sexual organs, *Articulata* the *viscera*, and *Vertebrata* the *essentially animal*, or *motive organs*. The subdivisions of these groups represent not only individual anatomical organs, but also each other, in a mode somewhat like that asserted by Mr. Swainson, but even more complex and ingenious, and which I have not space to develope*.

The work which most nearly represents, in Germany, the quinarian school, is the 'Classification der Säugthiere und Vögel' of Kaup, 1844. This author, like Oken, compares the Animal Kingdom to the human anatomy, but he extends the analogy of the "five senses" over every part of the system, (except his sub-kingdoms, which are three) so as to form a uniformly quinary arrangement. Thus though Kaup agrees with Swainson in adopting the number *five*, these authors are guided by different principles of analogy, the former looking to the development of the organs of sense, and the latter to points of external structure connected with habits. Hence these two quinary arrangements are very far from being coincident; Swainson for instance makes the *Raptores* one of his primary orders, while Kaup makes them a subdivision of his Water-birds! Again, Swainson makes *Corvus* the essential type of all birds, while Kaup gives the same dignified position to *Hirundo*. I need only add that Kaup's arrangement, like all *à priori* systems, is replete with conjectures and fallacies.

The fundamental error which appears to pervade these and many similar modes of classification, is the assumption of a *regularity* and, as it were,

* The author having assumed not only that the class *Mammalia* represents the organs of sense, but that the genera of each family represent the individual senses, and these latter being commonly (though not correctly) enumerated as five, it results that, as far as the *Mammalia* are concerned, Oken's system is, like Swainson's, a *quinary* one. This coincidence of number is, however, proved to be arbitrary, and not real, by the fact that these two authors, who seem to have been wholly unacquainted with each other's writings, have in no one instance adopted the same subdivisions for their corresponding groups.

organization in that which is a mere abstraction, the System of Nature. The point at issue is this,—whether or not it formed a part of the plan of Creative Wisdom, when engaged in peopling this earth with living beings, so to organize those beings that when arranged into abstract groups conformably with their characters, they should follow any regular geometrical or numerical law. Now such a proposition appears, when tested by reason, to be improbable, and when by observation, to be untrue. The researches of the comparative anatomist universally lead to this result,—that all organized beings are examples of certain general types of structure, modified solely with reference to external circumstances, and consequently that the final purpose of each modification is to be sought for in the conditions under which each being is destined to exist. But these conditions result from the infinitely varied arrangements of unorganized matter, they are consequently devoid of any symmetry themselves, and the wild irregularity of the inorganic is thus transmitted to the organic creation. Geology has revealed to us that in all ages of the world new organic beings have been from time to time called into existence whenever the changes of the earth's surface presented a new field for the development of life, and, judging from analogy, we cannot doubt that if a new continent were hereafter raised by volcanic agency in the Southern Ocean, a new fauna and flora would be created to inhabit it, adapted to the new set of influences thus brought into action. Such a supposition appears, as far as man can presume to reason on a subject so far above him, to be more consistent with the benevolence of an all-wise Creator, than the theory which would consider the final purpose for which certain groups of organic beings were created, to be the fulfilment of a fixed geometrical or numerical law. The supporters of the latter view appear to consider that in many cases whole tribes of animals have been made, not because they were wanted to perform certain functions in the external world, but merely in order to complete the circularity of a group, to fill a gap in a numerical arrangement, or to *represent* (in other words, *imitate*) some other group in a distant part of the system. But, from what is above advanced, irregularity, and not symmetry, may be expected to characterize the natural system, and to form, like the features of a luxuriant landscape, not a defect, but an element of beauty.

If this be true, it follows that the natural system cannot be arrived at in any part of its details by prediction, but only by the process of induction. The quinarian authors have themselves suggested a method by which the affinities of organic beings may be worked out inductively, and exhibited to the mind through the medium of the eye. Having observed that the true series of affinities cannot be expressed by a straight line, and having assumed from a few instances of groups returning into themselves, that the circular arrangement was universal, they proceeded to draw these circles on paper, and thus gave the first idea of *zoological maps*. For this idea we may be grateful to them, as it indicates a process, which, if pursued inductively and not syllogistically, seems likely to be of great use in arriving at the natural classification. This process consists in taking a series of allied groups of equal rank, and placing them at various distances and positions according to a fair estimate of the amount of their respective affinities. If this be done with care and impartiality, the traces of a symmetrical arrangement, if any such existed, would soon begin to show themselves; but I am not aware that any indications of such a law are apparent in the cases in which this method has yet been used.

In 1840 I endeavoured to apply this process to the natural arrangement of birds, and exhibited to the Glasgow meeting of the Association a map of the

family *Alcedinidæ* arranged upon this principle (Annals of Nat. Hist. vol. vi. p. 184). Last year I extended it to the *Insessores*, and I have brought to the present meeting a sketch of the whole class of birds exhibited by the same method. I do not of course guarantee the accuracy of any part of the arrangement in its present state, as the subject is too vast to be perfected by a single individual; but the specimen now shown may nevertheless serve to illustrate a *method* which I believe to be sound in principle, and which I would gladly see tested in other departments of organic creation*.

M. de Selys Longchamps, in the Appendix to his 'Faune Belge,' 1842, has given a sketch of an ornithological system, in which the order of succession differs little from that generally adopted. He divides the class into eleven orders, some of which, as the *Inertes*, *Chelidones*, *Alectorides*, and *Struthiones*, can hardly be said to be of equal rank with the rest. He adopts the plan proposed by Nitzsch, and followed by Keyserling and Blasius, of including with the zygodactyle *Scansores* several other groups allied to them in many points of structure, and differing from the remaining *Insessores* in having the paratarsus scutate instead of entire. It is doubtful how far this last character affords a good ground for the diagnosis of orders, and it may be objected that by adhering to this distinction we separate the *Trochilidæ* from the *Nectariniidæ*, *Phytotoma* from the *Tanagridæ*, and *Menura* from *Turdidæ*. On the other hand, this arrangement has the advantage of bringing into juxtaposition the unquestionably allied groups of *Alcedinidæ* and *Galbulidæ*, as well as the *Bucerotidæ* and *Rhamphastidæ*. The scutation of the paratarsus, therefore, may form a useful auxiliary to natural classification, although, if too rigidly adhered to, it would produce in some cases an artificial arrangement.

Few more valuable contributions have been made of late years to general ornithology than Mr. G. R. Gray's 'Genera of Birds,' which passed through two editions in 1840 and 1841. It is a list of all the generic groups which had been proposed by various authors, exemplified by reference to a *type-species* in each case, and classed according to Mr. Gray's ideas of the natural system. This work is deserving of praise on several distinct grounds. The author has exercised a rare degree of industry in collecting his materials from numerous sources difficult of access; he has applied the "law of priority" in nomenclature with great fairness and impartiality, and he has sought after a natural arrangement without any theoretical bias, and with very considerable success. Although professedly including in his list *every* genus proposed by others, yet he does not pledge himself to adopt them all, indeed he distinctly asserts that many so-called genera are too trivial for practical utility. With this limitation, the 'Genera of Birds' is by far the best manual extant for the purpose of arranging collections scientifically, and of guiding the student to more hidden and scattered sources of information.

In a compilation of such a nature as Mr. Gray's many errors of detail are unavoidable, and being sensible of the general value of the work, I ventured to point out some of them in a series of commentaries upon the two editions of the 'Genera of Birds,' which will be found in the 'Annals of Natural

* Mr. Waterhouse communicated to the Cork meeting of the Association an arrangement of Mammalia which is on very nearly the same principle as that above referred to. His groups are all *drawn* as circular, of equal size, and placed in contact, whereas in my map of birds the groups of the same rank are of irregular form and dimensions, and are placed at greater or less distances according to the amount of their affinities. I believe, however, that Mr. Waterhouse does not lay any stress on these points of difference, and that his method is in fact reducible almost to an identity with mine. A somewhat similar mode of exhibiting affinities by diagrams has also been recently adopted by Milne Edwards (Ann. Sc. Nat. 1844), De Selys Longchamps, and others.

History,' vols. vi. vii. viii. Some critiques on the second edition were also made in the 'Revue Zoologique,' 1842, by Dr. Hartlaub, a skilful ornithologist of Bremen, who is understood to be preparing a general work on ornithology, including the distinctive characters of the species.

Mr. G. R. Gray is now engaged in issuing the 'Genera of Birds' in a much more complete and extended form, including the essential characters of the various groups, and full lists of the species and their synonyms. In this work he endeavours to reduce the various genera to an equality of rank, and is consequently compelled to reunite such genera as appear to have been separated by other authors on insufficient grounds. This task requires much judgement as well as industry, but with the resources which the galleries of the British Museum supply to Mr. Gray, he has been enabled to execute it with great success. The lithographic plates which accompany the work exhibit the essential characters of every genus, and of a large number of new or rare species, and the admirable mode in which they are executed by Mr. D. W. Mitchell confers a high degree of excellence upon this publication.

I may here be allowed to mention an undertaking of my own which has occupied the leisure of several years, but which is not yet sufficiently matured for publication,—a complete Synonymy of all known species of birds, with full references to all the works where they are figured or described. This undertaking requires considerable labour and much careful comparison of specific character, as exhibited both in nature and in books, but there is probably no department of natural history in which, from the multiplication of nominal species, and the wide dispersion of the materials, such an analysis of the whole subject is more wanted than in ornithology.

Works of reference connected with ornithology, though not strictly systematic, may be briefly mentioned here. The 'Dictionnaire des Sciences Naturelles,' the 'Dictionnaire Nouveau d'Histoire Naturelle,' the 'Encyclopédie Méthodique,' and the 'Dictionnaire Classique d'Histoire Naturelle,' were all useful works, though now more or less superseded by the progress of science. The best and most recent work of the kind is the 'Dictionnaire Universel d'Histoire Naturelle,' now publishing at Paris, and edited by M. C. D'Orbigny. The ornithological articles have been, till recently, written by M. de Lafresnaye, whose name is a sufficient guarantee for their accuracy. The illustrative plates are engraved with care, but in a stiff and mechanical style, and the colouring is frequently too vivid. Our own country has been less prolific in dictionaries of natural history than France, but zoological subjects are adequately treated of in more comprehensive works of reference, such as the 'Encyclopædia Britannica,' and 'Metropolitana,' and the excellent 'Penny Cyclopædia,' in which the ornithological articles are very carefully compiled. The same remark applies to the 'Allgemeine Encyclopädie,' published at Leipzig by Ersch and Gruber.

An indispensable index to ornithology, as indeed to every other branch of natural history, is the 'Nomenclator Zoologicus' of Professor Agassiz, which is a list of all the names of groups, with references to the works where they were first proposed. The portion relating to birds has undergone careful revision, and is believed to present a near approach to accuracy.

While speaking of general methods of classification I may refer to a new and unlooked-for source, from which a reflected light may in some cases be thrown upon doubtful points of ornithic affinity. The parasitic insects of the order *Anoplura* which abound on almost every species of bird, have been till recently most unduly neglected, but that able entomologist Mr. Denny has lately taken up this branch of zoology, and after publishing, with the aid of the British Association, a beautiful work on British Anoplura, is now oc-

cupied with the exotic species. He finds that these parasites constitute numerous species, and exhibit many well-marked generic forms. The remarkable fact is further deduced, that several genera of *Anoplura* frequent certain groups of birds exclusively, so that there is a sort of parallelism between the affinities of birds and those of their insect parasites. Hence we are able to infer the probable position in the natural series of an anomalous bird by investigating the structure of the almost microscopical parasites which infest its plumage, and this apparently paradoxical method has been successfully applied by Mr. Denny, who has shown that the *Anoplura* inhabiting the genus *Talegalla* are allied to those of the *Rasores*, and the parasites of *Menura* to those of the *Insessores*, an arrangement entirely confirming the views recently obtained as to the affinities of these singular birds (Ann. Nat. Hist. vol. xiii. p. 313).

2. Ornithology of particular regions.

Europe.—The most important work ever published on the ornithology of our own quarter of the globe is unquestionably the 'Birds of Europe' of Mr. Gould. This gigantic undertaking, consisting of more than 400 beautifully coloured plates, would have sufficed, independently of his other elaborate works, to stamp the author as a man of genius and of enterprise. Nor should it be forgotten that the talents of Mr. Gould were most ably seconded by his amiable partner, who, up to the time of her decease, executed the lithographic department of his various works. The extensive patronage which the 'Birds of Europe' received on the continent as well as in Britain, is a proof both of the excellence of the work itself and of the scientific taste of the present age.

The long-expected supplements to Temminck's 'Manuel d'Ornithologie' made their appearance in 1835-40, and bring down our knowledge of European birds to the latter date. Although the author hesitates too much in adopting the generic groups of modern science, and does not sufficiently value the law of priority in nomenclature, yet the exactness of his descriptions and the general soundness of his criticisms will long render his work a valuable hand-book of European ornithology. The series of illustrative plates, published at Paris by Werner, are a useful accompaniment to Temminck's work. The 'Hist. Nat. des Oiseaux d'Europe', now publishing by Schlegel, aided by several zoologists, and superintended by Temminck, may be regarded as an improved and enlarged edition of the 'Manuel d'Ornithologie'. The plates, by Susemihl, are of a superior order. Delarue's 'Galerie Ornithologique' forms another set of illustrations to the birds of Europe.

The 'Wirbelthiere Europa's' of Count Keyserling and Professor Blasius is a well-digested synopsis of European vertebrate zoology. The first part, with which alone I am acquainted, and which is devoted to Mammals and Birds, contains an exact catalogue of the species, with their synonyms and localities, and a statement of the diagnostic characters of the several groups from the class down to the species. These characters are stated in an antithetical mode very similar to the dichotomous method used in Fleming's 'British Animals,' a method which, when viewed in its true light, as an artificial index to specific characters, and as a means of calling attention to the presence or absence of certain structures, is probably superior to any other. Indeed when the characters employed for the subdivisions are *really essential*, and are placed in successive subordination according to a just estimate of their functional importance, as seems to be generally the case in the work before us, this method is quite compatible with a natural classification. The authors have avoided the error of adopting indiscriminately every genus

which other authors have proposed, and by carefully estimating the value of their groups, reducing the less important ones to the rank of sub-genera, they have endeavoured to bring the standard of their generic groups to an approximate state of equality.

As a mere catalogue of the birds of Europe, the most full and the most accurate is that by the Prince of Canino, published in the 'Annali delle Scienze Naturali di Bologna,' 1842. It is an improved edition of that contained in the 'Geographical and Comparative List of the Birds of Europe and North America,' London, 1838, containing all the additional results at which the labours of its author have arrived. The names, synonyms, and localities of the species are given with the greatest accuracy, and by rigidly adhering to sound principles of nomenclature, the author has introduced a series of scientific names which there is reason to hope will be permanently adopted.

There remain some recent works on the ornithology of Europe, which I have not had an opportunity of consulting, such as Gloger's 'Naturgeschichte der Vögel Europas,' and others.

Britain.—Prior to 1828 the only complete hand-books of British ornithology were the valuable but somewhat obsolete 'Ornithological Dictionary' of Montagu, and the fascinating, though not always accurate, 'British Birds' of Bewick. In the above year appeared the 'British Animals' of Dr. Fleming, a work which had no small share in introducing into this country the improved systems of modern zoology. The genera adopted are for the most part those of Cuvier's 'Règne Animal,' and the specific descriptions and remarks, though brief, are in general accurate.

A somewhat similar work, the 'Manual of British Vertebrata' of the Rev. L. Jenyns, is one of the best examples of a *hand-book* that I am acquainted with, containing every fact of importance connected with each species, and being totally free from superfluous verbiage.

Of the magnificent plates to Mr. Selby's 'Illustrations of British Ornithology,' I shall speak elsewhere. The letter-press, in two volumes, 8vo, 1833, is very complete in its details, which are founded in great measure on the personal observations of the author, and the synonymy has been worked out with very great attention.

In 1836 Mr. T. C. Eyton published a 'History of the rarer British Birds.' It is intended as a supplement to the work of Bewick, containing the species which had been added to the British fauna since his time, and it is illustrated with wood-cuts, into which the artist has infused much of the spirit of that celebrated engraver.

Meyer's 'Illustrations of British Birds' are a series of coloured plates very neatly executed.

It remains to notice three other works on British ornithology, the nearly simultaneous appearance of which is an evidence of the popularity of the subject.

Professor M'Gillivray, in 1836, published an account of the 'Rapacious Birds of Great Britain,' which was followed in 1837 by his 'History of British Birds,' in 3 vols. The author, who is an active field naturalist, as well as an expert anatomist, gives very full descriptions of the external and internal structure, as well as of the habits, of the several species and groups. These are interspersed with matter of a more miscellaneous nature in the style of Audubon's 'Ornithological Biographies', which render the work an entertaining though voluminous production. The classification is novel, but cannot be regarded as successful, the terrestrial birds being classed in two large sections, one of which consists of the *Fissirostral* and *Raptorial* birds, and the

other includes the remaining *Insessores*, together with the *Rasores*. The remarks on Classification and Nomenclature in the Introduction are, for the most part, sound and judicious, though the author has not always adhered to his own rules.

Professor M'Gillivray has given a condensed abstract of his larger work in two small volumes, entitled 'A Manual of British Ornithology,' 1840–42.

Sir W. Jardine's 'History of British Birds,' forming three volumes of the 'Naturalist's Library,' is a well-illustrated work, and embodies a great mass of original observations, forming a cheap and excellent manual for the student of British ornithology.

The most elegant work on British Birds recently published, is that of Mr. Yarrell. From the beauty of the engravings and of the typography, it may rank as an "*ouvrage de luxe*," while the correctness of the descriptions, and the many details of habits, geographical distribution and anatomy, render it strictly a work of science. A second edition of this work is in preparation.

The birds of Ireland are treated of by Mr. W. Thompson in an elaborate series of papers, commenced in the 'Magazine of Zoology and Botany,' and continued in the 'Annals of Natural History.' The author has collected from his own observations and from external sources, much valuable information on habits, migrations, and other subjects connected with Irish ornithology. Being the most western portion of temperate Europe, Ireland presents some interesting peculiarities in its fauna, among which may be mentioned the occasional occurrence of American terrestrial birds in that country, though the nearest point of America is 1500 miles distant. The results of Mr. Thompson's labours are incorporated in his excellent 'Report on the Fauna of Ireland,' read to the British Association in 1840, in which careful comparisons are made between the species of Ireland and of Great Britain.

The subject of British ornithology is now so nearly complete, that the works above enumerated will probably long remain unsuperseded, and we may hope that students and collectors will now extend their attention to the far more neglected department of exotic ornithology.

North and Central Continental Europe.—Many useful works on the ornithology of Northern and Central Europe were published between 1820 and 1830, by Brehm, Nilsson, Faber, Boié, Naumann, Walter and others, but as these are prior in date to the period to which I have more particularly limited this report, and as their various merits are reviewed with candour by M. Temminck, in the Introduction to his 'Manuel d'Ornithologie,' part 3, I need not enlarge upon them here.

Of the voluminous works of M. Brehm, his last, the 'Handbuch der Naturgeschichte aller Vögel Deutschlands,' 1831, is perhaps the least valuable, on account of the immense number of so-called new species which he has introduced, based upon the most trivial and inappreciable variations of size, form, or colour. This view of the subject, if carried out, would upset the whole fabric of systematic zoology, the very foundation of which is a belief in the reality, the permanence, and the distinguishableness of species. This author still continues his predilection for imaginary diagnoses in the memoirs which he publishes in the 'Isis.'

Nilsson's 'Skandinavisk Fauna,' Lund, 1835, contains a very complete, and apparently very accurate summary of the ornithology of Scandinavia, but unfortunately the Swedish language renders it a sealed book to the majority of British naturalists. The ornithology of Scandinavia has received some recent additions and corrections from a memoir by Professor Sundevall in the 'Kongl. Vetenskaps Academiens Handlingar,' 1842.

M. de Selys Longchamps, well known by several valuable monographs of European Mammals and Insects, has published the first part of his 'Faune Belge,' Liege, 1842, containing a systematic arrangement of the Vertebrata of Belgium. The specific descriptions are postponed to the sequel of the work, which is nevertheless valuable for its critical remarks on structure, habits and distribution. In the preface are some very judicious observations on the subject of systematic nomenclature, the law of priority, the limitations of species, and the still more difficult, because more arbitrary question, of the due limitation of genera. It is very satisfactory to find that the majority of European zoologists are now making considerable approaches to unanimity upon these general principles, which form the groundwork of philosophical zoology.

Dr. Gloger's 'Schlesiens Wirbelthier-Fauna,' Breslau, 1833, contains a list of the birds of Silesia, with remarks on their habits and migrations.

M. Brandt of Petersburg, has published a work entitled 'Descriptiones et Icones Animalium Rossicorum novorum,' in which several of the natatorial birds of Russia are illustrated by full descriptions and accurate figures.

France.—The ornithological portion of the 'Faune Française,' by M. Vieillot, is a useful manual, though the author has made many unnecessary changes of nomenclature. The descriptions are accompanied with figures on copper, stiffly designed, but delicately engraved.

The 'Ornithologie Provençale' of M. Roux is a respectable work on the birds of Southern France, the text being carefully drawn up, though we may regret that the author has adopted the objectionable nomenclature of Vieillot.

Italy.—The ornithological researches of Savi, Bonelli, Ranzani, Costa, and many others, prepared the way for the magnificent 'Iconografia della Fauna Italica' of the Prince of Canino, a work which, after ten years' labour, has recently been completed. It consists of elaborate descriptions and beautiful coloured plates of all the new or imperfectly elucidated Vertebrata of Italy. The birds of that country, having been previously more fully investigated than the other classes, occupy in this work the least prominent place, yet several new species are there figured, and our knowledge of others is enriched with much interesting information. The Introduction to the work contains an excellent summary of the whole subject of Italian Vertebrata. The noble and philosophical author, who pursues with steady devotion the paths of science, unallured by the manifold attractions of rank and fortune, has devoted the best part of his life to the advancement of zoological knowledge. His elaborate researches on North American ornithology, his classification of vertebrate animals, his critique on the 'Règne Animal' of Cuvier, his comparisons of the European and American faunæ, are all works of the highest value, and we may now congratulate him on the completion of this admirable digest of the vertebrate zoology of Italy. Nor let it be forgotten that he was the first to establish beyond the Alps, that great *mental*, no less than *physical* barrier, a peripatetic congress of scientific men, similar to that at which we are now assembled. This *Italian Association for the Advancement of Science* has met in the plains of Piedmont and of Lombardy; it has crossed the Appenines into the happy region of Tuscany, and it will next year pass over the Papal dominions, to diffuse the light of knowledge in the distant kingdom of Naples.

An unpretending little volume by Sig^{r} L. Benoit, entitled 'Ornitologia Siciliana,' published at Messina in 1840, contains many interesting details on the habits and migrations of the birds of Sicily. A work of greater value is the 'Faune Ornithologique de la Sicile' of M. Malherbe, Metz, 1843, in which about fifty species are added to the list of Benoit, making a total of

318. The work abounds with important observations on the geographical distribution of species, not only in Sicily, but in other parts of South Europe and North Africa. As the island of Sicily serves as a sort of *stepping-stone* between these two continents, it affords an interesting station for observing the habits of migratory species.

A similar *catalogue raisonnée* of the birds of Liguria was published at Genoa in 1840, by the Marquis Durazzo, and is entitled 'Notizie degli Uccelli Liguri.' Catalogues of the birds of the Venetian provinces have been published by Catullo, Basseggio, and Contarini, the latter of whom enumerates no less than 339 species.

A brief notice of the birds of Sardinia will be found in the 'Voyage en Sardaigne,' 2nd ed. 1839, by Count de la Marmora, in which it is announced that Professor Géné is about to publish a complete fauna of that island.

The island of Malta possesses an able ornithologist in Sig^r Schembri, who has published a 'Catalogo Ornitologico del Gruppo di Malta,' 1843. His other work, the 'Quadro Geografico Ornitologico,' is a highly useful volume, showing in parallel columns the ornithology of Malta, Sicily, Rome, Tuscany, Liguria, Nice, and the department of Gard. These form almost the first works on zoology ever printed in the island of Malta, and they show that, even in the most insulated localities, an active naturalist will always find abundant occupation. The author enumerates about 230 species of birds in Malta, nearly the whole of which are migratory.

Several new species of birds have been added to the fauna of the South of Europe by Dr. Ruppell, in the 'Museum Senkenbergianum,' 1837.

Greece.—But little has been done in Greece to illustrate ornithological science. The 'Expédition Scientifique de la Morée' contains a summary of sixty-six species there observed, but without adding much to our knowledge. A few new species (which however require further examination) are described by M. Lindermayer in the 'Isis,' and 'Revue Zoologique,' 1843. The most complete work on the subject is the 'Beiträge zur Ornithologie Griechenlands,' by H. von der Mühle, Leipzig, 1844, in which no less than 321 species are noticed, and are accompanied with many original observations of great value. The researches of this author have added several species to the European fauna.

The birds of the Ionian Islands and of Crete are enumerated and accompanied with some valuable remarks on their migrations and habits by Captain H. M. Drummond, 42nd R.H. in the 'Annals of Natural History,' vol. xii. p. 412.

Spain.—The ornithology of the Spanish peninsula is as yet but imperfectly known. A list of some of the birds is given in Captain Cooke's (now Widdrington) 'Tour in Spain.' (See also his 'Spain in 1843.') That gentleman was, I believe, the first discoverer of the *Pica cyanea* in Spain, a species which, if it be really identical with the *Garrulus cyaneus* of Pallas, found in Siberia and Japan, presents a most unusual instance of the existence of the same species in two remote regions, without occurring in the intervening space. M. Temminck has described several new species brought from the South of Spain by Parisian collectors, and from the proximity of that region to Africa, it is probable that further additions to the European fauna may be there made.

Of the birds of Madeira there is a brief notice by Dr. Heineken in the 'Zoological Journal,' vol. v.; and several species are described by Sir W. Jardine in Ainsworth's 'Edinburgh Journal of Natural and Geographical Science.'

The Canary Islands present a fauna more allied to that of Europe than the

southern position of these islands and their proximity to the African continent would have led us to expect. The 'Histoire Naturelle des Isles Canariennes,' a splendid work lately published at Paris by MM. Webb and Berthelot, contains a list of birds, the whole of which, with the exception of a very few terrestrial species peculiar to the islands, are included in the ornithology of Europe.

Asia Minor.—The 'Proceedings of the Zoological Society' contain lists of the birds of Trebizond and Erzroum, by Messrs. Abbot, Dickson, and Ross, and of those of Smyrna by myself. There is also a short list of those obtained by Mr. C. Fellows in the 'Annals of Nat. Hist.' vol. iv. The greater part of the birds hitherto found in this country are also common to Europe, which may in part be attributed to their having been chiefly collected in the northern districts, or in my own case at Smyrna, during the winter season. An ornithologist who would visit the regions south of the Taurus during the spring, would doubtless meet with many interesting species, a foretaste of which we have in the beautiful *Halcyon smyrnensis*, discovered more than a century ago by the learned Sherard, and restored to science in 1842 by Mr. E. Forbes*.

I may here allude to the 'Catalogue of the Birds of the Caucasus' by M. Ménétries, in the 'Mémoires de l'Acad. Imp. des Sciences de St. Pétersbourg.' Although several of the supposed new species have been reduced to the rank of synonyms, yet this list supplies some valuable information on the geographical distribution of species. For the ornithology of Southern Russia, the student may also consult M. Eichwald's summary of the Caucasian and Caspian birds in the 'Nouveaux Mémoires de la Soc. Imp. des Naturalistes de Moscou,' 1842, and Demidoff's 'Voyage dans la Russie Méridionale,' the zoology of which is edited by Professor Nordmann.

Siberia.—The zoology of Northern Asia was long retarded by the delays which attended the publication of the 'Zoographia Rosso-Asiatica' of that Humboldt of the 18th century, the celebrated Pallas. This posthumous work, though printed in 1811, was not published till 1831, when it at once added to our knowledge a large number of new species. Many commentaries upon Pallas's work, and additions to his species, have been made by various authors, especially by M. Brandt, the learned and indefatigable curator of the Imperial Museum at St. Petersburg, in the 'Bulletin' of the Academy of that city, and by Nordmann in Erman's 'Reise um die Erde.' There are also some valuable 'Addenda' to the work of Pallas from the pen of Dr. Eversmann, in the 'Annals' of the distant University of Casan, and further additions have been recently contributed by that author to the Petersburg Academy. We may hope that the labours of these and other equally active Russian zoologists will soon make us fully acquainted with the natural history of Asiatic Russia.

A few of the birds of Behring's Straits are elaborately described, though indifferently figured, in Eschscholtz's 'Zoologischer Atlas,' to Kotzebue's second Voyage, Berlin, 1829.

Japan.—Drs. Von Siebold and Burger, who were attached for several years to the Dutch mission in Japan, devoted their leisure to the zoology of that little-known country, and the results have now been published by the Dutch government in a handsome work, entitled 'Fauna Japonica.' A remarkable fact established by their researches, is the great amount of coincidence between the ornithological faunæ of Japan and of Europe. In Temminck's 'Manuel d'Ornithologie,' (Introd. to part 3.), is a list of the species common to these two regions, amounting to no less than 114.

* See Annals of Nat. Hist. vol. ix. p. 441.

British India.—It is only within a very recent period that any really original and trustworthy researches have been made into Indian ornithology. Twenty years ago the utmost that was done by the numerous British officers in that country to illustrate this science, was to collect drawings of the species which attracted their notice. These drawings were in most cases made by native artists, who, being utterly ignorant of any scientific principles, executed them in a stiff mechanical style, and neglected the more minute but often highly important characters. Such designs are useful as aids to scientific research, but ought not to usurp its place; yet from these materials the too undiscriminating Latham described and named a great number of so-called species, many of which have not yet been identified in nature. The largest collection of these drawings was made by the late General Hardwicke, a selection of which were engraved and published in 1830; but though carefully edited by Mr. J. E. Gray, the number of nominal species there introduced shows the danger of founding specific characters on the sole authority of drawings.

A better day dawned about 1830, when several British officers in India became interested in the study of scientific ornithology; and we may hope that natural history in this and all its other branches will now become a general pursuit with our countrymen in that region. The first *original* contribution to the ornithology of India in recent times was made by Major Franklin, and was speedily followed by a valuable paper from Colonel Sykes, both of which are inserted in the 'Proceedings of the Zoological Society,' 1831–32. About the same period appeared the first effort of Mrs. Gould's pencil, the 'Century of Birds from the Himalaya Mountains,' a work the plates of which at once established the fame of this admirable artist, while the scientific characters were carefully prepared by Mr. Vigors. In 1832 was also commenced that most valuable repertory of oriental knowledge, the 'Journal of the Asiatic Society of Bengal,' which is still published with regularity at Calcutta. In this journal and in others of a similar nature, as the 'Asiatic Researches,' the 'Gleanings in Science,' Corbyn's 'Indian Review,' the 'Quarterly Journal of the Calcutta Medical and Physical Society,' the 'Calcutta Journal of Natural History,' are contained the valuable but unfortunately too scattered and inaccessible zoological researches of Hodgson, Hutton, Pearson, Tickell, M'Clelland, W. Jameson and others. Mr. Hodgson, who by his residence in Nepal has been so favourably circumstanced for zoological pursuits, has long since promised to include in an entire work his scientific researches in that country, but various delays have hitherto impeded the undertaking. He has recently, with the utmost liberality, presented the whole of his precious materials to the British Museum and other public collections, and we may hope that the facilities of comparison thus afforded will enable him shortly to commence this very desirable publication.

The Indian species of *Coturnix* and *Turnix* have been described with minute exactness by Colonel Sykes in the 'Transactions of the Zoological Society,' vol. ii. This paper is of great service in clearing up the characters of these obscure and ambiguous birds, which however are still far from being thoroughly investigated.

Professor Sundevall, in his valuable Report on recent Zoological Researches, Stockholm, 1841, refers to a paper on the Birds of Calcutta in the 'Physiographisk Tidskrift,' Lund, 1837, a work which has not yet fallen into my hands.

A great impulse has recently been given to Indian zoology by the appointment of Mr. Blyth to the care of the Asiatic Society's museum at Calcutta. Most of the previous workers in that field were civil or military officers, who

took up zoology as an afterthought, and as a relief from more important duties. But Mr. Blyth went to India a ready-made zoologist, who had long devoted himself to the study as a science, and was well acquainted with its literature and its principles. Of the zeal and success with which he is now bringing into order the heterogeneous materials of Indian zoology, the pages of the 'Journal of the Asiatic Society of Bengal' bear ample testimony. Besides many detached memoirs, the monthly reports which Mr. Blyth presents to the Asiatic Society contain a mass of interesting observations, and present an example which the curators of European museums would do well to imitate. By preparing complete lists of the species comprised in each successive accession to the museum, accompanied by critical remarks on the more novel or interesting specimens, previous to their being incorporated into the general collection, a number of important observations on structure, habits and geographical distribution are preserved from oblivion. In the midst of these active and useful labours Mr. Blyth retains his interest in European science, and occasionally sends communications of great value to the 'Annals of Natural History.'

While treating of Northern India I may mention the Catalogue of the Birds of Assam, by Mr. M'Clelland, in the 'Zoological Proceedings,' 1839. The author avoided the too common error of describing as new every species which was *unknown to him*, by the judicious plan of attaching provisional names and descriptions to such species, and then sending them to a highly competent naturalist in England, Dr. Horsfield, to be revised prior to publication.

The presidency of Madras can boast of a 'Journal of Literature and Science,' and of zoologists, Messrs. Jerdon and Elliott, equal in activity and scientific attainments to those of Bengal. The various memoirs of these gentlemen on the characters and habits of the birds of Southern India are of high value. Mr. Jerdon has commenced the publication of a series of 'Lithographed Drawings of Indian Birds,' illustrating many rare species in a style which does credit to the artists of India.

A few species of Indian birds have been described by Professor Jameson in the 'Memoirs of the Wernerian Society,' vol. vii., and several others are figured in Royle's 'Botany of the Himalaya Mountains,' and in the zoological part of Jacquemont's 'Voyage dans l'Inde,' Paris, 1843, the plates of which are beautifully executed. Mr. Blyth has drawn up a notice of the species received from the British officers in Tenasserim, and of the desiderata which remain to be sought for in that province. The zoological portion of M. Belanger's 'Voyage aux Indes Orientales,' 1834, contains descriptions and figures of many of the birds of Pegu and Java, among which are several novelties. Some of the species of continental India are also described in the same work. Ornithological information will also be found in Delessert's 'Souvenirs d'un Voyage dans l'Inde.

Malasia.—Under this name may be included the peninsula of Malacca and the islands of the Indian archipelago, which taken collectively form a well-marked zoological region, whose fauna, though for the most part agreeing *generically* with that of continental India, presents an almost wholly distinct series of *species*. The first contributor to the ornithology of this region was Brisson, who described, with an exactness that may serve as a model even at the present day, many new species of birds from the Philippine Islands. Sonnerat described some more species in 1776, but scarcely anything has since been added to our knowledge of the vertebrate zoology of that particular group of islands; and it is to be regretted that a considerable collection of birds recently brought thence by Mr. Cuming, were dispersed before any

scientific examination of them had been made. The zoology of western Malasia was first investigated by Dr. Horsfield and Sir Stamford Raffles, the first of whom described the birds of Java and the second those of Sumatra, in the 'Linnæan Transactions,' vol. xiii. These are very valuable memoirs, though it is to be regretted that from the brevity of the specific characters some of the species are rendered difficult to recognise. A selection of Dr. Horsfield's species is however more fully described and illustrated by figures in his 'Zoological Researches in Java,' and the original specimens collected by him are preserved in the museum of the East India Company. The species of Horsfield and of Raffles were arranged into one series by Mr. Vigors in the Appendix to the 'Life of Sir Stamford Raffles.'

Between 1820 and 1830 several Dutch and German naturalists visited the Malasian Islands, and enriched the continental museums with their collections. A considerable number of the species thus obtained are figured in the 'Planches Coloriées' of M. Temminck, who however too frequently described as new the species which had been long before characterized by Horsfield and Raffles.

For two centuries past the Dutch have been famed for their love of collecting rarities, and the numerous settlements of that people in all parts of the world have tended to the gratification of this taste. It is therefore not to be wondered at that the national museum of Holland at Leyden should have become one of the richest collections of natural objects in the world; and it is gratifying to find that the information which its treasures convey is in the course of being diffused abroad. The Dutch government are now publishing a complete zoology of their foreign colonies, under the title of 'Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen.' This superb work contains figures and descriptions of many new species from the remoter islands of the Malay archipelago; and it is only to be regretted that so valuable a publication should be compiled in a language with which few men of science out of Holland are acquainted.

A considerable number of ornithological specimens have recently been sent to Europe from the peninsula of Malacca, and indicate a fauna closely allied to, though often specifically distinct from, that of the adjacent islands of Java and Sumatra. Mr. Eyton has described several of these Malacca birds in the 'Proceedings of the Zoological Society,' 1839, and Mr. Blyth has characterized others which had been sent to the Calcutta Museum.

The great island of New Guinea presents features in its zoology which entitle it to be considered a distinct region from the Malasian archipelago, and connected rather with the Australian fauna. We here first meet with that extraordinary group of birds the *Paradiseidæ*, whose affinities it is impossible to assign with certainty until their anatomy and habits are better known. In this group will probably be ultimately included (as they were originally by the earlier writers) the genera *Seleucides*, *Ptilorhis*, *Epimachus*, *Phonygama* and *Astrapia*, which are at present arranged, from conjecture rather than induction, in many widely-separated families. These genera all agree with the *Paradiseidæ* in the very peculiar structure of their plumage, and what is of no less importance as an indication of zoological affinity, they all (with the exception of *Ptilorhis*, which is found in the adjacent Australian continent) inhabit the same island of New Guinea; and I think it not improbable that the anomalous Australian genera *Ptilonorhynchus*, *Calodera* and *Sericulus*, may be also referable to the *Paradiseidæ*. These questions however must be resolved by the anatomist and not by the studier of dried skins; and we may therefore regret that New Guinea has hitherto been so inaccessible to naturalists. The specimens from thence are mostly obtained

in a mutilated state from the savage inhabitants, and I believe the only zoologists who have seen the Birds of Paradise in a state of nature are M. Lesson, who made some interesting observations upon them during the few days which he spent in the forests of New Guinea, ('Voyage autour du Monde de Duperrey,' and Lesson's 'Manuel d'Ornithologie,') and MM. Quoy and Gaimard, whose observations, recorded in the 'Voyage de l'Astrolabe,' 1830–33, were still more limited.

Polynesia.—The ornithology of the innumerable islands of the Pacific Ocean is as yet very imperfectly investigated. From the small size of most of these islands they cannot individually be expected to abound in terrestrial species, though in the aggregate they would doubtless furnish a considerable number, while of aquatic species an interesting harvest might be collected. At present much of our information is derived from no better source than the incomplete descriptions made by Latham of species collected during Captain Cook's voyage. Some of the birds collected by the Rev. A. Bloxam in the Sandwich Islands are described in Lord Byron's 'Voyage;' others were made known by Lichtenstein in the 'Berlin Transactions,' 1838, and the 'Zoology of the Voyage of the Sulphur,' now in course of publication, contains some further materials which have been examined and described by Mr. Gould. A few Polynesian birds are described by MM. Hombron and Jacquinot among the scientific results of the Voyage of the Astrolabe and Zelée (Ann. Sc. Nat., 1841), and several new species from the Philippine, Carolina and Marian Islands, are characterized by M. Kittlitz in the 'Mémoires de l'Acad. Imp. de St. Pétersbourg,' 1838. The recent American voyage of discovery will extend our knowledge of Polynesian zoology, and its researches will be made known by Mr. Titian Peale, who is said to have discovered among other rarities a new bird allied to the Dodo, which he proposes to name *Didunculus*.

Australia.—Shaw's 'Zoology of New Holland,' 1794, was the first work devoted to the natural history of the Australian continent, but its publication was soon discontinued. It was followed by the 'Voyages' of Phillips and White, in which many of the birds of that country were figured and described. The next additions were made by Latham, who in the second 'Supplement to his Synopsis,' 1802, described and named many species on the authority of a collection of drawings belonging to the late Mr. A. B. Lambert. These drawings however were very rude performances, and being unaccompanied by descriptions, it is no wonder that Latham was led by them into many errors of classification and synonymy. Fortunately, however, they passed at Mr. Lambert's death into the possession of the Earl of Derby, who liberally entrusted them for examination to Mr. Gould, Mr. G. R. Gray, and myself. By carefully studying these designs and comparing them with Australian specimens, we have been able to identify almost the whole of the species which Latham founded upon them, and by this process many corrections have been introduced into the synonymy of the Australian birds. (See Ann. Nat. Hist., vol. xi.)

It is to be regretted that Messrs. Vigors and Horsfield had not access to this collection of drawings when they prepared their valuable paper on Australian birds in the 'Linnæan Transactions,' vol. xv. They would there have recognised several of the species which, from having failed to identify them in the brief descriptions of Latham, they described as new. Their memoir is notwithstanding a very important contribution to Australian ornithology, especially on account of the many generic forms peculiar to that region which they defined with logical precision.

The above, together with the brief but original work of Lewin (Birds of New South Wales) and a few species described by Quoy and Gaimard in the

'Voyage de l'Uranie,' 1824, and in the 'Voyage de l'Astrolabe,' 1830, and by Lesson in the 'Voyage de la Coquille' and the 'Journal de la Navigation de la frégate Thetis,' 1837, formed the chief materials for Australian ornithology until the expedition of Mr. Gould to that country made a vast accession to our knowledge, which is embodied in his great work, the 'Birds of Australia.' Among those splendid publications of science and art which the liberality of governments have given to the world, there are few which in point of beauty or completeness are superior to this unassisted enterprise of a single individual. Regardless of expense and risk, Mr. Gould proceeded to Australia for the sole purpose of studying Nature in her native wilds, and after spending two years in traversing the forests and plains of that continent, he returned home with a valuable collection of specimens, and a still more precious one of *facts*. These he is now engaged in bringing before the public, and the many new and interesting details of natural history which his work contains indicate powers of observation and of description which will place the name of Gould in the same rank with those of Levaillant, Azara, Bewick, Wilson, and Audubon.

Of the artistic merits of this publication I shall hereafter speak, and shall refer to it at present merely as a work of science.

Among the new generic groups proposed by Mr. Gould, some, as *Pedionomus*, *Sphenostoma*, &c., possess sufficiently well-marked characters; but others, as *Donacola*, *Erythrodryas*, *Erythrogonys*, *Synœcus*, *Geophaps*, appear hardly to deserve generic separation. These so-called genera seem to be founded upon slight peculiarities of form, habit, or colouring, to which, however interesting in themselves, we ought not, I think, to attach a generic value, unless we are prepared to reduce all our other genera to the same low standard, a step which would increase the number of genera and diminish their importance to an extent that would be highly inconvenient. I may also remark that some of the birds which Mr. Gould regards as distinct *species*, appear to possess insufficient diagnostic characters. Peculiarities of climate and food will always exert a certain influence on the stature and on the intensity of colour in the same species, and so long as the proportions and the distribution of the colours remain unaltered, we should hesitate in raising the local varieties thus produced to the rank of species, unless we are ready to go the same length as M. Brehm, who by this means has trebled the number of European species. As instances of Australian birds the real specific distinctness of which appears to me doubtful, I may mention Mr. Gould's *Malurus cyaneus* and *longicaudus*, *Amytis textilis* and *striatus*, *Astur approximans* and *cruentus*, *Hylacola pyrrhopygia* and *cauta*.

Passing over these slight defects, it is certain that the facts brought for the first time to our knowledge by Mr. Gould have cleared up many doubtful questions respecting the true affinities of the anomalous forms so prevalent in Australia. Being now informed as to their habits and, in many cases, their anatomy, we are enabled to classify with certainty the once ambiguous groups *Talegalla*, *Psophodes*, *Menura*, *Falcunculus*, *Artamus* and others. In other cases, as in the genera *Ptilonorhynchus* and *Calodera*, the observed habits of the birds are even more anomalous than their structure, and rather increase than diminish the difficulty of classifying them.

Mr. Gould's work is also valuable for its critical examinations of the labours of other authors, the synonyms being for the most part carefully elaborated, and a due regard paid to the principle of priority in nomenclature. It is to be hoped that this delightful and truly original work will be hereafter republished in a more portable form, as its present costly style of illustration necessarily restricts it to a small number of readers.

This publication has tended to create a taste for natural history in the Australian colonies, which will advance the cause of morality and civilization. Among recent proofs of an improved tone of mental cultivation, I may mention the 'Tasmanian Journal of Natural Science,' commenced at Hobart Town in 1842, and which is a publication highly creditable to the southern hemisphere. One of its chief contributors is the Rev. T. J. Ewing, who is ardently devoted to science, and who has already increased our knowledge of Australian ornithology.

The tropical parts of the Australian continent exhibit, as might be expected, many new and beautiful forms. A few of these were made known in Capt. King's 'Survey of Intertropical Australia,' 1827; and the labours of Mr. Gould's collector, Mr. Gilbert, will now render the zoology of Northern and Western Australia as familiar to us as that of New South Wales.

New Zealand.—The earliest information on the ornithology of New Zealand was obtained by Forster during the voyage of Capt. Cook, of which we shall learn more particulars in Prof. Lichtenstein's forthcoming edition of Forster's MSS. A few additional species are described in the Voyage of the Coquille, 1826, and of the Astrolabe, 1830; but little was subsequently added until 1842, when Dr. Dieffenbach submitted his collection to the examination of Mr. G. R. Gray, and the result will be found in the interesting 'Travels in New Zealand' of the former gentleman. As in most oceanic islands remote from a continent, the terrestrial ornithology of New Zealand is somewhat limited; but some interesting representatives of the Australian fauna are there found, and the extraordinary structures of those anomalous birds, the *Apteryx* and *Dinornis*, atone in point of interest for the general paucity of species.

The aquatic ornithology of the Southern Ocean and its isles has been hitherto in a state of the greatest neglect and confusion; but some valuable materials for its elucidation will be supplied by the 'Voyages of the Erebus and Terror,' now in course of publication, as well as by many details introduced in Gould's 'Birds of Australia.'

Africa.—The zoology of Lower Egypt has received but few accessions since the French expedition to Egypt; but that of Nubia and Abyssinia, the foundations of which were laid by Bruce and by the present Earl of Derby, who added a valuable appendix to Salt's 'Voyage,' has been since greatly extended by the labours of Rüppell and Ehrenberg. The 'Atlas zu der Reise in Nordlichen Afrika,' and the 'Neue Wirbelthiere' of the former author, are especially valuable for the fulness and accuracy of the descriptions, and for the critical remarks with which they are accompanied. The lithographic plates, though rather coarsely executed, are sufficiently characteristic. The author has made further additions to this subject in his 'Museum Senckenbergianum.' The 'Symbolæ Physicæ' of Messrs. Hemprich and Ehrenberg, contain some accurate information on the ornithology of Abyssinia, Egypt and Syria, and we may regret that this excellent work was never completed. Besides much original matter, the authors have added many careful criticisms on the works of other authors who have written on the zoology of those countries. Some additions to Abyssinian ornithology have also been made by M. Guerin-Meneville, 'Revue Zoologique,' 1843.

No special work has been produced on the ornithology of Western Africa, except the useful little book by Swainson, which forms two volumes of Sir W. Jardine's 'Naturalist's Library.' Many new species are there defined and figured with care.

The birds procured during the late unfortunate expedition to the Niger are described in the 'Proceedings of the Zoological Society' by Mr. Fraser, who accompanied the party as naturalist.

The ornithology of South Africa is now far advanced towards completeness. The 'Oiseaux d'Afrique' of Levaillant formed an admirable groundwork for the study, and through the labours of subsequent naturalists, there is probably little more to be added to our knowledge of the subject.

The enterprising Burchell characterized several new species in his 'Travels in South Africa,' and others collected by Sir J. Alexander were described by Mr. Waterhouse in the Appendix to that traveller's 'Expedition of Discovery into the Interior of Africa,' 1838. But we owe the largest additions to South African ornithology to the energy of Dr. Andrew Smith, who, in 1832, planned and executed an expedition of discovery into the remote interior, northwards of the Cape colony. The zoological results of this expedition were first published by Dr. Smith in the 'South African Quarterly Journal,' a scientific periodical printed at Cape Town, and less known in Europe than it deserves to be. They will also be found in a pamphlet entitled, 'Report of an Expedition for Exploring Central Africa,' Cape Town, 1836. By the liberality of Her Majesty's government Dr. Smith has since been enabled to publish these new and precious materials, under the title of the 'Zoology of South Africa,' in a style and form corresponding to the 'Zoology of the Voyage of the Beagle' and of the 'Sulphur,' and forming a standard work for the library of the naturalist.

Of the birds of Madagascar but few have been described since the days of Brisson. M. I. Geoffroy St. Hilaire has made known some remarkable forms from that island in Guerin's 'Magazin de Zoologie,' 'Comptes Rendus,' 1834, and 'Ann. des Sciences Naturelles,' ser. 2, vol. ix.

North America.—The ornithology of North America (exclusive of Mexico) is now more thoroughly investigated than that of any other quarter of the globe, except Europe. The fascinating volumes of Wilson, and the invaluable continuation of his work by Prince C. L. Bonaparte, contributed to produce in the United States a great taste for natural history, and for ornithology in particular. The works of Wilson and Bonaparte have been made more accessible in this country by means of smaller editions, one of which was edited by Sir W. Jardine, and another by Prof. Jameson. A small edition has also been published in America by T. M. Brewer, Boston, 1840. Foremost among the successors of Wilson is the indefatigable Audubon, whose life has been spent in studying nature in the forest, and in depicting with pen and pencil her manifold beauties. The plates of his 'Birds of America,' more than 400 in number, are the work of an enthusiastic naturalist and a skilful artist, though the designs are sometimes rather *outré*, and their size is inconveniently gigantic. The latter evil is however remedied in a smaller edition with lithographic plates, which the author has recently published in America. The text to these plates, entitled 'Ornithological Biography,' is an amusing as well as instructive work, though written in a too inflated style. Mr. Audubon has since published a 'Synopsis of the Birds of North America,' Edinburgh, 1839, containing condensed descriptions of the genera and species, and forming a very useful manual of reference. Several of the species of *Sylvicolinæ* had been unduly multiplied by Audubon, and their synonymy has been rectified by Dr. T. M. Brewer in Silliman's 'Journal of Science,' vol. xlii.

Mr. Nuttall's 'Manual of the Ornithology of the United States,' published at Cambridge, U.S., 1832–34, is a very convenient hand-book, containing a compendium of the labours of Wilson, Bonaparte and Audubon, accompanied with many original observations on the habits of the species. The work is illustrated with woodcuts, which, though not equal to the works of Bewick, are executed in a similar style and with considerable success.

Several of the States of the American Union have adopted the truly enlightened policy of making regular scientific surveys of their respective territories. Of these the state of New York has already published several handsome volumes on other branches of natural history; but the ornithological portion is not yet issued. A list of the birds of Massachusets will be found in Prof. Hitchcock's Report on the Geology of that State. This list has been further extended by Dr. Brewer and by the Rev. W. Peabody in the 'Boston Journal of Natural History,' 1837 and 1841. The latter gentleman has given much valuable information on the manners and migrations of the species. Some popular notices of the birds of Vermont are given by Mr. Z. Thompson in his 'History of Vermont,' Burlington, 1842.

A mass of interesting observations on the zoology of the arctic portion of North America is contained in the appendices to the narratives of Ross, Parry, Franklin and Back, and in the 'Memoir on the Birds of Greenland,' by our respected Secretary Col. Sabine (Linn. Trans. vol. xii.). These enterprising explorers found the means, during their arduous and protracted expeditions, to add greatly to our knowledge of Arctic zoology, and the results of their labours were brought together and reduced to system in the volumes of the 'Fauna Boreali-Americana,' of which the volume on birds is the production of Dr. Richardson, assisted by Mr. Swainson. The specific descriptions by the former gentleman are a model of accuracy and precision, and the lithographic plates are executed with Mr. Swainson's usual skill.

In his able 'Report on North American Zoology,' read to the British Association in 1836, Dr. Richardson has presented us with a full catalogue of the birds of North America, including Mexico. He enters at some length into the subject of migration, and has incorporated with his own observations those of the Rev. J. Bachman in Silliman's 'American Journal of Science,' 1836.

His Highness the Prince of Canino continues to take a lively interest in the zoology of North America, where so many years of his life were spent. In 1838 he published a very elaborate 'Comparative List of the Birds of Europe and North America,' exhibiting in parallel columns the species which, whether by identity or by close affinity, represent each other in the two countries. This work exhibits some interesting results connected with the geographical distribution of species and of forms. The region between Mexico and the Polar sea approaches in its fauna much more to the European, and less to the tropical American type, than might have been expected. Of 471 North American species of birds, no less than 100 are identical with European kinds. This is due not merely to similarity of climate, but to the comparatively short interval between western Europe and eastern America, which enables nearly all the marine and some of the terrestrial species to pass from the one continent to the other. Another cause is the proximity of north-western America to Siberia, which has extended the migrations of certain essentially arctic species, and caused them to spread completely round the world to the north of about lat. 50°.

The Prince is at present engaged on an improved edition of the 'List of North American Birds,' in which he now proposes to include the birds of Mexico. This addition will materially modify the numerical results of the former work, as it will introduce a large number of species of a more tropical character than most of those of the United States. It will form a valuable addition to our knowledge, the birds of Mexico being as yet but imperfectly determined and their descriptions scattered through many remote sources. Some of them have been described by Mr. Swainson (Philosophical Magazine, ser. 2, vol. i. and Animals in Menageries), others by Wagler and Kaup,

(Oken's 'Isis,' 1832,) and Lesson (Ann. Sc. Nat. ser. 2, vol. ix.). Not a few of the nominal species in Latham's 'Index Ornithologicus' are said to be from Mexico, some of which, taken from the original work of Hernandez, might doubtless be regained to science; others, described from the worthless 'Thesaurus' of Seba, are probably altogether apocryphal.

The voyage of Capt. Cook supplied the earliest materials for the zoology of north-western America. A few Rasorial birds were brought from that country by the botanist Douglas, and others are described by Mr. Vigors in the 'Zoology of Capt. Beechey's Voyage,' 1839. We may regret that no note was taken of the localities of many species brought home by that expedition, and which are described and figured with exactness in the above work. M. Lichtenstein's memoir in the 'Berlin Transactions,' 1838, and the recently published 'Zoology of the Voyage of the Sulphur,' have also furnished some additions to the ornithology of that remote part of the American continent, and twelve species from the Columbia river are described by Mr. Townsend in the 'Journ. Acad. Sc.,' Philadelphia, 1837.

Mr. J. P. Giraud has described several new species of birds from Texas in the 'Annals of the Lyceum of New York,' of which he has given coloured figures in a folio form, under the title of 'Description of Sixteen New Species of North American Birds,' New York, 1841.

Central America.—Of this region of tropical forests (in which Honduras and Yucatan may be geographically included) the zoology is almost unknown. Two or three beautiful birds from that country have found their way into Temminck's 'Planches Coloriées,' a few more are described by M. Lesson in the 'Revue Zoologique,' 1842, and Dr. Cabot, an American naturalist who accompanied Mr. Stephens in his interesting expedition in Yucatan, has enumerated some of the birds which he collected, in the work of the latter gentleman (Incidents of Travel in Yucatan). He considers many of them to be identical with species of the United States, but it is not stated how far this identification rests on a rigorous comparison of specimens from the two countries. Dr. Cabot has given an interesting account of the habits of that beauful bird the *Meleagris ocellata* in the 'Boston Journal of Natural History,' and the habits of *Trogon pavoninus*, another splendid bird of that country, are recorded by M. Delattre in the 'Revue Zoologique,' 1843.

Galapagos Islands.—This small group of islands illustrates that remarkable law which establishes a general coincidence between geographical distribution and zoological affinity. These islands of the Pacific, though several hundred miles distant from the American coast, are yet much nearer to it than to the numerous islands of the Polynesian archipelago, and in conformity with this position we find that the birds of the Galapagos, though belonging to species exclusively confined to these isles, are altogether referable to an American and not to a Polynesian type of organization. This result is derived from the researches of Mr. Darwin, who, in the 'Zoology of the Voyage of the Beagle,' has described several new species from these remote islands.

West Indies.—The ornithology, and I may say the natural history of the West Indies, is far less known than from the long connection of those islands with Europe might have been expected. Of the birds of Cuba a few were described by Mr. Vigors in the 'Zoological Journal,' vol. iii. This island has since been scientifically surveyed by Ramon de la Sagra in his 'Histoire Physique, Politique et Naturelle de l'Isle de Cuba,' in which a considerable number of new species of birds are accurately characterized. Many of the birds of St. Domingo were long since described by Brisson, Buffon and Vieillot, and few if any additions to our knowledge of its productions have

been made of late years. The natural history of our own island of Jamaica has experienced a degree of neglect which reflects but little credit upon the energy of individuals or of the government. Almost the whole of our knowledge of its ornithology is derived from the obscure descriptions and wretched figures in Sir Hans Sloane's 'Natural History of Jamaica,' published in the beginning of the last century. A few stray species have since been described by various authors, but nothing like a regular scientific survey of that beautiful and interesting island has yet been, or, judging from appearances, is likely to be, undertaken. The smaller West Indian islands have been equally neglected by naturalists; but few of their natural productions ever reach our museums, and these are too often consigned to the cabinet without being scientifically described or published.

South America.—The birds of Columbia were till a recent period wholly unknown (with the exception of a few brief notices by Humboldt in his 'Recueil d'Observations de Zoologie,' 1811), but a considerable supply of specimens has been lately sent to Europe from the province of Bogota, which have added greatly to our knowledge. Many new species thus obtained have been described by MM. De Lafresnaye, Boissonneau, Bourcier and De Longuemare in the 'Magazin de Zoologie' and 'Revue Zoologique,' and by Mr. Fraser in the 'Proceedings of the Zoological Society.' Many of the birds of that country are beautiful and interesting representatives of the better-known species of Brazil, and the family of Tanagers in particular has lately received large additions from that quarter.

The ornithology of British Guiana is not yet so fully worked out as it deserves to be. Mr. Schomburgk has collected many species during his various journeys in the interior, some of which have been characterized in miscellaneous works; but there is no collective publication of the natural history of that colony.

The ornithology of Brazil, on the other hand, is now very fully known, many species having been described by the older authors, and many more in recent times by Prince Maximilian of Neuwied, Spix, Swainson, and others.

The costly work of Spix, 'Avium species novæ in itinere per Braziliam collectæ,' is valuable rather for the amount of new materials which the travels of that author supplied, than for the skill or diligence with which those materials were digested. A sounder criticism was applied by Prince Maximilian of Wied, who has done much to illustrate the ornithology of Brazil, not only in his travels in that country, and his 'Recueil de Planches Coloriées d'Animaux du Brésil,' but in his 'Beiträge zur Naturgeschichte von Brazilien,' Weimar, 1832. A great number of species are there described in detail, and the work is especially valuable as a supplement and commentary to the writings of Azara and Spix. About 1833 Mr. Swainson commenced an illustrated work on the birds of Brazil, entitled, 'Ornithological Drawings,' but it only attained to about seventy plates. The figures are well drawn and carefully coloured; but they labour under the defect of being unaccompanied by descriptions, without which even the best designs are often insufficient for specific identification. M. Schreiber of Vienna commenced, in 1833, the 'Collectanea ad Faunam Braziliæ,' but only one number of the work was ever published. Several Brazilian birds are also described by Nordmann in the Atlas to Erman's 'Reise um die Erde,' 1835.

Since the publication of the invaluable work of Azara, nothing has been added to the ornithology of Paraguay; but as that country is intermediate to Brazil, Chili and Patagonia, most of Azara's species have been procured by naturalists who have visited the three last-named countries. Many of the

birds of Patagonia, Terra del Fuego and the Falkland Isles, are described by Mr. Darwin in the 'Zoology of the Voyage of the Beagle,' and by Capt. King (Zool. Journal, vol. iii. and Zool. Proceedings, 1831).

After the publication of Molina's not very accurate 'Saggio sulla storia naturale del Chili,' fifty years elapsed without any addition being made to the zoology of western South America. About 1831 M. Kittlitz published a short paper on the birds of Chili in the 'Mémoires de l'Académie Impériale de St. Pétersbourg,' in which several new and curious generic forms are for the first time indicated. Descriptions of a few Chilian birds will also be found in the 'Journal de la Navigation de la Frégate Thetis,' 1839, and in papers by M. Meyen in the 'Nova Acta Ac. Leop. Car.,' vol. xvi., and by M. Lesson in the 'Revue Zoologique,' 1842. Subsequently the 'Voyage dans l'Amerique Méridionale,' by M. D'Orbigny, and the 'Zoology of the Beagle,' by Mr. Darwin, have greatly extended our knowledge of this region. Nor ought I to omit the brief but very interesting notes on the birds of Chili by Mr. Bridges, in the 'Proceedings of the Zool. Soc.,' 1843, or the full list of Peruvian birds lately published at Berlin by M. Tschudi, in which many new species are described. Most of the species originally described by Molina are now identified with accuracy, and the long and narrow tract extending the whole length of South America, between the Andes and the Pacific, is shown to possess a peculiar and a highly interesting fauna.

M. A. D'Orbigny, who prosecuted his scientific researches for several years in South America, traversing the interior from Buenos Ayres to Columbia, has reaped a rich harvest of zoology, which is embodied in his 'Voyage dans l'Amerique Méridionale.' Besides discovering many new species of birds, he has identified most of those described by Azara. The plates of his work are however not so perfect as the text, the colouring being too vivid, and the figures unnecessarily reduced in size, when the natural dimensions might have been more frequently retained. He has drawn some interesting conclusions respecting the distribution of species through various zones of southern latitude, and through zones, in some degree corresponding to these, of elevation. Such generalizations, when carefully made, never fail to throw light on philosophical zoology.

3. *Ornithological Monographs.*

No method is so effective in advancing zoological science as that by which an author gives his whole attention to some special group or genus, examines critically all the works of previous writers that relate to it, adds his own original observations, and publishes the result in the shape of a Monograph. I will briefly notice the works of this kind which have appeared of late years.

The different species of *Vultur* known up to 1830 were critically analysed by M. Rüppell in the 'Annales des Sciences Naturelles' for that year, and his remarks must be studied by all who attempt to define the species of that intricate group.

The characters of the family *Strigidæ* and of its subdivisions are treated of by M. I. Geoffroy St. Hilaire in 'Ann. Sc. Nat.,' 1830.

Mr. Swainson published a monograph of the genera *Tachyphonus* and *Tyrannus* in the 'Quarterly Journal of Science,' London, 1826. Although several species have been discovered since, and new genera proposed, yet these papers still possess considerable value. An essay on the *Cuculidæ* by the same author is inserted in the 'Mag. of Zool. and Botany,' vol. i.

M. Ménétries has published in the 'Mém. de l'Acad. Imp. de St. Pétersbourg,' 1835, a monograph of the *Myiotherinæ*, preceded by an historical account of the authors who have treated of this complicated group. This memoir is a

valuable contribution to our knowledge, though the series of natural affinities would perhaps have been better exhibited if the *Thamnophili* had been included among the *Myiotherinæ* (passing, as they do, almost imperceptibly into *Formicarius*), and if the so-called *Myiotherinæ* of the East Indies had been formed into a separate section.

We owe to M. L'Herminier some interesting particulars respecting that anomalous and little-known bird, the *Steatornis* of Humboldt (Ann. Sc. Nat., vol. vi. p. 60, and Nouv. Ann. Mus. Hist. Nat., vol. iii.). It appears that this nocturnal bird, which inhabits the caverns of Venezuela and Bogota, can only be classed among the *Caprimulgidæ*, though it differs from all its congeners in its frugivorous habits, while it approaches the *Strigidæ* in many points of structure (as has been well insisted on by M. Des Murs, 'Rev. Zool.,' 1843).

The same indefatigable naturalist has thrown much light on the structure of the genera *Sasa*, *Palamedea*, *Turnix* and *Rupicola*, in the 'Ann. Sc. Nat.,' vol. viii. p. 96, and 'Comptes Rendus,' 1837. The first of these he shows to be a connecting link between the *Insessores* and *Rasores*; the second he places between the *Rallidæ* and *Ardeidæ*; the third he considers to have more affinity to the *Grallatores* than to the *Rasores*; and the last he retains among the *Ampelidæ*.

M. Lesson's monographs of the *Trochilidæ*, entitled 'Histoire Naturelle des Oiseaux Mouches,' and 'Histoire Naturelle des Colibris,' are valuable works for the illustration of species, but the generic subdivisions are not carried into sufficient detail. M. Lesson has elsewhere proposed several generic groups of *Trochilidæ*, and M. Boié has added others; but many of these appear difficult to define satisfactorily. In fact there is no family of birds whose classification is more imperfect and more in want of careful elucidation than the beautiful but bewildering group of Humming Birds. The two volumes of 'Humming Birds' in Sir W. Jardine's 'Naturalist's Library' contain a synopsis of most of the species, but without professing to form a complete monograph.

Other volumes of the 'Naturalist's Library' are devoted to particular groups, but as they only contain selections, and not entire lists of the species, they do not strictly constitute monographs. Such are the useful volumes by Mr. Selby on the 'Pigeons and Gallinaceous Birds,' and by Mr. Swainson on *Muscicapidæ*. A more complete work is the volume by Sir W. Jardine on the *Nectariniidæ*, or rather on the genus *Nectarinia*, containing a very full synopsis of the species of that extensive and beautiful group.

The 'Histoire Naturelle des Oiseaux de Paradis' by M. Lesson, is a useful monograph of an obscure and difficult group of birds, and is worked out with more care and just criticism than is to be found in many others of M. Lesson's publications.

M. Malherbe of Metz is at present engaged on a general history of the *Picidæ*, a work much wanted on account of the many genera and species introduced into this family since Wagler's monograph of *Picus* was published.

Several attempts have been made to compile monographs of the numerous family of *Psittacidæ*, but the subject is yet far from being exhausted. Levaillant in 1801 had figured and described all the species then known, and Kuhl in 1820 published a valuable monograph in the 'Nova Acta Acad. Leop. Car.' Another and a more complete monograph of the *Psittacidæ*, by the industrious Wagler, will be found in the 'Abhandlungen der Baierischen Akademie der Wissenschaften,' 1832. Although some of the author's generic divisions have been criticised as being artificial, yet this paper has a great value for its discrimination of species. Lear's 'Illustrations of the *Psittacidæ*,' 1832, is intended as supplementary to Levaillant's great work 'Les Pero-

quets.' The lithographic plates are beautifully executed, but as they are unaccompanied by letter-press they hardly belong to the class of monographs.

Another continuation to the work of Levaillant is the 'Histoire Naturelle des Peroquets,' by M. Bourjot St. Hilaire, Paris, 1835–38, folio. Many of the plates are original, others are copied from Spix, Temminck, or Lear; they are executed on stone, and though inferior to the works of Gould and Lear, they are perhaps the best ornithological lithographs which have issued from the French press. The text of this work is prepared with considerable care, but the nomenclature wants precision, the Latin names being often wrong-spelled, and the principle of binomial appellations departed from. Thus the genus *Palæornis* is in one instance designated *Psittacus*, in another *Psittacus sagittifer*, and in a third *Conurus sagittifer*, with the addition in each case of a specific name. What can we say of an author who designates a species as "*Psittacus platycercus viridis unicolor*," but that he is deserting that admirably concise and effective method of nomenclature introduced eighty years ago by the great Linnæus, and is resuming the vague and unscientific generalizations of the ancient naturalists?

I only know by name the 'Monographie der Papageien,' published in Germany by C. L. Brehm.

Some interesting details on the genera *Crotophaga* and *Prionites* were published by Sir W. Jardine in the 'Annals of Natural History,' vols. iv. and vi., and I last year communicated to the same work a paper on the structure and affinities of the genera *Upupa* and *Irrisor* (*Promerops* of some authors), showing that these genera are really allied, though M. Lafresnaye had maintained that they are widely separated (Proc. Zool. Soc., 1840).

Mr. Vigors communicated to the earlier volumes of the 'Zoological Journal' several papers of a monographic character, entitled "Sketches in Ornithology," which are distinguished by close research and careful induction.

Among the ornithological works of this class which have appeared of late years, Mr. Gould's 'Monographs of the *Trogonidæ* and of the *Rhamphastidæ*' occupy a conspicuous place. Of these I need only say that they are executed in the same form and with the same excellence as his other superb publications. Mr. Gould has also published a short monograph of *Dendrocitta* in the 'Zoological Transactions.' He is now collecting materials for monographs of other families, including the *Odontophorinæ*, the *Caprimulgidæ*, and the *Alcedininæ*. Of the *Odontophorinæ*, or American Partridges, the first number has already appeared; and though they are a less gaudy tribe of birds than many others, yet the admirable taste with which Mr. Gould has depicted them renders the work peculiarly attractive. A translation with reduced plates of Gould's 'Monograph of *Rhamphastidæ*' has been published in Germany by Sturm.

Prof. C. J. Sundevall has described some species of *Euphonia* in the 'Kongl. Vetenskaps Academiens Handlingar,' Stockholm, 1834. This paper is supplementary to the monograph 'De genere Euphones,' by Dr. Lund, published at Copenhagen in 1829.

Dr. Rüppell's work, entitled 'Museum Senckenbergianum,' Frankfort, 1836, contains some admirable monographs of the genera *Otis*, *Campephaga*, *Colius*, *Cygnus*, &c. They combine laborious bibliographical research with close observation of structure, and are accompanied by excellent illustrative figures.

Mr. Swainson published in the 'Journal of the Royal Institution,' 1831, an essay on the *Anatidæ*, which though founded on peculiar theoretical views deserves to be consulted even by those who do not agree in the author's conclusions. This memoir prepared the way for Mr. Eyton's 'Monograph of the *Anatidæ*,' 1838, which is in many respects a valuable and accurate work, and

is especially useful for its details of anatomical structure. The Latin specific characters might however have been drawn up with more care; and an appendix should have been added, containing the numerous species described by Latham and the old authors, which had not come under Mr. Eyton's observation. No monograph can be considered complete which does not, in addition to the *ascertained* species, enumerate also the *unascertained*, that is to say, those nominal species which for the present exist only in books and not in museums, many of which however will no doubt be again restored to science as real species, while others will be recognised as peculiar conditions of the species we now possess. In this respect, the collection of monographs published by Wagler under the title of 'Systema Avium,' and continued afterwards in Oken's 'Isis,' affords a useful model. It was his custom, after describing those species of a genus with which he was himself acquainted, to append two lists, one of "*species a me non visæ*," and the other of "*species ad genera diversa pertinentes*."

MM. Hombron and Jacquinot have communicated to the *Académie des Sciences* a memoir on the habits and classification of the *Procellariidæ*, of which an abstract is given in the 'Comptes Rendus,' March, 1844, and in which several new subgenera are proposed. Mr. Gould has also extended our knowledge of this obscure group in the 'Annals of Nat. Hist.,' May, 1844.

M. Brandt, of Petersburg, who has made the *Natatores* his peculiar study, has monographed the family *Alcidæ*, and the genera *Phaëton* and *Phalacrocorax*, in memoirs contributed to the Imperial Academy of Sciences at Petersburg.

Professor Sundevall states that there is a monograph of the genus *Dysporus* (*Sula*) in the 'Physiographisk Tidskrift,' Lund., 1837.

Many monographic summaries of different genera will be found in Temminck's 'Planches Coloriées,' Rüppell's works on Abyssinia, and Smith's 'Zoology of South Africa.'

Besides monographs of the larger groups, there are many valuable memoirs on individual species, such as that by M. Botta on *Saurothera californiana* (originally described by Hernandez as a Pheasant, and now properly termed *Geococcyx mexicanus*, Gm. (sp.)) in the 'Nouv. Ann. Mus. Hist. Nat.,' vol. iv.; that by Dubus on *Leptorhynchus pectoralis* and other new generic types, in 'Bullet. Acad. Roy. de Bruxelles;' by De Blainville on *Chionis* (Ann. Sc. Nat., 1836); by Lesson on *Euryceros* (Ann. Sc. Nat., 1831); by Mr. Yarrell on *Apteryx* (Trans. Zool. Soc., vol. i.), &c.

4. *Miscellaneous Descriptions of Species.*

Among recent works of this class, Guerin's 'Magazin de Zoologie,' commenced in 1831, demands notice. This publication, which for the excellence of its scientific matter and its moderate price deserves every encouragement, is rendered the more convenient to the working naturalist by being sold in separate sections. The ornithological portion of this periodical contains valuable papers by Isidore Geoffroy St. Hilaire, Lafresnaye, D'Orbigny, Eydoux, Gervais, L'Herminier, Delessert and others. Many new and important forms are there described and figured with great exactness, and although the authors are not in all cases sufficiently conversant with the writings of British ornithologists, yet they duly estimate the claims of the latter when brought before them.

Upon the whole, the 'Magazin de Zoologie' must be regarded as a work highly creditable to French science, and it is much to be regretted that since the discontinuance of our own 'Zoological Journal' no similar periodical has been set on foot in this country. Such a work might however be easily re-

produced if our Zoological Society would attach illustrative plates to their very valuable 'Proceedings,' and give them the form of a Journal, as has lately been done by the Geological Society.

A work closely connected with the 'Magazin de Zoologie' is the 'Revue Zoologique de la Société Cuvierienne,' the object of which is to assert without loss of time the claims of any zoological discovery, by publishing brief but adequate descriptions of new species. The multitude of labourers now at work in the same field, and the importance of adhering to the rule of priority as the basis of systematic zoological nomenclature, render it necessary to publish rapidly and diffuse widely the first announcements of new discoveries. The delays incident to the engraving of plates and the printing of memoirs in scientific Transactions have often robbed original discoverers of their due credit, and introduced confusion and controversy into science: and it is to remedy this evil that the valuable though unpretending 'Revue Zoologique' was established.

Original descriptions of new species are scattered so widely that it is impossible to notice all the recent works in which they occur, and I must therefore confine myself to simply enumerating the more important. Of regular periodical works devoted to natural history in general, and including original contributions to ornithology, I may mention (in addition to those above noticed) the 'Zoological Journal;' Ainsworth's 'Edinburgh Journal of Natural and Geographical Science,' 1829; Loudon's and Charlesworth's 'Magazine of Natural History;' Sir W. Jardine's 'Magazine of Zoology and Botany;' Taylor's 'Annals of Natural History;' and the popular rather than scientific 'Field Naturalist's Magazine' of Prof. Rennie; the 'Naturalist' of Mr. Neville Wood; and the 'Zoologist' of Mr. E. Newman. Among foreign periodicals are Oken's 'Isis;' Wiegmann's 'Archiv;' Kroyer's 'Naturhistorisk Tidskrift;' Van der Hoeven's 'Tijdschrift fur Natuurlijke Geschiedenis;' Wiedemann's 'Zoologisches Magazin;' 'Physiographisk Tidskrift,' Lund; Rohatzsch's 'Munich Journal;' the 'Annales des Sciences Naturelles;' Muller's 'Archiv für Anatomie;' Silliman's 'American Journal of Science,' 'Boston Journal of Natural History,' and the scientific journals of India, Tasmania and South Africa, which I mentioned when speaking of the ornithology of those regions. Among the authorized publications of scientific societies, ornithological details of greater or less amount will be found in the 'Philosophical Transactions;' the 'Proceedings and Transactions of the Zoological Society;' the Transactions of the Linnæan, the Cambridge Philosophical, the Newcastle and the Wernerian Societies; the 'Bulletin de la Société Philomathique des Pyrénées orientales;' 'Actes de la Soc. Linnéenne de Bordeaux;' 'Mémoires de la Soc. Linnéenne de Calvados;' 'Bulletin de l'Académie Royale des Sciences de Bruxelles;' 'Mémoires' and 'Comptes Rendus de l'Académie Royale de France;' 'Annales du Musée d'Histoire Naturelle;' 'Annales de la Soc. Linnéenne de Paris;' 'Mémoires de la Soc. d'Emulation d'Abbeville;' 'Mémoires de la Soc. Académique de Falaise;' 'Mémoires de la Soc. Royale de Lille;' 'Mémoires de l'Académie de Metz;' 'Mémoires de la Soc. des Sciences Naturelles de Neufchatel;' 'Mémoires de la Soc. de Physique de Genève;' 'Jahrbuch der Naturforschenden Gesellschaft zu Halle;' 'Nova Acta Academiæ Cæsareæ Naturæ Curiosorum;' 'Abhandlungen der Baierischen Akademie der Wissenschaften;' 'Abhandlungen der Akademie der Wissenschaften zu Berlin;' 'Kongl. Vetenskaps Akademiens Handlingar,' Stockholm; 'Mémoires' and 'Bulletins de l'Académie Impériale des Sciences de St. Pétersbourg;' 'Annales Universitatis Casanensis;' 'Mémoires' and 'Bulletins de la Soc. des Naturalistes de Moscou;' 'Annale delle Scienze Naturali di Bologna;' 'Nuovo Giornale

de'Litterati di Pisa;' 'Memorie della Academia delle Scienze di Torino;' 'Atti dell'Academia Gioenia de Catania;' 'Journal of the Academy of Natural Sciences of Philadelphia;' 'Annals of the Lyceum of Natural History of New York;' 'Transactions of the American Philosophical Society,' and many others.

Of recent works specially devoted to the description and illustration of new objects of zoology in general or of ornithology in particular, the following British ones may be mentioned:—Swainson's 'Zoological Illustrations,' 1st and 2nd series, 1820–33; Donovan's 'Naturalist's Repository;' Jardine and Selby's 'Illustrations of Ornithology,' an excellent work, which I regret to say is now discontinued; Wilson's 'Illustrations of Zoology,' fol. Edinburgh, 1827, an accurate and well-illustrated volume; J. E. Gray's 'Zoological Miscellany,' 1831, containing concise descriptions of new species; Swainson's 'Animals in Menageries,' 1838, (in Lardner's Cyclopædia,) comprising descriptions of 225 species, many of which however had before been published; Bennett's 'Gardens and Menagerie of the Zoological Society,' 1831, valuable for its observations on the habits of living individuals; and Gould's 'Icones Avium,' equal in merit and beauty to his other works.

Among foreign works of the same kind are Temminck's 'Planches Coloriées,' whose merits are too well known to be here dwelt on, and the text of which, if carefully translated and edited, would form an acceptable volume to the British naturalist; Lesson's 'Centurie Zoologique,' containing eighty miscellaneous plates; those relating to ornithology respectably executed, and exhibiting several new forms, especially of Chilian Birds; the 'Illustrations de Zoologie' form a second volume of the same character as the 'Centurie;' Kuester's 'Ornithologische Atlas der auseuropaischen Vögel,' Nuremberg; Dubois' 'Ornithologische Galerie,' Aix-la-Chapelle; (the last two works I know only by name;) Lemaire, 'Hist. Nat. des Oiseaux exotiques,' Paris, 1836, a collection of brief descriptions and very gaudy figures; and Rüppell's 'Museum Senckenbergianum,' a work of first-rate excellence.

5. *Progress of the Pictorial Art as applied to Ornithology.*

The preceding criticisms have chiefly referred to the claims of the descriptive or classificatory portion of the several works noticed, but it may be useful to make a few special observations on the success which has attended the various methods of representing the forms and colours of birds to the eye. In this branch of zoology as in all others the pencil is an indispensable adjunct to the pen. The minute modifications of form which constitute the distinctive characters of genera, and the delicate shades of colour by which alone the specific differences are in many cases indicated, are of such a nature as to be frequently beyond the power of language to define without the aid of art, and it is consequently indispensable that the zoological artist should combine a scientific knowledge of the subject with a perfect command of his pencil. In no branch of zoology are these peculiar talents more requisite than in ornithology, where the varieties of habit and of attitude, the unequalled grace and elegance of form, the remarkable modifications of structure in the plumage, and the endless diversities of colouring demand the highest resources of the painter's skill.

The three principal modes of engraving, namely, wood-engraving, metallic plate-engraving and lithography, have all been applied in turn to the illustration of ornithology.

1. *Wood-engraving.*—For such illustrations of birds as are not intended for colouring, this method is not only the cheapest, but for works of small size it is the best. The works of the immortal Bewick have shown us with what

complete success the structure and arrangement of the feathers, the relative intensities of the colours, and the characteristic expression of the living bird may be transferred to a block of wood by the hand of original genius. Many recent wood-engravers have approached Bewick, but none have yet equalled him. Among the most successful of these the Messrs. Thompson of London must be especially mentioned. Their woodcuts in Yarrell's 'British Birds' are beautiful works of art; in delicacy of execution they often exceed the engravings of Bewick; but the occasional stiffness of attitude in the birds, and a conventional *sketchiness* in the accompaniments, indicate the professional artist and not the self-taught child of Nature.

The beauty of Yarrell's 'British Birds' is much enhanced by improvements in the preparation of paper and ink, and in the mode of taking off the impressions which have been introduced since Bewick's time. It is probable that if the wood-blocks of Bewick, now in the possession of the great engraver's family, were entrusted to one of our first-rate London printers, an edition of Bewick's 'Birds' could be now produced, far superior in execution to any which was issued in the lifetime of the author.

2. *Metallic plate-engraving.*—Line engravings or etchings on copper or steel have been at all times extensively applied to the illustration of ornithological works. Such engravings, if uncoloured, are certainly inferior in effectiveness to good woodcuts, as an example of which I may mention the numerous plates of birds in Shaw's 'Zoology' and Griffith's 'Cuvier,' which though often respectably executed, are almost useless for the purpose of specific diagnosis; and even when carefully coloured, engraved plates rarely approach in excellence, and in my opinion never equal the best examples of lithography. The greater stubbornness of the material involves almost of necessity a certain constraint in the attitudes represented: just as the statues of ancient Egypt which were carved out of hard basalt, never attained the grace and animation which has been conferred upon the tractable marbles of Greece, and the still softer alabaster of Italy. In proof of this I may refer to Temminck's 'Planches Coloriées,' and to the recent works of Lesson, Quoy, D'Orbigny and other French ornithologists. The figures of birds in these plates, though delicately and even beautifully engraved, are often exceedingly stiff and unnatural, a defect owing partly no doubt to too great a familiarity with *stuffed specimens*, but in part also to the unyielding material on which they are engraved. If the Parisian ornithological artists have not the means of studying living nature, they might at least take for their models the designs of Nature's best copyist —Gould.

The defects shown to be incident to *line-engraving* attach indeed in a less degree to *etching*. The resistance to the tool being diminished in the latter process the lines are drawn with greater ease and freedom. Here the main difficulty is to avoid *hardness* and *coarseness* in the delineation of the plumage. Many etchings which are otherwise meritorious, have failed in this point, and the lines which were intended to represent the smooth soft plumage of birds, resemble rather the scales of a fish or the wiry hair of the Sloth or *Platypus*.

The plates of Mr. Selby's 'Illustrations of British Ornithology' are certainly the finest examples extant of ornithological etchings, though they are nearly equalled by some of the plates etched by Sir W. Jardine, Mr. Selby and Captain Mitford in the 'Illustrations of Ornithology.'

In the plates of Audubon's 'Birds of America' line-engraving is combined with aqua-tint, a method which, when well-executed, may be used with advantage to increase the depth and softness of line-engravings or etchings.

3. *Lithography.*—We have next to consider that style of illustration which

is beyond all question the best adapted to ornithology. Lithography possesses all the freedom and facility of *drawing* as contrasted with the laborious mechanical process of *engraving*, and is hence peculiarly fitted to express the graceful and animated actions of birds. Another merit is the expression of *softness* which it communicates to the plumage, and the power of showing the roundness of the forms by a homogeneous shading, instead of the parallel lines and cross hatchings employed in engraving. The lines introduced to represent the individual feathers possess just that amount of indistinctness which we see in the living object, and which adds so much to its beauty.

It is a matter of some pride to us, that while in certain other departments of natural history (especially in fossil conchology) the British lithographers must yield the palm to foreigners, yet in ornithology our own artists have never been equalled. Lithography was, I believe, first applied to the delineation of birds by Mr. Swainson, who soon attained great excellence in the art. His 'Zoological Illustrations,' his plates to the 'Fauna Boreali-Americana,' and his 'Ornithological Drawings of the Birds of Brazil,' possess great merits both of design and execution, as does also Mr. Lear's great work on the *Psittacidæ*. But all these productions are eclipsed by the pencil of Gould, whose magnificent and voluminous works exhibit a gradual progress from excellence to perfection. Temminck, who in 1835 said of Gould's 'Birds of Europe,' "Ils sont d'un fini si parfait, tant pour le dessin, la pose, et l'exacte verité de l'enluminure, qu'on pourrait, avec de si beaux portraits, se passer des originaux montés," would, I am sure, pass even higher encomiums on the 'Birds of Australia,' which Mr. Gould is now publishing. One little fault, and one only can I find in these beautiful drawings, and that is, that the hallux, which in all the *Insessores* is essential to the steady support of the bird, is too often represented as projecting backwards instead of firmly clasping, as it ought, the perch. Mr. Richter and Mr. Waterhouse Hawkins, both of whom have been employed in executing on stone the designs of Mr. Gould, have attained great excellence in the art, as has also Mr. D. W. Mitchell, the able coadjutor of Mr. G. R. Gray in the 'Genera of Birds.' The latter has successfully applied the new art of "lithotinting" to the representation of smooth and hard surfaces, such as those of the beak and legs of birds. He has also in some cases executed the whole plumage in lithotint, producing a beautiful and delicate finish, the effect of which is intermediate between lithography and engraving.

Lithography has never been applied extensively to ornithology upon the continent. The plates in Vieillot's 'Galerie des Oiseaux,' and in the Atlas to Erman's 'Reise um die Erde' are very indifferent, those in Werner's 'Atlas des Oiseaux d'Europe' a shade better, and in the 'Petersburg Transactions' they are tolerably good. The Prince of Canino's 'Fauna Italica,' Nilsson's 'Illuminade Figurer till Skandinaviens Fauna,' and Rüppell's 'Museum Senckenbergianum,' are the only continental works which I have seen, in which the lithographs at all approach to the excellence of the British artists.

The lithographic plates in Spix's 'Avium species novæ in itinere per Braziliam collectæ,' are tolerably executed; but in rather a peculiar style, the legs and beaks of the birds, and in some instances the whole body, being first covered with black, and the lighter parts afterwards scraped off with a sharp point. Examples of this style also occur in some of Mr. Mitchell's plates. In particular cases, especially in representing the scuta of the legs and feet, and the details of black plumage, this method may be adopted with great advantage.

There is a real though somewhat paradoxical cause of the superior excel-

lence of the drawings of Gould and of Swainson, which should not be overlooked. It is, that these artists have in almost every case (when the living bird was not accessible) made their designs from *dried skins*, and not from *mounted specimens*. In the skin of a bird, dried in the usual mode for convenience of carriage, the natural outlines and attitudes are nearly obliterated, and the artist is consequently *compelled* to study living examples, to retain the images thus acquired in his memory, and to transfer them to his design. By the constant habit of thus re-animating as it were these lifeless and shapeless corpses, he acquires a freedom of outline and a variety of attitude unattainable by any other means. But when an artist attempts to draw from a stuffed specimen, he beholds only a fabric of wire and tow, too often a mere caricature of nature, exhibiting only the caprices and mannerisms of an ignorant bird-stuffer. Knowing that the object before him is *intended* to represent nature, he is unconsciously and irresistibly led to copy it with all its deformities. Such is no doubt one cause of the stiff and lifeless designs which we see in the French works, drawn as they mostly are from mounted specimens in the Paris Museums.

6. *Anatomy and Physiology of Birds.*

The most complete general treatise on the anatomy of birds that I am acquainted with is the article *Aves* by Prof. Owen, in Todd's 'Cyclopædia of Anatomy and Physiology.' The author's original investigations on this subject are here combined with those of others, and the whole forms an excellent monograph of the structural peculiarities of the class, as well as of many differential modifications which mark particular groups. Much indeed remains to be added to our knowledge of individual organizations, but those anatomical arrangements which distinguish Birds from the other classes of *Vertebrata* can hardly be described with greater precision or reasoned upon more philosophically than in the work in question. We may indeed regret that this treatise of Prof. Owen is not published in a separate and more accessible form, especially if we consider how essential a knowledge of comparative anatomy is to the scientific zoologist, and what peculiar interest attaches to the anatomy of Birds, as indicating their affinities to Reptiles and to Mammals, and as exhibiting the wonderful arrangements by which their muscular bodies are sustained in a medium at least one thousand times lighter than themselves. We shall however be soon put in possession of Prof. Owen's most recent researches on the anatomy of birds, by the publication of that portion of his 'Hunterian Lectures' which relates to the *Vertebrata*, and which will doubtless be of equal value with the excellent volume already issued on the *Invertebrata*.

Another carefully-prepared summary of ornithic anatomy is that by Prof. M'Gillivray, in the Introduction to his 'History of British Birds.' The author has evidently bestowed much labour, both mental and manual, upon this subject, and has successfully vindicated the claims of comparative anatomy to be considered not an adjunct to, but a part of, scientific zoology. The above work is particularly valuable for its details respecting the organs of digestion, a part of the system to which the author justly attributes great importance, and which he has treated of in a special article in the 'Magazine of Zoology and Botany,' vol. i. *Résumés* of the anatomical peculiarities of birds will also be found in the 'Elémens de Zoologie,' by Milne Edwards, 1837, and in the 'Encyclopædia Britannica' and 'Penny Cyclopædia.' The article *Zoology* in the 'Encyclopædia Metropolitana' also contains a useful treatise on the subject, though it is damaged by the affectation of using new English terms in place of the received Latin terminology of anatomy.

In Dr. Grant's 'Outlines of Comparative Anatomy,' the structure of birds is described with the same accuracy as that of the other classes of animals; but as the work is arranged anatomically and not zoologically, the details of ornithic anatomy are necessarily intermixed with those of the other classes of animals.

Prof. Rymer Jones has given, in his 'General Outline of the Animal Kingdom,' a careful abstract of the anatomy of Birds, including more especially the structure of the eye and the important subject of the development of the ovum. The excellent mode in which the generalities of the subject are treated of, makes us regret that the limits of Prof. Jones's work prevent him from giving a fuller statement of the anatomical characters of the several orders and families.

An excellent synopsis of this subject is contained in Wagner's 'Comparative Anatomy,' of which Mr. Tulk has just published an English translation.

Of special treatises, either on the anatomy of particular organs throughout the whole class, or on the general anatomy of particular groups, many are to be found scattered over the field of scientific literature, and I shall notice some of the more important.

The general subject of the *pneumaticity* or circulation of air through the bodies of birds is ably treated of by M. E. Jacquemin in the 'Nova Acta Acad. Cæs. Leop. Car.' 1842. See also 'L'Institut' and 'Comptes Rendus,' 1836. After minutely describing the modifications of the aërating system in different forms of birds, the author deduces a series of conclusions, and shows that this structure, peculiar to the class of birds, performs the fourfold office of oxidizing the blood,—of enlarging the surface of the body, and consequently the points of muscular attachment,—of diminishing the specific gravity, and of producing a general elasticity which favours the act of flight.

The structure of the ear in birds is treated of in great detail in a memoir by M. Breschet, in the 'Annales des Sciences Naturelles' for 1836, and in a detached treatise on the same subject. After giving an historical sketch of the researches of previous authors, he enters upon an elaborate description of the characters of this organ in various groups of birds. He shows that of the three bones of the tympanum, the *stapes* alone is osseous in birds, while the *malleus* and the *incus*, which in Mammalia are composed of bone, are here represented by cartilaginous processes, and he points out many other minute but important characters which appear to distinguish the ears of birds from those of other *Vertebrata*.

Dr. Krohn has treated on the organization of the iris, and Dr. Bergman on the movements of the *radius* and *ulna* in Muller's 'Archiv für Anatomie,' 1837–9.

The structure of the *os hyoides* in birds, and the affinities of its several parts to the corresponding organs of the other *Vertebrata*, are explained in a memoir by M. Geoffroy St. Hilaire, in the 'Nouvelles Annales du Mus. d'Hist. Nat.' 1832.

M. Müller has described the modifications of the male organs of birds in the 'Abhandlungen der Akad. der Wissenschaften zu Berlin,' 1836.

M. Cornay, in 'Comptes Rendus,' 1844, p. 94, has announced that he finds an important character to exist in the anterior palatine bone, the modifications of which in the various orders he considers to form a more correct basis of classification than any one hitherto employed. Until more attention be paid to this organ than it has yet received, it would be premature to pronounce as to the value of it.

The gradual development of ossification in the sternum of young birds, and the relations of its several parts to the skeletons of other *Vertebrata*, were

treated of by M. Cuvier (Ann. Sc. Nat. 1832) and by M. L'Herminier (Ann. Sc. Nat. and Comptes Rendus, 1836–37). These essays involved theoretical views which gave rise to controversies in which MM. Serres and Geoffroy St. Hilaire also took part. The structure of the pelvis and hinder extremities was described by M. Bourjot St. Hilaire in a memoir read to the Académie des Sciences, 1834.

The osteology of the feet of birds is treated of by M. Kessler in the 'Bulletin de la Soc. de Naturalistes de Moscou,' 1841.

The internal temperature of various species and groups of birds is treated of in a general memoir on the subject of Animal Heat, by M. Berger, in the 'Mémoires de la Société de Physique de Genève,' 1836. Dr. Richard King has also published some observations on this subject.

Mr. Eyton has contributed some interesting information on the anatomy of *Menura*, *Biziura*, *Merops*, *Psophodes* and *Cracticus*, which throw much light on the affinities and classification of those genera (Annals of Natural History, vol. vii. *et seq.*).

Amidst the numerous profound researches of Prof. Owen on the comparative anatomy of various portions of the animal kingdom are many original investigations into the structure of such rare birds as have fallen under his scalpel. In the 'Transactions of the Zoological Society' he has described the anatomy of *Buceros cavatus*, showing the points of affinity which the *Bucerotidæ* bear towards the *Rhamphastidæ* on the one hand, and the *Corvidæ* on the other. He has also suggested that the probable design of the gigantic beak in the Hornbills and Toucans is to protect the eyes and head while penetrating dense thickets in quest of the nestling birds on which they feed. Another memoir, of still greater importance, is the elaborate description of the anatomy of the *Apteryx* (Trans. Zool. Soc., vol. ii.), for which our successors even more than ourselves will be grateful to Prof. Owen, seeing that but few years will probably elapse before that rare and extraordinary species will be erased from the list of animated beings. He has also contributed to the 'Proceedings of the Zoological Society' excellent anatomical monographs of the genera *Sula*, *Phœnicopterus*, *Corythaix*, *Pelecanus*, *Cathartes*, and *Talegalla*. The invaluable descriptive catalogues of the Museum of the Royal College of Surgeons, which are in great measure the work of Prof. Owen, contain a mine of information on the anatomy of every class, and not least on that of birds. The volume which relates to the Fossil Mammalia and Birds is now in the press.

We are indebted to Mr. Yarrell for several accurate notices on the more remarkable structures of certain birds, among which are papers on the anatomy of the *Raptores*, on the xiphoid bone and its muscles in *Phalacrocorax*, and on the muscles of the beak in *Loxia*, published in the 'Zoological Journal;' memoirs on the convolutions and structure of the trachea in *Numida*, the *Gruidæ*, and the *Anatidæ*, which will be found in the 'Linnæan Transactions;' and notices on the anatomy of *Cereopsis*, *Crax*, *Ourax*, *Penelope*, *Anthropoides* and *Plectropterus*, in the 'Proceedings of the Zoological Society.'

A very elaborate account of the anatomy of *Aptenodytes patachonica*, by Mr. Reid, is published in the 'Proceedings of the Zoological Society,' 1835, and we may regret that this gentleman has not made more such contributions to anatomical science.

There are some very interesting remarks by Mr. Blyth on the osteology of *Alca impennis*, in the 'Proceedings of the Zoological Society,' 1837, showing that in this bird (which is wholly unable to fly) the bones of the extremities are nearly solid and filled with marrow, while in the volatile species of *Alcidæ*

the air-cavities of the bones are highly developed, in order to compensate for the shortness of the wings. He adds the important remark, that "when once the object of aërial flight is abandoned, the wings are reduced to exactly that size which is most efficient of all for subaquatic progression; *species of an intermediate character of course never occurring.*" This principle of the *necessity of hiatuses* in the natural system (of which numerous other examples might be adduced), is one which I have long regarded as conclusive against that continuity of affinities and symmetry of arrangement which some writers have endeavoured to demonstrate.

Mr. T. Allis of York (whose beautifully prepared ornithic skeletons now in the York Museum are so highly creditable to his skill as an anatomist) has made some observations on the connexion between the furculum and sternum, showing that in certain birds possessing powers of long-continued flight these bones are connected by an intimate symphysis, which in *Pelecanus* and *Grus* amounts to an actual anchylosis. (Zool. Proc., 1835).

The anatomies of *Pelecanus*, *Dicholophus* and *Corythaix*, are described in detail by Mr. W. Martin in the work last quoted.

A paper on the anatomy of *Corvus corone* by M. Jacquemin, will be found in the 'Isis,' 1837, and the osteology of the *Trochilidæ* is described by M. J. Geoffroy St. Hilaire in 'Comptes Rendus,' 1838*.

Several points of ornithic anatomy are treated of by Prof. Wagner in the 'Abhandl. der Baierischen Akad.,' 1837, and the osteology of the genera *Crypturus*, *Dicholophus*, *Psophia* and *Mycteria*, is fully described. The structure of the *Struthionidæ* is beautifully portrayed by D'Alton in his 'Skelete der Straussartigen Vögel,' 1827.

There is a paper by M. Schlegel on the supposed absence of nostrils in the genus *Sula*, in the 'Tijdschrift voor natuurlijke Geschiedenis,' 1839, of which, from being unacquainted with the Dutch language, I regret my inability to give a summary.

The osteology of several groups of *Natatores* is treated of by M. Brandt in an elaborate and highly important paper in the 'Mémoires de l'Acad. Imp. de St. Pétersbourg,' 1839. The researches of this author throw great light upon the classification of many obscure groups, and nothing can be more exact than his figures and descriptions of ornithic osteology.

Mr. Yarrell has paid considerable attention to the subject of *hybridity* (Zool. Proc., 1832, 1836, &c.). The result of his observation seems to be that hybrid birds will occasionally propagate with the pure race on either side, but rarely, if ever, with each other, thus indicating a special provision of nature to preserve the distinctness and permanency of species. Mr. Eyton and Mr. Fuller have also made notes on the same subject (Zool. Proc., 1835). See also a paper by Mr. W. Thompson in the 'Mag. of Zool. and Bot.,' vol. i.

Mr. G. Gulliver, who has made a series of microscopic researches into the blood-corpuscles of the *Vertebrata*, taking exact measurements of these minute bodies in different genera and species, has in the course of this inquiry given a fair share of attention to the corpuscles of birds, and his labours are recorded in the 'Proceedings of the Zool. Soc.,' 1842, &c.

The difficult question of the influence of climate in producing permanent varieties of species is discussed by Dr. C. L. Gloger in a treatise published at Breslau, 1833, and which deserves translation for the use of British naturalists, although the author carries his theory to too great an extent.

The arrangement of the feathers on birds, to which attention was first

* The 'Disquisitiones Anatomicæ Psittacorum,' by M. Thuet, Turin, 1838, and Kuhlman's dissertation, 'De Absentiâ Furculæ in Psittaco Pullario,' Kiel, 1842, are works which I have not seen.

called by Nitzsch in his 'Pterylologie,' is briefly treated of in a memoir read to the Académie des Sciences by M. Jacquemin (Ann. Sc. Nat., 1836, p. 227), who points out several facts which have not been sufficiently attended to by previous ornithologists.

The various modes by which the changes of plumage in birds at different seasons are effected, whether by actual moulting, by the shedding of a deciduous margin to the feather, or by a change of colour in the feather itself, have been investigated by Cuvier, Temminck, Yarrell (Trans. Zool. Soc., vol. i.), and others. Dr. Bachman of Charleston has made some very interesting observations on this subject in the case of many of the North American birds, which will be found in the 'Transactions of the American Philosophical Society,' 1839.

The subject of moulting, and especially of that remarkable tendency in old female birds to assume the male plumage, is treated of by M. I. Geoffroy St. Hilaire (Ann. Sc. Nat., and Essais de Zoologie Générale, 1841). See also papers by Dr. Butler in the 'Memoirs of the Wernerian Society,' and by Mr. Yarrell in the 'Philosophical Transactions.'

M. de la Fresnaye published in the 'Mémoires de la Soc. Acad. de Falaise,' 1835 (L'Institut, 1837), a paper on *melanism*, or a supposed abnormal tendency in the *Raptores* to acquire a dark plumage, analogous to *albinoism* in other birds. The examples cited are few in number, and not very conclusive, but the subject is deserving of investigation.

Many writers have written descriptive works on the eggs of birds, especially of the European species. Of the older authors on this subject, as Klein, Wirsing, Sepp, Naumann, Schintz, Donovan, Roux, and Thienemann, I need not here speak. In the 'British Oology' of Hewitson the eggs of our native birds are accurately described and figured, and the second edition now publishing attests the popularity of the subject. An 'Atlas of Eggs of the Birds of Europe' is just commenced by A. Lefevre at Paris, the figures of which are well-executed. Of the eggs and nidification of exotic birds our information is very incomplete, and almost the only contributor to this branch of ornithology is M. D'Orbigny, who in his 'Voyage dans l'Amerique Méridionale' gives many figures of eggs and details of nidification, which may aid in clearing up the affinities of certain doubtful forms of the South American continent.

Mr. Gould brought home from Australia a large and interesting collection of eggs and nests, of which we may regret that he has not introduced the figures into the plates of his 'Birds of Australia.' We may hope, however, that when he has completed that great work he will publish an 'Australian Oology,' and perpetuate the knowledge which his unique collection of eggs supplies.

Dr. Carlo Passerini has given an account of the nidification and incubation of *Paroaria cucullata* in a domestic state, in a memoir published at Florence in 1841.

The subject of ornithic oology has been treated of in a philosophical manner by M. Des Murs (Revue Zoologique, and Mag. de Zool., 1842–43). By carefully studying the peculiarities of form, nature of shell and colour in the eggs of various birds, he finds a correspondence between these peculiarities and the structural characters of the several groups, and thus obtains an additional element in the process of classification.

The *number* of eggs laid by birds of different groups and species is the subject of a paper by M. Marcel de Serres (Ann. Sc. Nat., ser. 2. vol. xiii. p. 164), and the author deduces some interesting generalizations upon this subject.

There is a learned treatise on the structure of the egg prior to incubation

by Prof. Purkinje, under the title of 'Symbolæ ad Ovi Avium Historiam,' Leipzig, 1830. The structure of the *vitellus* has been investigated by M. Pouché (Comptes Rendus, 1839), and that of the umbilical cord by M. Flourens (Institut, 1835, p. 324), while M. Serres has described the branchial respiration of the embryo of mammifers and birds in the 'Ann. Sc. Nat.,' ser. 2. vol. xiii. p. 141.

Closely connected with oology is the subject of nidification, one of the most interesting branches of ornithological observation, and one which often throws important light on questions of natural affinities. I am not aware of any special work on this subject except the 'Darstellung der Fortpflanzung der Vögel Europa's,' by Thienemann, and the popular 'Architecture of Birds' by the late Prof. Rennie, but the details of the nidification of European birds are contained in most of the works which treat upon them. The nests of the majority of exotic species are still unknown, though Wilson, Audubon, Gould and others have in some measure supplied this deficiency in our knowledge.

The songs and call-notes of birds are very important in their relation to habits and affinities, though from the imperfect mode of indicating these sounds by alphabetical or musical characters, there is much difficulty attending their study. In some cases, such as the relation of *Phyllopneuste rufa* to *P. trochilus*, or of *Corvus corone* to *C. americanus*, the notes of the living birds present clearer specific distinctions than are shown by their physical structure, and the melody of the woods thus becomes no less interesting to the scientific zoologist than it is fascinating to the unlearned lover of nature.

External Terminology.—The series of terms employed by Brisson, Linnæus and Latham, in describing the external parts of birds, were greatly improved in precision and accuracy by the 'Prodromus Systematis Mammalium et Avium' of Illiger. His series of descriptive terms are still generally current, and have undergone comparatively little change. Definitions and figures illustrative of the terms employed in ornithology will be found in most general treatises on the subject, among which Lichtenstein's 'Verzeichniss der Doubletten,' Berlin, 1823, Stephens's 'General Zoology,' Swainson's 'Classification of Birds,' Wilson's article *Ornithology* in 'Encyclopædia Britannica,' the article *Birds* in the 'Penny Cyclopædia,' and M'Gillivray's 'History of British Birds,' may be mentioned as being useful guides to the language of descriptive ornithology.

There is an excellent summary of the different characters used for ornithological classification, and of the due value to be attached to them, by M. I. Geoffroy St. Hilaire, in the 'Nouv. Ann. Mus. Nat. Hist.' 1832, and in the 'Essais de Zoologie Générale' of the same author, 1841. He shows that the value of the emarginated upper mandible, of the feathers and of the caruncles has been much overrated, and points out that the structure of the tongue, the wing and the toes, furnishes characters which have not been duly appreciated. The importance of the feet, as indicating natural affinities by their structural details, is further insisted on by M. de Lafresnaye in the 'Magazin de Zoologie.'

7. *Fossil Ornithology.*

Our knowledge of Birds has received a less amount of extension from the discoveries of Palæontology than perhaps that of any other class of the animal kingdom. Not only are the fossil remains of birds of considerable rarity, and confined principally to the most recent deposits, but when found, they seldom present characters of such a nature as would enable us to predicate generic, much less specific, differences. The generic characters of birds being mostly drawn from the structure of the corneous appendages of the skin, such as

the beak, tarsal scuta, claws, remiges and rectrices, are of course effaced in a fossil state, and the study of the bony skeleton has not yet been carried into sufficient detail (except in the case of some very isolated groups) to serve as the basis of generic definitions. The fossil skeletons of birds will nevertheless often guide us to the *family* or even the *subfamily* to which the specimens belong, and as the science progresses a greater amount of precision will no doubt be attained.

Birds, like *Mammalia*, appear not to have generally "multiplied and replenished the earth" until the commencement of the Tertiary epoch. Examples of their existence at an earlier period do indeed occur, but though the evidence of this fact is indisputable, yet the information it conveys is vague and obscure, and we look in vain for such grand palæontological discoveries as those which in the classes *Reptilia*, *Pisces*, *Mollusca* and *Crustacea*, have added whole families and even orders to the zoological system.

Many geologists have supposed that the rarity of fossil Mammals and Birds in the Secondary rocks is owing to the improbability of their becoming imbedded in marine deposits, and not to their non-existence altogether. So far however as it is possible to draw a conclusion from negative evidence, there seem very strong reasons for believing that, in the European hemisphere at least, neither Birds nor Mammals were called into existence prior to the middle of the oolitic period. Let us take the case of the Coal-Measures, a formation of vast extent, and which is proved to have been in some cases a terrestrial deposit, and in others to have been formed in the immediate vicinity of dry land. Yet this vast series of beds, which has been quarried by man to a greater extent than any other, and which contains the remains of Plants and even of Insects in the most perfect state of preservation, has never yet afforded the slightest indication of a Mammal or a Bird. When we contrast this fact with the frequent occurrence of bones of these animals in recent peat-bogs, and in deposits, both marine and lacustrine, of the tertiary epoch, we can hardly attribute the absence of such remains in the Coal-Measures to any other cause than to the non-existence at that period of the two highest classes of *Vertebrata*. The Triassic or New Red Sandstone series leads in the European quarter of the globe to the same conclusion. We there find, in Germany and in Britain, evidences of ancient shores and sandbanks, exposed (probably during the recess of the tide) to the sun and the rain, and presenting the footprints of numerous reptiles which walked upon their surfaces. Now these are the localities to which aquatic birds, as well as certain mammals, love to resort, yet no traces of such animals have yet been met with in any ascertained triassic rock of the eastern hemisphere. The Lias and Lower Oolite again, though strictly marine deposits, contain in many places the remains of plants or of insects which have floated from adjacent shores, but invariably unaccompanied by any fragments of birds or of mammals. In the Stonesfield slate we find the *first* and the *only* indication of Mammalian remains in the whole secondary series; but the bones from that formation, which were once referred to birds, have been proved to belong to Pterodactyles, and no unequivocal examples of birds occur till we reach the horizon of the Wealden beds, where they are exceedingly rare, and apparently unaccompanied by *Mammalia*.

In the American continent however a remarkable case occurs, which seems to prove the existence of birds at a period long anterior to their first appearance in our hemisphere. I allude to the now well-known instance of *Ornithichnites*, or birds' footmarks, in the sandstone of the Connecticut valley, first discovered by Dr. J. Deane, and described by Prof. Hitchcock in the 'American Journal of Science,' 1836–37. (See also Buckland's 'Bridgewater

Treatise,' pl. 26 *a* and *b*, and 'Ann. Sc. Nat.' ser. 2. vol. v. p. 154.) Two questions arise in connexion with these impressions; first, whether they are really produced by birds; and secondly, what is the age of the rock in which they are found. The first question seems to be now finally settled in the affirmative, some of the impressions being so nearly identical with those of certain existing *Grallatores* and *Rasores* as to convince the most incredulous. The footmarks are evidently due to Birds of several distinct genera, some of which present structures as anomalous as those found in the Reptiles and Fish of the same remote epoch. The greater part, however, appear clearly referable to Wading Birds allied in structure to the *Charadriidæ* or *Scolopacidæ*. Some are of such a gigantic size that we can only seek their affinities among the *Struthionidæ*, and others appear to have had the tarsi clothed with feathers or bristles, a character which would exclude them from the *Grallatores* as at present defined, though, judging from the impressions made by living birds in snow, I think this appearance may possibly be due to the *trailing* action of the foot before it takes its hold of the ground. One very remarkable form (if really belonging to a bird) has the outer and middle toe united as in the so-called Syndactyles of Cuvier, and is further distinguished by all the four toes pointing forwards (neither of which characters are in the existing fauna ever found in ambulatory birds). Such anomalous structures however (reasoning from the analogy of the fish and reptiles of the older rocks) appear rather to confirm than to disprove the genuineness and antiquity of these Ornithichnites; and as there is no other known class of animals to which they can by possibility be referred, it would be very unphilosophical to deny them to be the footmarks of birds, to which they bear so strong a resemblance.

In his 'Report on the Geology of Massachusets,' Dr. Hitchcock has described no less than twenty-seven species of these footmarks, and in the 'Reports of the American Association of Geologists and Naturalists, 1843,' he has added five more. (See also Silliman's Journal of Science, Jan. 1844.) One of these much resembles the footprint of a *Fringilla*, others are similar to those of *Fulica*. In all these impressions, the phalanges of the toes obey the same numerical law which prevails, with hardly an exception, in the feet of existing birds*. They are accompanied in some cases by reptilian footmarks resembling those of *Chirotherium*, which are at once distinguished from the ornithic impressions by being *quadruped*, and by the forward position of the thumb.

Granting then that we have here the genuine indications of an ancient ornithological fauna, of which no other traces than these footmarks have been found, we have next to consider the geological age at which they were formed. Now it appears that the phænomena of superposition merely show that this deposit is intermediate between the Carboniferous and Cretaceous series. Could we have availed ourselves of such a latitude for speculation, the analogy of the oldest fossil birds found in the eastern hemisphere, would lead us to adopt the *latest* period within the above limits for fixing the age of these impressions. It has been announced however, both by Dr. Hitchcock and by Mr. Lyell (Proc. Geol. Soc. vol. iii. p. 796), that the only recognizable organic remains discovered in this deposit are Fish belonging to the genera *Palæoniscus* and *Catopterus*, and as these genera have never been found above the Triassic series, we are compelled to follow Dr. Hitchcock in refer-

* The remarkably simple law referred to is this: that if we consider the metatarsal spine of certain *Rasores* (and which is wanting in all other birds) as the first toe, the hind toe as the second, and the inner, middle, and outer toes as the third, fourth, and fifth, the number of phalanges is found to progress regularly from one to five. The only exceptions are in the *Caprimulgidæ*, *Cypselus*, and one or two others.

ring the sandstone of Connecticut to the New Red system. These Ornithichnites therefore, abounding in this ancient formation, and separated by so vast an interval of time from the oldest traces of fossil birds in our own hemisphere, remain as one of those anomalies which serve to curb the eager spirit of generalization, and to teach us that Nature fulfils her own designs without regard to human theories. Let us hope that the American geologists will never rest till they have discovered some osseous remains of the *rarœ aves* whose foot-prints have given rise to such perplexing questions.

The rest of the subject of Fossil Birds may be briefly noticed. The oldest example which I can meet with of their actual occurrence is mentioned in Thurmann's 'Soulèvemens Jurassiques,' (as quoted by Von Meyer, 'Palæologica,') who remarks however that the statement seems to require confirmation. It is there stated that the fossil remains of Birds occur, in company with those of Saurians and Tortoises, in the limestone of Soleure, which is considered equivalent to the Portland beds.

A better authenticated instance is recorded by Dr. Mantell (Fossils of Tilgate Forest, p. 81; Geol. Trans., vol. v.; Proc. Geol. Soc., vol. ii. p. 203), who describes certain bones from the Wealden beds of Sussex, which he shows (and his opinion is backed by that of Cuvier and of Owen) to belong to Waders and probably to *Ardeidæ*. Other bones from the same locality apparently belong to birds, yet present a nearer approach to the reptilian type than any known existing genus.

Another example of a fossil bird from the secondary series is mentioned by Dr. Morton (Synopsis of Cretaceous Rocks of United States), who procured a specimen which he refers to the genus *Scolopax*, in the ferruginous sand of New Jersey. This formation he considers to represent the Greensand of Europe, and though its precise equivalent may be somewhat doubtful, there is no doubt of its belonging to the Cretaceous series.

In the "Glaris slate" of Switzerland, a member of the lower portion of the Cretaceous system, a nearly entire skeleton of a bird resembling a Swallow, has been found by Professor Agassiz.

The Chalk of Maidstone has supplied Lord Enniskillen with some fragments of the skeleton of a large natatorial bird, considered by Professor Owen to be most nearly allied to the Albatros (Proc. Geol. Soc., vol. iii. p. 298; Geol. Trans., vol. vi.).

Proceeding to the Tertiary series, we find that ornitholites begin to appear in greater abundance. Here, as in every other department of the animal kingdom, we perceive a rapid approximation to the fauna which is characteristic of the period in which we now live.

The Eocene clays of the Isle of Sheppey have produced the bones of a bird affording almost the only example of a decidedly new ornithological form which has been rescued from the ruins of past geological ages. The sternum of this bird is fortunately preserved, and Professor Owen having worked out its affinities to all known genera with his usual sagacity and success, has arrived at the conclusion that it forms a new genus among the *Vulturidæ*, which he has denominated *Lithornis* (Proc. Geol. Soc., vol. iii. p. 163). This interesting specimen will soon be described in Prof. Owen's work on 'British Fossil Mammalia and Birds,' now in course of publication.

In Kœnig's 'Icones fossilium sectiles,' fig. 91, some fragments of bones from the Isle of Sheppey are delineated, which the author considers to belong to a natatorial bird, and which he designates *Bucklandium diluvii*. If the original specimens are in existence they would well deserve further examination.

The remaining instances of fossil birds from the Tertiary formations call for

but little remark. The fragments which have been found are either undistinguishable, or at any rate have not yet been distinguished, from the genera and species of the existing creation, though it is highly probable that new forms might in some cases be detected if they were subjected to rigid examination. In the Tertiary and for the most part Eocene strata of the continent, birds' bones have been found in Auvergne, at Pont du Chateau and Gergovia, overlaid by beds of basalt, and in one instance accompanied by fossil eggs; in the Cantal, at Perpignan, Montpellier, Wiluwe, St. Gilles, Sansan (where eggs have also been found), Montmartre, Monte Bolca, Œningen, Kaltennordheim, Ottmuth in Upper Silesia, Westeregeln near Magdeburg, and Neustadt in the Hardt, and are recorded in the writings of Dufrénoy, Bravard, Croizet, Jobert, Marcel de Serres, Karg, Cuvier, Mösler, Germar, Von Meyer, &c. Birds' feathers have been found fossil at Monte Bolca, Aix and Kanstatt.

Proceeding to the newer Tertiary beds, we meet with remains of birds in the Crag of Suffolk and in the Plistocene fluvio-lacustrine beds at Lawford (Buckland). M. Lund, whose researches into the bone-caverns of Brazil have already very greatly extended our knowledge of fossil Mammalia, has announced that he has also obtained a considerable variety of fossil birds, including a Struthious species larger than the existing *Rhea* of America; but these remains have not as yet I believe been fully investigated. The same remark also applies to the ornithic remains found by Dr. Falconer in that mine of palæontology the Siwalik Hills of India. Amidst the extraordinary remains of Mammals and of Reptiles obtained by that gentleman, the bones of several species of Birds were found mostly referable to the Grallatorial order, and exhibiting in some cases very gigantic proportions. As Dr. Falconer's collections are now in course of arrangement at the British Museum, we may hope soon to learn more particulars of these interesting ornithic fossils.

The *Gryphus antiquitatis* of Schubert, a supposed colossal ornitholite from Siberia, appears to be either altogether apocryphal, or to be founded on the cranium of a Rhinoceros, mistaken for that of a bird.

In bone-caverns fossil birds have been found in company with extinct Mammalia at Kirkdale (Buckland), Bize in the south of France (Marcel de Serres), Avison, Sallèles, Poudres near Sommières, and Chokier near Liège (Von Meyer).

The bones of birds are of frequent occurrence in the osseous brecciæ which fill the fissures of limestone on the coasts of the Mediterranean, but these are probably referable in many cases to the recent epoch. They are recorded as occurring at Gibraltar (Buckland), Cette, St. Antoin and Perpignan (Cuvier), Nice (Risso), and Sardinia (Wagner, Nitzsch and Marmora).

I may here mention the remarkable instances of birds which belong to the existing epoch of the world, but have become extinct in recent times. The first is the well-known case of the Dodo, a bird insulated alike in structure and in locality, and which being unable to fly, and confined to one or two small islands, was speedily exterminated by the thoughtless pioneers of civilization. Most fortunately a head and foot of this bird still exist in the Ashmolean, and another foot in the British Museum; and with these data, aided by the descriptions of the old navigators, we are in some degree informed as to the structure and natural history of this anomalous creature. The memoirs on the Dodo by Mr. Duncan in the 'Zoological Journal,' vol. iii., and by M. De Blainville in the 'Nouvelles Annales du Muséum d'Hist. Nat.,' vol. iv., are highly interesting, and there is an admirable synopsis of the whole subject from the pen of Mr. Broderip in the 'Penny Cyclopædia,' article *Dodo*.

The bird described by Leguat (Voyage to the East Indies, 1708,) as inhabiting the island of Rodriguez so recently as 1691, and termed by him *Le*

Solitaire, appears evidently to have been another lost species of terrestrial bird distinct from the Dodo, and more allied in its characters to existing species of *Struthionidæ*. It is therefore probable that the supposed bones of the Dodo, described by Cuvier as found beneath a bed of lava in the Mauritius, but which M. Quoy states to have been in fact brought from Rodriguez, as well as the bones from the latter island presented by Mr. Telfair to the Zoological Society (Proc. Zool. Soc., part i. p. 31), but which have been unfortunately mislaid, belonged, not to the Dodo, as Cuvier supposed, but to the *Solitaire*. On this supposition we can the better account for a fact which threw doubt at the time upon Cuvier's identification of the bones at Paris, namely, that the sternum in this collection presented a mesial ridge, indicating strong pectoral muscles. Now Leguat tells us that the *Solitaire*, though unable to fly, had its wings enlarged at the end into a knob, with which it attacked its enemies, a structure which would require large pectoral muscles and a sternal crest. These bones and others, said to be from the Mauritius, in the Andersonian Museum at Glasgow and at Copenhagen, require further investigation, and every additional fragment that can be recovered from the caverns or alluvial beds of Mauritius, Rodriguez, or Bourbon, ought to be most carefully preserved.

The island of Bourbon appears to have been inhabited at a recent date by two species of birds allied to, but distinct from, the Dodo of Mauritius and the *Solitaire* of Rodriguez. I lately found in a MS. journal given by the late Mr. Telfair to the Zoological Society, an exact and circumstantial account of two species of Struthious birds which inhabited Bourbon in 1670 (Zool. Proceedings, April 23, 1844, Ann. Nat. Hist., and Phil. Mag., Nov. 1844). It appears then that this small oceanic group of islands possessed several distinct species of this anomalous family, the whole of which were exterminated soon after the islands became tenanted by man.

Evidence of the recent existence and probable extinction of another Struthious bird has very lately come to light in New Zealand, where its bones are occasionally met with in the alluvium of rivers. The first portion that was brought to this country was a very imperfect fragment of a femur, which Professor Owen did not hesitate to assign to an extinct gigantic bird allied to the Emeu (Trans. of Zool. Soc., vol. iii. p. 29). This bold conclusion, which from the imperfection of the data seemed prophetic rather than inductive, was speedily confirmed by the arrival of fresh consignments of bones, and we are now in possession of a considerable portion of the skeleton of this ornithic monster, which has been appropriately named by Professor Owen *Dinornis*. That skilful anatomist has even been enabled, from the materials already received, to point out no less than *five* species of this genus, differing in stature and the proportions of their parts (Proc. Zool. Soc., Oct. 1843). These birds, *if extinct*, must have become so in very recent times, and probably through human agency; but it is as yet by no means certain that they do not still inhabit the unexplored interior of the middle island of the New Zealand group. See notices by Rev. W. Cotton in 'Zool. Proc.,' 1843, and by the Rev. W. Colenso in the 'Tasmanian Journal,' reprinted in the 'Annals of Nat. Hist.,' vol. xiv.

Another very interesting bird of the same region, the *Apteryx*, is now threatened with the fate which has befallen the Dodo and (as presumed) the *Dinornis*. Civilized man has already upset the balance of animal life in New Zealand. It is stated by Dieffenbach that *Cats*, originally introduced by the colonists, have multiplied greatly in the woods and are rapidly reducing the numbers of the *Apteryx*, as well as of other birds, so that unless some Antipodean Waterton will disinterestedly enclose a park for their preservation,

these extraordinary productions of the Creator's hand will soon perish from the face of the earth.

8. *Ornithological Museums.*

The conservation of specimens for the purpose of reference is no less essential to the progress of zoology than the description of species in books, and in the case of ornithology there certainly is no scarcity of collections, both public and private, of illustrative specimens. Unfortunately, indeed, *classification*, which is no less important, though far less easy, than *accumulation*, is too often wanting or imperfect in such repositories, and their scientific utility is thus very greatly diminished. I may congratulate the zoological world, however, that this is no longer the condition of our great national collection, the British Museum. Without adverting to the immense improvements introduced in the last few years into all its other departments, I need only remark that the ornithological gallery, from the beauty of its arrangements and the extent of its collections, rivals, if not exceeds, the first museums of the continent. The scientific classification of the specimens is making great progress, under the able superintendence of the two Messrs. Gray, and ornithologists will soon possess in this collection a standard model which may be applied with advantage to other museums. This latter object will be greatly aided by the recent publication of catalogues, scientifically arranged by Mr. Gray, of all the species contained in the museum.

These catalogues, which are brought out in an accessible form, are calculated to be of great service to science. The classification and the scientific nomenclature are based on sound principles, and are corrected by the latest observations of zoologists, and every specimen is separately enumerated, with its locality and the name of its donor, which is especially important in a collection containing the *type-specimens*, from which original descriptions have been made. The zoological catalogues of the British Museum will now become standard works of reference, exhibiting both the riches and the desiderata of our national collection, and setting an example which we may hope to see followed by the great public museums abroad. The catalogue of the Mammalia was published last year; of the Birds, the *Accipitres*, *Gallinæ*, *Grallæ* and *Anseres* are already issued, and the other portions will speedily follow. Dr. Hartlaub has been the first to profit by this spirited example, and has published an excellent catalogue of birds in the Bremen Museum.

Another collection, of almost equal value, is that of the Zoological Society, now in progress of arrangement in a new building at the Society's Gardens. Among private cabinets I may mention Mr. Gould's Australian collection as one which possesses a peculiar scientific value. It consists of selected specimens of the entire ornithology of Australia, the sexes, dates and localities of each being indicated, and as these specimens form the standard authorities for the accuracy of Mr. Gould's figures and descriptions, we may hope that this unique collection may be preserved for reference in some permanent repository. But I must abstain from further details, as it would be impossible to give anything like a fair report on the individual merits of the numerous ornithological museums now extant without a far more extended personal inspection of them than I have had opportunity to make. It may however assist the student to be furnished with a list of all the more important collections of birds which have come to my knowledge (though many others doubtless exist); and I shall venture on no other criticism of them than merely to distinguish those general collections which are of first-rate importance by CAPITALS, and those which are confined to British ornithology by *Italics*.

ENGLAND :—Public Museums.—London (1. British Museum ; 2. Zoological Society ; 3. East India Company ; 4. Linnæan Society ; 5. United Service Institution ; 6. College of Surgeons ; 7. London Missionary Society) ; Newcastle-on-Tyne ; Carlisle ; Kendal ; Durham ; Scarborough ; Leeds ; York ; Lancaster ; Manchester ; Liverpool (Royal Institution) ; Nottingham ; Derby ; Chester ; Shrewsbury ; Ludlow ; Hereford ; Burton-on-Trent ; Birmingham (School of Medicine) ; Warwick ; Cambridge ; Norwich ; Bury St. Edmunds ; Saffron Walden ; Oxford ; Worcester ; Cheltenham ; Bristol ; Plymouth ; Bridport ; Gosport (Haslar Hospital) ; Chichester ; Rochester ; Chatham (Fort Pitt) ; Canterbury ; Margate.

Private Museums.—Earl of Derby, Knowsley ; Lord Say and Sele, Erith ; Earl of Malmesbury, Christchurch, Hants ; Messrs. Hancock and Dr. Charlton, Newcastle ; P. J. Selby, Twizell ; *Dr. Heysham*, Carlisle ; — Crossthwaite, Keswick ; J. R. Wallace, Distington, Cumberland ; — Newell, Littleborough, Lancashire ; A. Strickland, Bridlington Quay ; *J. Hall*, Scarborough ; C. Waterton, Walton Hall ; *W. H. R. Read*, York ; *G. S. Foljambe*, Osberton ; *Rev. A. Padley*, Nottingham ; H. Sandbach, Liverpool ; *Rev. T. Gisborne*, Yoxall, Staffordshire ; T. C. Eyton, Donnerville, Shropshire ; *J. Walcot*, Worcester ; H. E. Strickland, Oxford ; *Rev. Dr. Thackeray*, Cambridge ; J. H. Gurney, Earlham Hill, Norfolk ; R. Hammond, Swaffham ; Rev. G. Steward, Caistor ; *E. Lombe*, Melton Hall, Norfolk ; Rev. C. Penrice, Plumstead ; *J. R. Wheeler*, Wokingham ; — Dunning, Maidstone ; *C. Tomkins*, M.D., Abingdon ; W. V. Guise, Rendcomb ; T. B. L. Baker, Hardwicke, Gloucester ; *Rev. A. Mathew*, Kilve, Somerset ; Dr. Roberts, Bridport ; Dr. E. Moore, Plymouth ; J. H. Rodd, Trebartha, Cornwall ; H. Doubleday, Epping ; *W. Yarrell*, J. Gould, J. Leadbeater, and G. Loddiges, London.

WALES :—Private.—L. L. Dillwyn, Swansea.

SCOTLAND :—Public.—Edinburgh ; Glasgow (1. Hunterian Museum ; 2. Andersonian Museum ; 3. King's College) ; Aberdeen ; St. Andrew's ; Kelso ; Dumfries.

Private.—Sir W. Jardine, Jardine Hall ; Capt. H. M. Drummond, Megginch Castle, Errol ; *E. Sinclair*, Wick ; Duke of Roxburgh, Fleurs ; Dr. Parnell, Edinburgh.

IRELAND :—Public.—Dublin (1. Royal Dublin Society ; 2. Natural History Society ; 3. *Ordnance Collection* ; 4. Trinity College) ; Belfast Museum.

Private.—*Dr. Farran* and *T. W. Warren*, Dublin ; *Dr. Burkitt*, Waterford ; *Dr. Harvey*, Cork ; *J. V. Stewart*, Rockhill, Donegal ; *R. Davis*, Clonmel ; *Rev. T. Knox*, Toomavara ; *W. Thompson*, Belfast.

FRANCE :—Public.—Paris ; Strasburg ; Bordeaux ; Clermont ; Lyons ; Boulogne ; Caen ; Rouen ; Metz ; Epinal ; Marseilles ; Avignon ; Arles ; Nismes ; Montpellier.

Private.—Prince Massena, Paris ; MM. Baillon and De Lamotte, Abbeville ; Lesson, Rochefort ; Allard, Montbrisson ; Baron de Lafresnaye, Falaise ; Fleuret, Bifferi, Boursier, and Jourdan, Lyons ; Crespon, Nismes ; Degland, Lille ; Bequillet, Toulouse.

BELGIUM :—Public.—Brussels ; Ghent ; Louvain ; Liège ; Cologne (Jesuits' College) ; Tournay.

Private.—M. Kets, Antwerp ; L. F. Paret, Ostend ; M. Dubus, Brussels.

HOLLAND :—Public.—Leyden ; Haarlem.

DENMARK :—Public.—Copenhagen.

NORWAY :—Public.—Christiania ; Bergen ; Drontheim.

Private.—Prof. Esmark, Christiania.

SWEDEN :—Public.—Stockholm ; Lund ; Upsal ; Gottenburg.

Private.—Mr. R. Dann, Sioloholm, Gottenburg.

RUSSIA :—Public.—St. Petersburg ; Moscow ; Casan ; Odessa.

PRUSSIA :—Public.—Berlin.

AUSTRIA :—Public.—Vienna ; Trieste ; Laibach.

WESTERN GERMANY :—Public.—Bonn ; Mannheim ; Mayence ; Frankfort-on-Main ; Darmstadt ; Heidelberg ; Karlsruhe ; Freiburg ; Munich ; Stuttgart ; Dresden ; Göttingen ; Greifswald ; Bremen.

Private.—Prince Maximilian, Neuwied ; C. L. Brehm ; J. A. Naumann, Dessau ; Dr. Hartlaub, Bremen.

SWITZERLAND :—Public.—Basle ; Neufchatel ; Berne ; Soleure ; Geneva ; Fribourg (Jesuits' College) ; Sion (Jesuits' College).

ITALY :—Public.—Turin ; Pavia; Parma; Bologna; Florence ; Rome (Academia della Sapienza) ; Genoa; Nice; Pisa; Naples.
Private.—Prince of Canino, Rome; Prince Aldobrandini, Frascati; Marchese Costa, Chambery; Marchese Breme, Turin; Signor Passerini, Florence; C. Durazzo, Genoa; Count Contarini, Venice; Contessa Borgia, Velletri; Signor Antenori, Perugia; Signor Costa, Naples.
SPAIN :—Public.—Madrid; Gibraltar.
IONIAN ISLANDS :—Public.—Corfu.
GREECE :—Public.—Athens.
MALTA :—Private.—Signor Schembri.
NORTH AMERICA :—Public.—Montreal; Cambridge; Salem; Philadelphia (1. Academy of Sciences; 2. Peale's Museum) ; Charleston; New York; Mexico.
Private.—Signor Constancia, Guatemala.
AFRICA :—Public.—Cape Town.
INDIA :—Public.—Calcutta.
Private.—T. C. Jerdon, Nellore.
AUSTRALIA :—Public.—Sydney; Hobart Town.

In connexion with Museums, the subject of Taxidermy may be briefly noticed. Although in acquiring the somewhat difficult art of preparing the skins of birds for collections, practice is far more important than precept, yet useful hints may often be obtained from the treatises which have been published on the subject. Among the best of these may be mentioned Mrs. Lee's 'Taxidermy,' Swainson's 'Taxidermy' in 'Lardner's Cyclopædia,' Waterton's 'Wanderings,' and his 'Essays in Natural History,' Boitard's 'Manuel du Naturaliste Préparateur,' Brehm's 'Kunst Vögel als Balge zubereiten,' &c., Weimar, and Kaup's 'Classification der Säugthiere und Vögel,' Darmstadt, 1844.

Ornithological Libraries.—It is needless to enumerate all the scientific libraries in which the subject of ornithology is adequately represented, especially as the museums above-mentioned are in most cases accompanied with appropriate collections of books. Of libraries unconnected with museums I may notice, as especially useful to the ornithological student, the Radcliffe at Oxford, the Royal Societies of London and of Edinburgh, and the fine collection of zoological works formed by Mr. Grut of Edinburgh, to whom I am indebted for access to several rare works.

9. *Desiderata of Ornithology.*

Having now given an account of the recent progress and present state of Ornithology, I will conclude with pointing out the *desiderata* of the science, showing the deficiencies which require to be supplied in order to refine the crude mass of knowledge already extracted from the mine, and to make further researches into the storehouses of Nature.

1. There is a great want of increased precision and uniformity in the value of the genera, and of the superior groups which various authors have introduced into ornithology. All groups of the same rank are supposed in theory to possess characters of the same value or amount of importance, and the object of the naturalist should be to bring them as nearly as possible to this state of equality. It must indeed be admitted, that no certain test seems to have been yet discovered for weighing the value of zoological characters. The importance of the same character manifestly varies in different departments of nature, and must therefore be estimated by moral rather than by demonstrative evidence. The real test of the value of a structural character ought to be its influence on the economy of the living animal, but here we too often have to lament our ignorance or our false inductions, and in many cases we are wholly unable to detect the relations between structure and

function. More definite principles of classification may hereafter be discovered, and meantime all that we can do is to arrange our systems according to sound reason and without theoretical prepossession. By care and judgement much may be done to give greater regularity and exactness to our methods of classification, either by introducing new groups where the importance of certain characters requires it, or by rejecting such as have been proposed by others on insufficient grounds. At the present day many authors are in the habit of founding what they term "*new genera*" upon the most trifling characters, and thus drowning knowledge beneath a deluge of names. As this is a point of great importance to the welfare of zoology in general, I may be excused for dwelling on it for a few moments.

In the subdividing of larger groups into genera, even in the strictest conformity with the natural method, there is evidently no other rule but *convenience* to determine how far this process shall be carried. However closely the species of a group may be allied, yet as long as any one or more of them possess a character which is wanting to the remainder, it will always be in the power of any person to partition off such species and to give them a generic name. Take the very natural group *Parus* for instance, as restricted by most modern authors (i. e. *Parus* of Linnæus, deducting *Ægithalus* and *Panurus*). First we may separate the *long-tailed* species, and follow Leach in calling it generically *Mecistura*. Of the remaining *Pari*, we may make a genus of the *crested* species (*P. cristatus*), then another of the *blue* species with short beaks (*P. cæruleus*, &c.), a third of *the black and yellow* group (*P. major*, &c.), and a fourth of the *gray* species (*P. palustris*, &c.). [N.B. Generic names have actually been given to these groups by Kaup in his 'Skizzirte Entwickelungsgeschichte der Europaïschen Thierwelt.'] But another author may go still further, and may again subdivide the groups above enumerated, a process which would lead to the absurd result of making as many genera as there are species, or in other words, of giving to each species *two specific* names and *no generic* one. Therefore genera should not be subdivided further than is *practically convenient* for the purpose of fixing really important characters in the memory; and seeing that there are already more than 1000 genera provided for the 5000 species of birds (which are probably all that can be said to be *accurately* known) it seems evidently inexpedient to increase the number of genera, except in the comparatively rare cases where new forms are discovered, or really important and peculiar structures have been overlooked.

The precise rank in the scale of successive generalizations which shall be occupied by those groups which we term *genera* is then a matter of *convenience*, and consequently of *opinion*. Nature affords us no other test of the just limits of a genus (or indeed of any other group), than the estimate of its value which a competent and judicious naturalist may form. The boundaries of genera will therefore always be liable in some degree to fluctuate, but this is unavoidable, and it is a less evil than to give an unlimited license to the subdivision of groups and the manufacture of names. The only remedy for this excessive multiplication of genera, is for subsequent authors who think such genera too trivial, not to adopt them, but to retain the old genus in which they were formerly included*.

* It is usual where this is done to retain the groups, which are thus deprived of a *generic* rank, under the title of *subgenera*. There appear to me however to be great objections to the adoption of *subgeneric names* in zoology. First, it would introduce into a science already overloaded by the weight of its terminology, an additional set of names whose rank is not (like that of families, subfamilies and genera) indicated by the *form* of the word, but which are undistinguishable to the eye from real generic names, and would therefore be perpetually confounded with them. Secondly, subgenera would greatly interfere with the harmonious working

We may obtain a great amount of fixity, in the position at least, if not in the extent of our groups, by invariably selecting a *type*, to be permanently referred to as a standard of comparison. Every family, for instance, should have its *type-subfamily*, every subfamily its *type-genus*, and every genus its *type-species*. But it must not be supposed, with some theorists, that these types really exist as such in nature; they are merely examples or illustrations selected for convenience to serve as permanent fixed points in our groups, whatever be the extent which we may give to their boundaries. By adhering to this notion of types we may often indicate these groups with greater precision than it is possible to do by means of definition alone.

2. Another desideratum in ornithology is to discover some sure mode of distinguishing *real species* from *local varieties*. The naturalists of one school are disposed to attribute nearly all specific distinction to the accidental influence of external agents, while others regard the most trivial characters which the eye can detect as indicating real and permanent species. Between these two extremes, the judicious and practised naturalist has seldom much difficulty in keeping a middle course, and perhaps in ornithology the cases of ambiguity are less frequent than in many other departments of nature; still the student will be sometimes at a loss to distinguish between those characters which were impressed on a species at its creation, and those which may be reasonably attributed to external agents, and we must look for further research to solve these difficulties.

3. We are greatly in want of more information as to the habits, anatomy, oology, and geographical distribution of the majority of exotic species. With no other data than are furnished by dried skins, we are too often compelled to guess at, rather than to demonstrate, the true affinities of species. However essential may be the arrangement of specimens in museums, they supply only a portion of the requisite evidence, and a vast and fascinating field of research awaits the naturalist who shall devote himself to *observing*, as well as *collecting*, the ornithology of foreign regions*. The anatomy of many genera and even families of birds is wholly unknown, and it would be well if some student would devote himself especially to this department, and endeavour to make a *classification of birds by their anatomical characters alone*. If such a system were found to coincide with the arrangements which have been based on external characters, the strongest proof would be furnished of its reality and truth.

4. There yet remain many extensive regions of the world, of whose ornithology we know little or nothing. Great as have been the zoological collections made of late years by individuals and governments, there is still much virgin soil for the naturalist to cultivate. The birds of the vast Chinese empire are only known by the rude paintings of the natives, though

of the "binomial method," that mainspring of modern systematic nomenclature; for one author would habitually indicate species by their *generic* and another by their *subgeneric* names, and the same word would be sometimes used in a *generic*, sometimes in a *subgeneric* sense, so that instead of a uniformity of language being adopted by zoologists, nothing but a vague and capricious uncertainty would result. If it were possible to establish a uniform system of *trinomial* nomenclature, so as always to indicate every species by its generic and subgeneric as well as by its specific name, the use of subgenera might indeed be tolerated, but such a method would be far too cumbrous and oppressive for practice, and I must therefore enter my humble protest against subgeneric names altogether. Not that I object to the subdividing large genera for convenience of reference into *defined* though *anonymous* groups; but let not these groups be designated by proper names, unless their characters be sufficiently prominent to warrant *generic* distinction.

* Collectors would double the value of their specimens if they would invariably attach to them a small label, stating at least the sex, date, and locality, and adding any other observations which they may be able to make.

nothing would be easier than to instruct those ingenious people in the art of collecting specimens. We obtain, too often indeed in a mutilated state, the gaudy *Paradisiidæ* of New Guinea, but the less attractive birds of that country, as well as of the whole Polynesian archipelago, are almost unknown. From Madagascar a few remarkable species have been occasionally sent to Europe, but the peculiarly insulated fauna of that island, partaking neither of an African nor an Asiatic character, is still very imperfectly explored. Even our own colonies of the West Indies and Honduras have been regarded only with a commercial, and not with a scientific eye, and their ornithology affords to this day—with shame be it spoken—an almost untrodden field of inquiry. Morocco, Eastern Africa, Arabia, Persia, Ceylon, the Azores, and the rocks and billows of the southern ocean, present ample materials for the future researches of the ornithologist, and will doubtless furnish many new generic and specific forms.

5. Besides the collecting of new species, the correct determination of those already described is no less important. The names and characters of species are scattered through such an infinity of works, and are often so vaguely defined, that the apparent number of known species far exceeds the real one, and much critical labour is required to reduce the nominal species to their actual limits. Having myself devoted much time to this department of ornithology, I have found that the number of synonyms is nearly threefold that of the species to which they refer, and it is important that the further growth of this evil should be checked by the publication of exact lists of species and their synonyms.

6. This vast multiplication of nominal species mainly results from the great number of scientific periodical works now issuing in all parts of the civilized world, and which it is almost impossible for any one person to consult. This is an unavoidable consequence of the great diffusion of knowledge at the present day, but the inconvenience which results from it might be much diminished if some method were adopted of centralizing the mass of scientific information which is daily poured forth. It is much to be wished that some publication like the excellent but extinct 'Bulletin des Sciences' were again established, containing abstracts of all the important matter in other scientific works; or if this were found too great an undertaking, a periodical which should merely announce the titles of the articles contained in all other scientific Journals and Transactions as they are published, would be a most useful indicator to the working naturalist. Perhaps the nearest approach towards supplying this desideratum at present, is made by the French scientific newspaper 'L'Institut,' and in Germany by Oken's 'Isis,' and Wiegmann's 'Archiv.' We shall shortly too possess an alphabetical index to all works and memoirs on zoology, through the praiseworthy efforts of Prof. Agassiz, whose gigantic undertaking, the 'Bibliographia Zoologica,' is now ready for the press.

7. The science of ornithology would be much advanced if a greater number of persons would devote themselves to the *general subject*. The majority of those who now study it, or form collections, confine themselves to the birds of their own country, under an impression that general ornithology is too wide a field for them to enter upon. They often are not aware at how small an expenditure of money or space a very large general collection may be formed. By adopting the plan first recommended by Mr. Swainson, of keeping the skins of birds in drawers, instead of mounting them in glazed cabinets, the collector may arrange many thousand specimens in a room of ordinary size, and have them at all times ready for reference and study. Or if the ornithologist considers a general collection too cumbrous, he may devote himself to the study and arrangement of particular groups, and supply

the science with valuable monographs. Such a course would be of far greater service to zoology, as well as more interesting to the student, than if he were to confine himself to the almost exhausted subject of European or British ornithology.

8. The last point which I shall notice is the prevailing want of scientific arrangement in our ornithological museums, both public and private. I have seen few collections in this country in which anything more is attempted than a general *sorting* of the specimens into their orders and families, and fewer still in which the generic and specific distinctions are indicated by systematic arrangement and uniformity of labelling. It is needless to remark how essential classification is to the scientific utility of a museum, but some excuse for the general want of it may be found in the scarcity of suitable works to serve as guides in arrangement. Now, however, by following the code of zoological nomenclature adopted by this Association (Report for 1842), and by taking as models the excellent 'Catalogues of the British Museum,' and Mr. G. R. Gray's 'Genera of Birds,' the scientific curators of museums can be no longer at a loss, and we may hope soon to see a great reform effected in the arrangement of our ornithological collections.

In concluding this sketch of the progress and prospects of Ornithology, I must apologize for many imperfections and omissions which are unavoidable in treating of so extensive a subject. A person with more time at command and more favourably circumstanced for consulting authorities, would doubtless have rendered this Report more complete, but I trust that it may be of some use in guiding the student to the sources of his information, and in pointing out the best methods of advancing this fascinating department of scientific zoology.

Report of Committee appointed to conduct Observations on Subterranean Temperature in Ireland. By Thomas Oldham, *Esq.*

In pursuance of this object thermometers were placed, in August 1843, in the deepest part of the Knockmahon Copper Mines in the County of Waterford; one being sunk three feet into the rock, and another into the lode at a depth of 774 feet from the surface. A thermometer of ordinary construction was hung in the gallery or level where these were placed, and another fixed four feet from the level of the ground at surface in shade, all protected from radiation, &c. By the zealous assistance of Mr. J. Petherick, the agent of the Mining Company of Ireland, arrangements were made that all these should be regularly read by the underground captains. It was intended to have completed an entire year's observations, but the necessity for extending the working of the mine in that part obliged the instruments to be removed in July 1844.

The readings are given in full in the tables, the necessary corrections having been made to reduce them all to the same standard.

These mines are in lat. 52° 8′ north, and the mean annual temperature at the surface calculated by the usual formula would, therefore, be 50°·026.

The general average of the thermometers at the depth of 774 feet, and the maxima and minima, were as follows:—

	Average.	Maximum.	Minimum.
	°	°	°
In air.....	57·176	58·5	56·25
In rock or country ..	57·369	58·5	56·25
In lode	57·915	58·5	57·25